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Net Impact Study on Annual Earnings for the Training Benefits Program 2002 through 2012

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Executive summary

Background

The purpose of this study is to analyze the net impact and cost-benefit of the Unemployment Insurance Training Benefits (TB) Program on the employment, earnings and unemployment benefits receipt of TB Program participants. The intent of the TB Program is to provide participants with the knowledge, skills and abilities to enhance their long-term earnings potential in high-demand occupations. People who are eligible for participation in the TB Program, as stated in RCW 50.04.075, include dislocated workers, U.S. military veterans, Washington National Guard members, mentally or physically disabled people and low income individuals. Overall, there have been 21,033 TB participants from 2002 through 2012.

Our findings indicate that participation in the TB Program had a positive effect on participant earnings and percent of time employed. Analysis of the TB Program also showed an overall decrease in unemployment benefits paid out to participants. However, the results suggest that there is a difference in earning and percent of time employed for participants who entered the program before, during and after the Great Recession.

Study design and methodology

Beginning with the 2002 TB Program cohort, there are 11 annual cohorts of TB participants that were analyzed through 2012. The study time period spanned the recession and recovery in 2001 through 2002, the Great Recession and the subsequent gradual recovery through 2012.

In order to calculate the net impact of the TB Program, a comparison group was created using propensity score matching to identify UI claimants who were statistically similar to TB participants. Next, multivariate statistical models were used to estimate the net effects of the TB Program on three outcomes:

1. Percent of time employed
2. Annual earnings
3. Annual receipt of unemployment benefits

A “black box” definition of training was used for this study so that regardless of the number of credits taken or the type of training received, all participants were coded in the same way.

The primary focus of the cost-benefit analysis was on the costs and benefits to society as a whole. To calculate, we made two assumptions. First, based on the economic volatility of the time span included in our analysis, we chose an interest rate of 4.0 percent to discount our net impact estimates. Second, since the length of training for each TB participant varied, we chose to assume a three-year training time frame based on the average amount of college credits TB participants received, as well as the requirements surrounding the availability of benefits during the period when a large portion of TB participants enrolled in the TB Program.

Key findings

Great Recession and subsequent recovery may contribute to net decrease

The Great Recession and subsequent recovery may be contributing to a net decrease in percent of time employed and in earnings for certain TB participant cohorts. Male participants in the 2007 through 2009 cohorts and female participants in the 2006 through 2009 cohorts continue to experience either a net decrease, or no statistically significant net increase, in percent of time employed after the third follow-on year.

TB Program most effective when employees returned to employer of record

TB participants who returned to their employer of record within two years comprise 18.3 percent of all participants approved for training from 2002 through 2012. TB participants who returned to their employer of record within two years after exiting training gained much higher returns on their job training and education compared to those TB participants who did not return.

TB Program has varying effects on percent of time employed

TB Program participants generally experienced a net decrease in the percent of time ever employed during the first three follow-on years. However, the results also suggest training has led to an increase in the percent of time ever employed beginning in follow-on year 5 for all TB participants included in the analysis.

The net impact on annual percent of time ever employed became positive in follow-on year 5 at 2.7 percent and increased to 8.65 percent by follow-on year 11. Male participants gained positive employment in follow-on year 4 and females in follow-on year 5. Additionally, males had consistently higher employment than females from follow-on year 5 through follow-on year 11.

However, male participants in the 2007 through 2012 cohorts and female participants in the 2006 through 2012 cohorts did not show any statistically significant increase in the percent of time employed during any follow-on year for which we have data. This difference in the results is possibly due in part to labor market conditions. The Great Recession began driving down employment in Washington state in February 2008, and only reached pre-recession levels in the fall of 2013.

TB participants show initial decrease then increase in earnings

TB participants experienced a decrease in earnings from follow-on year 1 through follow-on year 6. From follow-on year 7 through follow-on year 11, the full sample of participants generally experienced an increase in earnings. TB participants in the 2002 cohort experienced an increase in earnings from follow-on year 5 through follow-on year 11, while participants in the 2003 cohort experienced an increase in earnings from follow-on year 4 through follow-on year 10.

There were some differences between male and female participants. For example, male participants in the 2005 cohort experienced an increase in earnings from follow-on year 7 through follow-on year 8, while female participants in the 2005 cohort experienced an increase in earnings from follow-on year 5 through follow-on year 8.

However, both male and female participants in the 2004 and 2006 through 2012 cohorts did not experience a statistically significant net gain in earnings during any follow-on year for which we have data. As mentioned in the previous finding, it is possible that the difference in results is due in part to poor labor market conditions—specifically, the Great Recession and relatively slow post-recession recovery.

TB Program reduced dependence on Unemployment Insurance Program

Net unemployment benefits paid out to the total sample of TB participants were $5,944 in follow-on year 1, $4,964 in follow-on year 2 and $733 in follow-on year 3. During these first three follow-on years, the total amount benefits paid out were higher for TB participants than for matched non-participants.

Starting with follow-on year 4, net unemployment benefits paid out were lower for TB participants than for matched non-participants through follow-on year 11. The net reductions were $238 in follow-on year 4, $317 in follow-on year 8 and $109 in follow-on year 11. Total net unemployment benefit expenditures due to the TB Program were $9,758 undiscounted over the 11-year follow-on period and $8,869 discounted at 4.0 percent over the period from follow-on year 1 projected through age 64. However, the decrease in unemployment benefits paid out to TB participants in follow-on years 4 through 11 do not offset the increase in benefits paid out to participants in follow-on years 1 through 3.

TB Program social cost-benefit varies by group

Social cost-benefit estimates indicate the TB Program is cost-effective for all male participants and all participants who returned to their employer of record. For male participants, the lifetime social Net Present Value (NPV) is $24,719 at the 4.0 percent discount rate. For all participants who returned to their employer of record, the NPV is $68,160.

However, social cost-benefit estimates also suggest the TB Program is not cost-effective for the full sample of participants, all female participants and all participants who did not return to their employer of record. For the full sample of participants, the NPV is negative $412 and for all female participants, the NPV is negative $15,129. All TB participants who did not return to their employer of record show a negative NPV of $30,742.

Chapter 1: Methods used in the 2015 Training Benefits Program Net Impact Study

Introduction

In this chapter, we explain the methods used to evaluate the net impact of the Training Benefits (TB) Program. Please note that throughout this study we use the terms "net impact" and "net effect" interchangeably. We also use the term "earnings" rather than "wages" to avoid confusion regarding the terms "wages" and "wage rates," which are different concepts that are sometimes used interchangeably.

TB participants analyzed in this study are those who were approved for the TB Program from January 1, 2002, through December 31, 2012. The data we use to estimate the net impact of the TB Program extend from January 1, 1999, through December 31, 2013.

We use a non-experimental research design to evaluate the TB Program and to conduct the cost-benefit analysis. We compare TB participants to matched unemployment insurance (UI) claimants who are statistically similar to participants, but who did not participate in the program. We also group TB participants and matched non-participant UI claimants into calendar year cohorts.

Overview of the Training Benefits Program

In 2000, the Washington State Legislature enacted Substitute House Bill 3077 (SHB 3077), which created the TB Program. The goal of this program is to retrain unemployed individuals who qualify for unemployment benefits, but whose skills are no longer in demand. The TB Program is ultimately designed to provide trainees with knowledge, skills and abilities that enhance their long-term earnings potential in high-demand occupations.

SHB 3077 (2000) authorizes the Washington State Employment Security Department (ESD) to allocate up to $20 million each year from the Unemployment Insurance Trust Fund for the provision of additional unemployment benefits to qualified UI claimants who wish to receive job training. The bill defines a qualified UI claimant as a dislocated worker whose occupation is in decline in her or his local labor market and who needs training for a new occupation. Until June 30, 2002, SHB 3077 (2000) also made additional benefits available to claimants who had exhausted their benefit eligibility and who were employed in the aerospace, forest product and fishing industries during their base year.[1]

In 2009, the Washington State Legislature passed Engrossed Substitute House Bill 1906 (ESHB 1906) which substantially increased the number of individuals who qualify for the TB Program. In addition to dislocated workers, U.S. military veterans, active Washington National Guard members, mentally or physically disabled people, and low income individuals qualify for the TB Program as of April 2009.

[1] For a detailed explanation of TB Program eligibility requirements prior to 2009, see SHB 3077 (2000) Sec. 8. For a detailed definition of a dislocated worker, see RCW 50.04.075.

In 2011, Engrossed House Bill 1091 (EHB 1091) further expanded the number of individuals who qualify for the program by removing the requirement that claimants demonstrate a long-term attachment to the labor force. EHB 1091 (2011) also amended the law, such that TB Program payments are not charged to employers for purposes of calculating their experience-rated UI taxes.[2]

Upon entering the program, TB participants must enroll in training that prepares them for a high-demand occupation in their local workforce development area (WDA). On an annual basis, ESD develops a list that identifies occupations that are "in demand," "balanced" and "not in demand" in each WDA. Local workforce development councils (WDCs) then review, adjust and approve that list according to their knowledge of local labor market conditions.[3]

Under the current law, UI claimants who qualify for the TB Program receive up to 52 weeks of unemployment benefits. These 52 weeks include 26 weeks of regular benefits and an additional 26 weeks of benefits paid out of a portion of the trust fund set aside for the TB Program. Unemployment benefits eligibility reached a peak of 125 weeks for TB participants and 99 weeks for all other UI claimants during the period of federal benefit extensions that lasted from June 2008 through December 2013.[4] During the period of federal extensions, participants had to exhaust both their regular and extended unemployment benefits before they drew Training Benefits.

TB participants do not have to look for work as long as they are enrolled full time and making satisfactory progress in their approved training programs. Direct costs of training—such as tuition, books, tools, supplies and transportation—are not supported by the program.

Until April 5, 2009, all participants could receive Training Benefits for up to two years after the end of their regular UI claim year, which is 12 months from a UI claimant's effective claim date. Participants approved during the period of federal benefit extensions could receive Training Benefits for up to three years after the end of their regular UI claim year.[5]

In some cases, participants included in this study exited training before receiving Training Benefits from the trust fund. Participants who did not draw Training Benefits from the trust fund were likely still receiving federal unemployment benefit extensions when their training ended.

Prior to 2011, all UI claimants had to submit a training plan within 90 days of receiving their TB Program eligibility notice in order to qualify. All claimants were also required to enroll full time in an approved training program within 120 days of receiving their eligibility notice.

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[2] RCW 50.20.043.

[3] As required by RCW 50.22.150 and 50.22.155.

[4] U.S. Department of Labor, Employment and Training Administration (ETA), "Emergency Unemployment Compensation (EUC) Expired on January 1, 2014," www.workforcesecurity.doleta.gov/unemploy/supp_act.asp: accessed July 2, 2015.

[5] See RCW 50.22.010.

EHB 1091 (2011) amended the training plan submission and enrollment deadlines. Claimants who qualify as dislocated workers with an effective date of claim on or after July 1, 2012, must submit a training plan and enroll in an approved training program prior to the end of their claim year. The bill also waives the full-time enrollment requirement for dislocated workers.

Since April 2009, all qualifying claimants can receive a waiver for missing the training plan submission and enrollment deadlines if the Employment Security Commissioner (ESC) determines they have good cause for doing so. Similarly, the ESC can waive the full-time enrollment requirement for those who have a physical, mental or emotional disability.

Comparing the 2012 and 2015 Training Benefits Program net impact studies

The Labor Market and Economic Analysis (LMEA) branch of ESD published a net impact report for the TB Program in 2012.[6] The 2015 report differs from the 2012 report in the following ways: 1) statutory definition of the TB Program population; 2) time period covered; and 3) study design.

Differences in TB Program population definition

The 2012 net impact report analyzes the 2002 through 2008 TB Program cohorts. The 2015 report evaluates the 2002 through 2012 TB Program cohorts. The eligibility requirements for the TB Program changed substantially for participants approved after April 5, 2009. Consequently, there are important differences between the TB Program populations analyzed in the 2012 report and the populations analyzed in the 2015 report.

The 2012 report exclusively analyzes workers who meet the eligibility criteria defined in SHB 3077 (2000). To meet these requirements, TB participants and matched non-participants must have at least two years of employment in the same occupation during the four-year period prior to their base year. This is called the sufficient tenure requirement. In addition, SHB 3077 (2000) made additional benefits available until June 30, 2002, to claimants who exhausted their unemployment benefit eligibility and had sufficient tenure in the aerospace, forest product and fishing industries.

In April 2009, the Washington State Legislature eliminated the sufficient tenure requirement. The legislature also expanded eligibility to include U.S. military veterans, active Washington National Guard members, mentally and physically disabled people and low income individuals. These changes in TB Program eligibility opened up the program to a wider range of UI claimants, some of whom are chronically disadvantaged workers.[7] Thus, training may affect participants approved after April 2009 differently than it affects those approved before April 2009.

[6] Paterson, Toby, Ernst Stromsdorfer and Jeff Zahir, *Net-Impact Analysis on Before-Tax Annual Earnings for the Training Benefits Program, 2002 through 2008*, Washington State Employment Security Department/LMEA (February 2012).

[7] Compare eligibility requirements in Substitute House Bill 3077 (2000) with Engrossed Substitute House Bill 1906 (2009) and Engrossed House Bill 1091 (2011).

All TB participants approved prior to April 2009 could receive Training Benefits for up to two years after the end of their regular UI claim year. Those approved after April 2009 could receive Training Benefits for up to three years after the end of their regular UI claim year.

Changes in the amount of time participants can claim Training Benefits can lead to changes in their training and job search behavior. For example, participants approved after April 2009 can wait longer to finish training and start their initial job search. As a result, it may also take those in the 2009 through 2012 cohorts longer to experience net gains from training.

Differences in time period covered

In both the 2012 report and in this report, we specify a separate model for each successive 4-quarter period after the unemployment benefits payment date we use to define cohort membership. We refer to these 4-quarter periods as follow-on years.

However, the 2012 net impact report includes follow-on data from 2002 through 2009, while this report includes follow-on data from 2002 through 2013. The follow-on data in this report coincides with the entire Great Recession and most of the subsequent recovery period, which lasted from December 2007 into calendar year 2014. The Great Recession did not hit Washington state until the third quarter of 2008. As a result, the 2012 report only includes data for one follow-on year (2009) that coincides with the Great Recession in Washington state.

Both TB participants and matched non-participants in our samples faced difficult labor market conditions during the Great Recession and the subsequent recovery period. However, it is possible that the Great Recession affected TB participants differently than it affected matched non-participants in our samples.

There are many possible reasons the Great Recession may have affected TB participants and non-participants differently, one of which is that participants may be changing occupations at higher rates than non-participants. Changing occupations often involves competing with more experienced candidates, or accepting entry-level and part-time positions. During an economic downturn, finding a job while making an occupational transition may be more difficult than finding a job in an occupation for which one already has sufficient qualifications and experience. Thus, it is also possible that TB participants who exited training during the Great Recession and the subsequent recovery period will take longer to experience net gains in employment and earnings when compared to non-participants.

In addition, the number of follow-on years for which we have data differs in the 2012 and 2015 reports. For example, follow-on year 7 is the last year for which we have data on the 2002 cohort in the 2012 report. In this report, follow-on year 11 is the last year for which we have data on the 2002 cohort. We have one less year of follow-on data for each successive cohort in both reports.

Differences in research design

We also modified the research design for the 2015 report. In particular, we changed the definition of the earnings outcome variable, added two new outcomes to the net impact analysis and changed the criteria we used to select our samples.

The 2012 report defined the earnings outcome as a quarterly average for each follow-on year. The 2015 report defines the outcome as the sum of earnings for each follow-on year. In addition, we used the 2010 Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) to adjust earnings for inflation in the 2012 report. In this report we use the 2012 CPI-W, which is nearly 6 percent higher than the 2010 CPI-W. For these reasons, the net impact estimates presented in the 2015 report are larger than those presented in the 2012 report.

In the 2015 report, we also evaluate the TB Program's effect on two additional outcomes not evaluated in the 2012 report: 1) the percent of time employed in each follow-on year and 2) the level of unemployment benefits received in each follow-on year. We provide a more detailed description of these variables later in this chapter.

In the 2012 report, we eliminated a small number of participants who withdrew from training from our samples. In the 2015 study we do not eliminate those who withdrew from training. Instead, we include all individuals approved for the TB Program. In addition, we include TB participants who receive Graduate Equivalency Degree (GED) credits, English as a Second Language (ESL) credits and Adult Basic Education (ABE) credits in the 2015 report. These individuals are not included in the 2012 report's samples.

Consequently, the 2015 report includes individuals who did not complete their training, or who did not receive occupation-specific training during the time period for which we have follow-on information. This difference in sample composition may change the net impact estimates in the 2015 study, as there are a larger number of participants who may not have received sufficient training to qualify for a new occupation.

Other differences in the samples we use for the 2015 and the 2012 reports are as follows:

- We excluded individuals with more than a master's degree in the 2012 report and include them in the 2015 report;
- We excluded individuals younger than 20 and older than 60 in the 2012 report and include them in the 2015 report; and
- We eliminated all individuals whose employer reported positive quarterly earnings but no hours worked in the 2012 report, but we include them in the 2015 report.

For both the 2012 and 2015 reports, we use propensity score matching to identify UI claimants who are statistically similar to TB participants. However, in the 2015 report we include a larger number of variables in the propensity function than we included in the propensity function for the 2012 report. As a result, we have reduced potential sources of bias in the 2015 report by including more variables that influence TB Program participation and the outcome variables we analyze.[8]

[8] See Stuart, Elizabeth A., "Matching Methods for Causal Inference: A Review and a Look Forward," *Statistical Science* 25, (2010): 5.

Finally, we use one-to-one matching without replacement in the 2015 report, and we used one-to-many matching with replacement in the 2012 report. One-to-one matching without replacement means that for every TB participant, there is a unique, statistically similar non-participant in the sample. One-to-many matching with replacement means that non-participants from the comparison pool are matched to more than one TB participant.

Eligibility requirements prior to April 2009 reduced the number of potential non-participants we could include in the comparison pool samples for the 2012 study. As a result, there were often not enough non-participants in the comparison pool to use one-to-one matching. In fact, we reused up to one-third of the non-participants in the samples for the 2012 study.

Had we not used one-to-many matching with replacement in the 2012 report, we would have needed to remove unmatched TB participants from the sample. Removing participants from the sample would have biased the 2012 net impact estimates to the extent that unmatched participants were systematically different from matched participants.

For the 2015 study, we have a much larger pool of non-participants from which we can select a comparison group, so we are able to use one-to-one matching with replacement. As a result, we have more information to estimate net impacts in the 2015 report than we have in the 2012 report. This is because individuals do not add new information when they are used multiple times in the same sample.

General research design for the 2015 net impact study

We use a non-experimental research design to analyze 11 TB Program cohorts. We specify multivariate statistical models to estimate the net effects of the program on three outcomes. These outcomes are: percent of time employed, annual earnings and annual receipt of unemployment benefits.

We specify a separate model for each successive follow-on year. For example, the first follow-on year is calendar year 2002 for participants who receive their first unemployment benefits payment in the first quarter of 2002. The first follow-on year is the second quarter of 2002 through the first quarter of 2003 for participants who receive their first payment in the second quarter of 2002.

Figure 1-1 provides a graphic depiction of the number of follow-on years for each cohort. We have one less follow-on year of data for each successive study cohort. For example, we have 11 follow-on years of data for the 2002 cohort, 10 years for the 2003 cohort and 9 years for the 2004 cohort. The most recent cohort included in this study is the 2012 cohort, for which we have only one year of follow-on data. We have data for three years prior to the unemployment benefits payment date we use to define cohort membership for all of the cohorts in our sample.

For the purposes of this report, we use a “black box” definition of training. Under this definition of training, all participants are coded the same way, regardless of the number and types of classes they take. For our net impact models, all participants are coded as “one” and non-participants are coded as “zero.”

Figure 1-1. Data collection periods for the 2002 through 2012 cohorts*
Washington state, 1999 through 2013
Source: Employment Security Department/LMPA

Cohort	Participants	Pre-unemployment period			Follow-on period										
2002	2,399	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11
2003	1,616	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
2004	899	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9		
2005	1,106	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8			
2006	1,083	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7				
2007	878	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6					
2008	1,687	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5						
2009	4,020	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4							
2010	2,882	Y-3	Y-2	Y-1	Y1	Y2	Y3								
2011	2,350	Y-3	Y-2	Y-1	Y1	Y2									
2012	2,113	Y-3	Y-2	Y-1	Y1										

*We define cohort membership for TB participants by the quarter of the calendar year in which an individual receives his or her first unemployment benefits payment after being approved for the program. We define cohort membership for non-participants by the quarter of the calendar year in which they receive their first unemployment benefits payment on their most recent UI claim.

There is one less year of follow-on data for each successive cohort in this study.

Data sources

Data in this report come from three databases in ESD's Data Warehouse: the UI benefits database (UIBenefitDB); the covered employee wage database (WageDB); and the UI employer database (EmployerDB).

Note that we use the same data sources to define each variable for both TB participants and matched non-participants in this study. Thus, we eliminate additional sources of statistical bias found in many other training program evaluations.[9]

Using data in the WageDB, we measure quarterly earnings employers report for employees who are covered by the UI system. The earnings employers report include the following:

- Salary, commissions, bonuses and the value of gifts before deductions;
- Compensation paid in lieu of cash;
- Tips that are reported for federal income tax purposes;
- Vacation and holiday pay;
- Unsegregated expense allowances;
- Severance pay or pay in lieu of notice;
- An employee's entire gross pay if he or she shares the cost of a 401(K) or cafeteria plan through salary reduction; and
- Meals and lodging for employees required to eat and live on site, when the total value of meals and lodging is 35 percent or more of their total compensation.

[9] See Heckman, Ichimura and Todd (1997), pages 606 and 622, for example.

Earnings employers report for the purposes of UI taxes do not include:

- Sick leave;
- Allocated tips;
- Jury duty pay not reported for federal tax purposes;
- Death benefits; and
- Employee-exercised stock options.[10]

The earnings employers report also do not include the following non-tax fringe benefits:

- Social Security (FICA);
- Health insurance;
- Workers' compensation;
- Unemployment insurance; and
- Private pension funds other than 401(K) contributions.

Consequently, reported earnings understate the full compensation that workers receive before taxes and deductions.

Hollenbeck and Huang (2006) increase earnings by 20.0 percent to account for non-tax fringe benefits in their analysis of training and education programs in Washington state. The U.S. Department of Labor (DOL) estimates fringe benefits to be 23.3 percent of earnings for the entire United States and 20.4 percent for the West Coast Region. The U.S. Chamber of Commerce estimates the value of fringe benefits to be 24.3 percent of earnings for the Pacific Region. For the cost-benefit analysis in this study, we use the U.S. Bureau of Labor Statistics (BLS) estimate of 20.4 percent for the West Coast Region to adjust reported earnings for fringe benefits.[11]

The remaining 20 variables and dummy sets, such as age, education and gender, previous occupation, the percent of time ever employed in a given year, and total unemployment benefit payments, are extracted or calculated using data from these three databases. For a description of the variables used in our net impact models, see *Appendix 1*.

Study samples by cohort

We define cohort membership for TB participants according to the first unemployment benefits payment an individual receives after being approved for the TB Program. For example, all individuals who receive their first unemployment benefits payment as a TB participant in 2002 are members of the 2002 cohort. Matched non-participants in the sample cohorts are training-eligible UI claimants who receive their first unemployment benefits payment during the same calendar year, but who did not enroll in the TB Program. Thus, any training-eligible UI claimant who did not enroll in training and who received his or her first payment in 2002 is a part of the comparison pool for the 2002 cohort.

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[10] See Washington State Employment Security Department, *Unemployment Insurance Tax Information: A handbook for Washington state employers* (October 2014): 4.

[11] See Hollenbeck, Kevin and Wei-Jang Huang, *Net impact and Benefit-Cost Estimates of the Workforce Development System in Washington State*, Upjohn Institute Technical Report No. 06-020, Kalamazoo, Michigan, W.E. Upjohn Institute for Employment Research (2006): 166; U.S. Department of Labor (USDL), "Employer Costs for Employee Compensation," USDL News Release No. 02-346 (June 19, 2002); available at: www.bls.gov/news.release/History/ecec_06192002.txt, accessed July 22, 2015; The U.S. Chamber of Commerce, *The Employee Benefits Study* (2001): 167.

Figure 1-2 displays the sample size of training participants by cohort. For each cohort there is an equal number of matched non-participants in the study sample. For example, in the 2002 cohort there are 4,798 individuals in the sample, half of which are TB participants and half of which are non-participants. Summed over the 11 cohorts, there are 21,033 TB participants and 21,033 matched non-participants.

Figure 1-2 shows that the portion of female participants varies from a low of 40.1 percent for the 2002 cohort to a high of 58.7 percent for the 2005 cohort. The entire study sample for all cohorts is nearly balanced by gender, with men comprising 50.3 percent and women 49.7 percent of the sample, respectively.

During the study period, TB Program enrollments were countercyclical. For example, the seasonally adjusted state unemployment rate was 7.4 percent in January 2002, a period when the state was still in recovery from the national recession that began in November 2001.[12] There are 2,399 TB participants in the 2002 cohort. Meanwhile, there are only 878 TB participants in the 2007 cohort, and the seasonally adjusted unemployment rate in Washington state had dropped to 4.8 percent by January 2008.[13]

We removed 493 TB participants from the study because they were outliers on the earnings variable, were missing data for key demographic variables or because we did not find a suitable match from the comparison pool of non-participants. The 493 participants we removed comprise 2.3 percent of the 21,426 individuals who enrolled in the TB Program from 2002 through 2012.

TB participants who return to their employer of record

This study separately estimates the net impact of the TB Program for participants who do and who do not return to their employer of record within two years of beginning training. We assume participants who return to their employer of record are less likely to be dislocated workers as defined in EHB 1091 (2011).[14] We also assume workers who return to their employer of record are less likely to make an occupational transition after they exit training.

The distinction between dislocated workers and those who remain attached to an industry or employer is important. Both firm-specific and industry-specific forms of human capital are desirable from the perspective of employers. Dislocated workers may not have the same levels of firm-specific or industry-specific human capital as those who return to their employer of record. As a result, it can be more difficult for dislocated

[12] National Bureau of Economic Research, "U.S. Business Cycle Expansions and Contractions;" available at: www.nber.org/cycles.html, accessed July 22, 2015.

[13] U.S. Bureau of Labor Statistics, "Local Area Unemployment Statistics, Washington State (2005-2015);" available at: http://data.bls.gov/timeseries/LASST530000000000003, accessed July 22, 2015.

[14] The law requires a head count of TB participants who return to their employer, but not a separate net impact analysis for these individuals. See EHB 1091 (2011), Section 15(1)(d). For a definition of dislocated workers, see EHB 1091 (2011), Section 12.

workers to find full-time employment than it is for those with a strong attachment to an industry or firm. If this is true, then training may have a different effect on those who return to their employer of record than it has on those who do not.[15]

Figure 1-2 displays the number and percent of TB participants in each cohort who returned to their employer of record for their first job after entering training and those who returned to their employer of record within two years of entering training. Of the 21,033 individuals approved for the TB Program from 2002 through 2011, 81.7 percent did not return to their employer within two years of entering training. The participants who did return to their employer of record within two years comprise 18.3 percent of all participants approved for training from 2002 through 2012. Those who returned to their employer of record for their first job after entering training comprise 17.1 percent of the total sample of TB participants. Of the total sample of participants, 81.7 percent did not return to their employer of record for their first job after entering training.

Relatively high proportions of TB participants returned to their employer of record in the 2002, 2003 and 2005 cohorts. In 2002, 39.0 percent of participants returned to their employer of record, while 43.4 percent returned to their employer of record in 2003, and 30.2 percent returned to their employer of record in 2005. An average of 22.8 percent of TB participants returned to their employer of record for the 2002 through 2009 cohorts. That average dropped to 9.5 percent for the 2010 through 2012 cohorts.

[15] Corson and Nicolson (1981) argue that workers who return to their former employer are not dislocated, but are effectively on temporary layoff. For a detailed discussion of the differential effects of training on dislocated workers and those who remain attached to an employer, see: Gathmann, Christina and Uta Schoenberg, "How General is Human Capital? A Task-Based Approach," *The Journal of Labor Economics,* Vol. 28, No. 1, 2010; Lazear, Edward PI, "Firm-Specific Human Capital: A Skill-Weights Approach," Hoover Institution and Graduate School of Business, Stanford University, September 2002, Revised August 2004; Neal, Derek, "Industry-Specific Human Capital: Evidence from Displaced Workers," *The Journal of Labor Economics,* Vol. 13, No. 4, 1995; and Corson, Walter and Walter Nicholson, "Trade Adjustment Assistance for Workers: Results of a Survey of Recipients under the Trade Act of 1974" in Ronald G. Ehrenberg, editor, *Research in Labor Economics,* Vol. 4. 1981.

Figure 1-2. TB participants who did and did not return to their employer of record
Washington state, 2002 through 2012
Source: Employment Security Department/LMPA

Group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Sample
All TB participants in the study sample												
Men	1,436	907	373	457	527	405	851	2,091	1,359	1,111	1,067	10,584
Women	963	709	526	649	556	473	836	1,929	1,523	1,239	1,046	10,449
Total	2,399	1,616	899	1,106	1,083	878	1,687	4,020	2,882	2,350	2,113	21,033
TB participants who did not return to their employer of record within two follow-on years of entering training												
Men	846	473	307	321	442	341	731	1,780	1,204	998	968	8,411
Women	617	442	435	451	500	417	754	1,680	1,384	1,127	962	8,769
Total	1,463	915	742	772	942	758	1,485	3,460	2,588	2,125	1,930	17,180
Percent	61.0%	56.6%	82.5%	69.8%	87.0%	86.3%	88.0%	86.1%	89.8%	90.4%	91.3%	81.7%
TB participants who returned to their employer of record within two years of entering training												
Men	590	434	66	136	85	64	120	311	155	113	99	2,173
Women	346	267	91	198	56	56	82	249	139	112	84	1,680
Total	936	701	157	334	141	120	202	560	294	225	183	3,853
Percent	39.0%	43.4%	17.5%	30.2%	13.0%	13.7%	12.0%	13.9%	10.2%	9.6%	8.7%	18.3%
TB participants whose first job after entering training was with their employer of record												
Men	574	403	58	130	81	61	111	277	150	107	67	2,019
Women	335	256	69	186	52	52	81	228	129	105	80	1,573
Total	909	659	127	316	133	113	192	505	279	212	147	3,592
Percent	37.9%	40.8%	14.1%	28.6%	12.3%	12.9%	11.4%	12.6%	9.7%	9.0%	7.0%	17.1%

TB participants in the 2002, 2003 and 2005 cohorts were more likely to return to their employer of record than participants in the remaining cohorts.

Statistical matching: Selecting non-participants from the comparison pool

We use propensity score matching to identify UI claimants who are statistically similar to TB participants for inclusion in our study samples. We refer to matched non-participants as the comparison group throughout this report.

A propensity score is the estimated probability that an individual will participate in a training program, regardless of whether or not that individual actually participated in training. Thus, a training participant will often have the same propensity score as a non-participant in the sample.

To generate the propensity score, we specify a logit regression model, where the dependent variable takes the value "one" for those who participate in the program and the value "zero" for non-participants. This regression model is called a propensity function, and it includes independent variables believed to predict whether or not an individual will enter the training program. A correctly specified propensity function yields estimated participation probabilities that are greater than zero (absolutely certain not to participate) and less than one (absolutely certain to participate).

It is important to include variables in the propensity function that both predict participation in the program and influence the dependent variable in the net impact models. Using variables that influence both participation and the dependent variable in the net impact models reduces selection bias. This is because each participant and his or her matched non-participant are more likely to be similar on most of the observed variables included in the propensity function.[16]

Appendix Figure A1-1 summarizes the variables we include in the propensity function.[17] These variables are:

1. The Ashenfelter dip;
2. Earnings lost in the two quarters prior to the unemployment benefits payment date we use to define cohort membership;
3. Each individual's previous occupation;
4. Previous earnings, for each of the 12 quarters prior to the unemployment benefits payment date we use to define cohort membership;
5. Working to not working transitions between the third and second quarters prior to the unemployment benefits payment date we use to define cohort membership.

All five of these variables potentially influence the probability of finding work or earnings levels after becoming unemployed.

In addition to the variables previously listed, we also include the following variables in the propensity function:

1. The age and squared age of each individual on the date of the unemployment benefits payment we use to define cohort membership;
2. Formal educational level on the date of the unemployment benefits payment we use to define cohort membership;
3. Each individual's WDA on the unemployment benefits payment date we use to define cohort membership;
4. The individual's ethnicity or race;
5. U.S. veteran status;
6. Low income earner status; and
7. Disability status.

Including each individual's age serves as a proxy for on-the-job experience that may influence earnings over time. Including an individual's squared age adjusts this proxy for the fact that a worker's productivity tends to increase, reach a maximum and then decrease over time. Formal education is one of the strongest predictors of a person's earning ability, and is an essential variable in a propensity function designed to reduce bias in an earnings net impact model.

[16] See Stuart, Elizabeth A., "Matching Methods for Causal Inference: A Review and a Look Forward," Statistical Science, Vol. 25, No. 1, pages 3ff. See also *Appendix 1* for the formal proof of this statement.

[17] See also *Appendix 1* for a full definition of the variables we use in this study.

The pre-training WDA variable accounts for local differences in the method of delivering services to potential TB participants. It also serves as a statistical control for labor market conditions in the WDA at the time a participant enters the program. Many studies reveal that including a proxy for local labor market conditions reduces selection bias in net impact estimates of job training programs.

We include the ethnicity/race variable to adjust our estimates for differences in average earnings that are a function of race or ethnicity, rather than a function of training.

The U.S. veteran status, low income earner status and disability status variables adjust our estimates for differences in earnings and employment that are a function of these variables, rather than a function of training.

Prior to matching participants and non-participants on their propensity scores, we separate our participant and non-participant pools by gender and annual cohort. Separating the samples by gender accounts for the fact that men and women have different experiences in the labor market. Separating the sample into annual cohorts reduces bias in our estimates by adjusting for any changes to the regulation and administration of the TB Program. It also adjusts for labor market conditions that might affect an individual's decision to participate in the TB Program in a given year.

Some selection bias remains in our estimates of net program effects, because unmeasured variables that predict participation in the TB Program, or that influence the dependent variable in the net impact models are not accounted for in the matching process. Propensity score matching reduces bias in net impact estimates that are attributable to observed variables. However, it cannot replicate the results of a random assignment experiment.

Outcomes evaluated in the 2015 net impact study

We estimate the net impact of the TB Program on the following outcomes in each follow-on year:

1. The percent of time employed;
2. Earnings; and
3. Unemployment benefits received.

Appendix Figure A1-1 lists the independent variables we include in the net impact models for each of the three outcomes we evaluate in this report.

Annual percent of time employed

We define this outcome as the percentage of quarters during which an individual is employed in each follow-on year. If an individual in our sample earns at least $100 in a given quarter, we consider this individual employed during that quarter.

An individual who does not meet our definition of employment during any of the four quarters in a follow-on year receives a 0.0 on the percent of time employed variable. If an individual meets our definition of employment in one quarter of a follow-on year, his or her percent of time employed is 25.0 percent. If an individual is employed for two

quarters in a follow-on year, his or her percent of time employed is 50.0 percent. If an individual is employed for three quarters in a follow-on year, his or her percent of time employed is 75.0 percent. Finally, an individual employed for all four quarters in a given follow-on year has a percent of time employed of 100.0 percent.

As shown in *Appendix Figure A1-1*, our net impact models for the percent of time employed include the following independent variables:

1. Number of working to not working transitions during the 12 quarters prior to the unemployment benefits payment date we use to define cohort membership;
2. The age and squared age of each individual on the date of the unemployment benefits payment we use to define cohort membership;
3. Formal educational level on the date of the unemployment benefits payment we use to define cohort membership;
4. Previous quarterly earnings for each of the 12 quarters prior to the unemployment benefits payment date we use to define cohort membership;
5. The individual's ethnicity or race;
6. U.S. veteran status;
7. Low income earner status;
8. Disability status;
9. Each individual's WDA on the previous quarterly earnings for each of the 12 quarters prior to the unemployment benefits payment date we use to define cohort membership; and
10. Individual Training Account (ITA) status.

We provide a more detailed discussion of each of these variables, as well as the reasons we include them in the percent of time employed models, in *Appendix 1* of this report.

Annual earnings

We define annual earnings as the sum of earnings for all four quarters in each follow-on year. For example, annual earnings in follow-on year 1 are the sum of quarterly earnings in calendar year 2002 for individuals in our sample who received their first unemployment benefits payment during the first quarter of 2002. For individuals in our sample who received their first unemployment benefits payment in the second quarter of 2002, annual earnings for follow-on year 1 are the sum of earnings from the second quarter of 2002 through the first quarter of 2003.

As shown in *Appendix Figure A1-1*, our net impact models for annual earnings include the following independent variables:

1. The industry classification of each individual's employer of record;
2. The age and squared age of each individual on the date of the unemployment benefits payment we use to define cohort membership;
3. Formal educational level on the date of the unemployment benefits payment we use to define cohort membership;

4. Previous quarterly earnings for each of the 12 quarters prior to the unemployment benefits payment date we use to define cohort membership;
5. The individual's ethnicity or race;
6. U.S. veteran status;
7. Low income earner status;
8. Disability status;
9. Each individual's WDA on the unemployment benefits payment date we use to define cohort membership;
10. Individual Training Account (ITA) status.

We provide a more detailed discussion of each of these variables, as well as the reasons we include them in the earnings models, in *Appendix 1* of this report.

Annual unemployment benefits

The outcome for the UI net impact models is the sum of unemployment benefits received in each follow-on year after the unemployment benefits payment date we use to define cohort membership. For example, if an individual in our sample filed a UI claim during the first quarter of 2003, the first follow-on year is calendar year 2003. If an individual filed a UI claim in the second quarter of 2003, the first follow-on year is from the second quarter of 2003 through the first quarter of 2004.

Appendix Figure A1-1 lists the variables in the unemployment benefits net impact models that adjust our estimates for variables that may influence UI claim behavior, but that are not the result of training. The main identifier of the net impact of the statistical model is the measure of unemployment benefits level for each of the 12 quarters prior to the UI claim date we use to define cohort membership. Including this variable enables us to adjust our estimates for selection bias linked to previous UI claim behavior. The variable also controls for any unobserved variable that may be correlated with previous UI claim behavior that influences the likelihood of filing a current UI claim.

We also include categorical variables that indicate the following: 1) the individual's previous occupation; 2) the industry classification of each individual's employer of record; and 3) the individual's previous union status. Recent research demonstrates that each of these variables influence the likelihood of filing a UI claim, as well as the amount of unemployment benefits claimed.[18] As a result, they are essential variables in our net impact models for unemployment benefits received.

We provide a more detailed discussion of the variables and the reasons we included them in the unemployment benefits net impact models in *Appendix 1* of this report.

[18] For examples, see Michaelides, "Repeat Use in the U.S. Unemployment System," Monthly Labor Review (September 2014). Available at: http://www.bls.gov/opub/mlr/2014/article/repeat-use-in-the-u-s-unemployment-insurance-system-1.htm, U.S. Department of Labor, accessed May 14, 2015; Michaelides and Mueser, "Recent Trends in the Characteristics of Unemployment Insurance Recipients," Monthly Labor Review (July 2012), pp. 28-47.

Statistical methods used in the net impact models

We use ordinary least squares (OLS) to estimate the net impact models for the percent of time employed and the annual earnings outcomes. The approach we use for the unemployment benefits net impact models is called mediation analysis. Our mediation models are based on the quasi-Bayesian algorithm developed by Imai, Keele and Tingley.[19] We provide a more detailed explanation of our estimation strategies in *Appendix 1* of this report.

Difference-in-differences specification of the employment and earnings outcomes

We use a Difference-in-Differences (DID) specification of the percent of time employed and earnings outcomes. For the DID specification of the outcomes, we measure the percent of time employed and earnings from the 12th through 9th quarters prior to the unemployment benefits payment date we use to define cohort membership. We refer to this period as the "steady-state" period of earnings and employment. We then measure the percent of time employed and the earnings outcome for each follow-on year. Finally, we subtract levels of these outcome variables in the steady-state period from the outcome levels in each follow-on year.

The DID specification of the percent ever employed and earnings variables adjusts net impact estimates for unobserved, time-constant variables that influence the outcomes, but are not related to training. These variables are called individual fixed effects.

We chose outcome levels three years prior to the date we use to define cohort membership because individuals are more likely to be fully employed during that period. It is for this reason we refer to it as a steady-state period of earnings and employment. The steady-state period enables us to establish a baseline for the percent ever employed and earnings outcomes. These baseline levels serve as estimates of individual fixed effects.[20]

The key assumption in our DID estimation strategy is that TB participants would have experienced the same change in the outcome as non-participants experienced, had they not participated in training. This is called the common trends assumption. We also assume that other unmeasured factors, such as changes in economic conditions or other policy initiatives, affect both TB participants and matched non-participants in similar ways during the steady-state period.

Trends in average earnings for participants and non-participants were similar during this period. These data provide credible evidence that we are not violating the common trend assumption.

[19] Imai et al., "A General Approach to Causal Mediation Analysis," Psychological Methods, vol. 15, no. 4 (2010), pp. 309-344.

[20] For a discussion of the DID approach, see Lechner, Michael, "The Estimation of Causal Effects by Difference-in-Difference Methods," Discussion Paper no. 2010-28, Department of Economics, University of St. Gallen, St. Gallen, Switzerland, October 2011; Heckman, James J., Hidehiko Ichimura and Petra E. Todd, "Matching As An Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme," Review of Economic Studies, Vol. 64, 1997, p. 610 ff.

Levels specification of the unemployment benefits outcome

Analysts typically use a DID estimator to control for individual fixed effects. In order to estimate individual fixed effects, one must identify a baseline level of the outcome for both treatment and comparison group members at a point in time prior to the analysis period.

As shown in *Appendix Figure A1-1*, we do not use previous unemployment benefit levels in the propensity function. As a result, our samples are unbalanced with respect to previous unemployment benefit levels. Without balance on previous unemployment benefit levels, it is difficult to identify a steady-state period. We cannot use the same period for unemployment benefit payments we used for earnings and employment, because benefit levels during this period should be near zero for most individuals in the sample. This is because most people were fully employed at that time.

Without a steady-state period for unemployment benefit levels we can apply to all individuals in the sample, there is no baseline for unemployment benefits we can use to estimate individual fixed effects. Thus, we chose a levels outcome instead of a DID outcome for the unemployment benefits net impact models.

Chapter 2: Did the Training Benefits Program affect participant employment?

Introduction

In this chapter, we present net impact estimates for the TB Program on the percent of time employed during each follow-on year for each cohort. The analysis begins with the year and quarter in which TB Program participants receive their first unemployment benefits payment after being approved for the TB Program. Each 12-month period after the first relevant unemployment benefits payment, including the quarter during which a participant actually starts training, is a follow-on year. For a detailed discussion of our estimation strategy to determine the net impact of the TB Program on the percent of time employed, see *Appendix 1* in this report.

Our results indicate that all TB participants generally experience a net decrease in the percent of time employed during the first three follow-on years. However, the results also suggest training leads to net gains in the percent of time employed beginning in follow-on year 5 for the combined sample of TB participants, follow-on year 4 for all male TB participants and follow-on year 5 for all female TB participants.

Male TB participants in the 2002 through 2006 cohorts experience a net increase in the percent of time employed from follow-on year 5 through follow-on year 11, though the effect is consistently larger and more likely to be statistically significant for males in the 2002 and 2003 cohorts. Male participants in the 2007 through 2012 cohorts do not register a statistically significant net gain in the percent of time employed during any follow-on year for which we have data.

Female TB participants in the 2002 through 2005 cohorts are more likely to experience a net increase in the percent of time employed from follow-on year 4 through follow-on year 11. As with male participants, the impact of training on the percent of time employed is consistently larger and more likely to be statistically significant for female participants in the 2002 and 2003 cohorts. Female participants in the 2006 through 2012 cohorts do not register a statistically significant net gain in the percent of time employed during any follow-on year for which we have data.

Results for TB participants in the 2006 through 2009 cohorts, who were most likely to exit training during the Great Recession, suggest that poor labor market conditions affect participants differently than they affect non-participants. Poor labor market conditions may extend the duration of the average participant's occupational transition, as well as the period during which participants experience net decreases employment.

We present separate estimates for participants we assume are less likely to make an occupational transition—participants who return to their employer of record—as a partial test of the effects of occupational transitions and labor market conditions on participant employment. The difference in results for TB participants who did and did not return to

their employer of record indicate that participants making an occupational transition experience a longer period of a net decrease in percent of time employed. They also suggest that occupational transitions lasted longer for participants who likely exited training during the Great Recession.

Training Benefits Program net impact on percent of time employed

In this section we present the results of our net impact models for the percent of time employed in each follow-on year. We first present the statistically unadjusted averages for all cohorts combined, as well as the averages for all males and all females.

We then present the net impact estimates for the combined cohorts, as well as the estimates for the combined sample of males and females. Next, we present detailed net impact results for each cohort and each gender by follow-on year. Finally, we present the net impact estimates for the full sample of TB participants who did and did not return to their employer of record within two years of entering training.

Please note that we include each TB participant's matched non-participant in the samples we used to produce the estimates for participants who did and did not return to their employer of record. We did not determine whether or not matched non-participants in these samples returned to their employer of record.

Statistically unadjusted averages for percent of time employed

Figure 2-1 reports the statistically unadjusted averages for the percent of time employed variable from follow-on year 1 through follow-on year 11 for all cohorts combined. These data are not net impact estimates and are only shown to provide context to the results we present later in this chapter. See *Appendix Figure A2-1* for detailed unadjusted averages by cohort and follow-on year.

Unadjusted averages for the percent of time employed variable were lower among TB participants in the total sample, for all males and all females in follow-on years 1 through 3. From follow-on year 4 through follow-on year 11, TB participants had higher averages on the percent of time employed variable than non-participants. For follow-on year 11, the total sample percent of time employed was 67.7 percent for TB participants and 55.3 percent for non-participants.

Female and male TB participants had similar averages on the percent of time employed variable from follow-on year 1 through follow-on year 7. From follow-on year 8 through follow-on year 11, female TB participants had a lower average on the percent of time employed variable than male participants. In follow-on year 11, male participants were employed an average of 70.8 percent of the year, while female participants were employed an average of 63.1 percent of the year.

Averages on the percent of time employed variable declined for non-participants in each follow-on year. For the total sample, the average is 70.0 percent in follow-on year 1 and 55.3 percent in follow-on year 11. For non-participant males, the average is 71.5 percent in follow-on year 1 and 57.0 percent in follow-on year 11. For non-participant females, the average is 68.5 percent in follow-on year 1 and 52.9 percent in follow-on year 11.

Figure 2-1. Statistically unadjusted percent of time employed by follow-on year*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	42,046	37,828	33,128	27,364	19,324	15,950	14,194	12,028	9,816	8,018	4,788
Participants	39.9%	38.2%	61.0%	68.4%	69.2%	68.2%	67.5%	67.1%	66.7%	68.3%	67.7%
Non-participants	70.0%	68.4%	68.7%	67.5%	65.7%	63.0%	60.2%	58.6%	57.2%	56.3%	55.3%
Difference	-30.1%	-30.2%	-7.7%	0.9%	3.5%	5.2%	7.3%	8.5%	9.5%	12.0%	12.4%
All males (N)	21,150	19,024	16,802	14,084	9,902	8,200	7,390	6,336	5,422	4,676	2,864
Participants	39.9%	36.6%	59.6%	67.7%	68.7%	68.1%	67.6%	67.8%	67.7%	69.9%	70.8%
Non-participants	71.5%	69.1%	68.6%	67.3%	66.1%	62.8%	60.2%	59.1%	57.7%	57.4%	57.0%
Difference	-31.6%	-32.5%	-9.0%	0.4%	2.6%	5.3%	7.4%	8.7%	10.0%	12.5%	13.8%
All females (N)	20,896	18,804	16,326	13,280	9,422	7,750	6,804	5,692	4,394	3,342	1,924
Participants	39.8%	39.8%	62.2%	68.8%	69.5%	68.0%	67.1%	66.1%	65.4%	66.1%	63.1%
Non-participants	68.5%	67.6%	68.6%	67.5%	65.1%	62.7%	59.7%	57.9%	56.3%	54.8%	52.9%
Difference	-28.7%	-27.8%	-6.4%	1.3%	4.4%	5.3%	7.4%	8.2%	9.1%	11.3%	10.2%

*Cell values indicate the sample size (N) for each follow-on year and the average in percent of time employed for TB participants and non-participants in each follow-on year. The difference is the average for participants, minus the average for non-participants in each follow-on year. See *Chapter 1* for a description of data sources.

On average, treatment group members were employed for a greater portion of each year from follow-on year 4 through follow-on year 11.

Full sample net impact estimates for percent of time employed

Figure 2-2 displays the net impact of the TB Program for the percent of time employed variable. The estimates are the weighted average of the separate net impact estimates for each cohort and each follow-on year.

During the first three follow-on years, training led to a net decrease in the percent of time employed. In follow-on year 1, the net decrease was 27.0 percent for the total sample, 27.2 percent for all males and 26.7 percent for all females. During follow-on year 2, the net decrease was larger for the total sample, all males and all females. By follow-on year 3, the net decrease in percent of time employed dropped to 9.2 percent for the total sample of participants, 8.7 percent for all male participants and 9.7 percent for all female participants.

Training consistently led to a net gain in the percent of time employed from follow-on year 5 through follow-on year 11. The net gain in follow-on year 5 for the total sample of TB participants was 2.7 percent, 3.4 percent for all male participants and 1.9 percent for all female participants. By follow-on year 11, the total sample of participants registered a net gain of 8.6 percent on the percent of time employed variable. Male participants had a net gain of 9.9 percent in follow-on year 11 and female participants received a net gain of 5.7 percent on average.

Note in *Figure 2-1* that the unadjusted average difference in percent of time employed between participants and non-participants is 12.4 percent in follow-on year 11. *Figure 2-2* shows the net impact of the TB Program is 8.6 in the same follow-on year. These results

indicate 3.8 percentage points of the unadjusted difference are explained by the control variables included in our models and individual fixed effects. All other net impact estimates can be interpreted in the same way.

Figure 2-2. TB Program net impact on percent of time employed by follow-on year, total sample and gender*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Total sample	-27.0%	-31.8%	-9.2%	-0.2%	2.7%	4.4%	6.1%	6.8%	8.1%	9.2%	8.6%
Males	-27.2%	-33.3%	-8.7%	0.8%	3.4%	5.4%	7.3%	8.0%	8.6%	9.4%	9.9%
Females	-26.7%	-30.2%	-9.7%	-1.3%	1.9%	3.1%	4.6%	5.2%	7.2%	8.3%	5.7%

*The estimates in each cell are the inverse-variance weighted averages of the percent of time employed estimates for the combined cohorts from follow-on year 1 through follow-on year 11. For a theoretical justification of this weighting procedure, see: Hartung, Joachim, Guido Knapp and Bimal K. Sinha, *Statistical Meta-analysis with Applications*: John Wiley and Sons (2008). This weighting method preserves information from estimates that do not meet the conventional standard of statistical significance (p = 0.05). See *Chapter 1* for the description of data sources.

Net impact estimates indicate the TB Program leads to a net increase in the percent of time employed variable from follow-on year 5 through follow-on year 11 for the total sample and all females. All males begin to experience an average net increase in follow-on year 4.

Male TB participant net impact estimates for percent of time employed

Figure 2-3 shows net impact estimates for male participants in the 2002 through 2012 cohorts for each follow-on year. See *Appendix Figure A2-2* for detailed results by follow-on year for the combined sample of males and females in each cohort.

As with the total sample, training led to a net decrease in the percent of time employed during the first three follow-on years. Male cohorts from 2002 through 2006 consistently show a net gain in percent of time employed from follow-on year 5 through follow-on year 11, though the estimates are not always significant at the p = .05 level.

The 2002 cohort saw the largest net gain in follow-on year 5 at 5.8 percent, while the 2005 cohort registered the smallest net gain in follow-on year 5 at 1.9 percent. In follow-on year 7, the 2002 cohort again had the highest net gain in percent of time employed at 8.9 percent. The 2004 and 2006 cohorts both had the lowest net gain in percent of time employed in follow-on year 7 with an increase of 4.0 percent.

Male TB participants in the 2007 through 2012 cohorts also show a net decrease in percent of time employed during the first 3 follow-on years. However, males from these cohorts do not show consistent net gains in percent of time employed after the first four follow-on years. The 2008 cohort males show a small net gain of 0.1 percent in follow-on year 5, and the 2009 cohort males show a small net gain of 0.4 percent in follow-on year 4. However, neither of these estimates is statistically different from zero.

Figure 2-3. TB Program net impact on percent of time employed for 2002 through 2012 cohort males
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Estimate	-25.9%	-43.6%	-5.7%	3.4%	5.8%	6.8%	8.9%	9.9%	9.5%	9.2%	9.9%
	P-value	<0.0001	<0.0001	0.0016	0.068	0.0019	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2003	Estimate	-24.3%	-22.6%	-0.3%	3.6%	5.5%	7.4%	8.5%	8.2%	9.0%	9.7%	
	P-value	<0.0001	<0.0001	0.9	0.0864	0.0112	0.0006	0.0002	0.0004	0.0001	<0.0001	
2004	Estimate	-31.0%	-20.6%	-3.3%	1.7%	5.2%	6.2%	4.0%	1.8%	4.1%		
	P-value	<0.0001	<0.0001	0.3499	0.6421	0.1539	0.097	0.3	0.6508	0.2875		
2005	Estimate	-30.6%	-24.8%	-5.3%	-2.3%	1.9%	5.4%	5.3%	6.6%			
	P-value	<0.0001	<0.0001	0.1257	0.5208	0.609	0.1504	0.1562	0.0778			
2006	Estimate	-32.1%	-27.6%	-8.2%	0.1%	2.4%	0.8%	4.0%				
	P-value	<0.0001	<0.0001	0.017	0.9797	0.507	0.8291	0.2704				
2007	Estimate	-30.3%	-30.3%	-11.2%	-3.8%	-3.1%	-1.0%					
	P-value	<0.0001	<0.0001	0.0016	0.2884	0.3821	0.781					
2008	Estimate	-22.2%	-35.3%	-16.0%	-3.3%	0.1%						
	P-value	<0.0001	<0.0001	<0.0001	0.1759	0.9817						
2009	Estimate	-23.6%	-32.8%	-11.5%	0.4%							
	P-value	<0.0001	<0.0001	<0.0001	0.7909							
2010	Estimate	-27.4%	-35.2%	-12.1%								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Estimate	-31.1%	-36.2%									
	P-value	<0.0001	<0.0001									
2012	Estimate	-32.7%										
	P-value	<0.0001										

Net impact estimates from follow-on year 4 onward are generally positive, larger and more likely to be statistically significant for male participants in the 2002 and 2003 cohorts than for male participants in the remaining cohorts.

Female cohort net impact estimates for percent of time employed

Figure 2-4 shows separate net impact estimates for female TB participants in the 2002 through 2012 cohorts for each follow-on year. Training led to a net decrease in the percent of time employed for females in these cohorts during the first three follow-on years. Female cohorts from 2002 through 2006 also show a net gain in percent of time employed in most follow-on years after follow-on year 4. However, only the estimates for 2002 and 2003 cohort females are significant at the p = .05 level.

Females in the 2007 through 2012 cohorts also show a net decrease in percent of time employed during the first 3 follow-on years. Like their male counterparts, however, female TB participants from the 2007 through 2009 cohorts do not show net gains in percent of time employed after the first three follow-on years. Only the 2008 cohort females show a net gain of 1.2 percent in follow-on year 5. However, this estimate is not statistically different from zero.

Figure 2-4. TB Program net impact on percent of time employed for 2002 through 2012 cohort females
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Estimate	-23.9%	-35.1%	-5.8%	2.3%	5.8%	7.3%	7.6%	6.4%	7.0%	5.7%	5.7%
	P-value	<0.0001	<0.0001	0.0123	0.3254	0.0132	0.0021	0.0018	0.0105	0.0055	0.0247	0.0258
2003	Estimate	-20.9%	-19.6%	2.4%	4.9%	9.3%	10.0%	11.5%	10.0%	10.9%	11.5%	
	P-value	<0.0001	<0.0001	0.3432	0.0547	0.0003	0.0001	<0.0001	0.0003	<0.0001	<0.0001	
2004	Estimate	-30.6%	-26.7%	-9.8%	-3.8%	-1.4%	0.7%	0.1%	-0.4%	1.9%		
	P-value	<0.0001	<0.0001	0.0018	0.2399	0.6655	0.834	0.9849	0.9145	0.5851		
2005	Estimate	-34.4%	-18.9%	-2.3%	0.3%	0.8%	0.2%	-0.2%	1.7%			
	P-value	<0.0001	<0.0001	0.42	0.9112	0.8017	0.9432	0.9467	0.6014			
2006	Estimate	-32.7%	-23.9%	-11.6%	-7.2%	-3.5%	-3.5%	-2.1%				
	P-value	<0.0001	<0.0001	0.0002	0.0251	0.2846	0.2971	0.5303				
2007	Estimate	-33.5%	-34.2%	-19.1%	-11.1%	-7.0%	-4.5%					
	P-value	<0.0001	<0.0001	<0.0001	0.0009	0.0343	0.1875					
2008	Estimate	-22.9%	-31.7%	-15.7%	-2.7%	1.2%						
	P-value	<0.0001	<0.0001	<0.0001	0.2728	0.6395						
2009	Estimate	-20.8%	-31.8%	-12.6%	-0.7%							
	P-value	<0.0001	<0.0001	<0.0001	0.6729							
2010	Estimate	-27.3%	-33.3%	-11.5%								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Estimate	-28.9%	-34.0%									
	P-value	<0.0001	<0.0001									
2012	Estimate	-31.0%										
	P-value	<0.0001										

Net impact estimates from follow-on year 4 onward are generally larger and more likely to be positive and statistically significant for female participants in the 2002 and 2003 cohorts than for female participants in the remaining cohorts.

Discussion: Effects of the Great Recession on percent of time employed

As one would expect, all cohorts of TB participants experience a net decrease in their percent of time employed during the first three follow-on years. During this period, many participants are not actively searching for work because they are in training, or because they are beginning their initial job searches. As a result, the statistically adjusted average of the percent of time employed will be lower for TB participants than for matched non-participants during this period.

Male TB participants in the 2002 through 2006 cohorts are more likely to experience a net increase in the percent of time employed from follow-on year 4 onward. Female TB participants in the 2002 through 2005 cohorts are more likely to experience a net increase in the percent of time employed from follow-on year 4 onward. However, male participants in the 2007 through 2009 cohorts and female participants in the 2006 through 2009 cohorts continue to experience either a net decrease, or no statistically significant net increase in percent of time employed after the third follow-on year. We do not yet have sufficient data to assess the effects of training for the 2010 through 2012 cohorts beyond the first three follow-on years.

This difference in the results is possibly due in part to labor market conditions. TB participants from the 2006 through 2009 cohorts probably began their initial job search during the Great Recession, which lasted from 2007 through 2010 in Washington state, or during the post-recession recovery. For example, the second and third follow-on years for the 2006 cohort include calendar years 2008 and 2009. The second and third follow-on years for the 2009 cohort include 2011 and 2012.

While the National Bureau of Economic Research (NBER) officially declared the Great Recession over in June 2009, many economic indicators still had not reached pre-recession levels by the end of calendar year 2013. This is particularly true of employment and wage indicators. For example, the number of jobs needed to return the U.S. economy to pre-recession employment levels was still 7.9 million in December 2013. Likewise, the unemployment rate in Washington state was still nearly 10 percent in September 2010 and around 7 percent in September 2013. A result of the Great Recession and the slow recovery was a large increase in the number of long-term unemployed workers that lasted into calendar year 2014.[21]

Both TB Program participants and matched non-participants in our samples for the 2006 through 2009 cohorts faced these difficult labor market conditions. However, our results suggest the Great Recession may have affected TB participants differently than it affected matched non-participants in our samples. There are many possible reasons for this phenomenon, one of which is that participants may be changing occupations at higher rates than non-participants.

Occupational transitions often involve competing with more experienced candidates for open positions. They can also involve accepting part-time work in order to gain qualifications that enhance long-term competitiveness in a new occupation. We assume non-participants are less likely to face these issues for two reasons: 1) they may have to apply for positions with fewer qualifications because they exhaust their unemployment benefits sooner; 2) they are more likely to apply for positions for which they already possess competitive qualifications and levels of experience.

During the Great Recession, TB Program participants in our sample had to compete for a much smaller number of openings with a much larger number of more experienced candidates. Non-participants who filed UI claims during the recession also had to compete for a smaller number of jobs. However, they likely did so without the added disadvantage of making an occupational transition. Thus, it may have been more difficult on average for TB participants to find employment than it was for non-participants during the Great Recession.

[21] See for example U.S. Bureau of Labor Statistics, "BLS Spotlight on Statistics: The Recession of 2007-2009" (February 2012); available at: www.bls.gov/spotlight/2012/recession/pdf/recession_bls_spotlight.pdf, accessed June 16, 2015; Shierholz, Heidi, "Six Years from its Beginning, the Great Recession's Shadow Looms over the Labor Market," Economic Policy Institute, Issue Brief #374 (January 9, 2014); Washington State Employment Security Department/LMPA, "2014 Labor Market and Economic Report" (March 2015); available at: https://fortress.wa.gov/esd/employmentdata/docs/economic-reports/labor-market-and-economic-report-2014.pdf, accessed July 24, 2015.

Two caveats are in order. First, we do not have complete follow-on data for post-training occupation. Consequently, we cannot verify that TB participants are more likely to make an occupational transition than the matched non-participants in our samples. Second, we do not have data that enables us to verify that participants had a more difficult time finding full-time employment than matched non-participants during the Great Recession.

Nevertheless, the fact that TB participants in the 2006 through 2009 cohorts experienced different outcomes than those in the 2002 through 2005 cohorts suggests the Great Recession may have extended the occupational transition period. If this is true, then participants who likely made an occupational transition before the Great Recession should experience net gains in employment sooner than participants who likely made an occupational transition during the Great Recession.

In the following section, we provide evidence that the recession may have influenced employment outcomes for TB participants making an occupational transition by comparing the net impact results for participants who did and did not return to their employer of record.

Net impact results for TB participants who did and did not return to their employer of record

Of the 21,033 TB Program participants in our total sample, 18.3 percent returned to their employer of record within two years of entering training and 81.7 percent did not. The employer of record is the most recent employer for whom a UI claimant worked for prior to filing an unemployment benefits claim.

We assume TB participants who return to their employer of record are less likely to be structurally displaced workers. We also assume participants who return to their employer of record are less likely to make an occupational transition than participants who do not return to their employer of record. We consider these to be reasonable assumptions because participants who return to their employer of record have stronger ties to a specific industry and firm. Stronger ties to a specific industry or firm increase firm-specific or industry-specific human capital, which should translate into higher wages and more stable employment for participants who return to their employer of record.

Job training does provide some occupation-specific human capital. To the extent that occupation and industry are correlated, it can also increase the industry-specific human capital TB participants receive. However, workers with a strong attachment to a particular employer will always have an advantage in firm and industry-specific human capital. Thus, participants who return to their employer of record should see net gains from training sooner than those who do not return to their employer of record.

Figure 2-5 displays the weighted average of the net impact estimates for the combined cohorts of TB Program participants who did and who did not return to their employer of record within two years of entering training. *Appendix Figure A2-3*, *Appendix Figure A2-4* and *Appendix Figure A2-5* show separate estimates for the total sample of TB participants, and male and female participants who returned to their employer of record in each cohort by follow-on year. *Appendix Figure A2-6*, *Appendix Figure A2-7* and

Appendix Figure A2-8 show separate estimates for the total sample and each cohort of male and female participants who did not return to their employer of record in each cohort by follow-on year.

As shown in *Figure 2-5*, the weighted average for the total sample of TB participants who did not return to their employer of record shows a net decrease of 31.2 percent in the percent of time employed in follow-on year 1. The weighted average for those who returned to their employer of record shows an average net decrease of 10.1 percent in the percent of time employed. During follow-on year 2, the total sample of participants who did not return to their employer of record registered a net decrease of 33.8 percent, while those who returned to their employer of record experienced an average net decrease of 23.4 percent.

By follow-on year 3, the total sample of those who did not return to their employer of record experienced an average net decrease of 10.7 percent in the percent of time employed. The total sample of those who returned to their employer of record had an average net decrease of 3.7 percent. The magnitude of the net decrease in the percent of time employed was nearly three times smaller for TB participants who returned to their employer of record than it was for those who did not.

The total sample of TB participants who returned to their employer of record registered an average net gain in percent of time employed in follow-on year 4. The total sample of participants who did not return to their employer of record did not experience a net gain in the percent of time employed until follow-on year 5. In follow-on year 5, participants who returned to their employer of record received an average net gain in percent of time employed that was three times higher than the net gain experienced by those who did not return to their employer of record.

Female TB participants who returned to their employer of record fared better than male participants who returned to their employer of record when compared to their counterparts who did not return to their employer of record. For example, female participants who returned to their employer of record had a net gain in percent of time employed that is 5.5 times higher than female participants who did not return to their employer of record in follow-on year 5. Male participants who returned to their employer of record show a net gain that is a little more than two times higher than male participants who did not return to their employer of record in the same follow-on year.

The difference in net gains in the percent of time employed experienced by those who did and did not return to their employer of record generally declines from follow-on year 6 through follow-on year 11 for both genders. In follow-on year 11, male TB participants who returned to their employer of record experience a net gain that is about 22 percent larger than the net gain experienced by male participants who did not return to their employer of record. Female TB participants who returned to their employer of record experience a net gain that is over two times larger than the net gain experienced by female participants who did not return to their employer of record in the same follow-on year. Note, however, that follow-on year 11 estimates only contain information from the 2002 cohort.

Despite the fact that the difference in net gains in the percent of time employed experienced by those who did and did not return to their employer of record generally declines over time, the difference persists. Thus, there is some evidence that TB participants we assume are more likely to make an occupational transition have a more difficult time finding full-time employment when compared to their matched non-participants.

These results do not demonstrate that TB participants are more likely to make an occupational transition than non-participants. However, they do indicate the effect of training is different for participants who do not remain attached to an employer. To the extent that participants who do not remain attached to an employer are more likely to make an occupational transition, these results also suggest occupational transitions extend the period during which participants experience a net decrease in employment.

Appendix Figure A2-3 and *Appendix Figure A2-6* show the net impact estimates by cohort for the full sample of TB participants who did and did not return to their employer of record, respectively. These data indicate the Great Recession affected participants who returned to their employer of record differently than it affected participants who did not return to their employer of record. For example, participants from the 2007 cohort who returned to their employer of record experienced net gains in percent of time employed in follow-on years 5 and 6. Participants from the 2007 cohort who did not return to their employer of record experienced net losses in percent of time employed in follow-on years 5 and 6.

TB Participants from the 2009 cohort who returned to their employer of record experience a net gain in percent of time employed in follow-on year 4. Participants from the 2009 cohort who did not return to their employer of record experience a net decrease in percent of time employed in follow-on year 4. In the 2008 cohort, both participants who did and did not return to their employer of record experience their first net gain in percent of time employed in follow-on year 5. However, the net gain is about nine times larger for participants who returned to their employer of record than it is for participants who did not return to their employer of record. Among the cohorts who likely exited training during the Great Recession, participants we assume were less likely to make an occupational transition fared better than those we assume were more likely to make an occupational transition.

The results presented in *Appendix Figure A2-6* also reveal that net effect estimates for the full sample of TB participants who did not return to their employer of record vary by cohort. Participants who did not return to their employer of record from the 2002 through 2005 cohorts experience an average net gain in the percent of time employed by follow-on year 4, or by follow-on year 5.

In contrast, TB participants in cohorts we assume were most likely to exit training during the Great Recession were not as likely to experience a net gain in percent of time employed when compared to their matched non-participants. Only the participants who did not return to their employer of record from the 2008 cohort experience a net gain in percent of time employed by follow-on year 5. Participants who did not return to their

employer of record from the 2006 cohort experience a net gain in the percent of time employed in follow-on year 7. In both of these cases, however, the net effect estimate is small and statistically insignificant.

Again, these results do not confirm that participants are more likely to face difficulties associated with an occupational transition than their matched non-participants. They do suggest that participants who we assume are more likely to make an occupational transition experience a longer period of a net decrease in percent of time employed. They also suggest that occupational transitions lasted longer for participants who likely exited training during the Great Recession.

Figure 2-5. TB Program net impacts on percent of time employed for participants who did and did not return to their employer of record*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Participants who did not return to their employer of record within two years of entering training											
Total sample	-31.2%	-33.8%	-10.7%	-1.5%	1.7%	3.1%	4.6%	5.5%	5.9%	7.3%	6.6%
Male	-31.5%	-35.7%	-10.2%	-0.7%	2.2%	4.8%	6.6%	6.6%	5.9%	8.1%	7.9%
Female	-30.7%	-32.0%	-10.9%	-2.3%	1.1%	1.2%	2.6%	3.9%	5.6%	5.8%	3.3%
Participants who returned to their employer of record within two years of entering training											
Total sample	-10.1%	-23.4%	-3.7%	4.0%	5.1%	6.7%	8.1%	8.3%	10.3%	9.9%	8.8%
Male	-13.1%	-25.4%	-4.1%	3.7%	4.9%	5.5%	6.7%	8.1%	9.5%	8.7%	9.6%
Female	-6.1%	-20.7%	-2.1%	4.3%	6.4%	9.4%	10.3%	8.3%	11.3%	12.6%	8.5%

*The estimates are the net difference in earnings between TB participants and their matched non-participants in each group. We use the inverse-variance weighted averages for follow-on year 1 through follow-on year 11 for those who did and those who did not return to their employer of record within two years after exiting training.

TB participants who returned to their employer of record within two years of exiting training receive a higher average net gain in the percent of time employed than participants who did not return to their employer of record.

Chapter 3: How did the Training Benefits Program affect participant earnings?

Introduction

In this chapter, we present net impact estimates for the Training Benefits (TB) Program on annual earnings during each follow-on year for each cohort. For a detailed discussion of our estimation strategy to determine the net impact of the TB Program on earnings, see *Appendix 1* in this report.

Our results indicate that the full sample of TB Program participants experienced a net decrease in earnings from follow on year 1 through follow-on year 6. From follow-on year 7 through follow-on year 11, the full sample of participants generally experienced a net gain in earnings. All male TB participants in the study sample experienced a net decrease in earnings from follow-on year 1 through follow-on year 5, but a net gain in earnings from follow-on year 6 through follow-on year 11. All female TB participants in the study sample experienced a net decrease in earnings from follow-on year 1 through follow-on year 6 and a net gain in earnings from follow-on year 7 through follow-on year 11.

Male and female TB participants in the 2002 cohort experience a net increase in earnings from follow-on year 5 through follow-on year 11, while male and female participants in the 2003 cohort experience a net increase in earnings from follow-on year 4 through follow-on year 10. Male participants in the 2005 cohort experience net gains in earnings from follow-on year 7 through follow-on year 8. Female participants in the 2005 cohort experience net gains in earnings from follow-on year 5 through follow-on year 8. Male and female participants in the 2004 and 2006 through 2012 cohorts did not experience a statistically significant net gain in earnings during any follow-on year for which we have data.

Results for participants in the 2006 through 2009 cohorts, who were most likely to exit training during the Great Recession, suggest that poor labor market conditions affect participants differently than they affect non-participants. Poor labor market conditions may extend the duration of the average participant's occupational transition, as well as the period during which participants experience net decreases in earnings.

We present separate estimates for participants we assume are less likely to make an occupational transition—participants who return to their employer of record—as a partial test of the effects of occupational transitions and labor market conditions on participant earnings. The difference in results for TB participants who did and did not return to their employer of record indicate that participants making an occupational transition experience a longer period of a net decrease in earnings. They also suggest that occupational transitions lasted longer for participants who likely exited training during the Great Recession.

Training Benefits Program net impact on earnings

In this section we present the results of our net impact models for earnings in each follow-on year. We first present the statistically unadjusted averages for all cohorts combined, as well as the averages for all males and all females. We then present the net impact estimates for the combined cohorts, as well as the estimates for the combined sample of males and females. We then present detailed net impact results for each cohort by gender and follow-on year. Finally, we present the net impact estimates for the full sample of TB participants who did and did not return to their employer of record within two years of entering training.

Statistically unadjusted average earnings

Figure 3-1 presents the unadjusted average of annual earnings for the total sample, all male and all female TB participants by group for each follow-on year. See *Appendix Figure A3-1* for detailed averages by cohort.

In *Figure 3-1*, we present the unadjusted difference in average earnings between TB participants and matched non-participants for each follow-on year. Positive differences indicate participants are earning more on average than non-participants. Negative differences indicate that participants are earning less on average. Negative differences also represent a major cost of training, which is forgone earnings. These data are not net impact estimates and are only shown to provide context to the results we present later in this chapter.

The difference in average earnings is negative during each of the first five follow-on years for the full sample, meaning TB participants experience a five-year period of forgone earnings on average. Forgone earnings averaged $12,751 for the full sample in the first follow-on year, $17,966 in follow-on year 2 and declined to $9,794 in follow-on year 3. Average forgone earnings declined to $4,331 in follow-on year 4 and $1,286 in follow-on year 5.

By follow-on years 4 and 5, most participants have exited training. The negative earnings differential in these years likely indicate that participants are working, but are not yet earning as much as they earned during their steady-state year. This could be due to the fact that participants are more likely than non-participants to make an occupational transition, which can involve accepting part-time or entry-level positions that initially pay less than the jobs participants held during the steady-state year.

From follow-on year 6 through 11, the unadjusted averages for annual earnings are positive and increase from year to year. In follow-on year 6, the full sample of TB participants earned an average of $806 more than matched non-participants. In follow-on year 11, the full sample of participants were earning an average of $12,952 more than matched non-participants.

Summing the positive average difference in earnings from follow-on year 6 through follow-on year 11 yields a total gross gain of $42,512 to participants during those years. However, summing the negative differences from follow-on year 1 through 5 yields a total of $46,128 in gross forgone earnings. For the full sample, the average in gross forgone earnings was $3,616 higher than the average in gross earnings gained during the entire follow-on period.

Figure 3-1. Statistically unadjusted averages for earnings by follow-on year*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Full sample (N)	42,046	37,828	33,128	27,364	19,324	15,950	14,194	12,028	9,816	8,018	4,788
Participants	$15,230	$10,717	$20,836	$27,299	$30,833	$32,593	$34,101	$37,297	$40,168	$46,119	$47,026
Non-participants	$27,981	$28,683	$30,630	$31,630	$32,119	$31,787	$31,117	$31,516	$32,399	$33,897	$34,074
Difference	-$12,751	-$17,966	-$9,794	-$4,331	-$1,286	$806	$2,984	$5,781	$7,769	$12,222	$12,952
All males (N)	21,150	19,024	16,802	14,084	9,902	8,200	7,390	6,336	5,422	4,676	2,864
Participants	$16,554	$11,500	$22,785	$30,600	$34,825	$37,349	$39,349	$43,377	$46,704	$53,388	$54,786
Non-participants	$31,507	$32,772	$34,270	$35,431	$36,301	$35,929	$35,678	$36,406	$37,392	$39,249	$39,611
Difference	-$14,953	-$21,272	-$11,485	-$4,831	-$1,476	$1,420	$3,671	$6,971	$9,312	$14,139	$15,175
All females (N)	20,896	18,804	16,326	13,280	9,422	7,750	6,804	5,692	4,394	3,342	1,924
Participants	$13,828	$10,012	$18,920	$23,897	$26,585	$27,484	$28,435	$30,653	$32,310	$35,954	$35,474
Non-participants	$24,516	$24,766	$27,051	$27,776	$27,726	$27,303	$26,195	$26,259	$26,384	$26,449	$25,831
Difference	-$10,688	-$14,754	-$8,131	-$3,879	-$1,141	$181	$2,240	$4,394	$5,926	$9,505	$9,643

*Cell values indicate the sample size (N) for each follow-on year and the average in annual earnings across all cohorts for participants and non-participants in each follow-on year. The difference is the average for participants, minus the average for non-participants in each follow-on year. See Chapter 1 for a description of data sources.

TB participants initially experienced much lower statistically unadjusted earnings relative to their matched comparison group members. However, statistically unadjusted TB participant earnings gradually and consistently improved over time.

Full sample net impact estimates for earnings

Figure 3-2 displays the net impact of the TB Program on earnings in each follow-on year. The estimates are the weighted average of the combined cohorts for each follow-on year, as well as the upper and lower bounds of the 95 percent confidence intervals for those estimates. Confidence intervals that contain zero are not statistically significant at the p = 0.05 level.

During the first six follow-on years, training led to a net decrease in earnings for the full sample and for all female participants, while male participants experienced an average net decrease in earnings from follow-on year 1 through follow-on year 5. During follow-on year 1, the net decrease was $11,813 for the full sample, $13,595 for all male and $9,844 for all female participants. During follow-on year 2, the net decrease was larger for the total sample, all male and all female participants.

By follow-on year 3, the net decrease in earnings dropped to $9,919 for the full sample of participants, $11,105 for all male participants and $8,623 for all female participants. In follow-on year 4, the net decrease in earnings declined to $4,993 for the full sample of participants, $4,832 for all male participants and $4,839 for all female participants.

In follow-on year 5, the net decrease in earnings declined to $2,223 for the full sample of TB participants, $2,517 for all male participants and $1,774 for all female participants. The decline in net earnings lost from follow-on year 2 through follow-on year 6 is likely due to the fact that many participants found employment and gradually saw their earnings increase as they developed firm-specific and industry-specific human capital.

Training consistently led to a net increase in earnings for all groups from follow-on year 7 through follow-on year 11. The net gain in follow-on year 7 was $1,873 for the full sample of TB participants, $3,267 for all male participants and $973 for all female participants. However, the estimate for all female participants is not statistically significant in follow-on year 7.

By follow-on year 11, the total sample of participants registered a net gain of $9,180. Male participants had a net gain of $10,608, and female participants received a net gain of $6,217 on average in follow-on year 11. Note, however, that the estimates for follow-on year 11 only reflect the experience of the 2002 cohort.

During the full follow-on period, the TB Program impacted males and females differently. From follow-on year 1 through follow-on year 5, males register an average of $51,238 in forgone earnings. From follow-on year 1 through follow-on year 6, females register an average of $39,718 in forgone earnings. Thus, the average cost of participation in forgone earnings is $11,520 higher for males than it is for females.

However, males also experience higher average net gains in earnings than do females over the entire follow-on period. From follow-on year 6 through follow-on year 11, males experience a $35,251 average net gain in earnings. From follow-on year 7 through follow-on year 11, females experience a $19,703 net gain in earnings. The net gain in earnings is $15,548 less for females than it is for males over the entire follow-on period.

By subtracting total positive earnings from forgone earnings during the entire follow-on period, we can estimate the undiscounted net gain or loss. Neither males nor females recovered all of their forgone earnings over the 11-year follow-on period. The average net loss to males was $15,986, while for females the average net loss was $20,015. Thus, during the entire follow-on period, net costs to males were $4,029 less than net costs to females.

Note in *Figure 3-1* that the unadjusted average difference in earnings between participants and non-participants is $12,952 in follow-on year 11. *Figure 3-2* shows the net impact of the TB Program is $9,180 in the same follow-on year. These results indicate that $3,772 of the unadjusted difference in earnings, or 41 percent, is explained by the control variables included in our models and individual fixed effects. All other net impact estimates in this chapter can be interpreted in the same way.

Figure 3-2. TB Program net impact on earnings by follow-on year, total sample and gender*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Full sample	-$11,813	-$16,585	-$9,919	-$4,993	-$2,223	-$154	$1,873	$3,958	$5,408	$7,940	$9,180
Lower 95% CI	-12209	-17069	-10503	-5702	-3147	-1249	664	2580	3785	6068	6632
Upper 95% CI	-11416	-16101	-9334	-4284	-1299	941	3083	5335	7031	9812	11728
All males	-$13,595	-$19,188	-$11,105	-$4,832	-$2,517	$871	$3,267	$5,258	$6,471	$8,776	$10,608
Lower 95% CI	-14181	-19934	-11993	-5908	-3935	-845	1375	3129	4024	6091	6925
Upper 95% CI	-13010	-18442	-10217	-3756	-1098	2587	5159	7386	8919	11462	14291
All females	-$9,844	-$14,057	-$8,623	-$4,839	-$1,774	-$581	$973	$2,584	$3,886	$6,043	$6,217
Lower 95% CI	-10345	-14664	-9376	-5752	-2988	-1937	-513	857	1854	3576	2985
Upper 95% CI	-9344	-13449	-7870	-3926	-561	776	2459	4312	5917	8510	9449

*The estimates in each cell are the inverse-variance weighted averages of the percent of time employed estimates for the combined cohorts from follow-on year 1 through follow-on year 11. For a theoretical justification of this weighting procedure, see: Hartung, Joachim, Guido Knapp and Bimal K. Sinha, Statistical Meta-analysis with Applications: John Wiley and Sons (2008). This weighting method preserves information from estimates that do not meet the conventional standard of statistical significance (p = 0.05). See Chapter 1 for the description of data sources.

Net gains in earnings did not occur until follow-on year 7 for the full sample and all female participants, while they did not occur until year 6 for all male participants. Male participants received higher net gains than females during the entire follow-on period.

Male participant earnings net impact estimates

Figure 3-3 shows separate net impact estimates for the 2002 through 2012 cohort males for each follow-on year. See *Appendix Figure A3-2* for detailed results by follow-on year for the combined sample of males and females in each cohort.

Training led to a net decrease in earnings during the first four follow-on years for male participants in the all cohorts except for 2003 cohort participants, who experienced a net gain of $909 in follow-on year 4. Male participants in the 2002 cohort consistently registered a net gain in earnings from follow-on year 5 through follow-on year 11. Males in the 2003 cohort registered a net gain in earnings from follow-on year 4 through follow-on year 10. Most of these estimates are significant at the p = 0.05 level. Male participants in the 2005 cohort registered a net gain in earnings in follow-on years 7 and 8, and male participants in the 2006 cohort saw a net gain only in follow-on year 6. However, none of the positive estimates are statistically different from zero.

In Figure 3-3, male TB participants in the 2006 through 2012 cohorts show a net decrease in earnings during each follow-on year. However, the net decrease in earnings drops from year to year after follow-on year 2 for males in the 2007 through 2010 cohorts. We do not yet have enough data to assess the trend in net earnings lost for males in the 2011 and 2012 cohorts.

Figure 3-3. TB Program net impact on earnings for 2002 through 2012 cohort males
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Estimate	-$10,498	-$23,833	-$12,605	-$4,016	$1,492	$5,537	$7,236	$9,056	$9,317	$10,704	$10,608
	P-value	<0.0001	<0.0001	<0.0001	0.0022	0.32	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2003	Estimate	-$14,385	-$19,472	-$6,552	$909	$700	$2,767	$3,536	$4,285	$5,931	$6,272	
	P-value	<0.0001	<0.0001	<0.0001	0.59	0.69	0.1244	0.0607	0.0358	0.0074	0.0026	
2004	Estimate	-$17,237	-$19,565	-$10,174	-$3,975	-$970	$359	-$1,031	-$1,361	-$420		
	P-value	<0.0001	<0.0001	<0.0001	0.1341	0.71	0.89	0.72	0.64	0.88		
2005	Estimate	-$14,619	-$18,490	-$10,596	-$6,031	-$3,005	-$152	$1,427	$2,762			
	P-value	<0.0001	<0.0001	<0.0001	0.0119	0.23	0.95	0.6	0.32			
2006	Estimate	-$16,009	-$21,020	-$12,365	-$7,338	-$4,549	-$3,845	-$1,891				
	P-value	<0.0001	<0.0001	<0.0001	0.0013	0.056	0.1189	0.45				
2007	Estimate	-$15,320	-$21,475	-$11,231	-$10,105	-$8,064	-$7,576					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	0.002					
2008	Estimate	-$10,942	-$18,357	-$12,550	-$7,977	-$5,677						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
2009	Estimate	-$11,483	-$17,103	-$10,225	-$4,243							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001							
2010	Estimate	-$13,200	-$17,612	-$12,129								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Estimate	-$16,383	-$19,604									
	P-value	<0.0001	<0.0001									
2012	Estimate	-$15,727										
	P-value	<0.0001										

Male participants in the 2002 and 2003 cohorts receive an average net gain in earnings from follow-on year 5 onward. Male participants in the 2004 cohorts receive a net gain in earnings in follow-on year 6, while male participants in the 2005 cohort receive a net gain in follow-on years 7 and 8. Male participants in the remaining cohorts do not receive an average net gain in earnings during any follow-on year that is statistically different from zero.

Female cohort earnings net impact estimates

Figure 3-4 shows separate net impact estimates for female TB participants in the 2002 through 2012 cohorts for each follow-on year. Training led to a net decrease in earnings for females in the 2003 cohort during the first three follow-on years. Female participants in the 2002 and 2005 cohorts experience an average net decrease in the first four follow-on years. Female participants in the 2002 and 2005 cohorts experience a net increase in earnings each year after follow-on year 4, though none of the positive estimates for 2005 female participants is statistically different from zero.

Female TB participants in the 2003 cohort experience an average net increase in earnings each year after follow-on year 3. Female participants in the 2004 and 2006 cohorts register an average net decrease in earnings in all follow-on years for which we have data. *Figure 3-4* also shows all female participants in the 2007 through 2012 cohorts receive a net decrease in earnings during each follow-on year. Like their male

counterparts, the net decrease in earnings for female participants drops from year to year after follow-on year 2. The only exception to this general trend is female participants in the 2007 cohort, who register an increase in net earnings lost from follow-on year 5 to follow-on year 6. We do not yet have enough data to assess the trend in net earnings lost for females in the 2011 and 2012 cohorts.

Figure 3-4. TB Program net impact on earnings for 2002 through 2012 cohort females
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Estimate	-$7,106	-$15,700	-$8,996	-$3,226	$792	$3,712	$4,152	$4,459	$5,759	$5,401	$6,217
	P-value	<0.0001	<0.0001	<0.0001	0.0091	0.57	0.0109	0.0051	0.0046	0.0004	0.0014	0.0002
2003	Estimate	-$9,078	-$13,958	-$3,675	$753	$2,678	$4,053	$5,804	$5,992	$6,447	$6,841	
	P-value	<0.0001	<0.0001	0.0129	0.6344	0.101	0.0166	0.0013	0.0019	0.0007	0.0003	
2004	Estimate	-$12,506	-$14,816	-$8,938	-$5,654	-$3,922	-$3,694	-$2,998	-$2,386	-$1,402		
	P-value	<0.0001	<0.0001	<0.0001	0.0005	0.0228	0.0418	0.1031	0.1977	0.4663		
2005	Estimate	-$12,495	-$11,114	-$4,742	-$763	$444	$356	$1,299	$1,867			
	P-value	<0.0001	<0.0001	0.0011	0.62	0.79	0.83	0.4486	0.29			
2006	Estimate	-$12,136	-$14,833	-$9,949	-$7,592	-$5,378	-$4,412	-$4,576				
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0022	0.01	0.008				
2007	Estimate	-$13,512	-$20,834	-$14,723	-$9,788	-$6,811	-$7,127					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0003					
2008	Estimate	-$12,900	-$14,806	-$10,796	-$5,915	-$2,961						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0306						
2009	Estimate	-$8,049	-$13,798	-$9,137	-$5,747							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001							
2010	Estimate	-$9,194	-$13,115	-$7,809								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Estimate	-$10,127	-$13,049									
	P-value	<0.0001	<0.0001									
2012	Estimate	-$10,731										
	P-value	<0.0001										

Female TB participants in the 2002 and 2005 cohorts receive an average net gain in earnings from follow-on year 5 onward, and female participants in the 2003 cohort receive a net gain from follow-on year 4 onward. Female participants in the remaining cohorts do not receive an average net gain in earnings during any follow-on year for which we have data.

Discussion: Effects of the Great Recession on participant earnings

As one would expect, all TB participants experience a net decrease in earnings during the first three follow-on years. During this period, many participants are not actively searching for work because they are still in training, or because they are beginning their initial job searches. As a result, the statistically adjusted average earnings will be lower for TB participants than for matched non-participants during this period.

By follow-on years 4 and 5, most participants have exited training. However, net decreases in earnings are also not surprising during these years. If training participants are more likely to make an occupational transition, then they may have to accept part-

time or entry-level positions that initially pay less than the jobs they held during their steady-state year. Thus, even when participants are fully employed they experience a period of forgone earnings that lasts a few years after they exit training.

Male TB participants in the 2002 cohort registered a net increase in earnings by follow-on year 5. Male participants in the 2003 cohort registered a net increase in earnings by follow-on year 4. For 2003 cohort males, the size of the net increase grew from follow-on year 5 through follow-on year 10. For 2002 cohort male participants, the net increase grew from follow-on year 5 through follow-on year 10 and then dropped slightly from follow-on year 10 to follow-on year 11.

Female participants in the 2002, 2003 and 2005 cohorts also registered a net increase in earnings by follow-on year five. For 2002 and 2003 cohort females, the size of the net increase also grows from follow-on year 5 through follow-on year 9. The net increase also continues to grow through follow-on year 10 for 2003 cohort females, but declines slightly from follow-on year 9 through follow-on year 10 for 2002 cohort females. From follow-on year 10 through follow-on year 11, the net increase in earnings grows for female participants in the 2002 cohort.

However, both male and female participants from the 2004 and the 2006 through 2008 cohorts generally experienced a net decrease in earnings from follow-on year 5 onward. The only exception was the 2004 cohort male participants who experienced a net gain of $359 in follow-on year 6. We do not yet have sufficient data to assess the effects of training for the 2008 through 2012 cohorts beyond the first five follow-on years.

This difference in the results may be due to differences in labor market conditions. TB participants from the 2006 through 2009 cohorts probably began their initial job search during the Great Recession, which lasted from 2007 through 2010 in Washington state, or during the post-recession recovery. For example, the second and third follow-on years for the 2006 cohort include calendar years 2008 and 2009. The second and third follow-on years for the 2008 cohort include 2010 and 2011.[22]

Both TB participants and matched non-participants in these cohorts faced difficult labor market conditions during the Great Recession. However, our results suggest the Great Recession may have affected TB participants differently than it affected matched non-participants in our samples. This is possibly due to the fact that participants are more likely to face the added difficulties of making an occupational transition, which may extend the period of forgone earnings during an economic downturn. As we do in *Chapter 2*, we compare the net impact estimates for earnings among TB participants who did and did not return to their employer of record as a partial test of this hypothesis in the following section.

[22] See for example U.S. Bureau of Labor Statistics, "BLS Spotlight on Statistics: The Recession of 2007-2009" (February 2012); available at: www.bls.gov/spotlight/2012/recession/pdf/recession_bls_spotlight.pdf, accessed June 16, 2015; Shierholz, Heidi, "Six Years from its Beginning, the Great Recession's Shadow Looms over the Labor Market," Economic Policy Institute, Issue Brief #374 (January 9, 2014); Washington State Employment Security Department/LMPA, "2014 Labor Market and Economic Report" (March 2015); available at: https://fortress.wa.gov/esd/employmentdata/docs/economic-reports/labor-market-and-economic-report-2014.pdf, accessed July 24, 2015.

Net impact results for participants who did and did not return to their employer of record

Recall that we assume participants who return to their employer of record are less likely to be structurally displaced workers and are less likely to make an occupational transition than participants who do not return to their employer of record. We consider these to be reasonable assumptions because participants who return to their employer of record have stronger ties to a specific industry and firm. Stronger ties to a specific industry or firm increase firm-specific or industry-specific human capital, which should translate into higher wages and more stable employment for participants who return to their employer of record.

Figure 3-5 displays the weighted average of the earnings net impact estimates for the combined cohorts of TB participants who did and who did not return to their employer of record within two years of entering training. *Appendix Figures A3-3* through *A3-8* provide detailed results for the full sample, all male and all female participants who did and did not return to their employer of record by follow-on year. In every follow-on year, participants in all groups who returned to their employer of record fared better than those who did not when compared to their matched non-participants, both in terms of forgone earnings and in terms of net earnings gained.

As shown in *Figure 3-5*, the full sample of participants who did not return to their employer of record experienced average forgone earnings of $12,791 in follow-on year 1. The full sample of participants who returned to their employer of record experienced an average of $4,866 in forgone earnings during follow-on year 1. Forgone earnings reached an average of $17,005 in follow-on year 2 for the full sample of participants who did not return to their employer of record and $14,242 for those who did return to their employer of record. In follow-on year 3, forgone earnings declined to $10,531 for the full sample of participants who did not return to their employer of record and declined to $7,506 for those who did return to their employer of record.

Figure 3-5 also shows that the full sample of TB participants who returned to their employer of record experienced a net increase in earnings from follow-on year 5 through follow-on year 11. The total sample of TB participants who did not return to their employer of record experience an average net increase in earnings from follow-on year 7 through follow-on year 11. These trends are similar for all male and all female participants who did and did not return to their employer of record, though females who did not return to their employer of record experience a net gain in earnings from follow-on year 8 through follow-on year 11. Thus, participants we assume are less likely to make an occupational transition generally experience net gains in earnings sooner than those we assume are more likely to make an occupational transition.

Appendix Figure A3-3 shows estimates for the full sample of participants in each cohort who returned to their employer of record. *Appendix Figure A3-6* shows estimates for the full sample of participants in each cohort who did not return to their employer of record. The net impact estimates in these figures show that participants who returned to their employer of record fared better than those who did not, both in terms of forgone

earnings and in terms of net earnings gained, during every follow-on year. Data in these figures also show that participants in every cohort that we assume are less likely to make an occupational transition generally experience net gains in earnings sooner than those we assume are more likely to make an occupational transition.[23]

These results do not demonstrate that participants are more likely to make an occupational transition than non-participants. However, they do indicate the effect of training is different for participants who do not remain attached to an employer. To the extent that participants who do not remain attached to an employer are more likely to make an occupational transition, these results also suggest occupational transitions extend the period of forgone earnings.

The results presented in *Appendix Figure A3-6* also reveal that net effect estimates for the full sample of TB participants who did not return to their employer of record vary by cohort. Participants who did not return to their employer of record from the 2002, 2003 and 2005 cohorts experience an average net gain in earnings by follow-on year 6, or by follow-on year 7. In contrast, participants who did not return to their employer of record from the 2006 through 2009 cohorts do not experience an average net gain in earnings in any follow-on year for which we have data.

Appendix Figure A3-6 also shows that none of the negative estimates is statistically different from zero after follow-on year 4 for participants in the 2002, 2003 and 2004 cohorts who did not return to their employer of record. In contrast, all of the negative estimates are statistically different from zero for participants in the 2006 through 2009 cohorts who did not return to their employer of record. Differences in the precision of our estimates for these cohorts provide evidence that participants we assume were more likely to make an occupational transition during the Great Recession did not fare as well as their matched comparison group members. In contrast, participants we assume were more likely to make an occupational transition before the Great Recession either fared no worse, or fared better on average than their matched comparison group members from follow-on year 5 onward.

Again, these results do not confirm that TB participants are more likely to face difficulties associated with an occupational transition than their matched non-participants. They do suggest that participants who we assume are more likely to make an occupational transition experience a longer period of forgone earnings. They also suggest that occupational transitions were more difficult for participants who likely exited training during the Great Recession.

However, occupational transitions during the Great Recession probably do not explain differences in the net effect of training between the 2004 and 2005 cohorts. Most members of both cohorts exited training prior to the onset of the Great Recession in

[23] See *Appendix Figures A3-4* and *A3-7* for a comparison of the results for male participants who did and did not return to their employer of record, respectively. See *Appendix Figures A3-5* and *A3-8* for a comparison of the results for female participants who did and did not return to their employer of record, respectively.

Washington state. In fact, follow-on year 3 includes 2007 for the 2004 cohort, and follow-on year 3 includes 2008 for the 2005 cohort. Thus, a larger portion of the 2004 cohort probably exited training prior to the Great Recession in comparison to the 2005 cohort.

Among the cohorts whose members likely exited training before the Great Recession, the 2004 cohort is an anomaly for the earnings outcome. Differences in trainee demographics in each cohort, particularly the relative proportions of participants drawn from different industries, may partially explain the anomalous results for the 2004 cohort.

For example, 63 percent of male TB participants and 43 percent of female TB participants in the 2002 cohort had an employer of record in the durable goods manufacturing industry. In the 2003 cohort, 57 percent of male TB participants and 40 percent of female participants had an employer of record in the durable goods manufacturing industry.

The proportion of participants drawn from the durable goods manufacturing industry dropped sharply for both the 2004 and 2005 cohorts. Among 2004 cohort males, 27 percent had an employer of record in the durable goods manufacturing industry, while 14 percent of 2004 cohort females had an employer of record in durable goods manufacturing. Among 2005 cohort TB participants, nearly 22 percent of the males had an employer of record in durable goods manufacturing, while only 10 percent of the female participants had an employer of record in durable goods manufacturing.

Durable goods manufacturing is among the top two industry classifications for employers of record in each of the 2002 through 2005 cohorts. However, the relative proportion of males in the transportation industry is two times higher in the 2005 cohort than it is in the 2004 cohort. Similarly, the relative proportion of females in the transportation industry is nearly three times higher in the 2005 cohort than it is in the 2004 cohort.

Differences in the net impact estimates and in the proportion of participants drawn from each industry from cohort to cohort suggest that there may be an interaction between training and the industry of a participant's previous employer. This means that the net effect of training on the earnings outcome changes according to which industry an individual was affiliated with prior to entering training. Thus, future research should not only account for the effect that labor market conditions have on occupational transitions. It should also take into account possible interactions between training and a participant's previous industry of employment.

Figure 3-5. TB Program net impacts on earnings for participants who did and did not return to their employer of record*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Participants who did not return to their employer of record within two years after entering training											
Full sample	-$12,791	-$17,005	-$10,531	-$6,201	-$3,894	-$1,889	$67	$1,984	$2,054	$4,822	$7,476
Lower 95% CI	-13208	-17534	-11172	-6990	-4944	-3152	-1342	327	75	2467	4160
Upper 95% CI	-12374	-16476	-9891	-5412	-2845	-625	1476	3642	4033	7177	10792
Male	-$14,839	-$19,870	-$12,062	-$6,686	-$5,105	-$1,343	$1,048	$2,411	$2,449	$5,323	$9,104
Lower 95% CI	-15454	-20695	-13055	-7908	-6764	-3407	-1239	-260	-698	1748	4141
Upper 95% CI	-14224	-19044	-11070	-5464	-3445	721	3334	5082	5597	8898	14067
Female	-$10,743	-$14,476	-$9,079	-$5,782	-$2,856	-$1,959	-$459	$1,311	$1,384	$3,289	$4,334
Lower 95% CI	-11273	-15136	-9897	-6792	-4184	-3500	-2165	-723	-971	372	361
Upper 95% CI	-10213	-13816	-8261	-4773	-1528	-418	1248	3345	3738	6207	8307
Participants who returned to their employer of record within two years after entering training											
Full sample	-$4,866	-$14,242	-$7,506	-$661	$3,352	$5,226	$6,170	$7,595	$10,275	$10,624	$10,202
Lower 95% CI	-5959	-15496	-8981	-2353	1277	2917	3714	4954	7241	7372	6068
Upper 95% CI	-3773	-12987	-6031	1032	5427	7536	8626	10236	13310	13876	14336
All males	-$5,495	-$16,718	-$7,937	-$272	$4,597	$6,075	$7,574	$9,899	$10,811	$11,272	$11,825
Lower 95% CI	-7120	-18595	-10083	-2728	1530	2633	3925	6002	6551	6839	6023
Upper 95% CI	-3871	-14842	-5790	2184	7664	9518	11222	13796	15071	15705	17627
All females	-$3,685	-$11,585	-$6,278	-$588	$2,298	$4,649	$4,824	$4,827	$8,879	$9,560	$9,294
Lower 95% CI	-5180	-13298	-8389	-2973	-635	1459	1477	1226	4561	4780	3451
Upper 95% CI	-2190	-9873	-4168	1797	5232	7839	8171	8427	13196	14340	15137

*The estimates are the net difference in earnings between participants and their matched non-participants in each group. We use the inverse-variance weighted average for the combined cohorts for follow-on years 1 through 11 and the lower and upper 95-percent confidence interval boundaries for those estimates. Confidence intervals (CI) that do not include zero indicate the estimates are statistically significant.

TB participants who returned to their employer of record within two years of exiting training receive a higher average net gain in earnings than participants who did not return to their employer of record.

Chapter 4: Did Training Benefits participants reduce their use of unemployment benefits?

In this chapter, we estimate the net impact of the Training Benefits (TB) Program on unemployment benefits received during each follow-on year for each TB Program cohort from 2002 through 2012. The Washington State Employment Security Department (ESD) does not have access to complete data on other sources of income support. As a result, we do not evaluate the impact of training on other sources of income support.

We use an estimation strategy called mediation analysis to generate our unemployment benefit net impact estimates. The results indicate training led to a net increase in unemployment benefit levels among the total sample, all male and all female TB Program participants from follow-on year 1 through follow-on year 3. Training led to a larger net increase in unemployment benefit levels for male participants than for female participants from follow-on year 1 through follow-on year 3.

After controlling for the effect current-year earnings have on unemployment benefit levels, our results show training led to a net decrease in unemployment benefit levels from follow-on year 4 through follow-on year 11 for the total sample, all male and all female TB participants. All groups in participant cohorts who likely exited training during the Great Recession experienced a net decrease in unemployment benefit levels from follow-on year 5 through follow-on year 11. Training led to a larger net decrease in unemployment benefit levels for male participants than for female participants from follow-on year 4 through follow-on year 11.

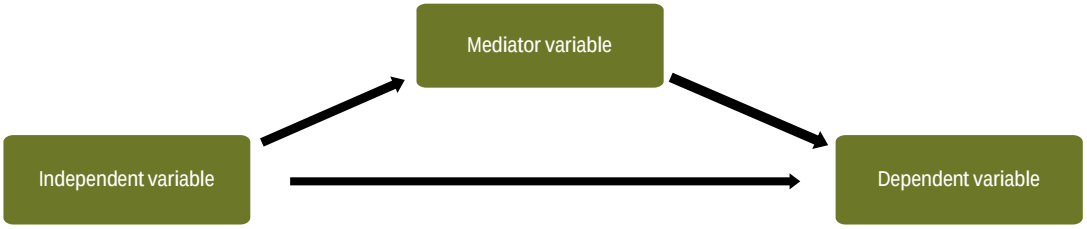
Mediation analysis explained

The goal of mediation analysis is to explore different mechanisms that link a dependent variable to an independent variable. For example, one might observe that a job training program (independent variable) increases employment over time (dependent variable). This is important information, but researchers and policymakers often want to know why job training increases employment.

Job training's effect on employment could be the result of increased levels of confidence among participants. However, the effect could also be the result of skills participants acquire during training. In this example, increased confidence and skill acquisition are different mechanisms—also called mediator variables—that potentially link job training to increased levels of employment.

Figure 4-1 provides a graphic illustration of a generic mediation model with one mediator variable. Mediation analysis allows researchers to separate the effects of an independent variable into two parts. The first part, called the "mediation effect," is the effect the independent variable has on the dependent variable through its influence on the mediator variable. The second part, known as the "direct effect," is the portion of the effect that is attributable to other mediator variables that link the independent and dependent variables.

Figure 4-1. Graphic illustration of a generic mediation model
Source: Employment Security Department/LMPA



Mediation analysis enables researchers and policymakers to identify mechanisms through which a training program influences an outcome of interest.

There are three reasons mediation analysis is useful for estimating the net impact of the TB Program on unemployment benefits received. The first is that post-training earnings and employment probably have more influence on the likelihood of filing an unemployment benefits claim than participation in training, *per se*. If training influences the likelihood of filing an unemployment claim, it is probably through its influence on earnings and employment in a given follow-on year. The second reason is the design of the TB Program, which directly increases benefit eligibility during an individual's training period. The third reason is the difficulty associated with making an occupational transition, which may influence the likelihood of filing an unemployment claim for reasons that are not directly attributable to participation in training.

The effects of post-training earnings on unemployment benefits received

As with other government-sponsored programs, the TB Program targets disadvantaged or displaced workers with the goal of providing them marketable skills that enhance long-term earnings potential. The TB Program is also designed to provide participants with knowledge, skills and abilities associated with high-demand occupations.[24] If participants do acquire marketable skills in a high-demand occupation, we can expect two things: 1) participants will eventually have higher earnings than similar non-participants; 2) participants will eventually find more stable employment.

In other words, we do not expect participants to file fewer unemployment claims just because they enrolled in training. Instead, we expect participants to earn more in a growing occupation, which should reduce the likelihood of becoming unemployed in the future. Thus, we expect post-training earnings and employment to mediate the effects of training on post-training UI claim behavior.

[24] Substitute House Bill 3077 (2000).

Effects of program design on unemployment benefit amounts during training

The TB Program increases unemployment benefit eligibility for participants while they are in training by design. Currently, participants receive up to 52 weeks of unemployment benefits. These 52 weeks include 26 weeks of regular benefits and an additional 26 weeks paid out of a portion of the Unemployment Insurance Trust Fund that is reserved for the TB Program. Unemployment benefit eligibility reached a peak of 125 weeks for TB participants and 99 weeks for all other unemployment claimants during the period of federal benefit extensions that lasted from June 2008 through December 2013.[25]

Participants can receive higher benefit amounts than similar non-participants during their training period, even when non-participants are unsuccessful in their job search. For example, under the current law a person in training who remains unemployed for a year would receive twice the annual benefit amount as a similar non-participant who also remains unemployed for a year. Thus, the TB Program directly increases unemployment benefit payments to participants during their training period.

The TB Program also grants a job-search waiver to participants that is unavailable to non-participants. This design feature probably has a direct effect on unemployment benefits paid because it reduces the likelihood that participants will search for a job while they are in training. However, this feature of the program also implies that part of the increase in benefits a participant receives relative to a similar non-participant depends on the duration of the non-participant's job search.

For example, under the current law a TB participant can remain unemployed for a year and collect 52 weeks of benefits. If a similar non-participant finds employment after collecting 10 weeks of benefits, the difference in benefits paid would be 42 weeks. In this scenario, 16 of the 42 additional weeks of benefits a participant receives (26 minus 10) are attributable to the fact that the non-participant found employment well before exhausting his or her benefit eligibility.

In other words, not all of the 42 additional weeks the TB participant receives in this example are the result of the program. Instead, a portion of the observed difference in unemployment benefits paid is a result of the non-participant's successful job search and increased level of earnings. Mediation analysis enables us to subtract out the portion of the difference in unemployment benefit levels that is attributable to the earnings and employment experience of non-participants. As a result, it produces an estimate of training's "direct" effect on unemployment benefit levels during an average participant's training period.

[25] U.S. Department of Labor, Employment and Training Administration (ETA), "Emergency Unemployment Compensation (EUC) Expired on January 1, 2014," www.workforcesecurity.doleta.gov/unemploy/supp_act.asp: accessed July 2, 2015.

Effects of occupational transitions on unemployment benefits received after training

The transition to higher earnings and stable employment takes time, meaning the effect training has on post-training earnings will vary during the course of an average participant's experience. The long-term expectation is that participants will earn more when compared to similar non-participants. However, while participants are making a transition into their new occupations they will probably experience a decline in earnings relative to similar non-participants.

Occupational transitions often involve competing with more experienced candidates for open positions during a participant's initial job search. It may also involve accepting temporary or part-time positions in order to gain qualifications that enhance one's long-term competitiveness in the job market. We assume non-participants are less likely to face these issues during their job searches for two reasons: 1) they are more likely to apply for positions with fewer qualifications because they will exhaust their unemployment benefits sooner; 2) they are more likely to apply for positions in an occupation for which they already possess competitive qualifications and levels of experience.

It may take longer for many TB participants to earn as much or more than they earned prior to becoming unemployed because they face additional difficulties associated with an occupational transition. As a result, participant earnings could be more unstable than non-participant earnings for a few years after training ends. If unstable earnings increase the likelihood of filing an unemployment claim, then occupational transitions may affect the average level of unemployment benefits participants receive.

This is especially true during an economic downturn like the Great Recession. TB participants who finished training during the recession had to compete for a much smaller number of openings with a much larger number of more experienced candidates. Non-participants who filed claims during the recession also had to compete for a smaller number of positions, but they likely did so without the added disadvantage of making an occupational transition. In many cohorts, the Great Recession may have lengthened the transition period for participants when compared to similar non-participants. Consequently, labor market conditions that are unrelated to training may have increased the likelihood of filing an unemployment claim among participants during the Great Recession.

Results presented in *Chapter 3* of this report indicate that participants in the cohorts most likely to exit training during the Great Recession did have longer transitional periods that were characterized by comparatively low earnings. For example, male participants in the 2002 through 2005 cohorts were more likely to show a net gain in earnings after follow-on year 4 than male participants in the 2006 through 2009 cohorts.

Mediation analysis provides a way to control for the influence that labor market conditions during the Great Recession might have had on post-training unemployment benefit levels because it enables us to remove the impact current-year earnings has on current-year unemployment benefit levels.

Control variables in the unemployment benefits net impact models

Several variables are different from those included in the net impact models for earnings and employment. In *Appendix 1*, we briefly explain our decision to include these variables in the context of recent research on UI claim behavior, including repeat use of the unemployment insurance system.[26]

The control variables included in our net impact models for unemployment benefits received are as follows:

1. Each individual's previous quarterly unemployment benefit levels;
2. Each individual's previous occupation;
3. Each individual's previous union status;
4. The magnitude of each individual's Ashenfelter dip;
5. The magnitude of each individual's earnings loss dip;
6. The industry of each individual's employer of record;
7. Each individual's age and squared age;
8. Each individual's level of formal education;
9. Each individuals previous quarterly earnings;
10. Each individual's race or ethnicity;
11. Each individual's workforce development area (WDA);
12. Each individual's U.S. veteran status;
13. Each individual's low income status;
14. Each individual's disability status.

Training Benefits Program net impact on unemployment benefits paid

In this section we first present the statistically unadjusted average benefit levels for all cohorts combined, as well as the average benefit levels for all male and female TB participants across cohorts. We then present the net impact estimates for the combined cohorts, as well as the estimates for the combined sample of male and female participants and their matched non-participants.

Statistically unadjusted averages for unemployment benefit levels

Figure 4-2 shows statistically unadjusted averages of unemployment benefits received for the entire study sample from follow-on year 1 through follow-on year 11. *Appendix Figure A4-1* shows detailed unadjusted averages for the total sample, all male and all female TB participants in each cohort.

[26] For examples, see Michaelides, "Repeat Use in the U.S. Unemployment System," *Monthly Labor Review* (September 2014). Available at: http://www.bls.gov/opub/mlr/2014/article/repeat-use-in-the-u-s-unemployment-insurance-system-1.htm, U.S. Department of Labor, accessed May 14, 2015; Michaelides and Mueser, "Recent Trends in the Characteristics of Unemployment Insurance Recipients," *Monthly Labor Review* (July 2012), pp. 28-47; Gould-Werth and Shaefer, "Unemployment Insurance Participation by Education and by Race and Ethnicity," *Monthly Labor Review* (October 2012): 28-41.

During the first three follow-on years, TB participants received more unemployment benefits than similar non-participants. The average benefit amount for TB participants in follow-on year 1 was $17,951, which is over two times more than the $8,455 average for matched non-participants. The average benefit level of $11,199 for TB participants is more than three times higher than the average of $3,548 received by matched non-participants in follow-on year 2. In follow-on year 3, participants received an average of $3,518, which is 86 percent higher than the average of $1,887 received by matched non-participants.

For each year after follow-on year 3, average benefit levels were lower for TB participants than for non-participants included in the total sample. The percentage difference in benefit levels was highest in follow-on year 11. During that year, non-participants received an average of $685, which is 74 percent more than the average of $393 TB participants received. The percentage difference in benefit levels was lowest in follow-on year 4. During that year, non-participants received an average of $1,687, which is 36 percent more than the average of $1,237 TB participants received. Note, however, that follow-on year 11 only includes information from the 2002 cohort.

The pattern in unemployment benefit levels for males is similar. The average benefit level for male TB participants in follow-on year 1 was $18,636, which is over two times more than the $8,437 average non-participant males received. The average benefit level of $12,051 for male participants is also more than three times higher than the average of $3,711 received by non-participant males in follow-on year 2. In follow-on year 3, male participants received an average of $4,069, which is 75 percent higher than the average of $2,325 received by non-participant males.

From follow-on year 4 through follow-on year 11, average benefit levels were lower for male TB participants than for their non-participant counterparts. The percentage difference in benefit levels for males was highest in follow-on year 9. During that year, non-participant males received an average of $1,601, which is more than twice the average of $786 male participants received. The percentage difference in benefit levels was lowest in follow-on year 4. During that year, non-participant males received an average of $1,999, which is 38 percent more than the average of $1,447 male participants received.

Females in our sample demonstrate a similar pattern. The average benefit level for female TB participants in follow-on year 1 was $17,267, which is over two times more than the $8,525 average non-participant females received. The average benefit level of $10,346 for female participants is also more than three times higher than the average of $3,352 received by non-participant females in follow-on year 2. In follow-on year 3, female participants received an average of $2,968, which is 75 percent higher than the average of $1,515 received by non-participant females.

From follow-on year 4 through follow-on year 11, average benefit levels were lower for female TB participants than for non-participant females. The percentage difference in benefit levels for females was highest in follow-on year 5. During that year, non-participant females received an average of $1,395, which is 68 percent higher than the average of $828 female participants received. The percentage difference in benefit levels

was lowest in follow-on year 4. During that year, non-participant females received an average of $1,375, which is 34 percent more than the average of $1,028 female participants received.

Figure 4-2. Statistically unadjusted unemployment benefits paid by follow-on year
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA*

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Total sample	$13,203	$7,373	$2,703	$1,462	$1,259	$1,348	$1,393	$1,263	$1,033	$822	$539
Participants	$17,951	$11,199	$3,518	$1,237	$925	$1,036	$1,063	$955	$774	$612	$393
Non-participants	$8,455	$3,548	$1,887	$1,687	$1,593	$1,661	$1,723	$1,570	$1,291	$1,032	$685
Difference	$9,497	$7,650	$1,631	-$450	-$667	-$625	-$659	-$615	-$517	-$420	-$292
All males	$13,510	$7,898	$3,164	$1,723	$1,406	$1,548	$1,615	$1,510	$1,194	$890	$583
Participants	$18,636	$12,051	$4,069	$1,447	$1,022	$1,113	$1,135	$1,074	$786	$587	$385
Non-participants	$8,437	$3,711	$2,325	$1,999	$1,790	$1,982	$2,095	$1,946	$1,601	$1,192	$780
Difference	$10,200	$8,341	$1,744	-$553	-$768	-$870	-$960	-$872	-$815	-$605	-$394
All females	$12,896	$6,849	$2,242	$1,201	$1,112	$1,149	$1,171	$1,015	$872	$755	$496
Participants	$17,267	$10,346	$2,968	$1,028	$828	$959	$992	$836	$763	$637	$401
Non-participants	$8,525	$3,352	$1,515	$1,375	$1,395	$1,339	$1,350	$1,195	$981	$873	$591
Difference	$8,742	$6,994	$1,453	-$347	-$567	-$380	-$359	-$358	-$218	-$236	-$190

*Dollar amounts are inflation-adjusted (base = CPI-W 2012). See *Appendix Figure A4-1* for unadjusted averages by cohort.

On average, TB Program participants collected fewer unemployment benefits than comparable non-participants from follow-on year 4 through follow-on year 11.

Full sample net impact estimates

Figure 4-3 shows the net impact estimates for unemployment benefits received by the entire sample of participants from follow-on year 1 through follow-on year 11. These estimates are the weighted average of the direct effect estimates for each cohort for each follow-on year. *Appendix Figures A4-2* through *A4-4* present results for the total sample, all male and all female participants in each cohort.

The estimates in *Figure 4-3* indicate TB participants received higher net benefit levels during the first three follow-on years, but lower net benefit levels from follow-on year 4 through follow-on year 11. In follow-on year 1, the estimated net impact of training on unemployment benefits received is $5,944 for the full sample of TB participants, $6,493 for all male participants and $5,178 for all female participants. In follow-on year 2, the estimated net effect is $4,964 for the full sample, $6,038 for all male participants, and $4,179 for all female participants. In follow-on year 3, the estimated net effect is $733 for the full sample, $858 for all male participants and $652 for all female participants.

Appendix Figures A4-2 through *A4-4* show much larger total effect estimates in each follow-on year for each cohort. However, the figures also show large and statistically significant mediation effects for all cohorts during the first three follow-on years. For example, the mediation effect estimate for the total 2002 cohort sample in follow-on year 1 is $2,440 and the estimated total effect is $10,300.

These results demonstrate that training does influence unemployment benefit levels through the earnings mediator during the training period in ways we expected. In particular, they show that participation in the TB Program (independent variable) decreases earnings (mediator variable), which then increases unemployment benefit levels (dependent variable) during the first three follow-on years. Note that much of the mediation effect is probably not the direct result of training, but the result of the average unemployment claim duration among matched non-participants in the first three follow-on years.

Figure 4-3 shows that the net impact of training on unemployment benefit levels is consistently negative from follow-on year 4 through follow-on year 11. For the total sample of participants, the largest negative effect is $317 during follow-on year 7, while the smallest negative effect is $109 in follow-on year 11. The 95-percent confidence interval only includes zero in follow-on year 11 for the total sample. Thus, it is the only estimate that is not statistically significant at the $p = 0.05$ level.

The net effect of training for males is also negative from follow-on year 4 through follow-on year 11. The largest negative effect for males is $383 in follow-on year 7, while the smallest negative effect is $166 in follow-on year 11. None of the confidence intervals reported here include zero, indicating that all the estimates for males are statistically significant.

Net effect estimates for the total female sample are negative and statistically significant from follow-on year 4 through follow-on year 11. The largest negative effect is $298 in follow-on year 6 for females, while the smallest negative effect is $165 in follow-on year 11. As with the estimates for males, none of the 95-percent confidence intervals include zero, an indication that all estimates are statistically significant.

Figure 4-3 also shows that training had a larger impact on male unemployment benefit levels than on female benefit levels. In each of the first three follow-on years, the net increase in unemployment benefits paid to female participants was smaller than the net increase in benefits paid to males. The largest difference between males and females was in follow-on year 2, when male participants received a net increase of $6,038 and females received a net increase of $4,179.

From follow-on year 4 through follow-on year 11, the negative net effect of training is also generally larger for males than it is for females. The only exception is follow-on year 5, when the net decrease in benefits received for females was $269 and $258 for males.

The difference in net impact estimates for males and females is not surprising. Unemployment benefit eligibility is tied to earnings and hours worked. On average, women still earn less than men, meaning they likely have lower maximum allowable unemployment benefit levels when they file an unemployment claim, both before and after training. Because females are generally eligible for fewer benefits, the net effects of training on the benefits they receive will also tend to be smaller.

Figure 4-3. Training Benefits Program net impact on unemployment benefits paid by follow-on year*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	Follow-on year										
	1	2	3	4	5	6	7	8	9	10	11
Total sample	$5,944	$4,964	$733	-$238	-$237	-$250	-$317	-$252	-$270	-$210	-$109
Lower 95% CI	5829	4853	661	-291	-297	-325	-437	-384	-406	-345	-218
Upper 95% CI	6058	5076	805	-185	-178	-174	-197	-120	-133	-75	0
Male	$6,493	$6,038	$858	-$284	-$258	-$333	-$383	-$331	-$428	-$294	-$166
Lower 95% CI	6320	5836	836	-362	-343	-444	-575	-534	-647	-491	-314
Upper 95% CI	6667	6239	880	-206	-173	-222	-191	-128	-209	-97	-19
Female	$5,178	$4,179	$652	-$225	-$269	-$298	-$245	-$244	-$288	-$260	-$165
Lower 95% CI	5028	4035	564	-298	-352	-404	-407	-412	-460	-449	-312
Upper 95% CI	5328	4322	740	-151	-185	-193	-84	-76	-116	-71	-19

*Dollar amounts are inflation-adjusted (base = CPI-W 2012). Cell estimates are the inverse-variance weighted average for the combined cohorts for follow-on years 1 through 11 and the lower and upper 95-percent confidence interval boundaries for those estimates. Confidence intervals (CI) that do not include zero indicate the point estimates are significant at the p = .05 level. See *Appendix Figure A4-2*, *Appendix Figure A4-3* and *Appendix Figure A4-4* for detail by cohort and gender, including the estimates for mediation effects and total effects.

Net impact estimates for unemployment benefit levels are negative and statistically significant for males, females and the total sample from follow-on year 4 through follow-on year 11.

Appendix Figures A4-2 through *A4-4* show that mediation effects change from positive to negative for both genders in some cohorts after follow-on year 3. The two cohorts for which this trend is the most consistent are the 2002 and 2003 cohorts. As shown in *Appendix Figure A4-2*, the largest negative mediation effect estimate for the total 2002 sample of participants is $317 in follow-on year 8. The smallest negative mediation effect estimate for the full sample of the 2002 cohort is $6 in follow-on year 4. In the total 2003 sample, the largest negative mediation effect is $204 in follow-on year 7, while the smallest negative mediation effect is $1 in follow-on year 4.

Most of the mediation effect estimates are statistically significant for the 2002 and 2003 cohorts from follow-on year 4 through follow-on year 11, but the effect size is generally smallest in follow-on years 4 and 5. These results suggest that participants earn about the same amount as non-participants during these two years. However, the size of the mediation effect is generally larger and negative from follow-on year 6 through follow-on year 11.

These results suggest that part of the negative total effect training has on unemployment benefit levels is the result of increased earnings from follow-on year 6 through follow-on year 11. For example, there is a negative mediation effect of $317 in follow-on year 8 for the 2002 full sample and a negative total effect of $534. This means that participants received an average of $534 less in annual unemployment benefits, but that 59 percent of that decrease in average benefit levels is due to the average TB participant's net increase in earnings.

In other words, participation in the TB Program (independent variable) increases current-year earnings (mediator variable), which then decreases unemployment benefit levels (dependent variable) for the 2002 and 2003 cohorts in follow-on years 4 through 11. To the extent that earnings are influenced by factors not attributable to training, the total effect estimate overstates the program's negative effect on unemployment benefit levels for the 2002 and 2003 cohorts in each follow-on year. Subtracting the mediation effect from the total effect provides an estimate of how the TB Program impacts unemployment benefit levels, independent of the effect current-year earnings has on unemployment benefit levels.

It is particularly important to consider the previous point when reviewing the results for the 2006 through 2009 cohorts because participants in each of these cohorts likely exited training during the Great Recession. Recall that we expect the unusual labor market conditions during the Great Recession to extend the occupational transition period linked to training. Likewise, we expect earnings and employment to be more unstable for TB participants during the transition period, which should increase the likelihood of filing an unemployment claim. If this is true, then participants in the 2006 through 2009 cohorts should have a longer period during which we see positive mediation effects.

The results in *Appendix Figures A4-2* through *A4-4* provide evidence for our model and indicate that the occupational transition period increases the probability of filing an unemployment claim. The results also indicate the transition period was longer for TB participants in the 2006 through 2009 cohorts, as the estimated mediation effect remains positive from follow-on year 4 onward for these cohorts.

The detailed results by cohort also show that, if we did not subtract the effect current-year earnings has on unemployment benefit levels from the total effect estimates, we would likely have understated the program's negative effect on unemployment benefit levels for TB participants in the 2006 through 2009 cohorts. An illustrative example is follow-on year 4 for the total sample of participants in the 2007 cohort.

As shown in *Appendix Figure A4*-2, the mediation effect was positive $514 in follow-on year 4 for TB participants in the 2007 cohort, while the total effect was negative $616 in the same follow-on year. This result indicates that participants in the 2007 cohort would have received even fewer unemployment benefits than they actually received, if they had earned as much in follow-on year 4 as comparable non-participants. Subtracting the mediation effect from the total effect (negative $616, minus positive $514) yields a direct, or net effect of negative $1,130.

In this example, the mediation effect is nearly as large as the total effect, but it has the opposite sign. This indicates that TB participants in the 2007 cohort were still earning less on average than similar non-participants in calendar year 2011, which was the height of the Great Recession. However, when we control for lower current-year earnings among participants in the 2007 cohort, our results show participants are much less likely to file an unemployment claim than comparable non-participants after training ends, even during a severe economic downturn like the Great Recession.

Chapter 5: Cost-benefit analysis of the Training Benefits Program

Introduction

This chapter presents a cost-benefit analysis of the Training Benefits (TB) Program. We base the analysis in this chapter on the weighted average of the net impact estimates for annual earnings and annual unemployment benefit payments presented in *Chapters 3* and *4*. Note that the net impact estimates from *Chapters 3* and *4* are all expressed in inflation-adjusted dollars using the 2012 Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W).

Social cost-benefit estimates indicate the TB Program is cost-effective for all male participants and all participants who returned to their employer of record. However, social cost-benefit estimates also suggest the TB Program is not cost-effective for the full sample of participants, all female participants and all participants who did not return to their employer of record.

Private cost-benefit estimates indicate the TB Program is cost-effective for the total sample, all male participants and all participants who returned to their employer of record. However, private cost-benefit estimates suggest the TB Program is not cost-effective for female participants and all participants who did not return to their employer of record.

Cost-benefit estimates from the government or non-participant taxpayer perspective indicate that projected future tax yields on net earnings gained by TB participants are insufficient to cover the initial costs of the TB Program.

Methods used to estimate costs and benefits

In this section, we explain the methods we use to conduct the cost-benefit analysis for this study. We first describe the cost-benefit perspectives we consider, including the data we use to estimate the costs and benefits of the TB Program from each perspective. We then explain our approach to assessing costs and benefits, which includes an estimation of the net present value (NPV) and the internal rate of return (IRR) of the TB Program. Finally, we briefly describe the method we use to project the net lifetime earnings of TB participants.

Cost-benefit perspectives

There are three groups that have an interest in whether or not the TB Program successfully aids participants in finding a job: 1) society as a whole; 2) TB participants; and 3) the government or non-participant taxpayer. The primary focus of this cost-benefit analysis is on the costs and benefits of the TB Program to society as a whole.[27]

[27] For a comprehensive discussion of social costs and benefits, see Edward M. Gramlich, *A Guide to Benefit-Cost Analysis,* Second Edition, Long Grove, Illinois: Waveland Press, Inc., 1998, p. 104 ff. See also, Boardman, Anthony E., David H. Greenberg, Aidan R. Vining and David L. Weimer, *Cost-Benefit Analysis: Concepts and Practice*, Fourth Edition, Boston, Massachusetts: Prentice Hall (2011).

Figure 5-1 demonstrates that the costs and benefits of the TB Program are different from the perspective of each group. For example, annual earnings (line 1b) are perceived as benefits to society and TB participants. The government or non-participant taxpayer perceive these earnings as neither a cost nor a benefit.

Inversely, the government or non-participant taxpayer perceives taxes and other deductions from participant earnings as a benefit, while the TB Program participant perceives taxes and deductions as costs (line 2). From the social perspective, taxes and deductions are neither a cost nor a benefit because one member of society is being taxed in order to provide services to other members of society. Thus, the net effect of taxes and deductions is zero on society overall.

The cost of an investment is generally expressed as the return society would have received, had it invested in another activity. For example, society could invest a portion of its resources in the stock market. If the annual rate of return from stock investments is 7 percent, then the social cost of the TB Program is 7 percent when expressed as the returns received from stock market investments.

Social benefits are those benefits received by people who are not directly involved in producing or consuming a good or service. These benefits produce a net social gain when they exceed the initial costs of the investment and the returns society would have received from an investment in another activity with a similar level of risk.

For example, assume that an investment in a job training program yields a 6 percent return. If society could have received a 7 percent return in the stock market, then job training imposes a net social cost. This is because the investment slightly reduces the resources that would have been available for investment in other activities, had society invested in the stock market.

Alternately, assume the same investment in a job training program yields the same 6 percent return. If society would have received a 5 percent return on an investment in the stock market, then job training produces a net social benefit. This is because the investment produces a higher yield than an investment in the stock market would have produced. Consequently, the investment in job training increases the resources available to other members of society for investment in other activities.

The government or non-participant taxpayer and the TB Program participant do not pay social costs or receive social benefits. Taxes and transfers shift a given resource between individuals from different groups. What an individual in one group gains, an individual in another group loses. However, these taxes or transfers do not necessarily increase or decrease the resources available to individuals in other groups for investments in other activities. It is for this reason we emphasize social costs and benefits when evaluating the TB Program in this report.

As *Figure 5-1* demonstrates, we need not consider the following variables when estimating the social costs and benefits of the TB Program: 1) taxes and tax-like deductions on gross earnings; 2) government or taxpayer subsidies for the direct costs of training; 3) government or taxpayer provided scholarships; 4) privately provided

scholarships and grants. The fact that we do not have data on the costs of tools and supplies, such as books or computers, means we underestimate the social costs these investments impose.

We also do not have data on college tuition costs to TB participants and society. To estimate the costs of tuition to participants and to society, we use administrative and instructional cost data from the Washington State Board of Community and Technical Colleges (SBCTC). The annualized average of administrative and instructional costs from 2003 through 2013 was $3,189 per student, expressed in inflation-adjusted dollars (CPI-W 2012). For more information about our estimates of SBCTC administrative and instructional costs, see *Appendix Figure A5-1*.

We assume that tuition and fees paid by students cover 100 percent of the average administrative and instructional costs. Because we do not have data on government-provided subsidies that cover the costs of tuition, we also assume the government or non-participant taxpayer do not subsidize the tuition payments of TB participants. As a result, we likely over-estimate the tuition costs of training to the individual participant and under-estimate the costs of educational subsidies to the government or non-participant taxpayer.

Unemployment benefits are transfer payments. While TB participants are in training, these payments are a cost to the government or non-participant taxpayer and a benefit to TB participants. Any reduction in these payments after training ends is a benefit to the government or taxpayer and a cost to the individual TB participant. Unemployment benefits enter into the estimation of the NPV of the TB Program for the individual participant and for the government or non-participant taxpayer.

In-program output is not considered since we have no data on any output that a participant might have produced while in training. In-program output includes examples like repairing a private individual's automobile in an automobile maintenance class. Non-monetary costs and benefits cannot be estimated in dollar terms, given the data we have available. As a result, we do not consider these costs and benefits to society and the private individual in this study.

Note also that TB participants must benefit from training. If participants do not receive net benefits, many eligible individuals will not enroll in the program. If eligible individuals do not enroll in the program, it is less likely the TB Program will yield benefits to society. For this reason, we also estimate the cost and benefits of the TB Program from the perspective of TB participants.

We can only provide a limited assessment of the costs and benefits of the TB Program from the government or non-participant taxpayer perspective because do not have information on public educational subsidies to TB participants. We also do not possess data necessary to estimate the costs and benefits of other government-sponsored programs, such as Temporary Assistance for Needy Families (TANF) and Food Stamps/Supplemental Nutrition Assistance Program (SNAP).

The data we have do allow us to estimate whether or not expected tax receipts from the net lifetime earnings of participants exceed the unemployment benefits paid to participants and the administrative costs of the TB Program. As a result, our cost-benefit estimates for the government or non-participant taxpayer only include this information. For more information about our estimates of ESD administrative costs, see *Appendix Figure A5-2*.

Tax rate and fringe benefit imputations

As *Figure 5-1* demonstrates, both earnings and fringe benefits like health insurance are benefits to society and the individual TB Program participant. However, the net impact estimates in *Chapter 3* do not include fringe benefits.

To account for fringe benefits, we multiply our annual earnings estimates by 20.4 percent and add the result to the original earnings net impact estimates. The 20.4 percent fringe benefit rate is based on field survey estimates from the U.S. Bureau of Labor Statistics for the West Census Region.[28] We use the same imputation for society and the individual TB Program participant.

Figure 5-1 also demonstrates that taxes and deductions from the net earnings of participants are benefits to the government or non-participant taxpayer, but costs from the individual participant's perspective. We do not have information on tax yields received from the earnings of participants; as a result, we impute the value of these deductions to our earnings net impact estimates. Various estimates exist in the literature for taxes and deductions paid out of gross earnings. For this study, we chose a consensus tax rate estimate of 20 percent.[29]

[28] Hollenbeck and Huang (2006) estimate fringe benefits for workers undergoing education and training in Washington state at 20 percent of gross earnings. See Hollenbeck, Kevin and Wei-an Huang, "Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State," Upjohn Institute Technical Report No. 06-020, Kalamazoo, Michigan, W.E. Upjohn Institute for Employment Research, 2006, pp. 166-167. Hollenbeck and Huang (2006) cited the following sources to back up their estimate choice: U.S. Bureau of Labor Statistics, *News,* No. 02-346, June 19, 2002; 23.3 percent for all U.S.; 20.4 percent for West Census Region. U.S. Chamber of Commerce, *The 2001 Employee Benefits Study:* 24.3percent for the Pacific Region. As noted above, we have selected the U.S. Department of Labor, BLS estimate for this study. Meyer, Bruce D., "Lessons from the U.S. Unemployment Insurance Experiments," Journal of Economic Literature, Vol. XXXIII, No. 1, 2007, p. 105.

[29] For the source of this tax imputation, see Meyer, Bruce D., "Lessons from the U.S. Unemployment Insurance Experiments," *Journal of Economic Literature,* Vol. XXXIII, No. 1, 2007. Hollenbeck and Huang (2006), page 167 ff., in their net economic impact analysis of a group of Washington state educational and training programs, impute an average tax rate of 17.25 percent for all programs except those for dislocated workers, where the tax imputation is set at 26.0 percent. Since alternate tax assumptions could be made for those made by Hollenbeck and Huang, for simplicity, we choose a 20.0 percent average tax rate for all TB Program participants.

Figure 5-1. Cost-benefit perspectives of society, individual TB participants and the government or taxpayer*
Source: Employment Security Department/LMPA

Benefits and costs	Society	TB participants	Government or taxpayer
1. Participant output			
a. In-program output	Benefit	Neutral	Benefit
b. Earnings	Benefit	Benefit	Neutral
c. Fringe benefits	Benefit	Benefit	Neutral
2. Taxes and tax-like deductions on gross earnings	Neutral	Cost	Benefit
3. Direct costs of education/training borne by the student/trainee			
a. Tuition and fees	Cost	Cost	Neutral
b. Books, transportation, clothing, tools, supplies	Cost	Cost	Neutral
c. Forgone earnings	Cost	Cost	Neutral
4. Government/taxpayer subsidies to the direct costs of training	Neutral	Benefit	Cost
5. Government/taxpayer-provided scholarships	Neutral	Benefit	Cost
6. Privately provided scholarships and grants	Neutral	Benefit	Neutral
7. Student educational loans	Cost	Cost	Neutral
8. Administrative costs of managing the TB Program	Cost	Neutral	Cost
9. Transfer payments/income maintenance subsidies			
a. TANF, Food Stamps/Supplemental Nutrition Assistance Program (SNAP)	Neutral	Benefit	Cost
b. Unemployment benefit payments	Neutral	Benefit	Cost
10. Non-monetary costs and benefits			
a. Benefits	Benefit	Benefit	Neutral
b. Costs	Cost	Cost	Neutral

*We do not estimate the costs and benefits listed in red typeface due to a lack of available data. This figure is derivative of Table 12-2 on page 295 of Boardman, Anthony E., David H. Greenberg, Aidan R. Vining and David L. Weimer, *Cost-Benefit Analysis: Concepts and Practice*, Fourth edition: Prentice Hall (2011).

Society, the government or non-participant taxpayer and the TB Program participant each view the costs and benefits of the TB Program from different economic perspectives.

Net present value and internal rate of return estimates for the Training Benefits Program

Determining whether an investment of present resources will be profitable in the future is difficult, because money is worth more in the present than it is in the future. The value of money earned from an investment may decrease over time because it can be invested in other activities that yield a higher return and because of inflation. This phenomenon is called the time value of money.

The net present value (NPV) is a calculation that is commonly used to determine whether or not the future value of an investment will be profitable in present-dollar terms. The NPV is the difference between the expected future value of an investment in present-dollar terms and the present-dollar cost of that investment.

For example, assume that one person wants to borrow $500 from another person this year and promises to pay back $570 dollars one year from now. Further assume that annual inflation is 0 percent and that one can get a 10 percent average annual return from the stock market at a similar risk level. The future cost of making the $500 loan in this example is 10 percent—expressed as a percentage, this cost is called a discount rate.

The present cost of the loan in this example is $500, since it is already expressed in present-dollar terms. In order to determine whether making this loan is a good investment, one must determine how much the $570 he or she will receive in one year is worth in present-dollar terms. At a 10 percent discount rate, one determines the present value of $570 using the following formula:

$$\text{Present value of \$570 in one year} = \$570/1.10 = \$518.18.$$

To determine the NPV, one would then subtract the present value of the loan ($500) from the present value of $570 at a 10 percent discount rate. The result is $518.18 minus $500, or a positive $18.18. This means a $500 loan for which one receives $570 in a year is worth $18.18 more in present-dollar terms than a $500 investment in the stock market that yields 10 percent.

Another measure commonly used to assess an investment is the internal rate of return (IRR). The IRR is the discount rate at which future returns on an investment would equal the costs of that investment in present value terms. In other words, the IRR is the discount rate at which an investor would "break even," given his or her projected future returns on an investment. In the example above, one would set the NPV of the hypothetical $500 loan to zero and then find the "break even" discount rate using the following formula:

$$\text{IRR} = \$0^{\text{NPV}} = \$570/\$500 - 1 = 14 \text{ percent}.$$

A higher IRR indicates a better investment because it suggests the future value of that investment is large enough to compensate for a decline in the value of money that is due to inflation, or that is due to returns one might have received from an investment in other activities. In this example, the IRR indicates that one would have to receive a return of 14 percent or more from another investment in order to reject the terms of his or her $500 loan as an undesirable investment.

As this example implies, calculating the NPV and the IRR for the TB Program requires knowing the full present value cost of that investment, as well as the future returns a participant can expect from participation in training. It is rare to have all of this information in practice. For this reason, we make two key assumptions in order to estimate the NPV and IRR of the TB Program.

Discount rate and training duration assumptions

The interest rate we use to discount our earnings net impact estimates is a critical variable that affects the size of our NPV estimates. According to the Washington State Treasurer's Office, the average interest rate the state pays on bonds it issues was about 3.5 percent as of April 23, 2015. As of 2013, the average annual interest rate paid on savings was approximately 4.0 percent, while the 10-year annualized average return on stock investments was 7.4 percent. Given the relative volatility of the stock market during the period we are analyzing, we chose the mid-range interest rate of 4.0 percent to discount our net impact estimates.

Differences in the length of training for the average participant can also affect our NPV estimates of the TB Program because the amount of time an average TB participant remains in training affects both administrative and tuition costs. We assume a three-year training period for two reasons: 1) college credit data we received from the Washington State Office of Financial Management (OFM) indicate that average credits earned continue to rise substantially from follow-on year 2 through follow-on year 3 for TB participants in the 2005 through 2010 cohorts; 2) a large portion of participants in our sample enrolled during a period of extended benefits, which enabled them to receive benefits under the auspices of the program for a longer period of time.

Estimating the net lifetime earnings of Training Benefits Program participants

NPV estimates of the TB Program also depend on the net gains or losses in earnings an average TB participant can expect during the course of his or her working life. However, we only have a maximum of 11 follow-on years of data for the 2002 cohort and one less year of follow-on data for each subsequent cohort. Thus, we must extrapolate future net gains or losses in earnings for the average participant using available data in order to conduct our cost-benefit analysis.

The average age of all TB participants in the full sample at the time they entered training is 42, while the average age is 41 for all male participants and 43 for all female participants at the time they entered training. We assume the average person retires at age 65, meaning we must project the average participant's net gains or losses in earnings for 11 years beyond our follow-on data for female participants. For male participants, we must project net earnings for an additional 13 years beyond our follow-on data for males and an additional 12 years for the full sample of TB participants.

Depending on the skills they acquire, workers who receive training typically experience a growth in earnings over time. This growth is attributable to on-the-job training and other kinds of experience that might increase human capital for the average TB participant. Likewise, certain skills a participant receives from training can lose value over time, because these skills become obsolete. The decline in value of a worker's skills is called the decay rate to human capital.

Up through the last follow-on year for which we have data, the growth in earnings and decay rates to human capital that influence earnings are incorporated in the net impact results. However, we must project future growth and decay rates. To project future earnings growth and decay rates, we use a logarithmic earnings function that incorporates the weighted averages of the earnings net impact estimates from follow-on year 1 through follow-on year 7 for the entire study sample.

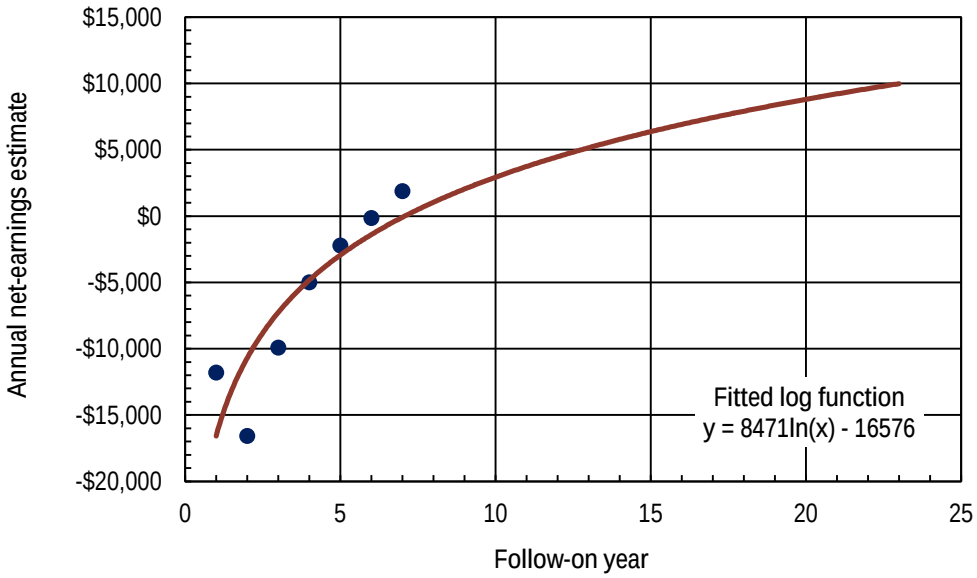
We use only information from the first seven follow-on years to project net lifetime earnings for two reasons: 1) TB participants in the 2002 and 2003 cohorts enjoyed much higher net gains in earnings than did participants in other cohorts; 2) participants in the 2002 and 2003 cohorts exert more influence on the earnings net impact estimates for each successive follow-on year. This is particularly true of the estimates for follow-on years 10 and 11, which only include information from the 2002 and 2003 cohorts. Thus, future earnings projections that incorporate information from follow-on years 8 through 11 may overstate future earnings for participants in the 2004 through 2012 cohorts.

Figure 5-2 shows a graph of the log function we use to project net lifetime earnings for the full sample of TB participants. The blue dots in the figure are the weighted averages of the net impact estimates from follow-on year 1 through follow-on year 7 for all cohorts. The red line in the graph represents the fitted logarithmic function we use to project future net earnings.

The log function we use still incorporates information from the 2002 and 2003 cohorts, but removing follow-on years 8 through 11 reduces the influence these cohorts have on net lifetime earnings projections. For example, projected net earnings gained for TB participants in follow-on year 23 is around $10,000 per year when we use our selected log function. This estimate is about 33 percent lower than the follow-on year 23 estimate we derive from estimates that incorporate information from follow-on years 8 through 11.

We cannot be certain our projected future net earnings will reflect the actual experience of TB participants. However, the log function we selected to estimate net lifetime earnings enables us to incorporate the experience of all participants in all cohorts, while recognizing the experience of the 2002 and 2003 cohorts is different from the rest. Consequently, our projections provide mid-range cost-benefit estimates for the TB Program based on available data.

Figure 5-2. Graph of lifetime net earnings projection for the full sample of TB participants*
Source: Employment Security Department/LMPA



*The blue points in the graph are the inverse weighted averages of the earnings net impact estimates for the full sample of TB participants from follow-on year 1 through follow-on year 7 (see *Figure 3-2* in *Chapter 3* of this report). The red line in the graph represents the fitted logarithmic function contained in the figure. We use this function to project future net earnings from follow-on year 12 through follow-on year 23.

The fitted log function we use to project future net earnings indicate a net gain of around $10,000 per year in follow-on year 23 for the full sample of TB participants.

Social cost-benefit projections

Figure 5-3 shows the estimated lifetime social NPV is positive for all male TB participants ($24,719) at the 4.0 percent discount rate. The NPV for the total sample of participants is negative $412, while the NPV is negative $15,129 for all female TB participants. These estimates indicate that society would have received a higher return from an investment in another activity that yielded a return of 4.0 percent or higher for the total sample and all female participants.

Figure 5-3 also shows that the social IRR for the full sample and all female participants do not exceed the 4.0 percent discount rate. The estimated IRR for the total sample of participants is 3.9 percent, and the estimated IRR for all female participants is 1.2 percent when we use the 7-year log function projections for net lifetime earnings. All of these estimates indicate the discount rate at which society would "break even" in present value terms. The fact that they are lower than the 4.0 percent discount rate suggests an investment in training likely did not yield as much as would have an investment in another activity with a similar level of risk that yielded a 4.0 percent return.

For all male participants, the estimated social IRR is 6.2 percent. This estimate indicates that society would have to receive a return of 6.2 percent or more from another investment in order to conclude the TB Program was not cost-effective for male participants.

Figure 5-3 also shows social NPV and IRR estimates for participants who did and did not return to their employer of record, respectively. The NPV estimate at the 4.0 percent discount rate for the total sample of participants who returned to their employer of record is $68,160, while it is negative $30,742 for the total sample of participants who did not return to their employer of record. The NPV estimate for all male participants who returned to their employer of record is $89,508, but it is negative $18,494 for all male participants who did not return to their employer of record.

The NPV estimate is negative $36,659 for all female participants who did not return to their employer of record, while it is positive $50,567 for all female participants who returned to their employer of record. The negative NPV estimate for female participants who did not return to their employer of record indicates society received $36,659 less than it would have received on an investment that yielded an average return of 4.0 percent.

The social IRRs for those who did and did not return to their employer of record indicate that training was a better social investment for participants who returned to their employer of record. The social IRR for all participants who returned to their employer of record is 12.6 percent, but it is only 0.3 percent for all participants who did not return to their employer of record. All male participants who returned to their employer of record have an estimated IRR of 14.0 percent, while the social IRR is 2.3 percent for male participants who did not return to their employer of record.

The estimated social IRR for all female participants who returned to their employer of record is 11.6 percent. The estimated IRR for female participants who did not return to their employer of record is negative 1.7 percent. A negative IRR for female participants who did not return to their employer of record suggests that, even at a 0 percent discount rate, their projected lifetime earnings are not enough to cover the social costs of training in present value terms. In other words, the TB Program produces a net loss to society for female participants who did not return to their employer of record.

Figure 5-3. Social cost-benefit projections for the TB Program*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	NPV of the TB Program	IRR of the TB Program
All TB participants		
Total sample	-$412	3.9%
Male	$24,719	6.2%
Female	-$15,129	1.8%
Participants who did not return to their employer of record		
Total sample	-$30,742	0.3%
Male	-$18,494	2.3%
Female	-$36,659	-1.7%
Participants who returned to their employer of record		
Total sample	$68,160	12.6%
Male	$89,508	14.0%
Female	$50,567	11.6%

*The social NPV and IRR estimates presented in this figure assume a three-year training period and a 4.0 percent discount rate. The social costs considered are: ESD administrative costs; community and technical college administrative and instructional costs; forgone earnings and forgone fringe benefits. The social benefits considered are: net earnings gained and net fringe benefits gained in each follow-on year.

Social NPV and IRR estimates indicate the TB Program is cost-effective for all male participants and all participants who returned to their employer of record.

Private cost-benefit projections

For a job training program to be successful, eligible individuals must enroll in the program. This will only occur if eligible individuals perceive that they will gain from program participation. Hence, NPVs and IRRs for TB Program participants must be estimated to assess whether or not eligible individuals will enroll at sufficiently high rates.

Figure 5-4 shows the estimated lifetime private NPV is positive for all male participants ($23,207) at the 4.0 percent discount rate. The NPV for the total sample of participants is positive $8,163, while the NPV is negative $5,616 for all female participants. These estimates indicate that female participants would have received a higher return from an investment in another activity that yielded a return of 4.0 percent or higher.

Figure 5-4 also shows that the private IRR for all female participants does not exceed the 4.0 percent discount rate. This 2.9 percent IRR estimate indicates that female participants would have earned more from any investment that yielded more than a 2.9 percent return than they earned from their investment in training.

The estimated private IRR for the full sample of TB participants is 5.2 percent, and the estimated IRR for all male participants is 6.9 percent. All of these estimates indicate the discount rate at which participants would "break even" in present value terms. These estimates suggest an investment in training is likely cost-effective for the full sample and all male participants.

Figure 5-4 also shows private NPV and IRR estimates for participants who did and did not return to their employer of record, respectively. The NPV estimate for the total sample of participants who returned to their employer of record is $73,216, while it is negative $17,767 for the total sample of participants who did not return to their employer of record. The private NPV estimate for all male participants who returned to their employer of record is $94,109, but it is negative $11,122 for all male participants who did not return to their employer of record.

The NPV estimate is negative $23,522 for all female participants who did not return to their employer of record, while it is positive $41,692 for all female participants who returned to their employer of record. The negative private NPV estimate for female participants who did not return to their employer of record indicates participants received $23,522 less than they would have received on an investment that yielded an average return of 4.0 percent.

The private IRR for all participants who returned to their employer of record is 17.0 percent, but it is only 1.1 percent for all participants who did not return to their employer of record. All male participants who returned to their employer of record have an estimated private IRR of 18.8 percent, while the estimated IRR for all male participants who did not return to their employer of record is 2.5 percent. The estimated private IRR for all female participants who returned to their employer of record is 11.9 percent, while the private IRR for female participants who did not return to their employer of record is negative 0.8 percent.

A negative IRR for female participants who did not return to their employer of record suggests that, even at a 0 percent discount rate, their projected lifetime earnings are not enough to cover the private costs of training in present value terms. In other words, the TB Program produces a net loss for female participants who did not return to their employer of record.

Figure 5-4. Private cost-benefit projections of the TB Program*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

Group	NPV of the TB Program	IRR of the TB Program
All TB participants		
Total sample	$8,163	5.2%
Male	$23,207	6.9%
Female	-$5,616	2.9%
Participants who did not return to their employer of record		
Total sample	-$17,767	1.1%
Male	-$11,122	2.5%
Female	-$23,522	-0.8%
Participants who returned to their employer of record		
Total sample	$73,216	17.0%
Male	$94,109	18.8%
Female	$41,692	11.9%

*The private NPV and IRR estimates presented in this figure assume a three-year training period and a 4.0 percent discount rate. The private costs considered are: tuition costs; forgone earnings; forgone fringe benefits; tax payments on net gains in earnings; net decreases in unemployment benefits received in each follow-on year. The private benefits considered are: net earnings gained; net fringe benefits gained; net gains in unemployment benefits received; net decreases in tax payments due to forgone earnings.

Private NPV and IRR estimates indicate the TB Program is cost-effective at a 4.0 percent discount rate for the total sample and all male participants, but not for all female participants.

Government or taxpayer cost-benefit projections

Due to a lack of sufficient data, we cannot generate a cost-benefit estimate of the TB Program from the perspective of the government or non-participant taxpayer that incorporates all of the tax and transfer payment programs in Washington state. As a result, we present a limited estimate of the costs and benefits of the TB Program.

Recall that unemployment benefit payments are a cost to the government or non-participant taxpayer while participants are in training. After training ends, any reduction in unemployment benefit payments attributable to training is a benefit from the government or non-participant taxpayer perspective. Inversely, any tax yield on the net lifetime earnings of TB participants is a benefit to the government or non-participant taxpayer. As a result, any net losses in lifetime earnings attributable to training imposes a cost on the government or non-participant taxpayer in the form of reduced tax yields.

Figure 5-5 shows NPV and IRR estimates for the government or non-participant taxpayer. These estimates add the projected net gains or losses in lifetime unemployment benefit payments to projected net gains or losses in tax receipts from the projected net lifetime earnings of TB participants. It also adds estimated ESD administrative costs of the program, assuming a three-year training period.

We use two tax rates to impute tax yields to the government or non-participant taxpayer: a 20.0 composite tax rate and an 8.8 percent tax rate based on Washington state's sales tax rate. We apply each of these tax rates to our net lifetime net earnings projections from follow-on year 1 through follow-on year 22.

We also use the net impact estimates on unemployment benefits received from follow-on year 1 through follow-on year 11 presented in *Chapter 4*. Note that we use the net effect estimates presented in *Figure 4-4* of this report, not the total effect estimates presented in the *Appendix 4* figures. We then extend the follow-on year 11 estimate for the total sample (negative $109) out an additional 12 years to generate our lifetime net unemployment benefits payment estimates for the full sample of TB Program participants. We project the follow-on year 11 estimate forward without a log function because our projections indicate there is no change in expected future net unemployment benefits received by participants.

Figure 5-5 displays the present values of expected future tax yields at a 4.0 percent discount rate, net of unemployment benefits paid and the estimated administrative costs of the TB Program. The NPV of the training program is negative $3,137 at the 20.0 percent tax rate. This indicates the government or non-participant taxpayer would have received $3,137 more in estimated tax yield, if it had invested in an activity with an average return of 4.0 percent or higher.

At the 8.8 percent tax rate, the government or non-participant taxpayer's NPV for the TB Program is negative $11,424 and the estimated IRR is negative 3.0 percent. The IRR estimates at both the 20.0 percent and 8.8 percent tax rates indicate the tax yield from projected future earnings is not enough to cover the government or non-participant costs of the TB Program in present value terms.

Two caveats are in order. First, future net earnings of TB participants are unknowable. Though our projections are based on past trends, a large portion of participants in our sample exited training during the Great Recession. As a result, it is possible that our log function projections underestimate lifetime net earnings for participants who likely exited during the Great Recession.

Second, the tax rates we apply to our earnings estimate assume that all TB participant earnings are derived from covered employment in Washington state, and all net earnings are spent on taxable goods in Washington state. Because of these assumptions, we may either be overestimating or underestimating the tax yield the government or non-participant taxpayer may receive over the course of the average participant's lifetime.

In sum, we cannot be certain that our projected future net earnings will reflect the actual experience of program participants, nor can we be certain of the actual tax yield the government or non-participant taxpayer can expect to receive. Consequently, our projections should not be seen as definitive cost-benefit estimates for the government or non-participant taxpayer.

Figure 5-5. Government or non-participant taxpayer cost-benefit projections for the TB Program*
Washington state, 2002 through 2013
Source: Employment Security Department/LMPA

20 percent tax rate		8.8 percent tax rate	
NPV	IRR	NPV	IRR
-$10,097	-0.2%	-$11,424	-3.0%

*The NPV and IRR estimates for the government or non-participant taxpayer presented in this figure assume a three-year training period and a 4.0 percent discount rate. The costs considered are: ESD administrative costs; net increases in unemployment benefits paid; net reductions in projected tax yields from participant earnings. The benefits considered are: net increases in tax yield attributable to net earnings gained for TB participants; net reductions in unemployment benefits paid after participants exit training.

NPV and IRR estimates for the government or non-participant taxpayer indicate benefits received from the TB Program are not sufficient to cover the costs of the TB Program.

Appendices

Appendix 1

In this appendix, we provide more detailed information about the methodologies we use in our net impact analysis. We first provide definitions for the variables we include in the propensity function and net impact models. We then briefly explain our estimation strategy for the percent of time employed and earnings net impact models. Finally, we explain the models we use to estimate the net effects of the TB Program on unemployment benefits received.

Independent variable definitions

Age and squared age: We include as controls in our net impact models the age and the squared age of all individuals at the date of the UI claim we use to define cohort membership.

Ashenfelter dip: We include two variables to measure a decline in earnings from the fifth through second quarters prior to the UI claim we use to define cohort membership. This decline in earnings is known as the "Ashenfelter dip."

The first variable is a dummy that indicates whether or not an individual did experience a decline in earnings during the fifth through second quarters prior to the UI claim we use to define cohort membership. The second identifies the magnitude of the decline as a percentage among individuals in our sample who did experience a decline in earnings. For example, if a person earned $200 in the second quarter and $500 in the fifth quarter prior to the UI claim date we use to define cohort membership, he or she would have a 60 percent decline in earnings.

As *Appendix Figure A1-1* shows, we include these variables in the propensity function to match participants and non-participants in our sample, but we do not include it in the percent of time employed and earnings functions.

We include the Ashenfelter dip variables in the UI net impact models because it is possible the severity of a drop in earnings during a previous period influences the likelihood of filing a current UI claim in ways that vary by individual. For example, a larger decline in earnings may make some people less optimistic about their job prospects during a future unemployment event. If this is true, they may be more inclined to file a UI claim than those who did not react the same way to a similar decline in earnings prior to filing a previous UI claim.[30]

Disability status: This is a categorical variable that indicates whether or not an individual was classified as disabled on the UI claim date we use to define cohort membership.

Earnings loss dip: We include a measure of lost earnings to control for the possibility that the severity of a previous economic shock might affect an individual's decision to enroll in training. We calculate this variable by subtracting the level of earnings in an individual's first quarter from the level of earnings in the second quarter prior to the UI

[30] Recent research shows optimism about job-search prospects influences the decision to file a UI claim. For an example, see Wandner and Stettner, "Why are Many Jobless Workers not Applying for Benefits?" *Monthly Labor Review* (July 2000), pp. 21-32.

claim date we use to define cohort membership. Thus, a large, positive number indicates a large drop in earnings in the two quarters immediately prior to filing the UI claim that establishes an individual's cohort membership.

Education: We use a set of nine dummy variables that indicate an individual's formal educational status on the unemployment benefits payment date we use to define cohort membership. We suppress the high school graduate category to the intercept, making it the baseline to which we compare all other categories.

Individual Training Account (ITA) status: This is a dummy variable that indicates if TB participants or matched comparison group individuals had an ITA during the calendar year that coincides with the unemployment benefits payment date we use to define cohort membership. For example, if a 2002 cohort member established an ITA in calendar year 2002, then she would receive a 1 for this variable. Those who did not establish an ITA in calendar year 2002 receive a 0 for this variable.

ITAs provide individuals with federal funding they can use for job training programs. This funding does not come from the Unemployment Insurance Trust Fund; however, it can be used to pay some of the costs of training an individual incurs while he or she is in the TB Program. This additional funding may influence the decision to enroll in training, making it a potential source of selection bias. For this reason, we include it in our net impact models.

Individual's workforce development area (WDA): We include a set of 14 dummy variables that indicate the local labor market in which each individual resides. We use the Seattle-King County WDA as the baseline category and suppress it to the intercept, making it the category to which we compare all others. This variable controls for local labor market conditions and the behavior of staff in local WorkSource offices that may affect an individual's participation in the TB Program. It also helps control for differences in local labor markets that may impact post-training earnings.

Industry of the employer of record: We include a set of 26 dummy variables that indicate the industrial classification of an individual's employer of record. We suppress manufacturing industries, except aerospace industries, to the intercept, making this category the baseline to which we compare all other categories. Including this dummy set controls for selection bias in the net impact estimates that may be associated with the industry of an individual's employer of record.

Low income status: This variable is a dummy indicating whether or not an individual is at or below the low income threshold established in Engrossed Substitute House Bill 1906 (2009), Sec. 4 (2)(b)(i). The low income threshold is set at 130 percent of the state minimum wage rate in an individual's base year. The base year is the period the Washington State Employment Security Department (ESD) uses to calculate the maximum unemployment benefit amount for each UI claimant.

We calculate this variable by summing an individual's quarterly earnings from the 12th through the 9th quarter prior to the unemployment benefits payment date we use to define cohort membership. This produces a measure of annual earnings for each individual three years prior to filing his or her relevant UI claim. For example, we summed the quarterly earnings for the calendar year of 1999 for 2002 cohort members who received their first unemployment benefits payment during the first quarter of 2002.

We compare this estimate of annual earnings with the inflation-adjusted value of the state's annual minimum wage, multiplied by 2,080 hours. We then multiply the result by 1.3 to establish a low income threshold (minimum wage * 2,080 * 1.3) for each steady-state year. Individuals whose earnings are below the low income threshold are scored "1" to indicate low income status. Individuals who are above the threshold are scored "0." We use this definition of low earner because the number of hours worked that employers report for our administrative databases is incomplete.

Number of working-to-not-working transitions: For this variable, we count the number of times an individual went from being employed to being unemployed during the 12 quarters prior to the unemployment benefits payment date we use to define cohort membership. We reserve this variable to identify the DID estimate for percent of time employed in each follow-on year.[31]

Previous occupation: We also add a set of 24 dummy variables that indicate an individual's previous occupation for the unemployment benefits net impact models. We suppressed "occupation unknown" to the intercept, making it the baseline category to which we compare all other occupations. We based our decision to include occupation in the unemployment benefit model on recent research that shows blue-collar workers, like welders and carpenters, are not as likely to receive unemployment benefits when they lose their jobs.[32]

We expect TB Program participants to change occupations upon completing their training, but we do not have the same expectations for comparison group members. We also do not have complete information on occupational status for the follow-on years we analyze. However, assuming comparison group members are not as likely to change occupations, previous occupation should still serve as a reasonable proxy for current occupation for at least half of our sample.

Previous quarterly earnings: We include a measure of earnings levels for the 12th through 2nd quarters prior to the unemployment benefits payment date we use to define cohort membership. For example, 2002 cohort members who received their first payment in the first quarter of 2002 have earnings levels from the calendar year 1999 through the second quarter of 2001 included as controls. Those in the 2002 cohort who received their first unemployment benefits payment in the second quarter have earnings levels from the second quarter of 1999 through the third quarter of 2001 included as controls.

Previous quarterly unemployment benefit levels: We include a measure of unemployment benefit levels for each of the 12 quarters prior to the UI claim date we use to define cohort membership. For example, 2002 cohort members have all benefit levels from the relevant quarters of 1999 through the relevant quarters of 2002 included as controls. Including these variables enables us to adjust our estimates for selection bias linked to previous UI claim behavior. We can also control for any unobserved variables correlated with previous UI claim behavior that influence the likelihood of filing a current UI claim.

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[31] See Heckman, Ichimura and Todd (HIT), "Matching As An Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme," *The Review of Economic Studies,* Vol. 64, 1997, pp. 612-613. The authors indicate that labor force transitions are important identifiers of selection into a training program. Thus, this variable should reduce selection bias in our estimates.

[32] See Michaelides and Mueser, "Recent Trends in the Characteristics of Unemployment Insurance Recipients," *Monthly Labor Review* (July 2012), p. 43.

Previous union status: We include a dummy variable indicating whether or not individuals in the sample belonged to a union when they filed the UI claim we use to define cohort membership in our unemployment benefits net impact models. Recent research shows that union members are more likely to file a UI claim than workers who do not belong to a union.[33] As with occupation, we do not have complete follow-up information on the union status of all individuals in our sample. To address this issue, we assume previous union status influences current union status. To the extent that this is a reasonable assumption, we should be able to control for a key variable that influences unemployment benefit levels, but that is not related to training.

Race/Ethnicity: We use a set of seven dummy variables that indicate an individual's race or ethnicity. We suppress the White/Caucasian dummy to the intercept, making it the baseline to which we compare all other categories.

U.S. veteran status: This is a dummy variable indicating whether or not an individual was a veteran of the U.S. military on the unemployment benefits payment date we use to define cohort membership. Veterans receive a "1" on this variable and all others receive a "0."

TB participants and non-participants included in our sample are matched on their propensity scores. As a result, our net impact models control for the influence of all the variables we used to estimate the propensity function for each gender and cohort.

Also, we estimate separate net impact models for each gender, cohort and follow-on year. This strategy ensures that each of the control variables in the net impact models directly interacts with cohort, gender and each follow-on year. Thus, our estimates adjust for cohort-specific, gender-specific and year-specific variables that we do not measure, such as changes in the law or labor market conditions, but that may also influence earnings.

[33] See Vroman, "An Analysis of Unemployment Insurance Non-Filers: 2005 CPS Supplement Results," ETA Occasional Paper 2009-7, U.S. Department of Labor (2008).

Appendix figure A1-1. Explanatory variables specified for the four key models*
Source: Employment Security Department/LMPA

Function to be estimated*			
Propensity function	Percent of time employed function	Earnings function	Unemployment benefits function
Variables to statistically identify the function			
Ashenfelter dip: identifies and measures the magnitude of a decline in earnings from the 5th through 2nd quarter prior to the date we use to define cohort membership	Number of working to not working transitions in the pre-training period.	Industry classification of the employer of record.	Ashenfelter dip: identifies and measures the magnitude of a decline in earnings from the 5th through 2nd quarter prior to the date we use to define cohort membership
Earning loss dip: measures the magnitude of a decline in earnings during the two quarters prior to unemployment benefits payment date we use to define cohort membership			Earning loss dip: measures the magnitude of a decline in earnings during the two quarters prior to unemployment benefits payment date we use to define cohort membership
Previous occupation dummy variable set			Previous occupation dummy variable set
Earnings for the 12th through 2nd quarter prior to the date we use to define cohort membership			Unemployment benefit levels for the 12th through 2nd quarter prior to the date we use to define cohort membership
Employment and unemployment transitions from the 2nd through 3rd quarters prior to the date we use to define cohort membership			Industry classification of the employer of record
			Union benefit claimant status dummy
			Current earnings in each follow-on year
Policy variable			
TB Program participation dummy	TB Program participation dummy	TB Program participation dummy	TB Program participation dummy
Additional variables			
Age and age squared	Age and age squared	Age and age squared	Age and age squared
Previous formal education status dummy	Previous formal education status dummy	Previous formal education status dummy	Previous formal education status dummy
Previous WDA dummy set	Previous WDA dummy set	Previous WDA dummy set	Previous WDA dummy set
	Pre-training earnings, each quarter taken separately, for Q_12 through Q_2	Pre-training earnings, each quarter taken separately, for Q_12 through Q_2	Pre-training earnings, each quarter taken separately, for Q_12 through Q_2

Function to be estimated*			
Propensity function	Percent of time employed function	Earnings function	Unemployment benefits function
Additional variables			
Ethnicity/race dummy set	Ethnicity/race dummy set	Ethnicity/race dummy set	Ethnicity/race dummy set
U.S. veteran status dummy	U.S. veteran status dummy	U.S. veteran status dummy	U.S. veteran status dummy
Low income earner status dummy	Low income earner status dummy	Low income earner status dummy	Low income earner status dummy
Disabled status dummy	Disabled status dummy	Disabled status dummy	Disabled status dummy
	Individual Training Account (ITA) dummy	Individual Training Account (ITA) dummy	

*The dependent variable of the propensity function is a categorical variable. The dependent variable for the earnings and percent ever employed functions is a difference-in-differences (DID) scalar variable. The dependent variable for the post-training unemployment benefits function is a levels outcome. The first six variables (the Ashenfelter dip is comprised of two variables) listed for estimating the propensity function satisfy the strong ignorability assumption required for a valid estimation of the propensity function. Given the one-to-one match, the statistical effect of each of the variables used to estimate the propensity function is accounted for in each of the net impact functions.

Explanation of the propensity score matching method

Propensity scores are the estimated probability that an individual will participate in a program, regardless of whether or not that individual actually participated in a program. Propensity score matching (PSM) removes selection bias due to any observed variables, like gender or previous income levels, which might influence a person's decision to participate in a training program.

When properly specified, a propensity function produces a sample of non-participants who are statistically similar to participants in the sample. The goal of PSM is to approximate a random assignment experiment with observational data. However, some unknown selection bias always exists in any net impact estimate in a non-experimental program evaluation. This conceptual discussion explains the application of PSM methods. Two papers by Heckman, Ichimura and Todd (HIT) are the primary basis and source for the discussion that follows.[34]

Individuals who receive government-funded job training do not receive that training at random. As a result, analysts cannot often evaluate job training programs in a controlled experiment. Thus, the non-experimental methods developed by HIT, emphasize the use of observational data in ways that mimic a random assignment experiment.

Non-experimental methods like PSM rely on assumptions which, when true, provide a conceptual foundation for estimating the net effect(s) of any government-sponsored social or economic program. This condition is most succinctly given by the Neyman-Rubin criterion, which is formally expressed as

$$Y_i = D_i Y_{i1} + (1 - D_i) Y_{i0},$$

[34] See Heckman, Ichimura and Todd (HIT), "Matching As An Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme," The Review of Economic Studies, Vol. 64, 1997, pp. 612-613.

where Y_i is the outcome variable for each individual, *i*. D_i is the participation dummy, where $D = 1$ indicates individuals who participated in a program and $D = 0$ indicates individuals who did not participate. Y_0 is the outcome for non-participants and Y_1 is the outcome for participants.

To implement a net impact analysis in any non-experimental framework, the first assumption is that each individual belongs to either the treatment or non-treatment group. This assumption is referred to as the "stable unit treatment assumption." An additional assumption that underlies PSM is called the "Conditional Independence Assumption." It states that, conditional on measured characteristics, outcomes are independent of treatment status. The formal expression of this assumption is,

$$Y_1, Y_0 \perp D \mid \mathrm{X} \qquad (1).$$

Here, X is the vector of observable variables used to estimate the conditional probability of program participation and the symbol $\perp$ is read as "is independent of." This statement implies that the outcomes for both the treatment and comparison group are independent of treatment status, given the variables used to statistically estimate probability of program participation.

The third key assumption for PSM is the "common support assumption." This assumption ensures that participants and non-participants with similar measured characteristics have a similar, positive probability of both participating and not participating in a training program.

For example, an individual who receives a propensity score of 0.65 has a 65 percent chance of participating in a program and a 35 percent change of not participating. For every participant who receives this propensity score, there should be a similar non-participant with the same propensity score in the sample. This means that every individual in the sample must have a propensity score that is greater than zero (absolutely certain not to participate), and less than one (absolutely certain to participate). Formally, the common support assumption is expressed as

$$0 < P(D = 1 \mid \mathrm{X}) < 1 \qquad (2).$$

What is essential is that there is a similar non-participant for every participant in a study sample, both in terms of their estimated propensity scores and in terms of the observed variables used in the propensity function. Our PSM algorithm involves multiple steps.

We begin by matching participants and non-participants who have the same propensity score out to five significant digits. For example, if a participant has a propensity score of 0.76543, we identify a non-participant who also has a score of 0.76543. If we do not find a non-participant who has the same five-digit propensity score as a participant in our sample, we look for someone who has the same four-digit score. In this example, we would look for someone who has a propensity score of 0.7654. We continue this process down to one-digit propensity scores, which in this example is 0.7, until there is one matched non-participant for every participant in our samples.

This matching process increases the balance in our participant and non-participant samples on all the independent variables used in the propensity function. Having balance on observed variables reduces selection bias in our net impact estimates that is due to the influence these variables have on participation in the program and the dependent variables in the net impact models.

HIT use PSM to determine the average treatment effect on the treated (ATT), which is

$$\text{ATT} = E(Y_1 - Y_0 \mid D = 1, \text{X}) .$$

We can rewrite the ATT as,

$$\text{ATT} = E(Y_1 \mid D = 1) - E(Y_0 \mid D = 1) .$$

The term $E(Y_0 \mid D = 1)$ is the outcome a program participant would have experienced had he or she not participated in the program. This counterfactual condition cannot be observed for any individual. As a result, one has to choose a proper substitution for this condition in order to estimate the ATT.

We know that we can observe or compute a corresponding value for the untreated as:

$$E(Y_1 \mid D = 1) - E(Y_0 \mid D = 0) \qquad (3)$$

The difference between equation 3 and ATT can be defined as

$$\text{ATT} + \text{SB},$$

where SB is the selection bias term, or the difference between the counterfactual for the treated and the observed outcomes for the untreated. For (3) to be an estimate of a program's net effect, the SB term must be zero. If the SB term is zero, then

$$\text{ATT} = E(Y_1 \mid D = 1) - E(Y_0 \mid D = 0) .$$

When assumptions (1) and (2) hold, the treatment assignment is considered "strongly ignorable" by Rosenbaum and Rubin (1983). In other words, assumptions (1) and (2) imply that program participants and non-participants are similar on observed and unobserved characteristics that might influence participation in a training program and any post-training outcome an analyst evaluates. If assumptions (1) and (2) hold, the PSM estimator for ATT is just the mean difference in outcomes between the treatment and comparison group.

HIT note several additional factors that are crucial to meeting the strong ignorability assumption necessary for PSM to produce valid estimates of a program's net effect. These are:

- Treatment and comparison groups should have the same distribution of observable attributes.
- Treatment and comparison group individuals should come from the same local labor markets.
- Variables used to measure economic behavior should be defined in exactly the same way for the treatment and the comparison groups.

The variables used in this study are defined identically and come from the same sources for the treatment and comparison groups. Our data indicate that treatment and comparison group members do in fact come from the same labor markets. Our data also indicate that treatment and comparison group samples are relatively balanced with respect to measured attributes we included in the propensity function.

Because we meet these conditions, there is some evidence that our data meet the conditions necessary for making the strong ignorability assumption, though we cannot be certain matching removed all of the selection bias in our net impact estimates. Consequently, we also regression-adjust our net impact estimates using the following model specifications.

Employment and earnings net impact models

Each of our net impact models for the percent of time employed and earnings outcomes takes the form

$$Y_{i1} - Y_{i0} = \alpha + \beta X_i + \delta T_i + \varepsilon_i,$$

where $Y_{i1} - Y_{i0}$ is the difference in each individual's percent of time employed or earnings during each follow-on year and his or her percent of time employed or earnings during his or her "steady-state" year. The steady-state year consists of the 12th through 9th quarters prior to the unemployment benefits payment date we use to define cohort membership. For example, the steady-state year is calendar year 1999 for an individual who received his or her first unemployment benefits payment in the first quarter of 2002. For a person who received his or her first unemployment benefits payment in the second quarter of 2002, the steady-state year is from the second quarter of 1999 through the first quarter of 2000.

We assume the 12th through 9th quarters prior to the unemployment benefits payment date we use to define cohort membership is a steady-state period because most individuals in our sample are likely to be fully employed during that period. We also assume that transitory shocks to steady-state employment do not impact an individual's decision to enroll in the TB Program.

The parameter α is the intercept coefficient for each follow-on year. The parameter β is the ordinary least-squares (OLS) estimator for a vector of control variables X_i, which we define previously in this appendix. The variable T_i is a dummy that indicates an individual's training status. Finally, the parameter δ is the OLS estimator for the net effect of training, and ε_i is the error term.

Our models are based on the work of HIT, which employs a difference-in-differences (DID) estimator to evaluate program net effects.[35] HIT define the DID estimator as

$$E(Y_{post} - Y_{pre} | X, T = 1) - E(Y_{post} - Y_{pre} | X, T = 0), \quad (2\text{-}2)$$

which is the expected difference in an outcome for comparison group members subtracted from the expected difference in an outcome for treatment group members.

The OLS estimator for a dummy variable that takes the value 1 or 0 yields the quantity

$$\bar{Y}_{treat} - \bar{Y}_{comp}$$

when applied to a levels outcome. This quantity is the difference in the average level of the outcome between those who are scored a 1 on the dummy variable and those who are scored a 0.

Our outcome is the difference between the steady-state year and each follow-on year. As a result, the OLS estimator in our models yields the quantity

$$(\bar{Y}_{treat\text{-}post} - \bar{Y}_{treat\text{-}pre}) - (\bar{Y}_{comp\text{-}post} - \bar{Y}_{comp\text{-}pre}), \quad (2\text{-}3)$$

which is also the expected difference in an outcome for non-participants subtracted from the expected difference in an outcome for participants. Thus, our approach produces a DID estimate of training net impact in the spirit of HIT.[36]

An advantage of the DID estimator is that it reduces statistical bias in the net impact estimate that is due to unmeasured variables whose impact on the outcome is constant over time, but that are unrelated to training status. These variables are called individual fixed effects. The DID estimator does not adjust for variables whose impact on the outcome is not constant over time.

It is for this reason we chose the third year prior to the unemployment benefits payment date we use to define cohort membership as the steady-state year. The steady-state year should not include any time-varying behavior or events that influence TB Program participation, or that temporarily influence pre-training outcome levels. If the steady-state year does include time-varying factors that influence participation or pre-training outcome levels, one may inappropriately estimate fixed effects or introduce selection bias into the net impact estimates.

The key assumption in our DID estimation strategy is that program participants would have experienced the same change in the outcome as non-participants experienced, had they not participated in training. This is called the common trends assumption. We also

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[35] Heckman, James J., Hidehiko Ichimura and Petra Todd, "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme," *The Review of Economic Studies* 64 (1997): 605-654; Heckman, Ichimura and Todd, "Matching as an Econometric Evaluation Estimator," *The Review of Economic Studies* 65 (1998): 261-294.

[36] For the proof, go to: http://stats.stackexchange.com/questions/86962/ols-estimate-of-a-linear-model-with-dummy-variable. See also the discussion in Imbens, Guido M. and Jeffrey M. Wooldridge, "Recent Developments in the Econometrics of Program Evaluation," NBER Working Paper 14251, National Bureau of Economic Research, Cambridge, Massachusetts, August 2008, Section 6.5 Difference-in-Differences Methods, p. 64.

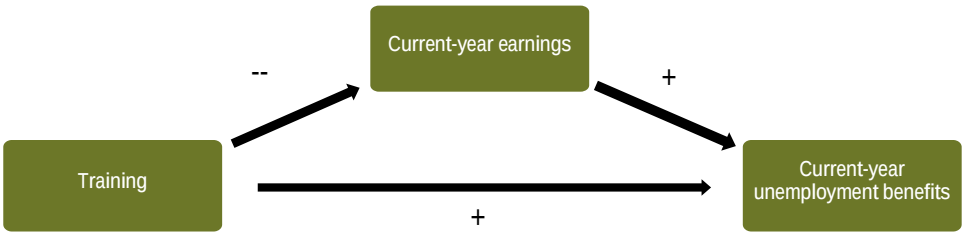
assume that unmeasured factors, such as changes in economic conditions or other policy initiatives, affect both TB participants and matched non-participants in similar ways during the steady-state year.

The unemployment benefit net impact models

Appendix Figure A1-2 provides a graphical representation of our mediation model linking training to post-training unemployment benefit amounts via the earnings mediator during the training and occupational transition periods.

During these periods, participants should expect lower current-year earnings on average than their matched non-participants. This negative effect on earnings should increase the likelihood of claiming unemployment benefits, other things equal. In other words, we expect the mediation effect of training through earnings to be positive, which is represented by the plus sign over the arrow linking current-year earnings to current-year unemployment benefits in *Appendix Figure A1-2*. During training, we also expect the direct effect to be positive due to design features of the TB Program.

Appendix Figure A1-2. Earnings mediator model during the training and occupational transition periods*
Source: Employment Security Department/LMPA



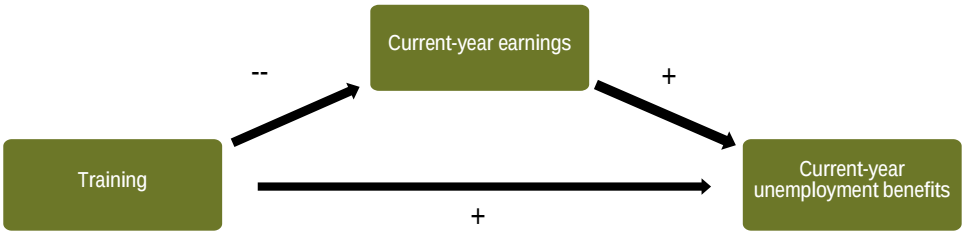
*The arrow linking training to follow-on year earnings represents the expected effect of training on current-year earnings. The arrow linking current-year earnings to current-year unemployment benefits represents the expected mediation effect of earnings on unemployment benefit levels. The arrow linking training to current-year unemployment benefits represents the direct effect of training on unemployment benefits. We report the direct effect as the "net effect" of training on current-year unemployment benefit levels.

During the training and occupational transition period, training participants should earn less on average in each follow-on year. Lower current-year earnings should increase unemployment benefits during this period, meaning the mediation effect should be positive.

Appendix Figure A1-3 provides a graphical representation of our mediation model linking training to post-training unemployment benefit amounts via the earnings mediator after the occupational transition period ends. If training has its intended impact, participants should eventually find more stable employment that pays a higher wage than the job they held prior to entering training. As a result, we expect training to have a positive impact on current-year earnings after they successfully transition into their new careers. This positive effect on current-year earnings should decrease the likelihood of filing a UI claim, other things equal. Thus, we expect the mediation effect of training through earnings to be negative in the post-occupational transition period. This is represented by

the minus sign over the arrow linking current-year earnings to current-year unemployment benefits in *Appendix Figure A1-3*. After the occupational transition period ends, we also expect the direct effect to be negative.

Appendix Figure A1-3. Earnings mediator model during the post-occupational transition period*
Source: Employment Security Department/LMPA



*The arrow linking training to follow-on year earnings represents the expected effect of training on current-year earnings. The arrow linking current-year earnings to current-year unemployment benefits represents the expected mediation effect of earnings on unemployment benefit levels. The arrow linking training to current-year unemployment benefits represents the direct effect of training on unemployment benefits. We report the direct effect as the "net effect" of training on current-year unemployment benefit levels.

During the post-occupational transition period, training participants should earn more on average in each follow-on year. Higher current-year earnings should decrease unemployment benefits during this period, meaning the mediation effect should be negative.

We chose current-year earnings as the mediator because earnings in previous years influence the maximum unemployment benefit amount an individual can claim, when he or she actually files a UI claim. However, previous-year earnings probably do not influence the likelihood of filing a UI claim in any given follow-on year.

If we were to compare participants and non-participants who actually file a UI claim in a given follow-on year, then previous-year earnings would be the appropriate mediator. This is because a UI claimant's earnings in his or her base year determine the maximum amount of unemployment benefits he or she can receive on a given UI claim. In most instances the base year is the first four of the five quarters prior to the date on which an individual files a UI claim.

Our approach uses information from the whole sample, regardless of whether or not an individual actually files a UI claim in a given follow-on year. This approach has two main advantages over an approach that only compares participants and non-participants who actually file a UI claim.

The first advantage is that our approach reduces selection bias in our net impact estimates. Estimating the net effect of training on unemployment benefit levels using only information from participants and non-participants who actually file a claim ignores the effects of training on the likelihood of filing a UI claim in the first place.

The second advantage of our approach is the ability to control for labor market conditions that might influence the likelihood of filing a UI claim, but that are not directly attributable to training. This is because the algorithm we use for our mediation models

enables us to estimate the expected level of unemployment benefits participants would have received, had they earned the same amount of money as an identical non-participant in a given follow-on year.

Labor market conditions may lower current-year earnings for participants and increase the likelihood of filing a UI claim when compared to matched non-participants. For this reason, removing the mediation effect attributable to current-year earnings from our estimates enables us to capture the difference in unemployment benefit levels that is more "directly" attributable to participating in the TB Program. It is for this reason we report the direct effect as the net effect of training in this study.

Definition of direct, mediation and total effects

In the counterfactual inferential framework, the net effect of a program is the difference between two potential outcomes. One outcome is what an individual experiences in the absence of treatment and the other is the outcome the same individual experiences after receiving treatment. For each individual i, we denote the net effect as $Y_i(T_i = 1) - Y_i(T_i = 0)$, where T_i indicates the individual's treatment status (1 indicating treatment and 0 indicating the absence of treatment).

Only one of these quantities can be observed for any individual. As a result, estimating net effects involves comparing people who received treatment to those who did not and estimating an average difference between the two groups. When treatment is orthogonal to individual-level covariates, the average net effect is

$$\bar{\tau}(T) = E((Y_i \mid T_i = 1) - (Y_i \mid T_i = 0)),$$

which is the difference-in-means estimator.

Potential outcomes in a mediation model are a function of both the treatment and mediator variables. For purposes of notation, let M_i represent an individual's mediator value given his or her treatment status, T. For each individual i, the mediation effect is

$$\delta_i(T) = Y_i(T, M_i(1)) - Y_i(T, M_i(0)),$$

for T = 0, 1. In other words, the mediation effect is the outcome each individual would experience by changing the mediator variable from its value under the control condition to its value under the treatment condition while holding treatment status constant. If treatment has no effect on the mediator, or if $M_i(1) = M_i(0)$, then the mediation effect is zero. Since only one of these quantities can be observed for each individual, we must estimate the average mediation effect, which is

$$\bar{\delta}(T) = E(Y_i(T, M_i(1) - Y_i(T, M_i(0))),$$

for T = 1, 0.

The unit-level direct effect is also the difference between two potential outcomes. One outcome is that which each individual experiences after receiving treatment, but holding the mediator variable constant at its value under the treatment condition. The other

outcome is that which each individual experiences in the absence of treatment while holding the mediator variable constant at the value it would take under the treatment condition. Formally, this quantity is

$$\zeta_i(T) = Y_i(1, M_i(T)) - Y_i(0, M_i(T)).$$

Given one cannot observe both quantities for each individual, the estimate of the direct effect is the average difference in Y_i across the population, holding the mediator variable constant, or

$$\bar{\zeta}(T) = E(Y_i(1, M_i(T)) - Y_i(0, M_i(T))).$$

The total effect for each individual i is the difference between the expected value of Y_i when both T and M_i are set to their treatment values and when they are set to their control values. Assuming no interaction between treatment and the mediator and no interaction between treatment and the outcome, the total effect is the sum of the mediation and direct effects, or

$$\tau_i = E(Y_i(1, M_i(1)) - Y_i(0, M_i(0))) = \frac{1}{2}\sum_{T=0}^{1}\{\delta_i(T) + \zeta_i(T)\}.$$

As with the other quantities of interest, only one condition can actually be observed for each individual, which means the average direct effect across the sample is the quantity to be estimated. Formally, this quantity is

$$\bar{\tau} = E(Y_i(1, M_i(1)) - Y_i(0, M_i(0))) = \frac{1}{2}\sum_{T=0}^{1}\{\bar{\delta}(T) + \bar{\zeta}(T)\}.$$

Properties of quasi-Bayesian mediation estimators

Our mediation models use the quasi-Bayesian algorithm proposed by Imai, et al (2010).[37] The authors refer to the quasi-Bayesian algorithm as a parametric inferential strategy because it involves fitting a parametric model to the sample data for both the mediator and the outcome variables. The estimates generated from these models are then used to conduct Monte Carlo simulations for the purposes of estimating mediation and direct effects. There are four steps in the quasi-Bayesian algorithm.

Step 1: Fit parametric models for observed mediator and outcome variables

This step involves fitting any parametric model (i.e., OLS, logit, probit, etc.) for both the mediator and the outcome. The mediator model regresses the mediator variable on a vector of pretreatment covariates and treatment status. The outcome model regresses the outcome on the mediator, treatment status and the same vector of pretreatment covariates. Each of these models generates parameters that estimate the effect each pre-treatment covariate has on the mediator and outcome, as well as the effect treatment has on the mediator and the outcome.

In our context, both the mediator and outcome models are OLS models with continuous dependent variables, meaning the mediator model has the functional form

$$M_i = \Omega T_i + \beta X_i + \varepsilon_i,$$

[37] Imai et al., "A General Approach to Causal Mediation Analysis," Psychological Methods, vol. 15, no. 4 (2010), pp. 309-344.

where M_i is the mediator value for individual *i*, X_i is a vector of pre-treatment covariates and their corresponding parameter estimates, β. T_i is the treatment status of individual *i*, while Ω is the parameter estimating the effect of treatment on the mediator.

The outcome model takes the functional form

$$Y_i = \Omega T_i + \Pi M_i + \beta X_i + \varepsilon_i,$$

where Y_i is the outcome value for individual *i*, X_i is the same vector of pre-treatment covariates and β is the corresponding slope estimates for the effect of X_i on the outcome. Π is the estimated effect of the mediator on the outcome, conditional on the pre-treatment covariates, and Ω is the estimated effect of treatment on the outcome.

Step 2: Sample covariate parameter values from their sampling distribution

According to the Central Limit Theorem, the parameters for covariates in the mediator and outcome models have sampling distributions that approximate the multivariate normal distribution, with a mean equal to the estimates and the variances equal to their asymptotic covariance matrices. Using the notation of Imai, et al, the parameter estimates for the mediator and outcome models are denoted θ_M and θ_Y, respectively.

The next step in the process is to randomly draw J values (usually 1,000 or more depending on sample size) of θ_M and θ_Y from their sampling distributions. These values are used in the next step of the algorithm, which is a repeated set of Monte Carlo simulations that estimate the counterfactual conditions described in the definitions section for both treatment and control group members.

Step 3: Run repeated Monte Carlo simulations using sampled covariate parameter values

Step three involves three parts. The first is to simulate potential values of the mediator using the sampled covariate parameter values, θ_M. Imai, et al (2010), use the following notation to describe this step: "For each T = 0, 1 and each i = 1,…n, sample K copies of $M_i(T_i)$ from $f_\theta(M_i | T, X_i)$ and denote them as $M_i^{(jk)}(T)$ for k = 1,…K."[38] This portion of step three generates two predicted values of the mediator for each Monte Carlo simulation—one under the treatment condition and one under the control condition—and requires using individual values of X_i and T_i in addition to θ_M^j.

The second part of step three involves using the simulated mediator values ($M_i(T_i)$) and the sampled covariate parameter values from the outcome model (θ_Y^j) to predict two potential outcomes. One outcome is that which an individual would experience with the mediator set to its simulated value under treatment, while holding his or her treatment status constant. The other outcome is that which an individual would experience with the mediator set to its simulated value under the control condition, also holding his or her treatment status constant. Imai, et al (2010), use the following notation to formalize this

[38] Ibid. pg. 328.

portion of step three: "For each T = 0, 1 and each i = 1,…n, sample one copy of $Y_i(T, M_i^{(jk)}(T'))$ from $f_{\theta M(j)}(Y_i | T, M^{(jk)}(T'), X_i)$ and denote it as $Y_i^{(jk)}(T, M_i^{jk}(T'))$ for k = 1,…, K."[39]

For direct effects, the algorithm does the obverse. It takes each individual's actual value of M_i as given and simulates K copies of Y_i using parameter values drawn from sampling distributions in the outcome model (θ_Y^j). Another way to conceptualize this part of the algorithm is by asking the question "what outcome would individual *i* experience under a different treatment condition, given the actual value of his or her mediator variable?"

Using the notation of Imai, et al (2010), this means for each T = 0, 1 and each i = 1,…n, we sample one copy of $Y_i((T^{(jk)}(T'), M)$ from $f_{\theta T(j)}(Y_i | T^{(jk)}(T'), M, X_i)$ and we denote it as $Y_i^{(jk)}((T^{(jk)}(T'), M))$. Similar to the algorithm that estimates mediation effects, we now have a predicted counterfactual value of Y_i, though in this case the counterfactual value is what each individual would have experienced under the opposite treatment condition while holding the mediator constant.

The third part of step three involves using the simulated values of Y_i from each of the each k = 1, …, K Monte Carlo simulations to compute the average mediation effects, direct effects and total effects. For mediation effects we compute the difference of two outcome predictions for each treatment status. One predicted outcome is with the mediator set to its value under the control condition and the other is with the mediator set to its value under the treatment condition. Formally, Imai et al define the mediation effect as

$$\bar{\delta}^{(j)}(T) = \frac{1}{nK}\sum_{i=1}^{n}\sum_{k=1}^{K}\{Y_i^{(jk)}\left(T, M_i^{(jk)}(1)\right) - Y_i^{(jk)}\left(T, M_i^{(jk)}(0)\right)\},$$

for each of the Monte Carlo simulations.

The average direct effect is

$$\bar{\zeta}^{(j)}(M) = \frac{1}{nK}\sum_{i=1}^{n}\sum_{k=1}^{K}\{Y_i^{(jk)}\left(T_i^{(jk)}(1), M\right) - Y_i^{(jk)}\left(T_i^{(jk)}(0), M\right)\},$$

for each of the Monte Carlo simulations.

Assuming no interaction between treatment and the mediator and no interaction between treatment and the outcome, the average total effect is simply the sum of the average direct and mediation effects for each Monte Carlo simulation.

Step 4: Compute Summary Statistics

Step 4 involves calculating the mean, median, percentiles and standard deviation of the distributions for the simulated values of each estimate. We ran 1,000 Monte Carlo simulations that generated 1,000 different estimates of mediation, direct and total effects. The mean from these 1,000 simulations are point estimates and the standard deviation of the simulation distributions are the standard error for each point estimate. Percentiles from the distribution of simulation estimates are then used to compute confidence intervals and generate p-values.

[39] Ibid. pg. 329.

Appendix 2

Appendix figure A2-1. Statistically unadjusted annual percent of time ever employed by follow-on year, treatment and comparison groups, by total sample and gender
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Follow-on year										
2002	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788
Participants	36.4%	20.1%	63.5%	74.5%	77.4%	77.5%	74.8%	70.8%	69.5%	68.9%	67.7%
Non-participants	63.8%	62.9%	68.0%	68.5%	68.3%	67.0%	63.5%	59.2%	57.8%	57.0%	55.3%
Difference	-27.4%	-42.8%	-4.5%	6.0%	9.1%	10.5%	11.3%	11.6%	11.7%	11.9%	12.4%
Male (N)	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864
Participants	37.8%	18.3%	64.2%	75.7%	78.7%	79.3%	77.1%	72.7%	71.7%	71.6%	70.8%
Non-participants	65.5%	64.4%	69.5%	69.2%	70.1%	69.1%	65.3%	60.2%	59.2%	58.6%	56.9%
Difference	-27.7%	-46.1%	-5.3%	6.5%	8.6%	10.2%	11.7%	12.6%	12.5%	13.0%	13.8%
Female (N)	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924
Participants	34.3%	22.8%	62.6%	72.8%	75.5%	74.8%	71.5%	67.9%	66.3%	64.8%	63.1%
Non-participants	61.4%	60.6%	65.8%	67.6%	65.7%	63.9%	60.8%	57.8%	55.7%	54.5%	52.9%
Difference	-27.1%	-37.9%	-3.2%	5.2%	9.8%	10.9%	10.7%	10.1%	10.5%	10.3%	10.2%
2003	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	
Participants	42.2%	46.7%	72.6%	77.1%	77.7%	76.0%	71.9%	70.0%	68.7%	67.8%	
Non-participants	67.6%	69.3%	71.4%	71.3%	69.2%	65.6%	60.4%	59.3%	57.1%	55.7%	
Difference	-25.4%	-22.5%	1.2%	5.8%	8.5%	10.4%	11.5%	10.7%	11.6%	12.2%	
Male (N)	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	
Participants	42.2%	46.6%	72.8%	78.1%	78.6%	76.7%	72.3%	71.1%	69.2%	68.2%	
Non-participants	69.5%	71.2%	73.1%	73.9%	72.0%	67.8%	62.1%	60.6%	58.2%	56.1%	
Difference	-27.3%	-24.7%	-0.2%	4.2%	6.6%	8.9%	10.2%	10.5%	11.0%	12.1%	
Female (N)	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	
Participants	42.3%	47.0%	72.4%	75.9%	76.6%	75.0%	71.4%	68.5%	68.2%	67.3%	
Non-participants	65.2%	66.7%	69.2%	68.1%	65.7%	62.7%	58.2%	57.6%	55.7%	55.0%	
Difference	-22.9%	-19.7%	3.1%	7.8%	10.9%	12.3%	13.2%	11.0%	12.4%	12.3%	
2004	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798		
Participants	42.5%	52.1%	68.7%	73.1%	71.9%	66.6%	64.2%	62.6%	61.9%		
Non-participants	72.6%	72.4%	71.8%	70.8%	66.4%	60.4%	58.7%	57.9%	56.6%		
Difference	-30.2%	-20.2%	-3.1%	2.3%	5.5%	6.2%	5.5%	4.7%	5.3%		
Male (N)	746	746	746	746	746	746	746	746	746		
Participants	41.6%	52.5%	68.6%	73.4%	71.4%	66.5%	63.8%	62.1%	62.3%		
Non-participants	72.9%	71.0%	69.6%	69.8%	65.1%	57.8%	56.2%	57.1%	55.6%		
Difference	-31.3%	-18.5%	-1.0%	3.6%	6.4%	8.6%	7.6%	5.0%	6.7%		
Female (N)	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052		
Participants	43.1%	51.9%	68.7%	72.9%	72.1%	66.6%	64.4%	62.9%	61.7%		
Non-participants	72.5%	73.3%	73.3%	71.4%	67.3%	62.2%	60.6%	58.5%	57.3%		
Difference	-29.4%	-21.5%	-4.6%	1.5%	4.8%	4.5%	3.9%	4.4%	4.4%		

Cohort	Follow-on year										
2005	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212			
Participants	42.9%	53.6%	71.2%	71.6%	68.0%	66.4%	65.6%	65.2%			
Non-participants	76.1%	74.4%	72.7%	69.4%	63.6%	60.7%	59.9%	58.0%			
Difference	-33.2%	-20.8%	-1.5%	2.2%	4.4%	5.7%	5.8%	7.2%			
Male (N)	914	914	914	914	914	914	914	914			
Participants	42.2%	49.3%	67.6%	68.9%	66.2%	66.2%	65.3%	65.3%			
Non-participants	76.0%	76.0%	73.7%	70.2%	64.2%	60.6%	59.6%	58.5%			
Difference	-33.8%	-26.8%	-6.1%	-1.4%	2.0%	5.7%	5.7%	6.7%			
Female (N)	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298			
Participants	43.4%	56.7%	73.7%	73.5%	69.3%	66.4%	65.8%	65.1%			
Non-participants	76.1%	73.3%	71.9%	68.8%	63.2%	60.7%	60.1%	57.7%			
Difference	-32.7%	-16.6%	1.8%	4.7%	6.1%	5.7%	5.8%	7.5%			
2006	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	2,166	2,166	2,166	2,166	2,166	2,166	2,166				
Participants	43.6%	48.8%	60.2%	61.2%	61.8%	61.7%	60.9%				
Non-participants	78.0%	75.0%	69.9%	63.5%	61.8%	61.4%	58.4%				
Difference	-34.4%	-26.2%	-9.8%	-2.3%	0.0%	0.3%	2.5%				
Male (N)	1,054	1,054	1,054	1,054	1,054	1,054	1,054				
Participants	44.2%	44.1%	56.6%	59.4%	60.6%	61.1%	59.5%				
Non-participants	79.6%	74.5%	68.6%	61.4%	61.1%	61.6%	57.8%				
Difference	-35.4%	-30.4%	-12.0%	-2.0%	-0.5%	-0.4%	1.7%				
Female (N)	1,112	1,112	1,112	1,112	1,112	1,112	1,112				
Participants	43.1%	53.2%	63.5%	62.9%	62.9%	62.3%	62.1%				
Non-participants	76.5%	75.4%	71.2%	65.4%	62.4%	61.3%	58.9%				
Difference	-33.5%	-22.2%	-7.7%	-2.5%	0.5%	1.0%	3.2%				
2007	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	1,756	1,756	1,756	1,756	1,756	1,756					
Participants	41.1%	40.4%	50.9%	57.6%	60.8%	60.8%					
Non-participants	77.9%	73.4%	65.7%	64.0%	65.2%	62.9%					
Difference	-36.8%	-32.9%	-14.7%	-6.3%	-4.5%	-2.1%					
Male (N)	810	810	810	810	810	810					
Participants	41.5%	39.0%	47.7%	56.4%	59.4%	58.5%					
Non-participants	79.4%	72.1%	61.4%	61.3%	64.0%	60.1%					
Difference	-37.8%	-33.1%	-13.7%	-4.9%	-4.5%	-1.7%					
Female (N)	946	946	946	946	946	946					
Participants	40.7%	41.6%	53.7%	58.6%	61.9%	62.9%					
Non-participants	76.6%	74.5%	69.3%	66.2%	66.3%	65.3%					
Difference	-35.9%	-32.8%	-15.6%	-7.6%	-4.4%	-2.4%					

Cohort	Follow-on year										
2008	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	3,374	3,374	3,374	3,374	3,374						
Participants	43.0%	27.1%	51.1%	64.4%	66.8%						
Non-participants	69.1%	62.5%	66.2%	66.4%	65.5%						
Difference	-26.0%	-35.3%	-15.1%	-2.0%	1.2%						
Male (N)	1,702	1,702	1,702	1,702	1,702						
Participants	44.8%	24.6%	48.3%	61.8%	65.7%						
Non-participants	71.5%	63.7%	66.3%	65.9%	66.1%						
Difference	-26.7%	-39.1%	-17.9%	-4.1%	-0.4%						
Female (N)	1,672	1,672	1,672	1,672	1,672						
Participants	41.2%	29.8%	53.9%	67.0%	67.9%						
Non-participants	66.6%	61.2%	66.1%	66.8%	64.9%						
Difference	-25.3%	-31.5%	-12.2%	0.2%	2.9%						
2009	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	8,040	8,040	8,040	8,040							
Participants	37.7%	28.7%	55.3%	67.4%							
Non-participants	62.8%	62.1%	66.4%	66.0%							
Difference	-25.0%	-33.4%	-11.1%	1.5%							
Male (N)	4,182	4,182	4,182	4,182							
Participants	37.0%	28.2%	54.9%	68.0%							
Non-participants	64.4%	63.1%	66.7%	66.4%							
Difference	-27.4%	-34.9%	-11.8%	1.5%							
Female (N)	3,858	3,858	3,858	3,858							
Participants	38.5%	29.2%	55.8%	66.9%							
Non-participants	61.0%	61.0%	66.1%	65.5%							
Difference	-22.4%	-31.9%	-10.3%	1.4%							
2010	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	5,764	5,764	5,764								
Participants	36.6%	30.3%	55.7%								
Non-participants	64.8%	64.3%	66.3%								
Difference	-28.2%	-34.0%	-10.6%								
Male (N)	2,718	2,718	2,718								
Participants	36.2%	29.3%	55.6%								
Non-participants	65.7%	65.1%	68.1%								
Difference	-29.5%	-35.8%	-12.4%								
Female (N)	3,046	3,046	3,046								
Participants	36.9%	31.2%	55.7%								
Non-participants	64.0%	63.6%	64.7%								
Difference	-27.1%	-32.4%	-9.0%								

Cohort	Follow-on year										
2011	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	4,700	4,700									
Participants	36.4%	34.1%									
Non-participants	67.9%	67.8%									
Difference	-31.5%	-33.7%									
Male (N)	2,222	2,222									
Participants	36.5%	34.1%									
Non-participants	70.5%	69.9%									
Difference	-34.0%	-35.8%									
Female (N)	2,478	2,478									
Participants	36.3%	34.1%									
Non-participants	65.5%	66.0%									
Difference	-29.2%	-31.9%									
2012	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	4,218										
Participants	36.3%										
Non-participants	69.4%										
Difference	-33.1%										
Male (N)	2,126										
Participants	35.1%										
Non-participants	71.0%										
Difference	-35.9%										
Female (N)	2,092										
Participants	37.5%										
Non-participants	67.7%										
Difference	-30.2%										

Appendix figure A2-2. TB Program net impact on annual percent of time ever employed by follow-on year, males and females combined
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-21.3%	-39.5%	-8.2%	1.8%	3.7%	4.8%	6.9%	7.7%	8.7%	7.6%	8.8%
	Standard error	1.7	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5
	P-value	<0.0001	<0.0001	0.0003	0.4442	0.1152	0.0441	0.004	0.0016	0.0004	0.0021	0.0004
2003	Net impact	-9.5%	-13.5%	5.9%	7.9%	8.0%	10.6%	13.4%	11.6%	11.7%	12.8%	
	Standard error	1.8	2.3	2.3	2.3	2.3	2.4	2.5	2.6	2.7	2.7	
	P-value	<0.0001	<0.0001	0.011	0.0006	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
2004	Net impact	-10.0%	-8.0%	-0.1%	4.2%	4.3%	9.8%	5.7%	9.1%	12.9%		
	Standard error	4.8	6.1	6.3	6.4	6.5	6.5	6.6	6.7	6.7		
	P-value	0.0388	0.1903	0.989	0.5071	0.5048	0.1322	0.3852	0.1741	0.0556		
2005	Net impact	-19.4%	-28.5%	-5.0%	0.4%	3.8%	1.8%	0.0%	0.2%			
	Standard error	2.9	3.9	3.9	4.1	4.3	4.5	4.4	4.4			
	P-value	<0.0001	<0.0001	0.1978	0.919	0.3771	0.6861	0.9955	0.9721			
2006	Net impact	-9.7%	-19.8%	-6.9%	-4.3%	-3.7%	-2.0%	1.5%				
	Standard error	4.9	6.6	7.0	7.6	7.7	7.7	7.6				
	P-value	0.0517	0.0031	0.3315	0.5706	0.6346	0.7995	0.8402				
2007	Net impact	-8.4%	-31.5%	-20.2%	-1.1%	3.7%	6.8%					
	Standard error	4.5	6.1	6.7	7.5	7.4	7.5					
	P-value	0.0625	<0.0001	0.003	0.88	0.62	0.367					
2008	Net impact	2.6%	-29.5%	-16.8%	-3.0%	4.5%						
	Standard error	4.2	5.2	5.2	5.2	5.1						
	P-value	0.5415	<0.0001	0.0014	0.5666	0.3796						
2009	Net impact	5.5%	-12.0%	-2.8%	7.2%							
	Standard error	2.4	3.1	3.1	3.0							
	P-value	0.0221	0.0001	0.3677	0.0166							
2010	Net impact	-3.0%	-20.9%	-6.3%								
	Standard error	3.5	4.2	4.3								
	P-value	0.39	<0.0001	0.1384								
2011	Net impact	-1.4%	-14.2%									
	Standard error	4.1	4.6									
	P-value	0.73	0.0022									
2012	Net impact	-3.4%										
	Standard error	4.8										
	P-value	0.4767										

Appendix figure A2-3. TB Program net impact on annual percent of time ever employed by follow-on year of TB participants, males and females combined, who returned to employer of record within 2 years of TB start
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-21.3%	-39.5%	-8.2%	1.8%	3.7%	4.8%	6.9%	7.7%	8.7%	7.6%	8.8%
	Standard error	1.7	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5
	P-value	<0.0001	<0.0001	0.0003	0.4442	0.1152	0.0441	0.004	0.0016	0.0004	0.0021	0.0004
2003	Net impact	-9.5%	-13.5%	5.9%	7.9%	8.0%	10.6%	13.4%	11.6%	11.7%	12.8%	
	Standard error	1.8	2.3	2.3	2.3	2.3	2.4	2.5	2.6	2.7	2.7	
	P-value	<0.0001	<0.0001	0.011	0.0006	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
2004	Net impact	-10.0%	-8.0%	-0.1%	4.2%	4.3%	9.8%	5.7%	9.1%	12.9%		
	Standard error	4.8	6.1	6.3	6.4	6.5	6.5	6.6	6.7	6.7		
	P-value	0.0388	0.1903	0.989	0.5071	0.5048	0.1322	0.3852	0.1741	0.0556		
2005	Net impact	-19.4%	-28.5%	-5.0%	0.4%	3.8%	1.8%	0.0%	0.2%			
	Standard error	2.9	3.9	3.9	4.1	4.3	4.5	4.4	4.4			
	P-value	<0.0001	<0.0001	0.1978	0.919	0.3771	0.6861	0.9955	0.9721			
2006	Net impact	-9.7%	-19.8%	-6.9%	-4.3%	-3.7%	-2.0%	1.5%				
	Standard error	4.9	6.6	7.0	7.6	7.7	7.7	7.6				
	P-value	0.0517	0.0031	0.3315	0.5706	0.6346	0.7995	0.8402				
2007	Net impact	-8.4%	-31.5%	-20.2%	-1.1%	3.7%	6.8%					
	Standard error	4.5	6.1	6.7	7.5	7.4	7.5					
	P-value	0.0625	<0.0001	0.003	0.88	0.62	0.367					
2008	Net impact	2.6%	-29.5%	-16.8%	-3.0%	4.5%						
	Standard error	4.2	5.2	5.2	5.2	5.1						
	P-value	0.5415	<0.0001	0.0014	0.5666	0.3796						
2009	Net impact	5.5%	-12.0%	-2.8%	7.2%							
	Standard error	2.4	3.1	3.1	3.0							
	P-value	0.0221	0.0001	0.3677	0.0166							
2010	Net impact	-3.0%	-20.9%	-6.3%								
	Standard error	3.5	4.2	4.3								
	P-value	0.39	<0.0001	0.1384								
2011	Net impact	-1.4%	-14.2%									
	Standard error	4.1	4.6									
	P-value	0.73	0.0022									
2012	Net impact	-3.4%										
	Standard error	4.8										
	P-value	0.4767										

Appendix figure A2-4. TB Program net impact on annual percent of time ever employed by follow-on year of male TB participants who returned to employer of record within 2 years of TB start
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-22.7%	-42.4%	-7.9%	1.8%	4.0%	3.2%	5.9%	8.3%	8.3%	6.9%	9.6%
	Standard error	2.1	2.8	2.9	3.1	3.0	3.0	3.0	3.2	3.2	3.2	3.2
	P-value	<0.0001	<0.0001	0.0067	0.5596	0.1895	0.2971	0.0517	0.0092	0.0083	0.0296	0.0028
2003	Net impact	-15.4%	-16.5%	3.5%	4.8%	4.1%	7.5%	9.4%	9.6%	10.6%	10.8%	
	Standard error	2.3	2.9	2.9	2.8	2.9	3.0	3.3	3.2	3.4	3.5	
	P-value	<0.0001	<0.0001	0.2291	0.0939	0.1586	0.0129	0.0041	0.0041	0.0019	0.0019	
2004	Net impact	-11.1%	-1.3%	0.3%	2.8%	5.2%	1.5%	10.4%	11.9%	11.3%		
	Standard error	8.5	11.2	11.8	11.9	11.5	11.5	11.4	11.7	11.3		
	P-value	0.1945	0.9113	0.983	0.8138	0.6558	0.8954	0.3645	0.312	0.3198		
2005	Net impact	-24.9%	-34.7%	-8.4%	2.9%	7.8%	5.8%	-2.1%	-1.9%			
	Standard error	4.4	6.2	6.1	6.4	6.8	7.0	7.0	7.1			
	P-value	<0.0001	<0.0001	0.169	0.6537	0.252	0.406	0.7678	0.7946			
2006	Net impact	-14.0%	-20.5%	-4.7%	-1.8%	0.3%	-1.7%	2.9%				
	Standard error	6.6	10.3	10.8	12.1	12.3	12.0	11.9				
	P-value	0.0356	0.0479	0.665	0.8819	0.9799	0.8893	0.8055				
2007	Net impact	-9.2%	-31.6%	-8.8%	11.5%	13.2%	22.9%					
	Standard error	7.3	9.3	11.5	12.9	12.7	12.6					
	P-value	0.2119	0.001	0.4427	0.3745	0.303	0.07					
2008	Net impact	-1.7%	-28.5%	-14.0%	-1.8%	9.6%						
	Standard error	5.5	6.6	6.7	6.8	6.8						
	P-value	0.7524	<0.0001	0.0385	0.7839	0.1565						
2009	Net impact	5.6%	-7.2%	-2.1%	6.7%							
	Standard error	3.2	4.3	4.1	3.9							
	P-value	0.0815	0.0934	0.61	0.0877							
2010	Net impact	-6.4%	-22.8%	-11.7%								
	Standard error	4.7	5.8	5.8								
	P-value	0.1736	0.0001	0.046								
2011	Net impact	0.9%	-20.0%									
	Standard error	6.0	6.8									
	P-value	0.8845	0.0036									
2012	Net impact	-4.1%										
	Standard error	7.3										
	P-value	0.57										

Appendix figure A2-5. TB Program net impact on annual percent of time ever employed by follow-on year of female TB participants who returned to employer of record within 2 years of TB start
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-19.6%	-34.7%	-8.6%	0.6%	2.7%	7.7%	9.2%	7.7%	10.6%	9.4%	8.5%
	Standard error	2.8	3.6	3.8	3.8	3.8	3.9	3.9	3.9	4.0	4.1	4.2
	P-value	<0.0001	<0.0001	0.0235	0.8799	0.4658	0.0479	0.0201	0.0514	0.0081	0.0214	0.0422
2003	Net impact	0.4%	-8.7%	10.0%	13.3%	15.2%	16.0%	18.8%	14.0%	14.0%	16.6%	
	Standard error	3.1	3.9	4.0	3.9	4.0	4.1	4.2	4.4	4.5	4.6	
	P-value	0.9081	0.0252	0.0116	0.0008	0.0002	<0.0001	<0.0001	0.0017	0.002	0.0003	
2004	Net impact	-10.1%	-16.5%	-2.0%	-4.3%	-7.4%	7.6%	-5.3%	-0.5%	3.7%		
	Standard error	7.1	9.1	9.5	9.2	9.7	9.6	9.9	9.6	9.7		
	P-value	0.1557	0.0718	0.8354	0.6408	0.4497	0.4335	0.5913	0.9614	0.7048		
2005	Net impact	-13.9%	-22.0%	0.4%	2.3%	4.6%	2.1%	1.6%	3.0%			
	Standard error	4.0	5.3	5.1	5.5	5.7	6.0	5.9	5.9			
	P-value	0.0006	<0.0001	0.9359	0.6729	0.4199	0.7193	0.7847	0.6073			
2006	Net impact	-3.1%	-18.5%	-11.1%	-14.4%	-4.7%	2.1%	9.0%				
	Standard error	9.2	9.7	11.2	12.4	12.6	13.1	13.1				
	P-value	0.7368	0.0602	0.3287	0.2495	0.7115	0.8753	0.4934				
2007	Net impact	-2.5%	-26.7%	-23.3%	-5.0%	9.2%	7.2%					
	Standard error	7.1	8.7	9.9	9.7	10.4	10.8					
	P-value	0.7268	0.003	0.02	0.6128	0.3805	0.5064					
2008	Net impact	11.3%	-28.7%	-18.7%	-2.6%	2.9%						
	Standard error	7.7	9.9	10.3	9.7	9.3						
	P-value	0.1464	0.0045	0.0717	0.7916	0.7569						
2009	Net impact	5.8%	-17.1%	-3.2%	7.4%							
	Standard error	3.7	4.6	4.7	4.7							
	P-value	0.1155	0.0002	0.5053	0.1198							
2010	Net impact	1.2%	-18.3%	0.6%								
	Standard error	5.4	6.2	6.5								
	P-value	0.8259	0.0034	0.9286								
2011	Net impact	-4.3%	-12.2%									
	Standard error	6.1	7.0									
	P-value	0.4785	0.0815									
2012	Net impact	-2.8%										
	Standard error	7.6										
	P-value	0.71										

Appendix figure A2-6. TB Program net impact on annual percent of time ever employed by follow-on year of TB participants, males and females combined, who did not return to employer of record within 2 years of TB start
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-28.1%	-41.2%	-5.1%	2.4%	5.9%	7.1%	7.6%	7.5%	6.7%	6.5%	6.6%
	Standard error	1.4	1.8	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.1
	P-value	<0.0001	<0.0001	0.0072	0.2224	0.0025	0.0003	0.0001	0.0003	0.0012	0.0017	0.0015
2003	Net impact	-34.0%	-27.4%	-2.7%	1.8%	7.0%	7.6%	7.8%	7.7%	8.7%	8.6%	
	Standard error	1.8	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.5	
	P-value	<0.0001	<0.0001	0.2443	0.4468	0.0035	0.0015	0.0016	0.0021	0.0005	0.0007	
2004	Net impact	-35.3%	-26.5%	-8.0%	-2.4%	0.9%	1.6%	0.9%	-1.0%	1.0%		
	Standard error	2.0	2.6	2.6	2.6	2.6	2.7	2.7	2.8	2.8		
	P-value	<0.0001	<0.0001	0.002	0.3537	0.7446	0.5487	0.754	0.7162	0.7256		
2005	Net impact	-37.9%	-18.1%	-3.1%	-0.6%	1.1%	3.4%	3.4%	5.7%			
	Standard error	2.0	2.7	2.7	2.8	2.9	2.9	3.0	3.0			
	P-value	<0.0001	<0.0001	0.2586	0.8161	0.7062	0.2456	0.2568	0.0538			
2006	Net impact	-36.0%	-25.6%	-10.1%	-4.0%	-0.8%	-1.5%	0.5%				
	Standard error	1.9	2.4	2.5	2.6	2.6	2.6	2.6				
	P-value	<0.0001	<0.0001	<0.0001	0.113	0.7537	0.5526	0.8511				
2007	Net impact	-35.6%	-31.7%	-13.8%	-8.6%	-6.5%	-3.9%					
	Standard error	1.9	2.6	2.6	2.7	2.6	2.7					
	P-value	<0.0001	<0.0001	<0.0001	0.0013	0.0143	0.1484					
2008	Net impact	-25.8%	-33.5%	-15.4%	-2.8%	0.5%						
	Standard error	1.4	1.8	1.9	1.9	1.9						
	P-value	<0.0001	<0.0001	<0.0001	0.1269	0.7938						
2009	Net impact	-27.0%	-35.9%	-13.6%	-1.3%							
	Standard error	1.0	1.2	1.2	1.2							
	P-value	<0.0001	<0.0001	<0.0001	0.296							
2010	Net impact	-30.0%	-35.7%	-12.3%								
	Standard error	1.1	1.4	1.4								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-33.0%	-37.2%									
	Standard error	1.2	1.5									
	P-value	<0.0001	<0.0001									
2012	Net impact	-35.0%										
	Standard error	1.3										
	P-value	<0.0001										

Appendix figure A2-7. TB Program net impact on annual percent of time ever employed by follow-on year of male TB participants who did not return to employers of record within 2 years of TB start
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-29.3%	-45.5%	-5.7%	1.8%	4.4%	6.6%	8.1%	8.5%	7.3%	8.2%	7.9%
	Standard error	1.8	2.3	2.4	2.5	2.5	2.5	2.6	2.7	2.7	2.7	2.7
	P-value	<0.0001	<0.0001	0.0189	0.48	0.0762	0.0089	0.0017	0.0015	0.0062	0.002	0.0029
2003	Net impact	-33.7%	-29.0%	-4.8%	1.0%	6.5%	7.5%	7.0%	5.5%	7.0%	7.9%	
	Standard error	2.3	3.1	3.2	3.2	3.4	3.3	3.4	3.5	3.5	3.5	
	P-value	<0.0001	<0.0001	0.1357	0.7489	0.0527	0.0246	0.0418	0.11	0.0452	0.0247	
2004	Net impact	-35.2%	-24.6%	-5.1%	-0.2%	2.5%	4.8%	2.1%	-0.6%	0.7%		
	Standard error	2.8	4.0	3.9	3.9	4.0	4.1	4.2	4.3	4.2		
	P-value	<0.0001	<0.0001	0.1904	0.9517	0.5282	0.2337	0.61	0.885	0.8722		
2005	Net impact	-32.9%	-19.1%	-2.5%	-1.8%	2.8%	8.7%	9.8%	11.7%			
	Standard error	3.4	4.3	4.4	4.4	4.6	4.6	4.6	4.6			
	P-value	<0.0001	<0.0001	0.5651	0.6888	0.54	0.0582	0.0354	0.0123			
2006	Net impact	-35.4%	-27.0%	-7.7%	-0.4%	1.7%	0.7%	4.4%				
	Standard error	2.8	3.8	3.8	3.9	3.9	3.9	3.9				
	P-value	<0.0001	<0.0001	0.0403	0.9112	0.661	0.8517	0.2637				
2007	Net impact	-33.2%	-27.9%	-8.8%	-3.5%	-3.7%	-2.0%					
	Standard error	2.8	3.9	4.0	4.0	4.0	4.0					
	P-value	<0.0001	<0.0001	0.0285	0.3879	0.3563	0.6206					
2008	Net impact	-25.8%	-36.3%	-15.9%	-3.5%	-1.0%						
	Standard error	2.0	2.5	2.6	2.7	2.7						
	P-value	<0.0001	<0.0001	<0.0001	0.1954	0.7277						
2009	Net impact	-28.7%	-37.3%	-13.3%	-0.8%							
	Standard error	1.3	1.6	1.7	1.7							
	P-value	<0.0001	<0.0001	<0.0001	0.6577							
2010	Net impact	-30.1%	-36.6%	-12.0%								
	Standard error	1.6	1.9	2.0								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-35.3%	-38.7%									
	Standard error	1.8	2.2									
	P-value	<0.0001	<0.0001									
2012	Net impact	-35.7%										
	Standard error	1.8										
	P-value	<0.0001										

Appendix figure A2-8. TB Program net impact on annual percent of time ever employed by follow-on year of female TB participants who did not return to employers of record within 2 years of TB start
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-27.2%	-35.4%	-4.4%	2.6%	6.8%	6.8%	5.6%	4.9%	4.4%	2.8%	3.3%
	Standard error	2.2	2.8	3.0	3.1	3.1	3.1	3.1	3.3	3.3	3.3	3.3
	P-value	<0.0001	<0.0001	0.1425	0.3925	0.027	0.0287	0.0763	0.134	0.1789	0.4016	0.3216
2003	Net impact	-33.9%	-25.9%	0.1%	3.1%	8.1%	7.9%	8.8%	10.0%	11.2%	9.7%	
	Standard error	2.6	3.3	3.4	3.5	3.5	3.5	3.6	3.7	3.7	3.7	
	P-value	<0.0001	<0.0001	0.9827	0.3773	0.0209	0.0262	0.0154	0.0067	0.0025	0.0087	
2004	Net impact	-34.8%	-27.3%	-9.8%	-4.2%	-0.6%	-0.9%	0.0%	-1.8%	1.2%		
	Standard error	2.7	3.5	3.5	3.6	3.6	3.7	3.7	3.7	3.8		
	P-value	<0.0001	<0.0001	0.0054	0.239	0.8663	0.8144	0.9992	0.63	0.75		
2005	Net impact	-41.6%	-16.6%	-2.0%	0.9%	1.0%	0.1%	-0.8%	1.8%			
	Standard error	2.6	3.4	3.5	3.6	3.8	3.9	3.9	3.9			
	P-value	<0.0001	<0.0001	0.5676	0.8105	0.8042	0.9785	0.8306	0.6386			
2006	Net impact	-36.0%	-24.6%	-11.6%	-6.5%	-2.3%	-2.8%	-1.9%				
	Standard error	2.5	3.3	3.3	3.4	3.5	3.5	3.6				
	P-value	<0.0001	<0.0001	0.0005	0.0614	0.5109	0.4248	0.5935				
2007	Net impact	-37.8%	-34.9%	-18.1%	-12.7%	-9.2%	-6.5%					
	Standard error	2.6	3.4	3.6	3.6	3.6	3.7					
	P-value	<0.0001	<0.0001	<0.0001	0.0005	0.0105	0.0802					
2008	Net impact	-26.4%	-31.2%	-15.0%	-2.6%	1.3%						
	Standard error	1.9	2.5	2.6	2.6	2.7						
	P-value	<0.0001	<0.0001	<0.0001	0.3227	0.6275						
2009	Net impact	-25.0%	-34.0%	-13.9%	-1.9%							
	Standard error	1.4	1.7	1.8	1.8							
	P-value	<0.0001	<0.0001	<0.0001	0.2971							
2010	Net impact	-29.7%	-34.5%	-12.0%								
	Standard error	1.6	1.9	2.0								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-30.9%	-35.9%									
	Standard error	1.7	2.1									
	P-value	<0.0001	<0.0001									
2012	Net impact	-33.4%										
	Standard error	1.8										
	P-value	<0.0001										

Appendix 3

Appendix figure A3-1. Statistically unadjusted annual by follow-up year, treatment and comparison group, by gender and total sample, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Follow-on year										
2002	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788
Participants	$19,956	$3,984	$17,920	$31,268	$41,850	$46,510	$45,415	$46,082	$46,876	$48,552	$47,026
Non-participants	$29,646	$27,257	$30,888	$34,115	$37,676	$38,468	$36,370	$34,764	$34,912	$35,435	$34,074
Difference	-$9,690	-$23,273	-$12,968	-$2,847	$4,174	$8,042	$9,045	$11,318	$11,964	$13,117	$12,952
Male (N)	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864
Participants	$22,898	$3,996	$19,483	$35,318	$48,531	$54,244	$52,875	$53,478	$54,553	$56,864	$54,786
Non-participants	$33,506	$31,204	$34,792	$38,608	$43,565	$44,838	$42,201	$39,943	$40,610	$41,221	$39,611
Difference	-$10,608	-$27,208	-$15,309	-$3,290	$4,966	$9,406	$10,674	$13,535	$13,943	$15,644	$15,175
Female (N)	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924
Participants	$15,577	$3,966	$15,593	$25,238	$31,903	$34,996	$34,311	$35,071	$35,448	$36,180	$35,474
Non-participants	$23,900	$21,381	$25,077	$27,427	$28,909	$28,986	$27,689	$27,054	$26,431	$26,823	$25,831
Difference	-$8,323	-$17,415	-$9,484	-$2,189	$2,995	$6,010	$6,622	$8,017	$9,018	$9,357	$9,642
2003	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	
Participants	$18,968	$12,763	$31,751	$40,368	$43,660	$43,461	$43,204	$44,645	$44,711	$43,685	
Non-participants	$32,825	$30,789	$35,656	$37,910	$38,875	$36,620	$34,445	$34,760	$33,627	$32,359	
Difference	-$13,857	-$18,026	-$3,906	$2,458	$4,785	$6,842	$8,759	$9,886	$11,084	$11,326	
Male (N)	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	
Participants	$21,281	$14,252	$35,824	$46,375	$49,777	$49,415	$48,916	$50,952	$51,189	$49,912	
Non-participants	$37,549	$35,320	$40,950	$44,072	$45,367	$42,344	$40,048	$40,288	$38,870	$37,277	
Difference	-$16,268	-$21,069	-$5,126	$2,303	$4,409	$7,070	$8,868	$10,664	$12,319	$12,635	
Female (N)	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	
Participants	$16,012	$10,861	$26,546	$32,692	$35,845	$35,854	$35,904	$36,586	$36,435	$35,728	
Non-participants	$26,787	$24,998	$28,892	$30,035	$30,579	$29,304	$27,285	$27,696	$26,928	$26,074	
Difference	-$10,775	-$14,137	-$2,346	$2,657	$5,265	$6,550	$8,619	$8,890	$9,507	$9,653	
2004	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798		
Participants	$16,267	$14,352	$24,240	$29,879	$30,306	$28,854	$28,554	$28,610	$28,915		
Non-participants	$30,346	$30,795	$32,524	$33,349	$31,722	$29,480	$29,251	$28,891	$28,657		
Difference	-$14,079	-$16,443	-$8,284	-$3,470	-$1,415	-$626	-$697	-$281	$258		
Male (N)	746	746	746	746	746	746	746	746	746		
Participants	$17,245	$16,465	$28,500	$36,162	$35,968	$34,660	$34,385	$34,531	$34,371		
Non-participants	$35,251	$36,902	$37,909	$38,909	$36,004	$33,112	$33,352	$33,373	$32,696		
Difference	-$18,006	-$20,437	-$9,410	-$2,747	-$36	$1,548	$1,033	$1,158	$1,675		
Female (N)	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052		
Participants	$15,574	$12,854	$21,220	$25,424	$26,292	$24,738	$24,420	$24,412	$25,046		
Non-participants	$26,867	$26,465	$28,706	$29,407	$28,685	$26,905	$26,343	$25,713	$25,793		
Difference	-$11,294	-$13,611	-$7,486	-$3,984	-$2,393	-$2,167	-$1,923	-$1,301	-$747		

Cohort	Follow-on year										
2005	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212			
Participants	$17,198	$15,083	$24,000	$27,611	$27,908	$28,598	$29,183	$29,850			
Non-participants	$29,636	$31,332	$32,360	$31,356	$28,737	$28,187	$27,863	$27,650			
Difference	-$12,438	-$16,250	-$8,361	-$3,745	-$828	$411	$1,320	$2,200			
Male (N)	914	914	914	914	914	914	914	914			
Participants	$18,382	$16,045	$26,303	$30,626	$31,456	$32,654	$33,577	$34,546			
Non-participants	$33,405	$37,791	$38,632	$36,624	$33,372	$31,990	$32,077	$32,020			
Difference	-$15,022	-$21,746	-$12,330	-$5,998	-$1,916	$665	$1,500	$2,526			
Female (N)	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298			
Participants	$16,364	$14,405	$22,378	$25,488	$25,410	$25,741	$26,089	$26,544			
Non-participants	$26,983	$26,785	$27,944	$27,646	$25,472	$25,508	$24,895	$24,573			
Difference	-$10,618	-$12,379	-$5,566	-$2,159	-$62	$233	$1,194	$1,971			
2006	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	2,166	2,166	2,166	2,166	2,166	2,166	2,166				
Participants	$18,215	$14,499	$20,412	$20,975	$22,784	$24,004	$24,148				
Non-participants	$32,271	$32,602	$31,273	$27,962	$28,318	$28,027	$27,656				
Difference	-$14,056	-$18,103	-$10,861	-$6,987	-$5,534	-$4,023	-$3,509				
Male (N)	1,054	1,054	1,054	1,054	1,054	1,054	1,054				
Participants	$21,576	$15,010	$21,718	$22,878	$25,578	$27,111	$26,993				
Non-participants	$37,885	$37,184	$34,823	$30,434	$31,381	$31,276	$30,710				
Difference	-$16,310	-$22,173	-$13,104	-$7,556	-$5,803	-$4,165	-$3,717				
Female (N)	1,112	1,112	1,112	1,112	1,112	1,112	1,112				
Participants	$15,030	$14,015	$19,174	$19,172	$20,135	$21,059	$21,451				
Non-participants	$26,950	$28,260	$27,908	$25,620	$25,413	$24,947	$24,762				
Difference	-$11,920	-$14,245	-$8,734	-$6,448	-$5,278	-$3,888	-$3,311				
2007	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	1,756	1,756	1,756	1,756	1,756	1,756					
Participants	$17,816	$11,904	$17,043	$20,420	$23,047	$24,129					
Non-participants	$33,175	$32,873	$29,298	$29,263	$29,734	$29,941					
Difference	-$15,359	-$20,970	-$12,255	-$8,843	-$6,687	-$5,813					
Male (N)	810	810	810	810	810	810					
Participants	$19,761	$12,790	$18,352	$22,286	$25,381	$26,012					
Non-participants	$36,617	$35,522	$30,183	$32,063	$32,924	$32,015					
Difference	-$16,856	-$22,732	-$11,831	-$9,777	-$7,543	-$6,004					
Female (N)	946	946	946	946	946	946					
Participants	$16,151	$11,144	$15,922	$18,822	$21,048	$22,516					
Non-participants	$30,227	$30,605	$28,540	$26,866	$27,003	$28,166					
Difference	-$14,076	-$19,461	-$12,618	-$8,044	-$5,955	-$5,650					

Cohort	Follow-on year										
2008	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	3,374	3,374	3,374	3,374	3,374						
Participants	$15,830	$8,148	$16,622	$23,067	$26,278						
Non-participants	$27,365	$25,361	$27,728	$28,867	$29,772						
Difference	-$11,535	-$17,212	-$11,106	-$5,800	-$3,493						
Male (N)	1,702	1,702	1,702	1,702	1,702						
Participants	$16,475	$7,386	$16,403	$23,529	$27,084						
Non-participants	$27,877	$27,039	$28,840	$30,161	$31,495						
Difference	-$11,402	-$19,653	-$12,437	-$6,632	-$4,411						
Female (N)	1,672	1,672	1,672	1,672	1,672						
Participants	$15,174	$8,924	$16,844	$22,597	$25,458						
Non-participants	$26,845	$23,652	$26,596	$27,550	$28,017						
Difference	-$11,671	-$14,728	-$9,752	-$4,953	-$2,559						
2009	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	8,040	8,040	8,040	8,040							
Participants	$13,186	$8,956	$18,733	$24,805							
Non-participants	$24,305	$26,031	$29,111	$30,216							
Difference	-$11,119	-$17,075	-$10,378	-$5,411							
Male (N)	4,182	4,182	4,182	4,182							
Participants	$12,992	$9,771	$20,362	$27,627							
Non-participants	$26,265	$28,819	$31,587	$32,576							
Difference	-$13,273	-$19,048	-$11,225	-$4,949							
Female (N)	3,858	3,858	3,858	3,858							
Participants	$13,396	$8,073	$16,968	$21,746							
Non-participants	$22,179	$23,009	$26,428	$27,657							
Difference	-$8,784	-$14,936	-$9,461	-$5,912							
2010	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	5,764	5,764	5,764								
Participants	$10,036	$8,356	$16,806								
Non-participants	$21,899	$24,303	$26,832								
Difference	-$11,863	-$15,947	-$10,026								
Male (N)	2,718	2,718	2,718								
Participants	$10,636	$8,895	$18,118								
Non-participants	$24,708	$27,396	$30,713								
Difference	-$14,072	-$18,501	-$12,595								
Female (N)	3,046	3,046	3,046								
Participants	$9,501	$7,875	$15,635								
Non-participants	$19,393	$21,543	$23,368								
Difference	-$9,892	-$13,668	-$7,733								

Cohort	Follow-on year										
2011	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	4,700	4,700									
Participants	$9,521	$9,128									
Non-participants	$22,724	$25,491									
Difference	-$13,203	-$16,363									
Male (N)	2,222	2,222									
Participants	$10,199	$10,386									
Non-participants	$27,087	$30,546									
Difference	-$16,888	-$20,160									
Female (N)	2,478	2,478									
Participants	$8,913	$8,000									
Non-participants	$18,811	$20,959									
Difference	-$9,898	-$12,958									
2012	1	2	3	4	5	6	7	8	9	10	11
Total sample (N)	4,218										
Participants	$10,533										
Non-participants	$23,600										
Difference	-$13,066										
Male (N)	2,126										
Participants	$10,649										
Non-participants	$26,425										
Difference	-$15,775										
Female (N)	2,092										
Participants	$10,415										
Non-participants	$20,729										
Difference	-$10,313										

Appendix figure A3-2. TB Program net impact on annual earnings by follow-up year, male and female combined, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$9,131	-$20,413	-$11,314	-$3,720	$1,350	$4,853	$5,899	$7,348	$8,256	$8,949	$9,180
	Standard error	861	731	858	927	1066	1133	1148	1185	1241	1283	1300
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.2100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
2003	Net impact	-$13,517	-$17,124	-$5,420	-$333	$1,524	$3,351	$4,665	$5,314	$6,469	$6,686	
	Standard error	1300	909	1082	1184	1228	1252	1321	1430	1497	1430	
	P-value	<0.0001	<0.0001	<0.0001	0.7788	0.2147	0.0075	0.0004	0.0002	<0.0001	<0.0001	
2004	Net impact	-$14,877	-$16,916	-$9,688	-$5,290	-$2,983	-$2,524	-$2,450	-$1,968	-$1,008		
	Standard error	1270	1171	1308	1443	1468	1564	1599	1611	1662		
	P-value	<0.0001	<0.0001	<0.0001	0.0003	0.0423	0.1066	0.1258	0.2220	0.5443		
2005	Net impact	-$13,586	-$14,464	-$7,510	-$3,087	-$1,132	$27	$1,186	$2,148			
	Standard error	1263	1148	1274	1342	1394	1441	1474	1509			
	P-value	<0.0001	<0.0001	<0.0001	0.0215	0.4171	0.9853	0.4212	0.1548			
2006	Net impact	-$13,659	-$17,978	-$11,426	-$7,941	-$5,722	-$4,801	-$4,099				
	Standard error	1142	1319	1385	1367	1458	1466	1502				
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0011	0.0064				
2007	Net impact	-$14,259	-$21,045	-$13,382	-$10,145	-$7,466	-$7,356					
	Standard error	1069	1274	1336	1415	1445	1526					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
2008	Net impact	-$11,826	-$16,231	-$11,379	-$6,600	-$3,854						
	Standard error	913	802	875	943	985						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
2009	Net impact	-$9,836	-$15,471	-$9,648	-$4,901							
	Standard error	450	552	589	624							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001							
2010	Net impact	-$11,091	-$15,276	-$9,807								
	Standard error	442	560	624								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-$12,861	-$15,963									
	Standard error	469	619									
	P-value	<0.0001	<0.0001									
2012	Net impact	-$13,049										
	Standard error	512										
	P-value	<0.0001										

Appendix figure A3-3. TB Program net impact on annual earnings by follow-up year, males and females combined, TB participants who returned to employer of record within 2 years of TB start, inflation-adjusted, base year 2012, CPI-W Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$7,590	-$21,053	-$12,093	-$2,502	$2,680	$5,763	$6,627	$8,577	$10,045	$10,106	$10,202
	Standard error	1622	1274	1425	1594	1842	1945	1955	2036	2105	2190	2109
	P-value	<0.0001	<0.0001	<0.0001	0.1168	0.1458	0.0031	0	<0.0001	<0.0001	<0.0001	<0.0001
2003	Net impact	-$6,658	-$15,820	-$931	$4,853	$5,660	$6,951	$8,897	$9,477	$11,297	$11,322	
	Standard error	1576	1675	1994	2125	2203	2234	2367	2502	2564	2542	
	P-value	<0.0001	<0.0001	1	0.0225	0.0103	0.0019	0.0002	0.0002	<0.0001	<0.0001	
2004	Net impact	-$15,242	-$10,202	-$2,885	$2,105	$4,261	$3,089	$1,729	$4,444	$7,647		
	Standard error	5986	3698	4214	4688	4352	4885	4976	4859	5039		
	P-value	0	0	0	0.6537	0.3285	0.5277	0.7285	0.3613	0.1304		
2005	Net impact	-$5,195	-$15,571	-$6,894	-$1,201	$2,823	$2,824	$3,421	$3,831			
	Standard error	1956	2196	2461	2671	2769	2842	2947	3052			
	P-value	0	<0.0001	0	0.653	0.308	0.321	0.246	0.210			
2006	Net impact	-$13,074	-$13,001	-$7,703	-$4,671	-$94	$2,356	$3,497				
	Standard error	4674	3932	4581	4535	5044	4957	4921				
	P-value	0	0	0	0.3042	0.9851	0.6351	0.4781				
2007	Net impact	-$6,991	-$17,200	-$7,221	$2,828	$7,475	$5,558					
	Standard error	2974	3792	3791	3947	4150	4505					
	P-value	0	<0.0001	0	0	0.0733	0.2190					
2008	Net impact	-$1,854	-$13,328	-$12,388	-$5,605	$100						
	Standard error	2500	2660	2863	2920	3004						
	P-value	0.46	<0.0001	<0.0001	0.06	0.97						
2009	Net impact	-$2,065	-$7,778	-$4,358	-$647							
	Standard error	1196	1590	1753	1795							
	P-value	0.08	<0.0001	0.01	0.72							
2010	Net impact	-$3,266	-$10,851	-$8,335								
	Standard error	1507	1959	2061								
	P-value	0	<0.0001	<0.0001								
2011	Net impact	-$5,082	-$9,199									
	Standard error	1521	1973									
	P-value	0	<0.0001									
2012	Net impact	-$6,063										
	Standard error	1986										
	P-value	0										

Appendix figure A3-4. TB Program net impact on annual earnings by follow-up year, males only, TB participants who returned to employer of record within 2 years of TB start, inflation-adjusted, base year 2012, CPI-W Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$7,559	-$24,913	-$13,876	-$3,013	$3,959	$6,115	$7,731	$11,137	$11,116	$11,782	$11,825
	Standard error	2349	1788	1958	2184	2561	2700	2715	2816	2916	3053	2960
	P-value	0.0013	<0.0001	<0.0001	0.1681	0.1225	0.0237	0.0045	<0.0001	0.0001	0.0001	<0.0001
2003	Net impact	-$6,657	-$16,198	-$1,142	$3,800	$4,963	$5,564	$8,626	$10,348	$11,575	$10,652	
	Standard error	2083	2254	2590	2791	2904	2975	3157	3287	3400	3367	
	P-value	0.0015	<0.0001	0.6595	0.1737	0.0878	0.0618	0.0064	0.0017	0.0007	0.0016	
2004	Net impact	-$13,908	-$6,243	-$7,457	-$3,595	-$4,675	-$6,569	-$1,777	-$3,398	-$2,614		
	Standard error	15441	8634	10413	11464	10083	10526	11125	10952	11479		
	P-value	0.3700	0.4700	0.4700	0.7500	0.6400	0.5300	0.8700	0.7500	0.8200		
2005	Net impact	-$7,002	-$21,472	-$6,735	$914	$6,248	$6,913	$6,008	$6,560			
	Standard error	3662	4083	4741	5201	5411	5570	5988	6203			
	P-value	0.0572	<0.0001	0.1569	0.8607	0.2495	0.2159	0.3169	0.2914			
2006	Net impact	-$13,904	-$7,398	-$697	-$2,464	$5,548	$6,943	$7,111				
	Standard error	6810	6204	7548	7419	8300	7980	7745				
	P-value	0.0437	0.2357	0.9266	0.7400	0.5053	0.3863	0.3606				
2007	Net impact	-$17,304	-$26,822	-$1,492	$11,632	$15,223	$13,435					
	Standard error	5542	5805	6692	6868	7181	7648					
	P-value	0.0026	<0.0001	0.8242	0.0948	0.0038	0.0834					
2008	Net impact	-$1,992	-$14,722	-$12,491	-$5,384	$2,389						
	Standard error	2964	3647	3975	4123	4103						
	P-value	0.50	<0.0001	0.0020	0.1933	0.5611						
2009	Net impact	-$1,558	-$6,574	-$3,485	$506							
	Standard error	1690	2343	2532	2531							
	P-value	0.3568	0.0052	0.1692	0.8417							
2010	Net impact	-$4,999	-$11,638	-$9,727								
	Standard error	2362	2983	3001								
	P-value	0.0353	0.0001	0.0014								
2011	Net impact	-$8,112	-$15,576									
	Standard error	2442	3481									
	P-value	0.0011	<0.0001									
2012	Net impact	-$6,213										
	Standard error	3157										
	P-value	0.0511										

Appendix figure A3-5. TB Program net impact on annual earnings by follow-up year, females only, TB participants who returned to employer of record within 2 years of TB start, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$5,780	-$15,601	-$9,096	-$1,580	$1,605	$6,709	$6,839	$6,480	$10,103	$9,262	$9,294
	Standard error	1858	1682	2022	2328	2588	2697	2688	2886	3002	3091	2981
	P-value	0.0019	<0.0001	<0.0001	0.4976	0.5354	0.0131	0.0112	0.0251	0.0008	0.0028	0.0019
2003	Net impact	-$2,916	-$14,042	-$321	$6,503	$6,683	$9,533	$8,327	$5,234	$7,345	$10,052	
	Standard error	2323	2546	3248	3277	3409	3451	3679	3941	3997	3970	
	P-value	0.2100	<0.0001	0.9213	0.0477	0.0505	0.0060	0.0241	0.1848	0.0667	0.0117	
2004	Net impact	-$12,729	-$11,992	-$4,797	$645	$1,372	$437	-$2,345	$3,114	$7,653		
	Standard error	5958	4634	4861	4913	5141	5889	5893	5596	5545		
	P-value	0.0347	0.0109	0.3257	0.8958	0.7900	0.9400	0.6914	0.5790	0.1701		
2005	Net impact	-$3,470	-$11,407	-$6,323	-$1,115	$493	-$52	$1,316	$2,701			
	Standard error	2462	2709	2802	3039	3224	3268	3352	3536			
	P-value	0.1579	<0.0001	0.0247	0.7141	0.8786	0.9872	0.6949	0.4455			
2006	Net impact	-$199	-$11,129	-$10,155	-$6,373	$1,300	$2,803	$3,346				
	Standard error	6018	5364	7177	7445	7981	8563	8829				
	P-value	0.9737	0.0432	0.1633	0.3961	0.8713	0.7447	0.7063				
2007	Net impact	-$2,184	-$13,154	-$8,157	-$772	$6,406	-$689					
	Standard error	4666	5081	5275	5170	5682	7076					
	P-value	0.6415	0.0123	0.1277	0.8818	0.2644	0.9228					
2008	Net impact	-$1,613	-$13,354	-$11,604	-$5,402	-$3,517						
	Standard error	5399	5190	5542	5215	5739						
	P-value	0.7656	0.0115	0.0387	0.3026	0.5413						
2009	Net impact	-$2,824	-$8,469	-$5,048	-$1,763							
	Standard error	1661	2142	2443	2534							
	P-value	0.09	<0.0001	0.04	0.49							
2010	Net impact	-$1,667	-$9,952	-$4,467								
	Standard error	1972	2872	3194								
	P-value	0.3989	0.0006	0.1634								
2011	Net impact	-$4,109	-$5,534									
	Standard error	2064	2428									
	P-value	0.0482	0.0240									
2012	Net impact	-$6,908										
	Standard error	3367										
	P-value	0.0426										

Appendix figure A3-6. TB Program net impact on annual earnings by follow-up year, males and females combined, TB participants who did not return to employer of record within 2 years of TB start, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$9,001	-$20,282	-$10,471	-$4,875	-$659	$3,346	$4,771	$5,560	$5,820	$6,901	$7,476
	Standard error	929	903	1077	1156	1322	1383	1404	1479	1561	1610	1692
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.6182	0.0156	0	0	0	<0.0001	<0.0001
2003	Net impact	-$15,055	-$18,164	-$10,115	-$6,085	-$2,842	-$615	$225	$1,179	$1,897	$2,209	
	Standard error	1753	1121	1308	1456	1517	1564	1635	1832	1956	1805	
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0613	0.6943	0.8759	0.5199	0.3323	0.2211	
2004	Net impact	-$15,340	-$18,549	-$11,448	-$6,859	-$4,831	-$4,084	-$3,969	-$3,687	-$2,814		
	Standard error	1088	1250	1396	1525	1597	1665	1718	1749	1799		
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0025	0.0143	0.0210	0.0353	0.1180		
2005	Net impact	-$15,371	-$12,856	-$6,485	-$2,334	-$523	$1,024	$2,155	$3,440			
	Standard error	1576	1373	1534	1592	1637	1694	1739	1780			
	P-value	<0.0001	<0.0001	<0.0001	0.143	0.749	0.546	0.215	0.054			
2006	Net impact	-$14,306	-$17,979	-$11,349	-$8,137	-$6,234	-$5,147	-$4,535				
	Standard error	1056	1417	1470	1461	1556	1566	1613				
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0010	0.0050				
2007	Net impact	-$16,900	-$20,248	-$13,241	-$10,784	-$8,223	-$7,875					
	Standard error	1147	1388	1460	1548	1580	1668					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
2008	Net impact	-$13,282	-$16,695	-$11,450	-$6,939	-$4,447						
	Standard error	987	849	926	1004	1052						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
2009	Net impact	-$11,094	-$16,732	-$10,586	-$5,639							
	Standard error	482	587	624	667							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001							
2010	Net impact	-$11,892	-$15,675	-$9,960								
	Standard error	460	587	659								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-$13,551	-$16,658									
	Standard error	491	653									
	P-value	<0.0001	<0.0001									
2012	Net impact	-$13,891										
	Standard error	533										
	P-value	<0.0001										

Appendix figure A3-7. TB Program net impact on annual earnings by follow-up year, males only, TB participants who did not return to employer of record within 2 years of TB start, inflation-adjusted, base year 2012, CPI-W Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$10,311	-$24,151	-$11,924	-$5,381	-$1,575	$3,898	$6,295	$6,877	$6,650	$8,496	$9,104
	Standard error	1363	1303	1515	1675	1919	2003	2031	2154	2296	2355	2532
	P-value	<0.0001	<0.0001	<0.0001	0.0013	0.4120	0.0519	0	0	0	0	0
2003	Net impact	-$17,571	-$22,003	-$13,828	-$9,334	-$5,455	-$1,874	-$2,197	-$2,178	-$900	$568	
	Standard error	1932	1721	2055	2249	2378	2409	2476	2841	3230	2883	
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0221	0.4369	0.3751	0.4435	0.7805	0.8437	
2004	Net impact	-$16,735	-$22,319	-$12,568	-$6,136	-$2,912	-$1,586	-$2,751	-$3,049	-$2,203		
	Standard error	1837	2183	2469	2727	2804	2951	3079	3112	3127		
	P-value	<0.0001	<0.0001	<0.0001	0.0248	0.2995	0.5911	0.3719	0.3277	0.4814		
2005	Net impact	-$15,084	-$15,613	-$9,065	-$6,004	-$3,375	$500	$2,931	$4,183			
	Standard error	1793	2528	2849	2879	2989	3130	3194	3230			
	P-value	<0.0001	<0.0001	0	0.038	0.259	0.873	0.359	0.196			
2006	Net impact	-$17,808	-$21,779	-$12,858	-$8,111	-$5,883	-$5,071	-$3,136				
	Standard error	1753	2451	2605	2494	2576	2725	2818				
	P-value	<0.0001	<0.0001	<0.0001	0.0012	0.0227	0.0631	0.2661				
2007	Net impact	-$18,087	-$18,678	-$10,235	-$10,097	-$8,299	-$8,115					
	Standard error	1840	2290	2432	2647	2635	2785					
	P-value	<0.0001	<0.0001	<0.0001	0	0.0017	0.0037					
2008	Net impact	-$12,477	-$19,318	-$12,911	-$8,888	-$7,021						
	Standard error	975	1201	1342	1518	1556						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
2009	Net impact	-$13,054	-$18,798	-$11,460	-$5,153							
	Standard error	698	903	933	987							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001							
2010	Net impact	-$14,018	-$18,367	-$12,433								
	Standard error	710	908	1042								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-$17,214	-$20,268									
	Standard error	812	1085									
	P-value	<0.0001	<0.0001									
2012	Net impact	-$17,019										
	Standard error	811										
	P-value	<0.0001										

Appendix figure A3-8. TB Program net impact on annual earnings by follow-up year, females only, TB participants who did not return to employer of record within 2 years of TB start, inflation-adjusted, base year 2012, CPI-W Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year										
		1	2	3	4	5	6	7	8	9	10	11
2002	Net impact	-$7,987	-$15,671	-$8,541	-$4,215	$241	$2,386	$2,682	$3,053	$3,366	$3,461	$4,334
	Standard error	1153	1156	1440	1492	1654	1746	1798	1883	1933	2039	2027
	P-value	<0.0001	<0.0001	<0.0001	0.0048	0.8843	0.1720	0	0	0	0	0
2003	Net impact	-$11,445	-$14,698	-$6,336	-$2,961	-$225	$166	$2,221	$4,088	$4,095	$3,093	
	Standard error	2343	1420	1643	1883	1991	2021	2142	2286	2188	2178	
	P-value	<0.0001	<0.0001	0	0.1163	0.9065	0.9344	0.3000	0.0741	0.0616	0.1559	
2004	Net impact	-$13,371	-$15,485	-$10,194	-$7,229	-$5,712	-$5,426	-$4,578	-$4,722	-$3,687		
	Standard error	1317	1477	1659	1800	1937	1994	2026	2054	2150		
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0033	0.0066	0.0241	0.0218	0.0867		
2005	Net impact	-$14,929	-$10,359	-$3,496	$557	$2,109	$1,995	$2,543	$3,180			
	Standard error	2377	1594	1773	1893	1939	2006	2080	2141			
	P-value	<0.0001	<0.0001	0	0.769	0.277	0.320	0.222	0.138			
2006	Net impact	-$11,866	-$14,728	-$9,654	-$7,190	-$5,223	-$4,096	-$4,388				
	Standard error	1234	1504	1597	1666	1872	1781	1776				
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.0054	0.0217	0.0137				
2007	Net impact	-$15,867	-$21,249	-$15,316	-$11,010	-$8,567	-$7,993					
	Standard error	1471	1716	1829	1878	1970	2089					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001					
2008	Net impact	-$14,462	-$15,216	-$10,975	-$6,128	-$3,287						
	Standard error	1657	1172	1276	1338	1436						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.02						
2009	Net impact	-$9,029	-$14,559	-$9,803	-$6,295							
	Standard error	658	740	828	895							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001							
2010	Net impact	-$9,888	-$13,278	-$7,926								
	Standard error	594	765	832								
	P-value	<0.0001	<0.0001	<0.0001								
2011	Net impact	-$10,917	-$13,940									
	Standard error	560	772									
	P-value	<0.0001	<0.0001									
2012	Net impact	-$11,226										
	Standard error	678										
	P-value	<0.0001										

Appendix 4

Appendix figure A4-1. Statistically unadjusted average annual unemployment benefits paid by follow-on year, treatment and comparison group, by gender and total sample, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Follow-on year										
2002	1	2	3	4	5	6	7	8	9	10	11
Total sample	$17,686	$13,194	$1,997	$380	$395	$390	$857	$1,720	$1,457	$1,009	$621
Treatment	$23,246	$21,164	$3,144	$233	$254	$235	$624	$1,362	$1,075	$732	$404
Comparison	$12,126	$5,224	$850	$526	$536	$545	$1,089	$2,079	$1,839	$1,287	$837
Sample size	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788
All males	$18,679	$14,412	$2,440	$479	$433	$430	$1,018	$2,206	$1,700	$1,108	$650
Treatment	$24,954	$23,432	$3,756	$263	$230	$208	$700	$1,613	$1,013	$673	$355
Comparison	$12,405	$5,391	$1,125	$695	$635	$652	$1,337	$2,799	$2,387	$1,542	$946
Sample size	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864
All females	$16,692	$11,977	$1,554	$281	$357	$351	$695	$1,234	$1,213	$911	$591
Treatment	$21,537	$18,896	$2,532	$204	$278	$263	$548	$1,111	$1,137	$790	$453
Comparison	$11,847	$5,057	$576	$357	$436	$439	$842	$1,358	$1,290	$1,033	$729
Sample size	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924
2003	1	2	3	4	5	6	7	8	9	10	11
Total sample	$16,273	$5,226	$626	$398	$418	$1,124	$1,979	$1,330	$1,003	$714	$458
Treatment	$22,187	$8,763	$583	$263	$260	$850	$1,626	$1,020	$668	$490	$382
Comparison	$10,358	$1,689	$669	$533	$576	$1,399	$2,331	$1,639	$1,339	$938	$534
Sample size	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230
All males	$17,017	$5,982	$762	$426	$462	$1,231	$2,179	$1,451	$1,139	$747	$515
Treatment	$23,479	$9,963	$676	$254	$306	$910	$1,696	$1,039	$655	$515	$416
Comparison	$10,555	$2,001	$848	$597	$617	$1,552	$2,661	$1,864	$1,623	$979	$614
Sample size	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812
All females	$15,528	$4,470	$491	$370	$374	$1,017	$1,779	$1,208	$868	$681	$401
Treatment	$20,896	$7,563	$491	$271	$214	$790	$1,557	$1,001	$680	$466	$348
Comparison	$10,160	$1,378	$491	$469	$534	$1,245	$2,000	$1,414	$1,055	$896	$454
Sample size	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418

Cohort	Follow-on year										
2004	1	2	3	4	5	6	7	8	9	10	11
Total sample	$12,265	$2,240	$564	$503	$1,084	$2,304	$1,941	$1,332	$907	$743	
Treatment	$17,779	$3,571	$405	$313	$850	$2,072	$1,751	$1,138	$837	$614	
Comparison	$6,752	$910	$724	$693	$1,319	$2,535	$2,132	$1,525	$977	$872	
Sample size	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	
All males	$13,189	$2,634	$592	$588	$1,293	$2,739	$2,355	$1,601	$1,033	$814	
Treatment	$19,091	$4,109	$280	$269	$947	$2,326	$1,968	$1,392	$922	$573	
Comparison	$7,287	$1,160	$905	$908	$1,639	$3,152	$2,742	$1,809	$1,144	$1,055	
Sample size	746	746	746	746	746	746	746	746	746	746	
All females	$11,342	$1,847	$536	$418	$875	$1,868	$1,528	$1,063	$781	$672	
Treatment	$16,466	$3,032	$530	$357	$752	$1,818	$1,534	$885	$752	$655	
Comparison	$6,218	$661	$543	$479	$998	$1,919	$1,521	$1,241	$810	$689	
Sample size	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	
2005	1	2	3	4	5	6	7	8	9	10	11
Total sample	$11,035	$2,102	$709	$1,200	$2,196	$2,032	$1,536	$1,271	$764		
Treatment	$16,099	$3,159	$630	$816	$1,754	$1,563	$1,079	$775	$518		
Comparison	$5,970	$1,045	$788	$1,583	$2,639	$2,502	$1,993	$1,767	$1,010		
Sample size	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212		
All males	$11,070	$2,420	$891	$1,455	$2,375	$2,307	$1,769	$1,508	$902		
Treatment	$16,287	$3,561	$808	$975	$1,815	$1,653	$1,102	$844	$553		
Comparison	$5,852	$1,279	$974	$1,935	$2,936	$2,962	$2,436	$2,171	$1,250		
Sample size	914	914	914	914	914	914	914	914	914		
All females	$11,000	$1,783	$527	$944	$2,017	$1,757	$1,303	$1,035	$626		
Treatment	$15,911	$2,756	$453	$658	$1,693	$1,474	$1,056	$707	$483		
Comparison	$6,089	$811	$601	$1,230	$2,341	$2,041	$1,551	$1,363	$769		
Sample size	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298		
2006	1	2	3	4	5	6	7	8	9	10	11
Total sample	$10,606	$2,339	$3,023	$3,494	$2,296	$1,556	$1,125	$661			
Treatment	$15,561	$3,450	$3,729	$3,553	$1,810	$1,151	$734	$481			
Comparison	$5,651	$1,229	$2,317	$3,436	$2,783	$1,960	$1,517	$842			
Sample size	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166			
All males	$10,819	$2,803	$3,748	$4,227	$2,582	$1,696	$1,349	$785			
Treatment	$15,878	$4,130	$4,761	$4,394	$2,064	$1,183	$787	$483			
Comparison	$5,761	$1,477	$2,735	$4,060	$3,100	$2,210	$1,911	$1,087			
Sample size	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054			
All females	$10,392	$1,875	$2,298	$2,762	$2,011	$1,415	$902	$537			
Treatment	$15,244	$2,770	$2,697	$2,712	$1,556	$1,120	$682	$478			
Comparison	$5,540	$981	$1,898	$2,812	$2,466	$1,710	$1,123	$597			
Sample size	1,112	1,112	1,112	1,112	1,112	1,112	1,112	1,112			

Cohort	Follow-on year										
2007	1	2	3	4	5	6	7	8	9	10	11
Total sample	$11,082	$6,778	$5,989	$3,039	$1,887	$1,248	$920				
Treatment	$16,370	$10,266	$7,307	$2,453	$1,094	$776	$566				
Comparison	$5,794	$3,290	$4,672	$3,625	$2,680	$1,720	$1,274				
Sample size	1,756	1,756	1,756	1,756	1,756	1,756	1,756				
All males	$10,659	$7,223	$6,832	$3,448	$2,113	$1,590	$1,019				
Treatment	$15,987	$10,730	$8,168	$2,757	$1,366	$1,002	$558				
Comparison	$5,331	$3,715	$5,497	$4,139	$2,859	$2,178	$1,481				
Sample size	810	810	810	810	810	810	810				
All females	$11,505	$6,334	$5,147	$2,630	$1,662	$906	$820				
Treatment	$16,754	$9,802	$6,446	$2,149	$822	$550	$575				
Comparison	$6,257	$2,866	$3,847	$3,111	$2,501	$1,263	$1,066				
Sample size	946	946	946	946	946	946	946				
2008	1	2	3	4	5	6	7	8	9	10	11
Total sample	$13,392	$12,528	$5,444	$1,966	$1,014	$783					
Treatment	$17,399	$18,024	$7,603	$1,817	$748	$603					
Comparison	$9,385	$7,031	$3,286	$2,114	$1,281	$964					
Sample size	3,374	3,374	3,374	3,374	3,374	3,374					
All males	$13,005	$12,954	$6,303	$2,305	$1,157	$840					
Treatment	$17,189	$18,824	$8,818	$2,199	$836	$509					
Comparison	$8,821	$7,085	$3,788	$2,412	$1,477	$1,171					
Sample size	1,702	1,702	1,702	1,702	1,702	1,702					
All females	$13,779	$12,101	$4,586	$1,626	$872	$726					
Treatment	$17,609	$17,225	$6,387	$1,436	$660	$696					
Comparison	$9,950	$6,977	$2,785	$1,817	$1,085	$756					
Sample size	1,672	1,672	1,672	1,672	1,672	1,672					
2009	1	2	3	4	5	6	7	8	9	10	11
Total sample	$15,562	$12,759	$4,499	$1,242	$781						
Treatment	$19,322	$18,087	$6,516	$1,021	$633						
Comparison	$11,803	$7,431	$2,482	$1,463	$928						
Sample size	8,040	8,040	8,040	8,040	8,040						
All males	$15,583	$13,053	$5,073	$1,464	$836						
Treatment	$19,778	$18,767	$7,198	$1,165	$614						
Comparison	$11,389	$7,338	$2,947	$1,763	$1,058						
Sample size	4,182	4,182	4,182	4,182	4,182						
All females	$15,541	$12,465	$3,925	$1,020	$726						
Treatment	$18,865	$17,407	$5,833	$877	$653						
Comparison	$12,217	$7,523	$2,017	$1,163	$799						
Sample size	3,858	3,858	3,858	3,858	3,858						

Cohort	Follow-on year										
2010	1	2	3	4	5	6	7	8	9	10	11
Total sample	$12,658	$9,801	$2,659	$939							
Treatment	$16,349	$14,479	$3,497	$665							
Comparison	$8,967	$5,124	$1,821	$1,213							
Sample size	5,764	5,764	5,764	5,764							
All males	$13,093	$10,409	$3,032	$1,116							
Treatment	$17,182	$15,435	$3,957	$745							
Comparison	$9,004	$5,384	$2,107	$1,486							
Sample size	2,718	2,718	2,718	2,718							
All females	$12,223	$9,194	$2,286	$762							
Treatment	$15,516	$13,523	$3,036	$585							
Comparison	$8,930	$4,864	$1,535	$939							
Sample size	3,046	3,046	3,046	3,046							
2011	1	2	3	4	5	6	7	8	9	10	11
Total sample	$12,687	$8,098	$1,518								
Treatment	$16,905	$12,588	$1,769								
Comparison	$8,468	$3,608	$1,266								
Sample size	4,700	4,700	4,700								
All males	$13,232	$8,591	$1,966								
Treatment	$18,133	$13,445	$2,263								
Comparison	$8,331	$3,738	$1,670								
Sample size	2,222	2,222	2,222								
All females	$12,142	$7,604	$1,069								
Treatment	$15,678	$11,730	$1,275								
Comparison	$8,606	$3,478	$862								
Sample size	2,478	2,478	2,478								
2012	1	2	3	4	5	6	7	8	9	10	11
Total sample	$11,989	$6,043									
Treatment	$16,249	$9,636									
Comparison	$7,728	$2,450									
Sample size	4,218	4,218									
All males	$12,268	$6,396									
Treatment	$17,040	$10,170									
Comparison	$7,496	$2,621									
Sample size	2,126	2,126									
All females	$11,709	$5,690									
Treatment	$15,458	$9,102									
Comparison	$7,961	$2,278									
Sample size	2,092	2,092									

Appendix figure A4-2. TB Program net impact on annual average unemployment benefits paid by follow-on year, by total sample, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2002	Mediation effect	$2,440	$3,120	$268	$1	-$6	-$13	-$66	-$317	-$239	-$137	-$67	-$35
	Standard error	115	145	33	2	3	5	14	43	33	20	13	10
	P-value	<0.0001	<0.0001	<0.0001	0.64	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Net effect	$7,890	$12,200	$2,010	-$136	-$155	-$215	-$255	-$217	-$321	-$187	-$190	-$193
	Standard error	196	230	125	45	49	50	95	167	149	112	82	65
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.19	0.03	0.1	0.02	<0.0001
	Total effect	$10,300	$15,400	$2,280	-$136	-$161	-$228	-$322	-$534	-$560	-$324	-$257	-$228
	Standard error	194	230	125	45	48	49	94	171	150	112	79	62
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	<0.0001	<0.0001
	Sample size	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788	4,788
		1	2	3	4	5	6	7	8	9	10	11	12
2003	Mediation effect	$2,210	$1,088	$17	-$1	-$3	-$37	-$204	-$120	-$82	-$56	-$14	
	Standard error	130	98	7	2	3	14	46	27	21	16	8	
	P-value	<0.0001	<0.0001	0.01	0.58	0.35	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.11	
	Net effect	$8,800	$6,019	$67	-$159	-$221	-$393	-$216	-$285	-$412	-$279	-$40	
	Standard error	214	236	82	59	67	141	204	166	139	116	76	
	P-value	<0.0001	<0.0001	0.43	<0.0001	<0.0001	0.01	0.3	0.09	<0.0001	0.01	0.6	
	Total effect	$11,000	$7,107	$83	-$160	-$224	-$431	-$420	-$404	-$494	-$335	-$53	
	Standard error	204	233	82	60	67	138	213	167	140	113	78	
	P-value	<0.0001	<0.0001	0.32	<0.0001	<0.0001	<0.0001	0.04	0.01	<0.0001	<0.0001	0.48	
	Sample size	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	3,230	
		1	2	3	4	5	6	7	8	9	10	11	12
2004	Mediation effect	$2,290	$431	$28	$6	$19	$59	$61	$26	$5	$0		
	Standard error	158	64	15	6	18	64	57	30	15	7		
	P-value	<0.0001	<0.0001	0.05	0.19	0.27	0.35	0.24	0.38	0.74	0.96		
	Net effect	$8,550	$2,236	-$268	-$296	-$277	-$136	-$58	-$149	-$102	-$153		
	Standard error	253	169	83	87	153	288	251	206	154	132		
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.08	0.61	0.8	0.46	0.53	0.27		
	Total effect	$10,800	$2,667	-$240	-$290	-$258	-$77	$2	-$123	-$96	-$152		
	Standard error	230	163	84	87	156	288	256	207	154	132		
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.09	0.79	0.99	0.53	0.56	0.27		
	Sample size	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798	1,798		

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2005	Mediation effect	$1,890	$341	$43	$25	-$27	-$38	-$47	-$54	-$19			
	Standard error	125	51	14	22	60	51	33	26	10			
	P-value	<0.0001	<0.0001	<0.0001	0.25	0.67	0.46	0.16	0.02	0.01			
	Net effect	$7,910	$1,844	$0	-$578	-$365	-$257	-$394	-$588	-$232			
	Standard error	232	157	93	151	226	225	183	170	122			
	P-value	<0.0001	<0.0001	0.98	<0.0001	0.13	0.27	0.03	<0.0001	0.05			
	Total effect	$9,810	$2,186	$43	-$553	-$391	-$295	-$441	-$642	-$250			
	Standard error	247	152	91	153	233	232	181	175	121			
	P-value	<0.0001	<0.0001	0.63	<0.0001	0.12	0.21	0.02	<0.0001	0.03			
	Sample size	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212	2,212			
		1	2	3	4	5	6	7	8	9	10	11	12
2006	Mediation effect	$2,110	$494	$536	$493	$224	$106	$61	$2				
	Standard error	140	65	74	90	54	35	25	4				
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.52				
	Net effect	$7,640	$2,024	$843	-$101	-$768	-$498	-$556	-$152				
	Standard error	232	168	234	286	254	199	162	105				
	P-value	<0.0001	<0.0001	<0.0001	0.72	<0.0001	0.01	<0.0001	0.13				
	Total effect	$9,750	$2,518	$1,379	$393	-$544	-$392	-$495	-$150				
	Standard error	235	159	233	291	261	198	163	105				
	P-value	<0.0001	<0.0001	<0.0001	0.18	0.05	0.05	<0.0001	0.14				
	Sample size	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166				
		1	2	3	4	5	6	7	8	9	10	11	12
2007	Mediation effect	$2,210	$2,551	$1,449	$514	$197	$74	$25					
	Standard error	176	212	189	94	53	26	15					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.03					
	Net effect	$8,360	$4,813	$1,866	-$1,130	-$1,300	-$602	-$359					
	Standard error	293	164	609	284	240	170	145					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.02					
	Total effect	$10,600	$7,364	$3,315	-$616	-$1,100	-$528	-$333					
	Standard error	281	369	397	290	240	172	147					
	P-value	<0.0001	<0.0001	<0.0001	0.04	<0.0001	<0.0001	0.02					
	Sample size	1,756	1,756	1,756	1,756	1,756	1,756	1,756					

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2008	Mediation effect	$3,754	$4,600	$1,389	$240	$51	$9						
	Standard error	169	235	114	39	14	6						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.07						
	Net effect	$4,285	$6,590	$3,244	-$224	-$367	-$163						
	Standard error	206	276	238	167	117	92						
	P-value	<0.0001	<0.0001	<0.0001	0.19	<0.0001	0.07						
	Total effect	$8,039	$11,200	$4,634	$16	-$316	-$153						
	Standard error	232	306	252	169	114	91						
	P-value	<0.0001	<0.0001	<0.0001	0.96	<0.0001	0.09						
	Sample size	3,374	3,374	3,374	3,374	3,374	3,374						
		1	2	3	4	5	6	7	8	9	10	11	12
2009	Mediation effect	$3,156	$4,150	$851	$78	$14							
	Standard error	104	151	56	12	4							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001							
	Net effect	$4,438	$6,760	$3,432	-$385	-$227							
	Standard error	146	171	132	78	58							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001							
	Total effect	$7,594	$10,900	$4,284	-$308	-$214							
	Standard error	155	230	138	76	58							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001							
	Sample size	8,040	8,040	8,040	8,040	8,040							
		1	2	3	4	5	6	7	8	9	10	11	12
2010	Mediation effect	$2,962	$3,073	$437	$15								
	Standard error	109	124	36	6								
	P-value	<0.0001	<0.0001	<0.0001	<0.0001								
	Net effect	$4,374	$6,416	$1,467	-$328								
	Standard error	150	196	118	73								
	P-value	<0.0001	<0.0001	<0.0001	<0.0001								
	Total effect	$7,336	$9,489	$1,904	-$313								
	Standard error	168	220	123	73								
	P-value	<0.0001	<0.0001	<0.0001	<0.0001								
	Sample size	5,764	5,764	5,764	5,764								

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2011	Mediation effect	$3,411	$2,657	$144									
	Standard error	136	126	21									
	P-value	<0.0001	<0.0001	<0.0001									
	Net effect	$4,622	$6,329	$622									
	Standard error	168	198	101									
	P-value	<0.0001	<0.0001	<0.0001									
	Total effect	$8,033	$8,985	$766									
	Standard error	191	200	101									
	P-value	<0.0001	<0.0001	<0.0001									
	Sample size	4,700	4,700	4,700									
		1	2	3	4	5	6	7	8	9	10	11	12
2012	Mediation effect	$2,958	$1,388										
	Standard error	129	87										
	P-value	<0.0001	<0.0001										
	Net effect	$5,115	$5,759										
	Standard error	187	199										
	P-value	<0.0001	<0.0001										
	Total effect	$8,072	$7,147										
	Standard error	199	197										
	P-value	<0.0001	<0.0001										
	Sample size	4,218	4,218										

Appendix figure A4-3. TB Program net impact on average annual unemployment benefits paid by follow-on year, males only, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2002	Mediation effect	$2,480	$3,409	$313	$3	-$4	-$9	-$86	-$441	-$279	-$162	-$69	-$42
	Standard error	158	188	53	3	4	7	21	71	49	32	18	14
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.24	0.23	0.15	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Net effect	$8,830	$13,711	$2,360	-$175	-$225	-$320	-$284	-$412	-$67	-$347	-$271	-$269
	Standard error	275.51	333.41	181.12	66.70	73.39	71.33	133.47	228.42	196.90	157.84	100.42	82.22
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.01	<0.0001	<0.0001	0.03	0.08	<0.0001	0.02	0.01	<0.0001
	Total effect	$11,300	$17,120	$2,670	-$171	-$229	-$330	-$370	-$853	-$939	-$509	-$340	-$311
	Standard error	306	314	173	67	75	69	135	233	200	158	101	83
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.01	<0.0001	<0.0001	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Sample Size	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864	2,864
		1	2	3	4	5	6	7	8	9	10	11	12
2003	Mediation effect	$2,480	$1,328	$29	$0	-$3	-$34	-$201	-$101	-$84	-$64	-$24	
	Standard error	184	147	13	3	4	19	66	34	28	22	15	
	Prob > |t|	<0.0001	<0.0001	0.01	0.89	0.37	0.01	<0.0001	<0.0001	<0.0001	<0.0001	0.08	
	Net effect	$9,630	$6,580	$20	-$210	-$169	-$442	-$257	-$265	-$478	-$191	-$31	
	Standard error	298	371	118	76	88	205	314	208	201	156	114	
	Prob > |t|	<0.0001	<0.0001	0.86	0.01	0.04	0.02	0.40	0.22	0.02	0.22	0.78	
	Total effect	$12,100	$7,908	$48	-$210	-$172	-$475	-$458	-$365	-$562	-$255	-$55	
	Standard error	306	326	121	162	88	202	320	214	204	156	113	
	Prob > |t|	<0.0001	<0.0001	0.68	0.01	0.03	0.02	0.14	0.07	0.00	0.09	0.63	
	Sample Size	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	1,812	
		1	2	3	4	5	6	7	8	9	10	11	12
2004	Mediation effect	$2,470	$382	$10	$1	-$27	-$103	-$32	-$5	-$5	$5		
	Standard error	265	120	19	11	38	119	93	74	22	21		
	Prob > |t|	<0.0001	<0.0001	0.60	0.93	0.44	0.37	0.72	0.97	0.78	0.79		
	Net effect	$9,390	$2,800	-$535	-$522	-$379	-$209	-$117	-$20	-$184	-$414		
	Standard error	423	311	128	146	282	504	459	363	263	238		
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	0.18	0.68	0.80	0.95	0.46	0.10		
	Total effect	$11,900	$3,180	-$524	-$522	-$406	-$313	-$150	-$25	-$190	-$409		
	Standard error	434	291	127	148	282	499	467	383	265	243		
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	0.15	0.55	0.77	0.95	0.45	0.09		
	Sample Size	746	746	746	746	746	746	746	746	746	746		

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2005	Mediation effect	$1,970	$437	$81	$47	-$28	-$79	-$73	-$89	-$29			
	Standard error	245	106	33	47	111	92	59	58	23			
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.26	0.78	0.39	0.20	0.10	0.11			
	Net effect	$8,470	$2,010	$11	-$730	-$491	-$332	-$615	-$662	-$256			
	Standard error	411	304	176	292	403	384	324	312	216			
	Prob > |t|	<0.0001	<0.0001	0.99	0.01	0.22	0.42	0.06	0.04	0.21			
	Total effect	$10,400	$2,450	$93	-$683	-$519	-$411	-$688	-$751	-$286			
	Standard error	395	291	175	302	426	396	332	319	218			
	Prob > |t|	<0.0001	<0.0001	0.61	0.02	0.22	0.31	0.04	0.02	0.17			
	Sample Size	914	914	914	914	914	914	914	914	914			
		1	2	3	4	5	6	7	8	9	10	11	12
2006	Mediation effect	$1,800	$531	$575	$452	$194	$64	$47	$0				
	Standard error	184	107	118	147	91	46	38	5				
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	0.02	0.12	0.16	0.95				
	Net effect	$8,070	$2,707	$1,642	$315	-$633	-$501	-$788	-$305				
	Standard error	339	285	395	463	371	313	259	156				
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.49	0.09	0.12	<0.0001	0.07				
	Total effect	$9,870	$3,238	$2,217	$767	-$439	-$438	-$742	-$305				
	Standard error	347	266	392	485	377	308	263	155				
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.10	0.27	0.18	<0.0001	0.07				
	Sample Size	1,054	1,054	1,054	1,054	1,054	1,054	1,054	1,054				
		1	2	3	4	5	6	7	8	9	10	11	12
2007	Mediation effect	$2,320	$2,472	$1,255	$491	$198	$82	$32					
	Standard error	270	316	285	158	88	47	28					
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.05	0.19					
	Net effect	$8,090	$4,873	$2,395	-$1,152	-$656	-$529	-$377					
	Standard error	434	582	523	492	386	293	254					
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.02	0.09	0.07	0.14					
	Total effect	$10,400	$7,345	$3,650	-$661	-$458	-$447	-$346					
	Standard error	429	592	605	510	394	296	254					
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.19	0.27	0.14	0.19					
	Sample Size	810	810	810	810	810	810	810					

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2008	Mediation effect	$4,068	$5,230	$1,679	$321	$76	$6						
	Standard error	246	332	184	64	27	11						
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.55						
	Net effect	$4,277	$6,890	$3,864	$30	-$301	-$269						
	Standard error	285	416	362	265	169	132						
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.94	0.07	0.05						
	Total effect	$8,345	$12,100	$5,543	$351	-$225	-$263						
	Standard error	332	459	366	266	166	135						
	Prob > |t|	<0.0001	<0.0001	<0.0001	0.18	0.17	0.06						
	Sample Size	1,702	1,702	1,702	1,702	1,702	1,702						
		1	2	3	4	5	6	7	8	9	10	11	12
2009	Mediation effect	$3,440	$4,163	$920	$57	$8							
	Standard error	153	203	80	16	5							
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	0.02							
	Net effect	$5,075	$7,700	$3,660	-$477	-$310							
	Standard error	192	259	206	110	81							
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001							
	Total effect	$8,516	$11,862	$4,581	-$419	-$302							
	Standard error	224	305	217	109	80							
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001							
	Sample Size	4,182	4,182	4,182	4,182	4,182							
		1	2	3	4	5	6	7	8	9	10	11	12
2010	Mediation effect	$3,169	$3,295	$552	$31								
	Standard error	171	190	64	12								
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001								
	Net effect	$4,950	$6,969	$1,719	-$399								
	Standard error	239	292	181	114								
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001								
	Total effect	$8,119	$10,264	$2,271	-$368								
	Standard error	261	309	195	112								
	Prob > |t|	<0.0001	<0.0001	<0.0001	<0.0001								
	Sample Size	2,718	2,718	2,718	2,718								

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2011	Mediation effect	$3,938	$2,950	$246									
	Standard error	207	196	43									
	Prob > |t|	<0.0001	<0.0001	<0.0001									
	Net effect	$5,261	$6,860	$868									
	Standard error	275	327	183									
	Prob > |t|	<0.0001	<0.0001	<0.0001									
	Total effect	$9,199	$9,810	$1,114									
	Standard error	296	324	178									
	Prob > |t|	<0.0001	<0.0001	<0.0001									
	Sample Size	2,222	2,222	2,222									
		1	2	3	4	5	6	7	8	9	10	11	12
2012	Mediation effect	$3,000	$1,429										
	Standard error	182	131										
	Prob > |t|	<0.0001	<0.0001										
	Net effect	$5,996	$6,048										
	Standard error	270	303										
	Prob > |t|	<0.0001	<0.0001										
	Total effect	$8,996	$7,476										
	Standard error	284	275										
	Prob > |t|	<0.0001	<0.0001										
	Sample Size	2,092	2,092										

Note: Estimates and standard errors are based on quasi-Bayesian Monte Carlo experiments (1000 iterations).

Appendix figure A4-4. TB Program net impact on average annual unemployment benefits paid by follow-on year, females only, inflation-adjusted, base year 2012, CPI-W
Washington state, cohort 2002 through 2012
Source: Employment Security Department/LMPA

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2002	Mediation effect	$2,921	$3,421	$313	$3	-$4	-$9	-$85	-$438	-$282	-$166	-$69	-$42
	Standard error	204	197	51	3	4	7	21	69	49	31	18	14
	P-value	<0.0001	<0.0001	<0.0001	0.29	0.23	0.15	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Net effect	$5,912	$13,718	$2,350	-$176	-$219	-$327	-$285	-$421	-$663	-$346	-$265	-$269
	Standard error	273	312	176	72	71	70	136	234	207	152	105	85
	P-value	<0.0001	<0.0001	<0.0001	0.01	<0.0001	<0.0001	0.04	0.06	<0.0001	0.02	0.01	0.01
	Total effect	$8,833	$17,139	$2,660	-$173	-$223	-$337	-$371	-$860	-$945	-$512	-$334	-$310
	Standard error	310	308	173	71	71	71	136	244	206	151	106	84
	P-value	<0.0001	<0.0001	<0.0001	0.02	<0.0001	<0.0001	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Sample size	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924	1,924
		1	2	3	4	5	6	7	8	9	10	11	12
2003	Mediation effect	$1,900	$743	$8	-$3	-$3	-$38	-$175	-$124	-$77	-$59	$1	
	Standard error	171	117	8	5	6	22	63	46	30	25	10	
	P-value	<0.0001	<0.0001	0.22	0.52	0.63	0.03	<0.0001	<0.0001	<0.0001	<0.0001	0.93	
	Net effect	$7,860	$5,270	$98	-$107	-$282	-$287	-$73	-$209	-$311	-$372	-$61	
	Standard error	298	332	102	92	99	200	315	247	197	181	107	
	P-value	<0.0001	<0.0001	0.30	0.27	<0.0001	0.16	0.80	0.38	0.11	0.04	0.54	
	Total effect	$9,760	$6,010	$107	-$110	-$285	-$325	-$248	-$333	-$388	-$431	-$60	
	Standard error	319	329	104	93	100	205	317	246	197	181	108	
	P-value	<0.0001	<0.0001	0.27	0.25	<0.0001	0.12	0.43	0.19	0.04	0.01	0.57	
	Sample size	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	1,418	
		1	2	3	4	5	6	7	8	9	10	11	12
2004	Mediation effect	$2,200	$438	$32	$6	$38	$130	$117	$36	$18	$2		
	Standard error	202	79	21	9	22	82	69	30	22	12		
	P-value	<0.0001	<0.0001	0.12	0.47	0.04	0.09	0.07	0.18	0.39	0.81		
	Net effect	$7,840	$1,876	-$71	-$161	-$153	-$102	-$25	-$360	-$154	-$48		
	Standard error	316	193	109	95	186	333	290	221	193	172		
	P-value	<0.0001	<0.0001	0.52	0.08	0.42	0.76	0.94	0.11	0.44	0.79		
	Total effect	$10,000	$2,314	-$38	-$155	-$115	$28	$92	-$323	-$135	-$46		
	Standard error	306	181	107	95	190	339	295	230	196	171		
	P-value	<0.0001	<0.0001	0.70	0.08	0.53	0.94	0.75	0.17	0.50	0.80		
	Sample size	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052		

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2005	Mediation effect	$2,004	$312	$15	$6	-$72	-$61	-$72	-$55	-$14			
	Standard error	178	58	10	20	69	66	49	33	10			
	P-value	<0.0001	<0.0001	0.06	0.78	0.31	0.33	0.43	0.06	0.13			
	Net effect	$7,365	$1,681	-$37	-$384	-$293	-$149	-$187	-$493	-$182			
	Standard error	275	174	101	172	286	274	236	196	136			
	P-value	<0.0001	<0.0001	0.70	0.01	0.34	0.59	0.24	0.02	0.18			
	Total effect	$9,369	$1,993	-$21	-$378	-$365	-$210	-$259	-$548	-$196			
	Standard error	283	167	100	173	302	282	240	200	137			
	P-value	<0.0001	<0.0001	0.83	0.02	0.26	0.44	0.19	0.01	0.16			
	Sample size	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298	1,298			
		1	2	3	4	5	6	7	8	9	10	11	12
2006	Mediation effect	$2,710	$450	$559	$621	$250	$155	$84	$11				
	Standard error	212	77	105	129	79	63	36	10				
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.01	0.22				
	Net effect	$7,040	$1,425	$146	-$453	-$881	-$635	-$333	-$35				
	Standard error	301	190	302	340	324	257	201	135				
	P-value	<0.0001	<0.0001	0.65	0.21	<0.0001	0.02	0.09	0.79				
	Total effect	$9,750	$1,875	$704	$169	-$631	-$480	-$250	-$24				
	Standard error	301	182	307	356	332	267	197	135				
	P-value	<0.0001	<0.0001	0.02	0.66	0.05	0.08	0.20	0.86				
	Sample size	1,112	1,112	1,112	1,112	1,112	1,112	1,112	1,112				
		1	2	3	4	5	6	7	8	9	10	11	12
2007	Mediation effect	$2,200	$2,932	$1,608	$485	$195	$61	$4					
	Standard error	227	305	243	115	77	30	18					
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.82					
	Net effect	$8,300	$4,152	$1,213	-$1,340	-$1,870	-$563	-$284					
	Standard error	383	478	512	387	296	214	189					
	P-value	<0.0001	<0.0001	0.01	<0.0001	<0.0001	<0.0001	0.14					
	Total effect	$10,500	$7,084	$2,820	-$855	-$1,680	-$502	-$281					
	Standard error	375	495	529	389	309	207	190					
	P-value	<0.0001	<0.0001	<0.0001	0.03	<0.0001	0.02	0.14					
	Sample size	946	946	946	946	946	946	946					

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2008	Mediation effect	$3,506	$4,280	$1,218	$183	$28	$12						
	Standard error	247	352	152	51	18	10						
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.08	0.14						
	Net effect	$4,328	$6,160	$2,537	-$477	-$425	-$72						
	Standard error	296	411	313	222	153	133						
	P-value	<0.0001	<0.0001	<0.0001	0.03	0.01	0.60						
	Total effect	$7,834	$10,400	$3,754	-$294	-$397	-$60						
	Standard error	336	482	345	221	153	134						
	P-value	<0.0001	<0.0001	<0.0001	0.18	0.01	0.69						
	Sample size	1,672	1,672	1,672	1,672	1,672	1,672						
		1	2	3	4	5	6	7	8	9	10	11	12
2009	Mediation effect	$2,983	$4,262	$771	$104	$23							
	Standard error	151	199	75	20	8							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001							
	Net effect	$3,635	$5,626	$3,171	-$336	-$136							
	Standard error	193	238	162	105	83							
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.12							
	Total effect	$6,618	$9,888	$3,942	-$231	-$113							
	Standard error	227	308	174	104	84							
	P-value	<0.0001	<0.0001	<0.0001	0.02	0.18							
	Sample size	3,858	3,858	3,858	3,858	3,858							
		1	2	3	4	5	6	7	8	9	10	11	12
2010	Mediation effect	$2,798	$2,810	$345	$6								
	Standard error	153	168	46	6								
	P-value	<0.0001	<0.0001	<0.0001	0.3								
	Net effect	$3,804	$5,978	$1,296	-$230								
	Standard error	209	254	147	91								
	P-value	<0.0001	<0.0001	<0.0001	0.02								
	Total effect	$6,602	$8,789	$1,641	-$224								
	Standard error	236	285	154	92								
	P-value	<0.0001	<0.0001	<0.0001	0.02								
	Sample size	3,046	3,046	3,046	3,046								

Cohort	Statistic	Follow-on year											
		1	2	3	4	5	6	7	8	9	10	11	12
2011	Mediation effect	$3,094	$2,609	$81									
	Standard error	163	176	19									
	P-value	<0.0001	<0.0001	<0.0001									
	Net effect	$3,736	$5,539	$446									
	Standard error	199	229	118									
	P-value	<0.0001	<0.0001	<0.0001									
	Total effect	$6,830	$8,149	$527									
	Standard error	238	264	117									
	P-value	<0.0001	<0.0001	<0.0001									
	Sample size	2,478	2,478	2,478									
		1	2	3	4	5	6	7	8	9	10	11	12
2012	Mediation effect	$2,974	$1,360										
	Standard error	166	122										
	P-value	<0.0001	<0.0001										
	Net effect	$4,203	$5,488										
	Standard error	231	242										
	P-value	<0.0001	<0.0001										
	Total effect	$7,177	$6,848										
	Standard error	248	253										
	P-value	<0.0001	<0.0001										
	Sample size	2,092	2,092										

Appendix 5

Appendix figure A5-1. Washington state community and technical college expenditure and enrollment data
Washington state, 2001 through 2013
Source: Washington State Board of Community and Technical Colleges

Academic year (AY)	Instruction	Primary support services	Libraries	Student services	Institutional support	Plant operation and maintenance	Total AY expenditures	Students enrolled	AY costs per student	Calendar year (CY)	Unadjusted CY costs per student	Adjusted CY costs per student
2001-2002	$386,183,344	$41,626,341	$22,625,776	$80,696,971	$117,848,038	$73,947,036	$722,905,787	316,895	$2,281			
2002-2003	$399,644,146	$43,262,859	$23,265,648	$86,474,908	$124,551,907	$77,049,348	$754,234,398	327,718	$2,301	2002	$2,291	$2,923
2003-2004	$410,283,960	$45,229,883	$23,742,246	$87,582,949	$127,667,755	$72,326,321	$766,841,084	313,303	$2,448	2003	$2,375	$2,963
2004-2005	$424,007,161	$47,383,736	$24,867,002	$91,489,770	$130,473,371	$78,030,126	$796,251,166	309,600	$2,572	2004	$2,510	$3,050
2005-2006	$445,553,824	$52,348,014	$26,143,254	$97,362,854	$140,155,623	$89,537,935	$851,101,453	316,959	$2,685	2005	$2,629	$3,090
2006-2007	$467,558,035	$55,306,561	$28,172,149	$106,176,098	$144,767,822	$94,490,840	$896,476,657	314,153	$2,854	2006	$2,769	$3,153
2007-2008	$521,001,407	$58,987,310	$28,731,873	$122,281,133	$162,125,917	$101,218,846	$994,314,712	322,975	$3,079	2007	$2,966	$3,284
2008-2009	$532,037,855	$61,348,855	$28,591,093	$126,719,700	$157,825,296	$108,003,375	$1,014,533,870	334,332	$3,035	2008	$3,057	$3,260
2009-2010	$552,554,007	$60,347,911	$28,621,993	$127,989,695	$163,693,101	$115,452,145	$1,048,664,045	338,109	$3,102	2009	$3,068	$3,283
2010-2011	$560,854,575	$63,149,573	$28,150,435	$130,787,919	$158,388,182	$120,888,372	$1,062,220,406	330,608	$3,213	2010	$3,157	$3,324
2011-2012	$545,273,758	$61,672,566	$25,884,867	$129,487,149	$149,717,140	$105,008,664	$1,017,044,176	305,709	$3,327	2011	$3,270	$3,337
2012-2013	$526,598,011	$76,738,564	$25,521,415	$131,003,792	$157,263,459	$106,207,672	$1,023,332,912	292,119	$3,503	2012	$3,415	$3,415
Annual averages											$2,864	$3,189

Academic year expenditure data exclude "sponsored research and programs" data. Student enrollment data are the unduplicated head count of all students who were enrolled at any time during an academic year, including summer sessions. Because academic years overlap with calendar years, we compute the calendar year costs per student as a two-year moving average. For example, the costs per student for calendar year 2002 is the average cost per student for academic years 2001 to 2002 and 2002 to 2003. We then inflation-adjust the calendar year headcount cost estimates using the 2012 CPI-W. The inflation-adjusted annual average of $3,189 is the estimate we use in our social and private cost-benefit projections.

Appendix figure A5-2. ESD administrative costs for the TB Program*
Washington state, 2002 through 2013
Source: Washington State Board of Community and Technical Colleges

State fiscal year (SFY)	SFY TB Program costs	Calendar year (CY)	CY TB Program costs	Number of TB Program participants	Unadjusted cost per participant	Inflation-adjusted cost per participant
SFY 2002	$1,425,241					
SFY 2003	$1,460,551	2002	$1,442,896	2,443	$591	$754
SFY 2004	$1,765,386	2003	$1,612,968	1,639	$984	$1,228
SFY 2005	$1,549,871	2004	$1,657,628	915	$1,812	$2,202
SFY 2006	$1,526,557	2005	$1,538,214	1,125	$1,367	$1,607
SFY 2007	$1,680,693	2006	$1,603,625	1,092	$1,469	$1,672
SFY 2008	$1,141,510	2007	$1,411,101	887	$1,591	$1,762
SFY 2009	$1,495,738	2008	$1,318,624	1,695	$778	$830
SFY 2010	$2,460,519	2009	$1,978,128	4,065	$487	$521
SFY 2011	$2,763,768	2010	$2,612,143	2,955	$884	$931
SFY 2012	$1,875,420	2011	$2,319,594	2,415	$960	$980
SFY 2013	$1,246,041	2012	$1,560,730	2,195	$711	$711
Annual averages					$1,058	$1,200

*Because fiscal years overlap with calendar years, we compute the calendar year costs as a two-year moving average. For example, the calendar year costs for 2002 is the average costs per student for state fiscal years 2002 and 2003. We then inflation-adjust the calendar year headcount cost estimates using the 2012 CPI-W. The inflation-adjusted annual average of $1,200 is the estimate we use in our social and government or non-participant taxpayer cost-benefit projections.