



National Institute of
Environmental Health Sciences
Worker Training Program

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The Economic Impact of the Environmental Career Worker Training Program

NOVEMBER 2015

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Preface

The Environmental Career Worker Training Program (ECWTP), known as the Minority Worker Training Program (MWTP) until 2014, strives to empower underrepresented minorities with training to increase their employment opportunities and promote engagement in improvement efforts, often in their own communities. The program provides general training in basic construction skills; hazardous waste, asbestos, and lead abatement; and safety and health training. Federal grants are awarded to universities, labor, and community organizations to conduct the program. Its main goal is to increase the number of underserved populations who seek entry into construction and environmental remediation industries.

The ECWTP specializes in recruiting young, low-skilled people who are eligible for the labor force. African Americans have been the primary group served, followed by Hispanic/Latino participants at a distant second. As one of the most successful components of the National Institute of Environmental Health Sciences, Worker Training Program, the ECWTP provided instruction and job skills for 9,605 people from 1995 through 2013 with an overall job placement rate of 70%.¹

Trainees typically enter the ECWTP with low levels of education and job experience. Many trainees have troubled backgrounds (including time served in prison), little experience with work, and they may lack a basic understanding of how to go about finding a job. For these reasons, the program also aims to

impart literacy and life skills to its participants. The ECWTP provides the first marketable skill set for many program graduates.

With a history in more than 30 communities in 20 states nationwide, the ECWTP provides a successful model for other federally-funded worker training programs. By increasing opportunities for people from underserved and disadvantaged communities, the program advances environmental justice. It enables people to help address the needs of their communities in a meaningful way. For more information about the program and its program accomplishments and successes, go to [Minority Worker Training Program Guidance on How to Achieve Success and Best Practices](#).

The September 20, 1994, U.S. House of Representatives, Conference Report 103-311, authorizes \$3,000,000 for the Minority Worker Training Program (now the Environmental Career Worker Training Program) and describes how the funds should be used and administered.

¹ This number includes 3,365 individuals trained under the Brownfields Minority Worker Training Program between 1998 and 2008. It does not include training using supplemental funding.

Conference Report 103-311

U.S. House of Representatives
Subcommittee of Appropriations for HUD,
VA, and Independent Agencies (pp. 61-62):
Superfund Minority Worker Training Program

September 20, 1994

\$3,000,000 added for a minority worker training program. The Committee recognizes that, as the demand for cleaning up the environment continues-- in order to prevent disease, dysfunction and premature death and to protect the country's natural resources--there is a parallel demand for workers to perform the multiple tasks necessary to achieve environmental improvements. Assuring an adequate workforce to perform these tasks will require an aggressive and coordinated program of recruitment, training, and service delivery. The nature of these jobs — including an understanding of the behavior of certain environmental pollutants and of remediation technology—is such that they require substantial level of training.

The Committee realizes that while efforts are underway to address these needs, there is growing consensus that these efforts are not adequate to meet current and projected needs for environmental workers. The scope of this need includes technicians, as well as doctoral-level physical and biological scientists. At the same time, the Committee is aware that there is a large population of males, ages 18-25, in urban communities impacted by environmental pollutants who are unemployed because they lack the skills and knowledge required for many of the available career opportunities. The Committee urges the agency to establish a series of national pilot programs to test a range of strategies for the recruitment and training of young persons, who live near hazardous waste sites or in the community at risk of exposure to contaminated properties, for work in the environmental field. These environmental career-oriented projects should be developed within the context of other social and health needs of the community. The program should provide pre-employment job training, including literacy, life skills, environmental preparation and other related courses construction skills training; environmental worker training including hazardous waste, asbestos and lead abatement training; and safety and health training. Training may also include enrollment in apprenticeship programs for construction and environmental remediation worker training. Training may also include a program of mentoring. The Committee intends that these projects should enhance the participants problem solving skills, their understanding of self-esteem and team work in the application of technical knowledge to environmental and related problems, in this regard, the program should allow for partnerships or subagreements with academic and other institutions, with a particular focus on historically black colleges and universities, and public schools located in or nearby the impacted area to provide pre-math, science or other related education to program participants prior to or concurrent with entry into the training program.

The Committee urges EPA to evaluate the effectiveness of these pilot programs to determine the course of future funding priorities. This evaluation should give consideration to retention of participants in the training program, and longevity of post-training employment. None of the funds provided in this appropriation may go for supporting the post- training employment under this program. This program should be administered by NIEHS.

Executive Summary

The following report, presents the results of an analysis to quantify and document a range of economic benefits from the Environmental Career Worker Training Program (ECWTP). It responds to increased public interest in allocating resources to public health programs that demonstrate the greatest benefits to society, and it validates past resources expenditures. Data sources included grantee reports on number of people trained and related demographics, pre- and post-program employment status, employment rates, salary levels, and health status information. Narrative accounts that illustrate intangible benefits to program participants or their communities were also obtained.

This study was initiated at the direction of National Institute of Environmental Health Sciences (NIEHS) Worker Training Program (WTP) to assess the economic impact of the ECWTP. This study was conducted by labor economists Bryan Engelhardt, Ph.D. and Robert Baumann, Ph.D. from College of the Holy Cross. The ECWTP grantees provided data on their programs, the training, job placement, and other relevant information. Given the nature of the task to assess the economic impact of an ongoing federal grant program, the economists analyzed both grantee data and relevant national data bases to assess the economic impact of the program. The analytic approach was to use the most appropriate conservative assumptions in conducting this study.

The ECWTP, known as the Minority Worker Training Program (MWTP) until 2014, has provided instruction and job skills for roughly 9,600 underserved individuals since 1995. The goal of the program is “to increase the number of disadvantaged

and underrepresented workers in areas such as environmental restoration, construction, hazardous materials/waste handling, and emergency response”² by delivering comprehensive training. The ECWTP provides training in basic construction skills as well as hazardous waste, asbestos, and lead abatement, and safety and health training. Additionally, trainees receive job readiness training, life skills instruction, counseling, and courses on obtaining a General Equivalency Diploma (GED).

Major findings include:

- The ECWTP effectively reaches underserved populations, some of whom have low levels of education. Many ECWTP trainees enter the program with little or no job experience or training, and in some cases legal issues and difficult home situations. For many graduates, the ECWTP provides them with their first marketable job skill, and we estimate the ECWTP increases the probability of employment by approximately 59 percent.
- The cumulative total value added of the ECWTP is estimated to be \$1.79 billion from 1995 through 2013, or roughly \$100 million annually.
- The cumulative reduction of government expenditures as a result of the ECWTP is estimated to be \$717 million from 1995 through 2013, or roughly \$40 million annually.
- The ECWTP grantees also received significant support from local firms, non-profit organizations, and individuals of \$2.29 million in 2013 (e.g. transportation, child care, life skills training, etc.).
- ECWTP graduates receive higher earnings than dropouts. This can happen through three channels: a higher likelihood of employment, more hours

² National Institute of Environmental Health Sciences, Minority Worker Training Program. Available: http://www.niehs.nih.gov/careers/hazmat/about_wetp/ecwtp/index.cfm [accessed 26 June 2015].)

- worked, and greater hourly wages.
- ECWTP safety and health training decreases the number of injuries, which can have large costs. These include the direct cost of medical care as well as the indirect costs of lost wages and personal suffering.
 - Higher employment rates decrease hiring costs incurred by the firm. The costs of recruitment, interviewing, and selecting job candidates can be substantial. Grantee reports have shown that ECWTP graduates are more qualified and likely to hold on to a job after training, so employers will spend less money on hiring.
 - The increased earnings, employment, and other benefits participants receive reduce criminal participation and its related costs. The economists quantify reductions in victimization and prison costs.
 - Higher earnings and employment rates increase government revenues and reduce government payments in the form of higher taxes and fewer social assistance costs, respectively. As ECWTP graduates earn more, they pay more in taxes and there will be fewer payments on public programs including unemployment insurance, refundable tax credits, and the Supplemental Nutrition Assistance Program.
 - Neither environmental benefits nor redevelopment benefits could be quantified at this time.
 - In addition to the monetary benefits, there are substantial non-monetary benefits to ECWTP's participants. Many student interviews done after completing the program discuss the ECWTP's transformative effect on their lives. A common theme in these stories is an increased attachment to the labor force after training, and an increase in self-worth from having regular employment.

The students have employment, which allows them to be independent and support their families. They have more confidence and are able to achieve their long-term goals. This improves their relationship with their family and builds self-esteem. The community benefits since the students become productive members in society. The environmental work that is being done in the community creates a healthy environment. For many students this is the first time they have graduated from a school. The students are thus more well-rounded and earn the respect of family, friends and the community. (Program Coordinator, East Palo Alto, from CPWR 2011-2012 Evaluation report Evaluating the Programmatic Effectiveness of the Center for Construction Research and Training Minority Worker Training Program)

ECWTP Benefits Summary 1995 - 2013³

Effects on earnings (present value)	\$1,593 million
Safety and related cost savings	\$153 million
Hiring cost savings	\$16.8 million
Crime cost savings*	\$22.1 million
Effects on taxes and transfers	\$717 million
Environment-related benefits	Indeterminate
Matching funds and community involvement (2013 only)	\$2.3 million

* *Crime costs savings could have alternatively been included in the taxes and transfers calculation.*

³ All figures are in January 2014 dollars using the Consumer Price Index for All Urban Consumers (CPI-U). Other than matching funds and community involvement, all figures are in present value terms.

Introduction

This report presents the results of an analysis whose purpose was to quantify and document a range of economic benefits from the ECWTP. It responds to increased public interest in allocating resources to public health programs that demonstrate the greatest benefits to society, and it validates past resource expenditures. Data sources included grantee reports on number of people trained and related demographics, pre- and post-program employment status, employment rates, salary levels, and health status information. Narrative accounts that illustrate intangible benefits to program participants or their communities are also presented. Definitions of economic and statistical terms can be found in Appendix B.

Program Background

Since 1995, the ECWTP, known as the Minority Worker Training Program (MWTP) until 2014, has provided instruction and job skills for roughly 9,600 individuals.⁴ There are several goals of the program, but the ECWTP description notes the focus on increasing “the number of disadvantaged and underrepresented minority workers in areas such as environmental restoration, construction, hazardous materials/waste handling, and emergency response.”⁵ The ECWTP specializes in recruiting young, low-skilled members of the labor force. In general, the ECWTP provides training in basic construction skills; hazardous waste, asbestos, and

lead abatement; and safety and health training. Typically, trainees enter the ECWTP with low levels of education and job experience. Many trainees have troubled backgrounds and in some cases lack a basic understanding of how to go about finding a job. For this reason, the ECWTP also provides pre-employment job training, including literacy and life skills to its trainees.

Methodology

The authors began with the data that ECWTP grantees are required to collect under their cooperative agreement with the WTP. This includes the following data that grantees enter into the WTP data management system annually: dates of the program; course name/s; participant’s race, age, gender, whether the student completed the program, participant’s level of education, whether the participant had been under or unemployed prior to starting the program, participant’s employment status at the end of the program; if the participant is employed, whether the job is at a Superfund site; and the type of work the participant was hired to do if employed. Grantees also submit an annual progress report which provides narrative on the program’s accomplishments, as well as evaluations reports and success stories. In addition, some grantees collect additional data on the program participants. Where those databases existed, they were shared with the authors after removing any personal identifiers.

We held a webinar so that economists and grantees could interact and ask questions of each other and understand the study process and the data available. After spending time reviewing the data, the economists were interested in data on specific issues such as injury and illness and more quantitative data

4 This includes 3,365 individuals trained under the Brownfields Minority Worker Training Program between 1998 and 2008. It does not include training using supplemental funding.

5 National Institute of Environmental Health Sciences, Minority Worker Training Program. Available: http://www.niehs.nih.gov/careers/hazmat/about_wetp/ecwtp/index.cfm [accessed 26 June 2015].

on leveraging program funds then had been provided in the progress reports or databases. A conference call was held with grantees to explore whether this data existed. When it was determined that it did not currently exist, a short seven-question survey was designed for grantees to use with their current training classes. Another document was designed to collect more specific data on how grantees have been able to leverage the NIEHS funding.

Once the final draft of the report was prepared, the report was peer reviewed. Authors addressed the reviewers' comments and then the report went through an internal NIEHS review. Again, comments were addressed and this report presents the findings of the economic impact study.

In each section, we tried to use data from the ECTWP trainees. Empirical data and anecdotal information for this report rely on the information provided by grantees. Unfortunately, the information in the annual progress reports does not encompass every source of benefit of the ECTWP. In these cases, we used other data sets with samples similar to the ECTWP trainees. These situations are described in each section.

Summary of Study Results

The economist team on this study analyzed and quantified a range of ECWTP benefits.

1. **Effect on earnings.** ECWTP graduates receive higher earnings than dropouts. This can happen through one of three channels: a higher likelihood of employment, more hours worked, and greater hourly wages.
2. **Safety and related cost savings.** Safety and health training decreases the number of injuries, which can have large costs. These include the direct cost of medical care as well as the indirect costs of lost wages and personal suffering.
3. **Hiring cost savings.** Higher employment rates

decrease hiring costs incurred by the firm. The costs of recruitment, interviewing, and selecting job candidates can be substantial. Grantee reports have shown that ECWTP graduates are more qualified and likely to hold on to a job after training, so employers will spend less money on hiring.

4. **Crime cost savings.** The increased earnings, employment, and other benefits participants receive reduce criminal participation and its related costs. The economists quantify reductions in victimization and incarceration costs.
5. **Effects on taxes and transfers.** Higher earnings and employment rates increases government revenues and reduces government expenditures in the form of higher taxes and fewer social assistance costs, respectively. In other words, as ECWTP graduates earn more, they pay more in taxes and there will be fewer expenditures on public programs including unemployment insurance, refundable tax credits, and the Supplemental Nutrition Assistance Program.
6. **Environment-related benefits.** The community may benefit from an improved environment as many ECWTP graduates begin employment in the environmental remediation industry near their home. However, the authors were unable to quantify this benefit and call for further research in this area.
7. **Matching funds and community involvement.** The ECWTP has motivated many local organizations to provide funds and services toward its cause. Without the ECWTP, these contributions would not exist.

The following analysis is divided into a section for each of the seven benefit streams.

Table 1 below summarizes findings for each category.

Table 1: ECWTP Benefits Summary 1995 - 2013⁶

Effect on earnings (present value)	\$1,593 million
Safety and related cost savings	\$153 million
Hiring cost savings	\$16.8 million
Crime cost savings*	\$22.1 million
Effects on taxes and transfers	\$717 million
Environment-related benefits	Indeterminate
Matching funds and community involvement (2013 only)	\$2.3 million

* *Crime costs savings could have alternatively been included in the taxes and transfers calculation.*

The value added that can be measured sums the effect on earnings, safety and related costs, hiring costs, and crime cost savings. The total value added in present value terms and 2014 dollars is estimated at approximately \$1.79 billion for all monetary benefits derived from the ECWTP to date (1995 through the 2013 training year). The \$717 million under the “Effects on taxes and transfers” category was not included in the total because it is an additional cost savings to the federal government rather than a benefit. The “Matching funds and community involvement” figure is annual, rather than cumulative; therefore it is not included in the total monetary benefits estimate.

In addition to these large monetary effects, we also

⁶ All figures are in January 2014 dollars using the Consumer Price Index for All Urban Consumers (CPI-U). Other than matching funds and community involvement, all figures are in present value terms.

find evidence of non-monetary benefits to ECWTP graduates. Awardees typically provide a few student success stories in each of their annual progress reports and many of these accounts highlight the transformative effect the ECWTP has on its participants. This is in part due to the program’s outreach to minorities with very little education and work experience. Several student success stories highlight their improved self-worth from finding regular employment and earning better wages. While these benefits cannot be converted to dollars, they are clearly a critical benefit of the program. The vignettes in side bars throughout the report, demonstrate additional benefits that cannot be monetized.

Charlie⁷ is a graduate of the 2011-12 MWTP. When he entered the program, Charlie was unemployed and living in a homeless shelter. While in training he was a very enthusiastic student who was always on time for class even though he got up at 5:00 a.m. to ride a borrowed bicycle to school. After graduating Charlie was unable to join the carpenters union and apprenticeship because he could not afford to pay the dues. He did not let this get him down. He worked odd jobs and did trade show carpentry at the New Orleans Convention Center at the \$10.68/hr. pre-apprenticeship rate. In March 2013 he finally had his money together. He joined the union, receiving credit for pre-apprenticeship training, and is now working as a second-year apprentice earning over \$14/hr. Charlie no longer lives in the homeless shelter but volunteers his time to help those who still do. (New Orleans Success Story, CPWR-The Center for Construction Research and Training 2013 Progress Report)

⁷ Names have been changed to maintain student confidentiality.

Tom, a single father of four took his experience gained through the training program and made life changing improvements. With all of the guidance provided by the program, Tom is in the process of buying a home, purchased a new vehicle and in the process of getting full custody of his children. His prior work experience was minimal and he has made a complete 360 degree turn around. Tom stated he was grateful for being in the program and that it was a life changing experience. (St. Paul Success Story, CPWR-The Center for Construction Research and Training 2013 Progress Report)

Study Findings

1. Effects on Earnings

The ECWTP's impact on wages is derived from three components: higher employment rates, more hours worked, and higher wages. All of these components are driven by improved human capital, i.e., job skills of each ECWTP participant. For example, an ECWTP participant is more likely to find work because the program provides its students with marketable skills that make them more attractive to employers. The same increase in skills can also lead to more hours worked, assuming employers find ECWTP participants more useful. Finally, an ECWTP graduate can use his/her improved skill set to bargain for higher wages.⁸

While we measure the immediate impacts of the program, the benefits are expected to last long after training is completed since graduates are more likely to remain employed. Previous employment and earnings are known to be highly correlated with current employment and earnings. As a result, improving access to employment and increasing earnings today means the participants are far more likely to be employed and making higher earnings long after the training is complete. These long-run

⁸ To be more precise about the model we are using to calculate the earnings effect, we are assuming segmented markets with perfectly elastic demand in each market. Our assumptions are based upon the Nobel prizing winning work of Pissarides (2000) among many others. First, the jobs being created do not push other workers out due to what can be referred to as a "constant returns to scale" production function and free entry of firms, which is assumed to result in zero profits. Second, the initial match is created via the program and the program is attributed the benefit. Third, the value added is relative to the job the participants would have had. Therefore, the opportunity cost of employment at the new job is incorporated by subtracting the earnings of the counterfactual wage as described below. Fourth, we incorporate the employment and unemployment transitions via a constant matching and separation rate. Finally, note the dollar valued can be considered in utility assuming a risk neutral individual.

benefits are included in our analysis.⁹

The short and long term benefits of the ECWTP are particularly important for the population that the program serves. The number of trainees who have earned no more than a high school diploma and their unemployment and underemployment rates prior to training are unusually high (refer to Table 2). Furthermore, some trainees have criminal records and battled drug addiction and homelessness. The ECWTP provides its graduates with important marketable skills that improve their circumstances on many levels including the likelihood of being employed with higher earnings.

While we measure the program's effects on hours worked, wages, and initial employment, the benefits are not limited to these measurable monetary gains. This is apparent in several student success stories of ECWTP graduates. For example, the 2013 OAI, Inc. progress report describes the impact of the ECWTP on three graduates. In each case, the ECWTP training provided skills its graduates used to find a new or better job. These skills will benefit them during future job searches and provide them confidence and motivation in other endeavors. Student success stories in the 2013 Dillard progress report detail how the ECWTP gave its graduates a far stronger labor force attachment with their current job or intensity of their search while unemployed. While we can observe low levels of human capital in the data, these personal stories illustrate deeper difficulties that led to weak labor force attachment prior to ECWTP training. The causes of weak labor force attachment are varied. Common themes are legal issues and

⁹ Detailed data and computations can be found in Appendix A. Definitions of economic and statistical terms can be found in Appendix B.

difficult home situations. In some cases graduates reported not knowing how to obtain a job, due to not knowing where to look, how to write a résumé, or proper interview etiquette, prior to participating in the program.

To summarize, the lessons from these student success stories are twofold. First, the problem is bigger than low levels of human capital - ECWTP graduates have a weak attachment to the labor force prior to training. By acclimating its graduates to the culture of the workforce, the program has the potential to produce long-lasting positive effects on both employment and earnings. Second, there are substantial non-monetary benefits to ECWTP graduates. Most student success stories illustrate the transformative effect of the ECWTP to its graduates, who now have a far greater sense of self-worth due to regular employment. While we cannot measure these benefits in dollars, the testimonies in the student success stories indicate they are equally important benefits.

Juan came into the Pre-Apprenticeship Construction Training (PACT) program shortly after being released from prison. He was a native of California, but had been incarcerated in Washington State. He had decided that he had a better chance of making a new life for himself in Washington away from the old influences in California. He heard about the PACT program and came to check it out. Like many people who have been incarcerated for many years, Juan was a bit skeptical about the program and his own opportunities. However, he was introduced to a PACT instructor and journeyman carpenter. Both being of Mexican descent, they comfortably communicated in Spanish. As they talked, Juan learned that many PACT students were ex-offenders and had built successful careers in the construction industry. Through this conversation, he developed greater confidence in the program. In the spring of 2012, Juan qualified for class. While in the program, he and his class visited many apprenticeship programs. Juan became interested in the carpenters, ironworkers, and laborers, and, applied to all three apprenticeship programs. [Shortly after graduating he began working with a starting wage of just over \$24.00 per hour. A few months after graduating he qualified for the Ironworkers apprenticeship program earning more than \$30/hour.] Seven months later, he continues to enjoy steady work. Juan is also now building a life by surrounding himself with positive people and pursuing long-time hobbies such as leather-working. (Seattle Success Story, Western Region Universities Consortium 2013 Progress Report)

1a. Employment Effects

In order to estimate the effect on employment due to ECWTP, we use data from 3,880 individuals who began the program sometime between 2003 and 2013. Crucial to this analysis are those who began the ECWTP but did not complete it, which constitutes about 7.8 percent of the data. This population serves as our control group and allows us to identify the immediate employment benefits of the ECWTP.

The data also include information on race/ethnicity, gender, age, education level, and whether the trainee was unemployed prior to the ECWTP.

Table 2 provides summary statistics of the entire sample, those who completed ECWTP, and those that did not. Please note that limited data was available for those who did not complete the program.

Table 2: Employment Data Summary Statistics

	All data (n = 3,880)	Completed ECWTP (n = 3,576)	Did not complete ECWTP (n = 304)
EMPLOYMENT			
Employed after ECWTP*	72.0	76.6	18.8
Unemployed prior to ECWTP*	81.7	81.5	84.5
EDUCATION			
High school diploma*	57.1	57.7	49.3
GED*	26.2	25.6	32.9
Neither*	16.7	16.7	17.8
DEMOGRAPHICS			
Female*	12.5	12.8	9.2
Hispanic*	12.9	13.0	11.2
Black*	79.6	79.4	82.9
Average age in years (std. dev.)	27.1 (8.95)	29.2 (9.76)	27.3 (8.35)

* Data expressed as percent of the total population.

There are two important conclusions of the summary statistics. First, those that begin the ECWTP training have low levels of education (57.1 percent have a high school diploma) and high levels of unemployment (81.7 percent unemployed) prior to training. Over the same time frame, the average unemployment rate in the United States was about 6.7 percent and over 86 percent of Americans over age 25 completed four years of high school. Alternatively, the average unemployment rate for African Americans in the United States is 12 percent and about 83 percent over age 25 completed four years of high school.¹⁰ The latter comparison may be more appropriate since about 80 percent of the sample is African American. This confirms that ECWTP trainees have below average levels of human capital and are far more likely to be unemployed compared to the average American in the workforce.

The second feature is the vast difference in employment rates between those that completed and those that did not complete the ECWTP training. After the ECWTP training, the employment rate was 57.8 percentage points higher for those that completed the program compared to those that did not. This suggests that the employment benefits only accrue to trainees who finish, and not those who only start the program. Employers may potentially consider incomplete training as a signal that the worker is not reliable, or the applicant may not disclose the incomplete training in which case the ECWTP training should have no effect on the hiring decision. In either case, the employment rates after training illustrate the importance of completing the program for all those who begin.

¹⁰ Unemployment statistics from U.S. Bureau of Labor Statistics, and educational attainment statistics from the U.S. Census Bureau.

It is difficult to compare the racial/ethnic composition of those who began ECWTP training to the American population because the ECWTP trainee data only includes one racial/ethnic distinction, although “other” is an option. This is especially problematic for those who consider themselves black and Hispanic. Nevertheless, it is clear that these categories are much larger than those that identify themselves as American Indian, Asian, Pacific Islander, as other. For brevity, we omit these percentages in the table above.

One concern with interpreting the summary statistics is non-random sampling. In other words, are those who did not complete the training fundamentally different than those who completed the program? If so, the above estimation of the employment effect would include the impacts of the ECWTP training and also the fundamental differences between the samples. In other words, the estimate would not isolate the impact of the ECWTP training. Ideally, selection to the control group (in this case, completing ECWTP training) would be randomly assigned like an experiment, which provides the best chances for isolating the impact of the ECWTP. But in reality completing the program is non-random, i.e., those with greater drive, focus, and ability are more likely to finish.

Fortunately the data include several characteristics of each trainee, which allows us to control for some of the fundamental differences between the samples. For example, using education level and unemployment status prior to starting ECWTP training removes some human capital and employment history effects from the estimate of the ECWTP’s effect on employment. We also include controls for gender and whether the trainee is black or Hispanic, which is a common practice in an estimation that seeks to explain employment rates. There are also

controls for each grantee and year of the sample to account for differences in employment rates across training sites or time, respectively. With these controls in place, we can better isolate the impact of our main variable of interest: completing the ECWTP.

To control for these differences, the basic approach would be to use an ordinary least squares regression. However, our outcome variable, employment after the ECWTP training, is either zero or one. Therefore we use a probit model to control for the participants’ differences. Probit models are designed for zero or one outcome variables where the standard regression approach would produce (heteroskedastic¹¹) errors and predict values outside of zero and one.

The Employment Probit Table in Appendix A presents the probit¹² estimates. Note that perfect collinearity requires that we cannot include every category. For example, we only include female, whose estimate is the marginal effect compared to a male counterpart. Similarly, general equivalency diploma (GED) and high school graduate marginal effects are compared with those who have neither. Finally, Hispanic and black marginal effects are compared with those who belong to neither classification. Even though not all categories are included as variables, note that all categories are accounted for either as a variable or a comparison group.

We estimate that completing the ECWTP training increases the probability of employment by about 59 percentage points. This impact is similar to the difference in employment rates seen in Table 2, suggesting that non-random sampling is not

11 Heteroskedasticity (meaning multiple error variances) is a well-known problem with estimates of zero/one outcome models. Using a probit solves this issue and produces a homoscedastic (one variance) error term. Without this correction, the standard errors (which impact the p-value calculations) on any estimate could be incorrect.

12 A unit of probability based on deviation from the mean of a standard distribution.

a concern.¹³ The p -values show this estimate is statistically significant, which is a test of whether the true effect of completing ECWTP training is different than zero. This means the estimation rejects the possibility of zero impact from completing ECWTP training with very high certainty. For the average person in our sample, this enormous effect changes the probability of unemployment from 81.5 percent prior to training to 22.5 percent¹⁴ after training for those who complete the program. It is important to note this large increase in the probability of employment remains after accounting for each participant's prior unemployment status, education level, gender, race/ethnicity, and age.

1b. Hours Worked Effects

Hours worked effects in the aftermath of ECWTP training can come from one of two sources depending on the employment status of the incoming trainee. Those who are already employed can use their completed ECWTP training to ask for more hours or take a new job that provides them with more employment. Those who are unemployed can use their completed ECWTP training to find employment, in which case any hours worked is a net benefit as no hours are worked while unemployed.

Compared to employment effects, hours worked effects are harder to isolate. One problem is the unemployment rate prior to training is very high (over 80 percent in Table 2), which means very few

trainees have any hours worked prior to training. In addition, only two grantees —CPWR —The Center for Construction Research and Training (CPWR) and Western Region Universities Consortium (WRUC) – collected data on hours worked after training. These data are comprised of 78 observations in 2013, and the average hours worked after training is 40.01 per week.

Ideally, we would compare hours worked before and after training to estimate the ECWTP's impact on hours worked. Since we only had information on hours worked after training, we estimated hours worked before training using a national sample from 2005 and 2006 Current Population Surveys (CPS). To do this, we constructed a model where hours worked is a function of age, age squared, education level, gender, prior work history, and race as controls. A least squares regression provides the sensitivity of each control on hours worked for the national sample. Next, we substituted the ECWTP averages of each control from Table 2 into the regression. This produces an estimate for hours worked for someone with the same average characteristics as ECWTP graduates but without the training.

Using this process, we estimated an individual with the same characteristics as an ECWTP graduate worked 37.22 hours per week relative to the 40.01 hour average. Therefore, ECWTP training increases hours worked by 2.79 hours per week, or a 7.5 percent. Due to the limited number of observations, we also provide the employment effects with no difference in hours worked.

1c. Wage Effects

Similar to hours worked, ECWTP benefits on wages can be dissected in two categories: the increase in wages for those already employed and the presence of wages for those who transition from unemployment to employment as a result of training.

13 The authors acknowledge the absence of a randomized controlled trial but believe that the variables that are available to compare the two populations (education, race, gender, previous employment rate) are adequate to support that the two populations were comparable prior to ECWTP training. The application of the probit model also allows for an empirical test of the co-linearity of these variables. The only significant difference between the two populations is the post training employment rates, therefore non-random sampling is not a concern. The low p -value ($p < 0.001$) also demonstrates that this finding is statistically significant.

14 This is the unemployment rate before training (81.5%) from Table 2 minus the marginal effect of training on employment (59%) from Table 3.

Because we lack sufficient pre-ECWTP wage data from the sample of graduates, we estimate wage impacts from the ECWTP using a similar process used in the hours worked case. Wages after training are from follow up interviews with ECWTP graduates for training that occurred between 2001 and 2014. Based on these 1,580 data points, ECWTP graduates earned \$13.25 per hour in their first job after training.¹⁵ When including benefits, which account for roughly 30 percent of employee compensation,¹⁶ the average hourly compensation for an ECWTP graduate is taken to be \$18.93 per hour.

Wage benefits of the ECWTP require earnings data for a control group of workers who did not receive training. We again turn to the 2005 and 2006 CPS to produce the estimate. The first step is to estimate hourly pay using a log wage regression from the CPS. This regression controls for age, age squared, education level, gender, prior work history, and race/ethnicity, many of which are common controls in an estimation that predicts wages. Once these estimates are produced, we substitute the averages of these controls for ECWTP trainees in order to predict wages for a control group of workers who did not receive ECWTP training. We estimate that an ECWTP participant would earn \$9.91 per hour if the program were not undertaken. Including benefits, this represents \$14.16 in hourly compensation. Therefore, we estimate that the ECWTP training increases hourly compensation from \$14.16 to \$18.93, or by \$4.77.

¹⁵ All monetary amounts are in January 2014 dollars using the CPI-U.

¹⁶ Bureau of Labor Statistics, Employer Costs for Employee Compensation

1d. Cumulative Effect on Earnings

The additional hours, wages, and employment determined in Sections 1a–1c are calculated at the point where the program ends. However, the benefits accrue overtime and depreciate, i.e., decay.

Estimating the benefits of the ECWTP throughout the worker's life requires accounting for (1) human capital depreciation over time and (2) bringing future benefits back to today using a present value calculation. Following the literature, we assume the additional wages and hours worked depreciate using a geometric growth rule. Arrazola and de Hevia (2004) and Weber (2009) estimate a human capital depreciation rate of 1.5 percent per year. As a result, we determine the hourly wage premium in any particular week "t" to be $\$4.77 \cdot (1 - 0.015)^{t/52}$. As time passes, and "t" rises, this premium decreases and eventually goes to zero. Furthermore, the additional hours worked fall over time. Assuming a conservative depreciation rate of 15 percent following the average annual job turnover rate discussed in Appendix A, we estimate the additional hours worked by the average participant to be $2.79 \cdot (1 - 0.15)^{t/52}$ in any particular week "t." Again, as the weeks pass the additional hours worked falls to zero. Combining these two effects, we can see the weekly income of an employed participant in week "t" is $(37.22 + 2.79 \cdot 0.85^{t/52}) \cdot (14.16 + 4.77 \cdot 0.985^{t/52})$, or the number of hours worked times the hourly wage. This is in contrast to a non-participant with the same characteristics who earns $37.22 \cdot 14.16$ on average per week.¹⁷ Discounting the future income to today

¹⁷ In estimating the effects over time, age, experience and other changing factors that affect hours worked and hourly wages have been included for the initial baseline estimates of 37.22 for hours worked and \$14.16 for hourly pay. However, they have been held constant thereafter for simplicity. As non-participants' and participants' baseline wages and hours would be assumed to evolve in the same way, controlling for these effects has only a small effect.

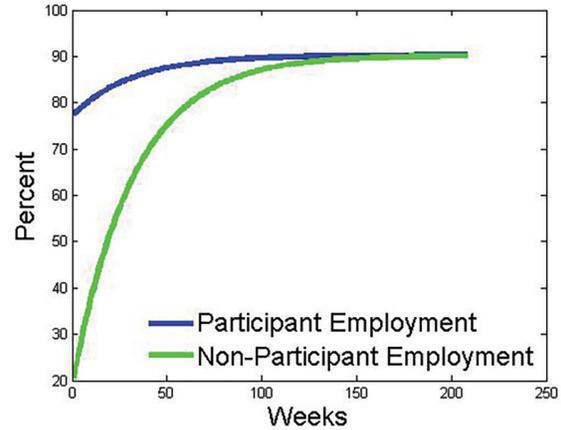
using an interest rate of 3.5 percent,¹⁸ a future weekly payment in period “t” is $37.22 \cdot 14.16 / 1.035^{t/52}$ and $(37.22 + 2.79 \cdot 0.85^{t/52}) \cdot (14.16 + 4.77 \cdot 0.985^{t/52}) / 1.035^{t/52}$ for the non-participants and participants in today’s terms, respectively.

To accurately estimate the increased likelihood of employment over time, we must take a different approach than the geometric one used when estimating the weekly and hourly benefits over time. We estimate the probability a non-participant and participant is employed in any particular week using a two-state Markov process. A detailed discussion is provided in Appendix A. However, we plot the probability of employment for participants and non-participants over time in Figure 1. In the figure, the participants have a 59 percent greater chance of being employed in the first week after graduation relative to the non-participants. However, we make the conservative assumption that the transition probabilities are the same. As a result, the level of employment for each group converges over roughly a 4-year time span. The long-run, or steady state employment rate, is roughly 90 percent for each group given the identical job finding and layoff-discharge rates discussed in Appendix A.

Finally, the weekly wage, employment, and hourly benefits are summed over the average participant’s 40 year career.¹⁹ The combined employment benefit per participant, in present value terms, is estimated to be \$165,965 in 2014 dollars.²⁰ Given roughly 9,600 trainees, we estimate the total employment benefit from

the ECWTP to be $\$165,965 \times 9600 = \1.59 billion, which is in present value terms and in 2014 dollars.^{21,22}

Figure 1: Probability of Employment



2. Effects on Safety and Related Costs

We estimate the ECWTP reduces the direct and indirect costs of injury by \$18,878 per worker in 2014 dollars in present value terms. The estimate combines the reduced likelihood of injury from training on an annual basis, the cost of injury, the depreciation rate of the human capital acquired during the training over a 40 year career, and the value of future savings discounted to today. Research has found training has a statistically significant effect on reducing the likelihood of injury. Specifically, the research show training reduces injury by 3 percentage points per year whether injury is tracked by worker compensation claims or OSHA recordable injuries (Kinn et. al. 2000, Dong et. al.

18 30-year U.S. government securities at constant maturities published by the Federal Reserve System on the “Selected Interest Rates - H.15” is roughly 3.5 percent.

19 The average age from the 3,880 observations used in the employment estimate is 27, and assuming an average retirement age of 67, results in 40 years.

20 The net benefits is the participants income

$$\sum_{t=1}^{52 \cdot 40} (.817 - .0589, .183 + .0589) \left(\frac{1 - \frac{1}{36}}{0.003} \frac{\frac{1}{36}}{1 - 0.003} \right)^t \left(1 \right)^{\frac{(14.16 + 4.77 \cdot 0.985^{t/52})(37.22 + 2.79 \cdot 0.85^{t/52})}{1.035^{t/52}}}$$

minus the non-participants income

$$\sum_{t=1}^{52 \cdot 40} (.817, .183) \left(\frac{1 - \frac{1}{36}}{0.003} \frac{\frac{1}{36}}{1 - 0.003} \right)^t \left(1 \right)^{\frac{(14.16)(37.22)}{1.035^{t/52}}}$$

, which is summed over the 40 years.

21 The estimate is sensitive to the discount and human capital depreciation rate. If one took a 5 percent discount rate and a 15 percent depreciation rate, then the individual and total benefit is estimated at \$58,394 and \$560.5 million, respectively. The Schochet et. al. (2008) results suggests a higher depreciation rate

22 Due to the limited number of observations for hours worked in Section 1b, if the increase in hours is assumed to be zero, then we estimate the employment benefit to be \$153,830 per worker and \$1.4767 billion in total.

2004).²³ Furthermore, the average direct and indirect injury cost is highly variable across occupations, but is relatively high for the construction industry at \$35,266 in 2014 dollars²⁴ per injury on average and \$19,592 for all industry (Waehrer et. al. 2007). As roughly 65 percent of trainees report their job placement to be in construction or a construction related job,²⁵ we take the cost per injury to be the weighted average of \$29,780. Using a 1.5 percent depreciation rate for the human capital (Arrazola and de Hevia 2004, Weber 2009), an average career length of 40 years,²⁶ and a discount rate of 3.5 percent using the 30 year U.S. Treasury bond, we estimate the cumulative cost savings is roughly \$15,942 per worker. Given roughly 9,600 trainees, we estimate the total cost savings as \$15,942 x 9,600 = \$153.0million.

Although the estimated cost savings from injury is obtained out of sample, we note the available data from the ECWTP supports our estimate and suggests

the estimate is conservative. Specifically, surveys from the WRUC show zero out of 47 respondents suffered an OSHA defined injury in the prior three months. Although the small sample restricts the analysis given the rarity of the event, the data suggests the training has a positive impact on work place safety and reduces injury. Furthermore, the safety climate questionnaire provided by CPWR graduates shows a similar impact of the training on an individual's safety behavior such as an individual's willingness to stop work in unsafe conditions. Given the results from Donald and Canter (1993) among others, the climate questionnaire survey results support our estimate that the ECWTP safety training greatly reduces the incidence and related costs from injury.

3. Effects on Hiring Costs

Based on the history of these programs, many local companies hire graduates directly from the program thus avoiding normal recruitment costs. Estimates on hiring costs are relatively variable depending upon the source. Data from the California Establishment Survey, as administered by the UC Berkeley Survey Research Center (Dube, Freeman, and Reich 2010), finds hiring cost savings to be \$2,464 per hire in 2014 dollars.²⁷ These costs include the cost of employee recruitment, selection, screening and separation including reading applications and conducting interviews, and on-the-job training. Bersin & Associates, a human resources advisory firm based in Oakland, CA, estimates the costs for small and midsize firms per recruit is roughly \$3,600. Alternatively, several European studies (Blatter et al. 2009, Muehleemann and Pfeifer 2012) find it costs roughly \$4,400 and \$6,500, respectively, to recruit and hire skilled workers. Due to the variability, we take the most conservative estimate to predict the

23 Kinn et. al. (2000) and Dong et. al. (2004) are key to understanding the impacts of the training on safety. They use two different measures to come to very similar results. Kinn et. al. (2000) finds a reduction in OSHA recordable injuries between plumbers and pipefitters with training and those without to have fallen from 11.1 percent to 3.4 percent in northwestern Ohio. Dong et. al. (2004) finds a reduction in worker compensation claims for laborers between 16 and 24 years old who are members of the Northwest Laborers union with training and those without training to have fallen from 30 percent to 17 percent in Washington State over a two year period. Both articles are seminal to the literature of safety training and injury rates with over 80 citations.

24 The CPI-U was used to adjust the cost of injury across time. The estimate came from 2002 data and the average of the CPI was used in that year.

25 29 percent of job placements are in carpentry, painting, weatherization, or generally "construction," 34.5 percent are in environmental jobs including green construction, asbestos abatement, lead abatement, environmental, and hazardous waste. Although some of the environmental jobs may not be construction related, an additional 11.7 percent of the respondents are categorized as "laborers" and we do not include them. Therefore, we take 65 percent as an approximation of the total.

26 The average age from the 3,880 observations used in the employment estimate is 27, and assuming an average retirement age of 67, results in 40 years.

27 The CPI-U was used to adjust the hiring costs across time. The estimate came from 2003 data and the average of the CPI was used in that year.

ECWTP provides \$2,464 in hiring services. From Table 2, we see that 76.6 percent of graduates, who make up 92 percent of participants, are placed in jobs. Therefore, we attribute 71 percent of participants are placed as a result of the training. Given roughly 9,600 trainees, we estimate the total hiring cost savings at $\$2,464 \times 0.71 \times 9,600 = \16.8 million.

I believe that the most significant contribution of this program is the head-start it gives its graduates; they not only gain job skills, but they gain the confidence and the skillset necessary to jumpstart a successful career. These students not only improve their own lives and the lives of their family, but their success also has a greater impact on all of our communities. Our company has partnered closely with JobTrain²⁸ in a variety of ways; but one of the greatest successes I have seen in my career has been to watch one of my current team members first interview for a laborer's position right after completion of Project Build, CPWR's local ECWTP, to then moving up into a carpentry role and hearing about how his field team members were constantly asking to work with him due to work ethic and dedication, to now helping research colleges to attend because our company has been so impressed with him that they have committed to helping him earn a degree with a guarantee of a position within our office upon completion! (Community Advisory Committee member, East Palo Alto, from CPWR- Center for Construction Research and Training 2011-2012 Evaluation Report, Evaluating the Programmatic Effectiveness of the Center for Construction Research and Training Minority Worker Training Program)

28 JobTrain is a 501(c)3 nonprofit educational and training institution accredited by the Western Association of Schools and Colleges. Each of JobTrain's programs combines vocational training, academics, and essential skills development, preparing students to turn their lives around—from unemployment and poverty to success and self-sufficiency. <http://www.jobtrainworks.org/about-us/>

4. Effects on Crime Related Costs

The increased earnings, employment, and other benefits (like skills, mentoring, and specific technical/environmental training) participants receive reduce criminal participation or recidivism, and its related costs.

Recent reports such as the 2014 Department of Justice funded study by the Council of State Governments "Reducing Recidivism" emphasize that employment and job training programs are critical tools to reduce recidivism and prison populations. For example Wisconsin has used a "focus on skills training...for...finding and maintaining employment." Such programs are a key part of the overall effort by the federal and state governments to address the root causes and societal impacts of the nation's historically high incarceration and parole rates. To estimate the program's effects on crime related costs, we determine the program's impact on criminal participation and the associated costs. We limit our cost savings estimates to victim and incarceration costs.

In terms of the participants' criminal activity:

- One grantee reported that average previous incarceration rates of participants were 74 percent.
- Another grantee reported that 10 percent of participants were formerly incarcerated and 30-35 percent had been involved with the legal system.
- A third grantee estimated that 22 percent of enrollees had criminal backgrounds.
- A fourth grantee estimated that between 60-75 percent had criminal backgrounds, but the number could vary.

Due to known misreporting of such characteristics by participants, we used values from Schochet et. al. (2008), which finds arrest, conviction, and incarceration rates of participants of a similar job

training program (Job Corps) to be 33 percent, 25 percent, and 18 percent, respectively. More importantly, their experimentally-based results show a statistically significant decline in arrest, conviction, and incarceration rates of 4 percent, 3 percent, and 2 percent, respectively, for a 48 month period. From this study and in conjunction with the available data, we make a conservative assumption that the ECWTP reduces participants' criminal participation and incarceration by 2 percent.

To support the 2 percent benchmark and suggest it is conservative, Grogger (1998) finds a 10 percent increase in wages reduces crime participation by 1.8 percent using a different data set and approach. We estimate a change in the wage in Section 1c to equal 29 percent, resulting in a predicted reduction in crime participation of 5.2 percent - a rate that declines as the wage premium depreciates. Furthermore, Engelhardt (2010) finds the transition from unemployment to employment reduces the incarceration rate by 0.5 percent per month. Therefore, an increase in employment of 59 percent using the Engelhardt (2010) estimates results in a reduction in incarceration of roughly 1.7 percent. In combining the wage and employment impacts from two alternative studies, we argue the 2 percent reduction in participation and incarceration is a conservative estimate and in line with the literature.

To get the total cost savings, we incorporate four other estimates related to costs. First, the average cost per crime is taken to be \$1,550 in 2014 dollars using Cohen (1988) estimates on victim costs. This estimate is conservative relative to other sources (Anderson 2011). Second, Piehl and Dilulio (1995) estimate criminal participants commit roughly 12 crimes per year or 48 over a 48 month span using a variety of sources. Third, the average cost per inmate using the most recent data available is \$30,600

in 2014 dollars according to Table 2 of the Bureau of Justice Statistics report on "State Correction Expenditures, FY 1982-2010." Finally, the average length of incarceration is 16 months according to the Bureau of Justice Statistics report on "State Court Sentencing of Convicted Felons, 2004."

The combination of these estimates provides the cost savings related to victimization and incarceration. Specifically, the reduction in victim related costs is the 2 percent reduction in participation, times the 48 crimes committed over the 48 month period, times the \$1,550 in cost savings to victims per crime on average. As a result, the crime related cost savings totals \$1,488 per participant. Furthermore, the reduction in incarceration of 2 percent, times the annual cost of \$30,600 to incarcerate an individual, times the average length of 16 months per incarceration implies an incarceration savings on average of \$816 per participant.

Combining the victimization costs and incarceration costs results in crime related savings of an average of \$2,304 per participant.²⁹ The estimate is based on a relatively short window of 48 months. Given roughly 9,600 trainees, we estimate the crime related cost savings at $\$2,304 \times 9,600 = \22.1 million. The \$22.1 million in savings is a result of an estimated 2 percent decrease in crime among all participants, and not an assumption that each participant would engage in criminal activity.

29 It could be argued the sum of these two numbers over estimates the impact due to some "double" counting as those in jail are not committing crime. However, the probability of being caught is relatively small and makes the rounding insignificant from an economic standpoint.

Lyle had not been able to shake mistakes that he had made in the past. Lyle has spent time in prison for aggravated robbery and this conviction has prevented him from earning enough money to support his family. His most recent employment before entering the Worker Training Program was a ranch hand. He had earned very little money and definitely not enough to support his family. He felt that this was opportunity to change things for the better for his family. For him, this was the opportunity to prove to his wife, his mother, and his children that he could finish something. During the program, he struggled with math. However, he was committed. He would arrive much early before the school day started to receive tutoring and stay at the end of the day to have additional tutoring. Lyle was voted the Survivor Award recipient. Lyle earned it and as he stated “I have finally finished something and everyone here was responsible for helping me to get there.” Today, Lyle works as an asbestos worker with Brand International and now earns enough money to support his family. (Houston Success Story, Dillard 2012 Progress Report)

Although the Crime Cost Savings is a relatively small aspect (\$ 22 million) of the overall ECWTP program, it represents a positive societal impact.

This real impact is its demonstrated reduction in the recidivism rate in ECWTP graduates due to the program’s comprehensive assistance to the trainees. It may be better, more accurately categorized as a “recidivism reduction effect” achieved by the program.

This “recidivism reduction” is achieved by offering both training and employment opportunities to former prisoners who otherwise face considerable burdens to entering the workforce.

The economic impact is based on a conservative figure of only a 2% reduction in recidivism/ incarceration. This is the lower end figure from data from peer reviewed studies of other similar government training /job placement programs.

5. Effects of Taxes and Transfers

We estimate the ECWTP saves the Federal government \$74,684 per participant in increased tax payments and reductions in cash or near cash transfers. To determine the estimate, we take from the Congressional Budget Office’s estimated amounts of federal taxes paid and cash or near-cash transfers received by income quintiles (Congressional Budget Office 2006). Extrapolating from the quintile estimates in Exhibit 18 for non-elderly households, we find a nearly linear relationship between a decline in cash and near-cash transfers of \$0.25 for every additional dollar earned for those in the bottom three quintiles (making less than \$59,900 or less on average in 2006). Cash and near-cash transfers include among others things unemployment insurance, Supplemental Security Income, refundable tax credits, and the Supplemental Nutrition Assistance Program. For the same bottom three quintiles, we estimate a linear, or nearly flat, tax rate of \$0.20 per dollar earned.³⁰ Using these estimates and the estimated impact that the ECWTP increased income by \$165,965 over the course of the participants’ careers, we estimate \$33,193 of the earnings will be paid in taxes and the government will spend \$41,491 less in transfers and near-cash transfers. As a result, the cumulative savings for the federal government from the 9,600 participants in the ECWTP is $\$74,684 \times 9,600 = \717.0 million in present value terms and in 2014 dollars.

³⁰ Authors assume the tax rate will remain constant throughout the career of the ECWTP graduate. While it is possible the tax rate could change over this long period, we do not speculate on this change.

A key assumption in this calculation is that ECWTP graduates enter jobs that represent new employment for their firms. In other words, the firms that hire ECWTP graduates would have a difficult time filling the job without the program. If this were not the case, then the employment of an ECWTP graduate would be offset by the unemployment of another person. Confirming this claim empirically requires employment data over time for each firm that hires an ECWTP graduate, which is unavailable. However, we are confident that these hires likely represent new employment. Many of these jobs require specialized training but not high education levels. If there were many people with the same training, these firms would not seek graduates of ECWTP in the manner described in several ECWTP progress reports. While it is possible the firms could fill these jobs if they paid a higher wage, it is not clear that the work is valuable enough for firms to offer higher wages.

6. Effects on Environment and Related Benefits

For this section, we reviewed the literature for environmental effects and found that we are unable to monetize an economic impact. However, we believe this is an area that would benefit from future research. Since the ECWTP trains workers for employment in hazardous waste, asbestos and lead abatement firms, as well as for employment in construction, we anticipate that their jobs will lead to increased environmental quality. Of the workers who were employed after training, 8.6 percent were employed in the hazardous waste industry, almost 13.0 percent in an environmental industry, and 9.0 percent in asbestos abatement.

The benefits that society receives from the environmental remediation undertaken by these workers will be partially captured in the wages paid

out. Firms will be willing to pay up to the value that they receive for abatement to the workers. However, decreasing pollution will also benefit individuals not in the marketplace, including those individuals who would no longer be exposed to the pollutants. These individuals will face reduced cancer and other non-cancer health risks once the site has been cleaned, or the pollution abated. The reduction of these negative externalities are benefits that are never paid for monetarily by those outside the market, but are nonetheless important.

It is difficult to estimate the dollar value of the benefits from the reduction of pollution. One technique that is used by economists is the hedonic technique, which uses changes in the prices of houses as pollution levels change as an indication of the value that individuals receive from the removal of pollution. One such study (Kiel and Zabel 2001) estimated that cleaning the Superfund site in Woburn Massachusetts would yield benefits of \$122 million (2014 U.S. dollars) to the community surrounding the site.

Of the workers in our sample who are employed on a Superfund site, most work at the Hunters Point Shipyard which is a site in San Francisco, California. This site is currently being cleaned, with an expected completion date of 2016. We cannot know what each workers' contribution to the cleanup is, but since they have been hired we can assume that there was unmet demand for workers. It is likely that the increased number of employees will lead to a more timely completion of the project, so that benefits will begin to accrue more quickly.

The abatement of pollution will reduce the risks of those who are exposed. That reduction is often measured as a reduction in the risk of death. Values for statistical lives can then be used to monetize that reduction. Commonly used statistical values for lives

range from \$5 million (Viscusi 1978) to \$20 million (More and Viscusi, 1990) (all values in 2000 U.S. dollars) depending on the situation.

Similar arguments can be made for lead and asbestos abatement; there will be social benefits beyond what is captured by the labor market but those benefits will be difficult to quantify and monetize. One study (Gould 2009) estimates that the benefits from childhood lead reduction (including lead-based paint) are between \$192 billion and \$270 Billion (1996 U.S. dollars). Given that lead and asbestos issues are generally greater in areas with lower income residents, the social benefits are particularly important to consider.

The current federal regulations on lead focus on providing information to buyers and sellers, as well as renters and landlords, about the risks of lead paint. There are no requirements that the paint be removed, just that residents be informed about the dangers of lead paint and be given information about how to manage the risk. If additional residents in the community are made aware of the situation due to attending the program, then the program leads to more individuals abating lead in their residence, and we would expect to see an increase in health outcomes in that community. Again, estimating and valuing those health benefits is difficult, was unable to be done in this study, and requires more research.

7. Matching Funds and Community Involvement

Survey responses from five awardees —Dillard University, CPWR , New Jersey/New York Hazardous Materials Worker Training Center, OAI, Inc., and the

Western Region Universities Consortium — show that each receives substantial support from local firms, non-profits, and individuals to help mitigate the cost of training. The majority of this support is funding, but donors also provide important services to the program including computer equipment, uniforms, tools, transportation to and from training, child care, union dues, counseling, and GED training.

Based on survey responses, we find the ECWTP generated approximately \$1.936 million in matching funds from outside sources in the past year. An additional \$350,000 of in-kind transfers has been provided in the past year. Approximately half of the matching funds came from the New Jersey/New York Hazardous Materials Worker Training Center, and the remaining matching grants are roughly evenly distributed among the other grantees. In addition, most of these funds come with a multi-year commitment, which in a few cases lasts over ten years into the future. Finally, these figures underestimate the true amount of leveraged funds as not all of the in-kind transfers have valuations in the survey responses. We did not impute a value for these services in our calculations as the descriptions were often not sufficient enough to produce a reasonable estimate.

It is clear from the long and varied list of in-kind transfers that the ECWTP and its donors provide more than job training. By paying some indirect costs of participating, such as transportation and child care, the donors and the ECWTP mitigate many of the issues that limit participation. Other in-kind transfers like job readiness training, life skills training, and counseling show that the ECWTP and its donors try to do more than increase minority employment.

See graphics on the following pages.

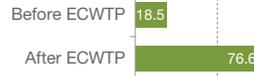
Economic Impacts Overview of ECWTP 1995-2013

\$1.79 Billion
Total value added

\$717 Million
Reduced spending

\$2.28 Million
Additional local support in 2013

Percent Employed



Average Wages

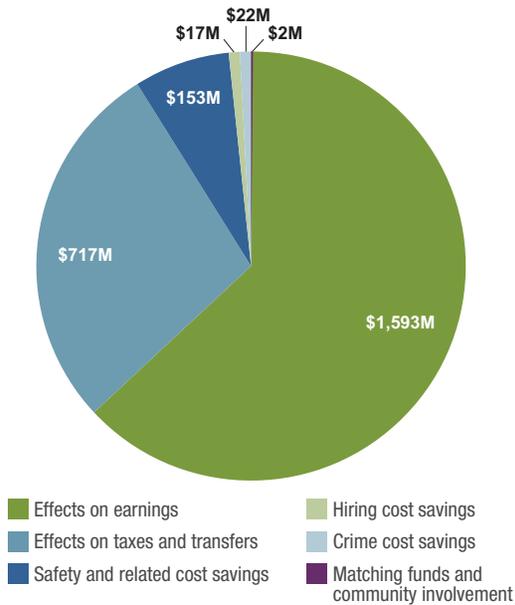


59% Increased probability of employment for ECWTP graduates

Benefits

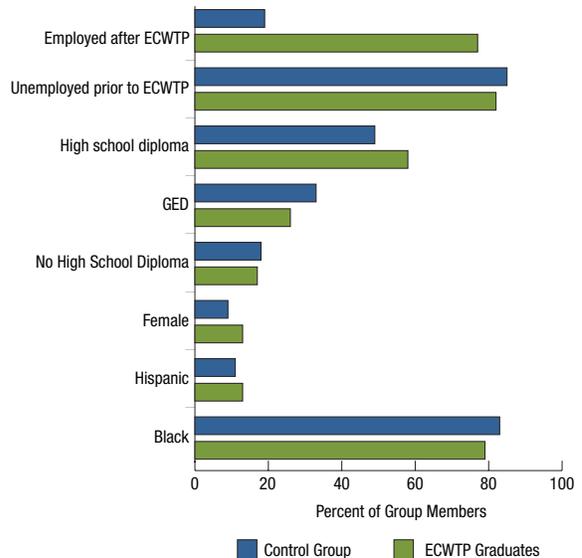


Monetized Benefits of ECWTP*



* All figures are in present value terms except matching funds.
* Environmental benefits are relevant though undetermined.
* Matching funds are only for 2013.

Summary Statistics for Control Group and ECWTP Graduates



The control group consists of individuals who began the ECWTP training but did not complete it; those individuals consist of 7.8% of the total number of individuals who started ECWTP.

Conclusions

To summarize the results, we find the ECWTP provides a value added of \$1.79 billion while reducing U.S. government expenditures by \$717.0 million. Furthermore, we found the program generated \$2.3 million annually in matching funds from local sponsors.

Given the results, it is important to point out the estimates we provide are conservative along at least three dimensions. First, the environmental cost savings and redevelopment benefits could not be determined given the current data and literature. In particular, it proved infeasible to differentiate the environmental benefits of the ECWTP relative to the other associated government and non-government programs. Second, the estimates do not include any “multiplier effects.” In other words, we did not include the added impact the participants had on their local businesses as a result of their additional earnings and spending within the community. We did not include a multiplier effect because of the wide range in estimates and the long-term impact of the program. The addition of these estimates could increase the value added from the program by 20 percent or more. Finally, we did not include higher job finding rates and lower job separation rates due to data limitations. However, if the program results in a 20 percent higher job finding rate and a 20 percent lower job separation rate as the anecdotal stories suggest, then the overall estimated effects on earnings would rise by roughly 16 percent, or from \$1.59 billion to \$1.85 billion.

As mentioned above, in this study we were not able to quantify the environmental benefits or the redevelopment benefits that impact communities as a result of cleanup being performed by graduates of this Environmental Career Worker Training Program. This should be a future area of research.

To conclude, we provide a brief description provided in the 2013 Dillard Progress Report of one participant’s success story. It has been chosen as one of the many examples provided by the awardees.

“Steve is a 2013 graduate who started with a struggle when entering the training. He had legal issues and a bad attitude to match. Throughout the training, the walls in his life began to break down and he began changing the company that he kept. By the end of training, his attitude and hunger to learn completely turned around and he was going with classmates on the weekend to do flooring jobs. When it was time for the job fair, he was presented with several offers for him to begin work. He is now working for [Company X] as a Construction contractor/supervisor.”

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Appendix A – Calculation for ECWTP Employment Effects and Employment Probit Table

We assume the probability a non-participant is employed in a particular week “t” equals

$$(.815, .185) \begin{pmatrix} 1 - \frac{1}{36} & \frac{1}{36} \\ 0.003 & 1 - 0.003 \end{pmatrix}^t \begin{pmatrix} 0 \\ 1 \end{pmatrix},$$

which is a two state Markov process with probability 1/36 of finding a job when unemployed and probability 0.3 percent probability of losing a job when employed. The probability a participant is employed in any week “t” is

$$(.815 - 0.59, .185 + 0.59) \begin{pmatrix} 1 - \frac{1}{36} & \frac{1}{36} \\ 0.003 & 1 - 0.003 \end{pmatrix}^t \begin{pmatrix} 0 \\ 1 \end{pmatrix}.$$

The average length of unemployment is 36 weeks,³¹ and using an exponential distribution, the probability of finding employment when unemployed is 1/36. Furthermore, the weekly layoff and discharge rate is 0.3 percent³² with an equivalent probability. The key difference between the participant and non-participant employment probability is the completion of the program increases the likelihood of employment by 59 percent as seen in the initial state of each type.

Employment Probit Table

	Estimate of Marginal Effect (standard error)	p-value
Completed ECWTP	0.5904 (0.0241)	p < 0.001
Unemployed prior to ECWTP	-0.0754 (0.0187)	p < 0.001
GED	-0.0277 (0.0250)	p = 0.262
High school diploma	-0.0019 (0.0217)	p = 0.929
Female	-0.0272 (0.0234)	p = 0.236
Hispanic	0.0401 (0.0326)	p = 0.234
Black	-0.0107 (0.0290)	p = 0.716
Age	0.0003 (0.0009)	p = 0.702

31 Bureau of Labor Statistics, Table A-12.

32 Bureau of Labor Statistics, Job Openings and Labor Turnover Survey

Appendix B – Glossary of Statistical and Economic Terms

The *Consumer Price Index for All Urban Consumers (CPI-U)* consists of all urban households in Metropolitan Statistical Areas (MSAs) and in urban places of 2,500 inhabitants or more. Non-farm consumers living in rural areas within MSAs are included, but the index excludes rural consumers and the military and institutional population. The Consumer Price Index for All Urban Consumers (CPI-U) introduced in 1978 is representative of the buying habits of approximately 80 percent of the non-institutional population of the United States, compared with 32 percent represented in the CPI-W. The methodology for producing the index is the same for both populations.

In labor economics, **attachment to the workforce** or **workforce attachment** refers to increased job placement, advancement, and job retention as well as strong commitment and positive self-image with regard to a person's current job or intensity of their search while unemployed.

In *statistics*, **collinearity** refers to a linear relationship between two *explanatory variables*. Two variables are *perfectly collinear* if there is an exact linear relationship between the two, so the correlation between them is equal to 1 or -1.

In *statistics*, a **probit model** is a type of *regression* where the *dependent variable* can only take two values, for example married or not married. The name is from **probability + unit**.^[1] The purpose of the model is to estimate the probability that an observation with particular characteristics will fall into a specific one of the categories; moreover, if estimated probabilities greater than 1/2 are treated as classifying an observation into a predicted category, the probit model is a type of *binary*

classification model.

A *probit* model is a popular specification for an ordinal^[2] or a *binary response model*. As such it treats the same set of problems as does *logistic regression* using similar techniques. The probit model, which employs a *probit link function*, is most often estimated using the standard *maximum likelihood* procedure, such an estimation being called a probit regression.

In *statistics*, a collection of *random variables* is **heteroscedastic** if there are sub-populations that have different variabilities from others. Here “variability” could be quantified by the *variance* or any other measure of *statistical dispersion*. Thus heteroscedasticity is the absence of *homoscedasticity*.

The possible existence of heteroscedasticity is a major concern in the application of *regression analysis*, including the *analysis of variance*, because the presence of heteroscedasticity can invalidate *statistical tests of significance* that assume that the *modelling errors* are uncorrelated and normally distributed and that their variances do not vary with the effects being modelled. Similarly, in testing for differences between sub-populations using a *location test*, some standard tests assume that variances within groups are equal.

The term means “differing variance” and comes from the Greek “hetero” (‘different’) and “skedasis” (‘dispersion’).

In *statistical significance testing*, the **p-value** is the *probability* of obtaining a *test statistic result* at least as extreme as the one that was actually observed, assuming that the *null hypothesis* is true.^{[1][2]} A

researcher will often “reject the null hypothesis” when the p -value turns out to be less than a predetermined *significance level*, often 0.05[3][4] or 0.01. Such a result indicates that the observed result would be highly unlikely under the null hypothesis. Many common statistical tests, such as *chi-squared tests* or *Student’s t-test*, produce test statistics which can be interpreted using p -values.

In a statistical test, sample results are compared to possible population conditions by way of two competing hypotheses: the *null hypothesis* is a neutral or “uninteresting” statement about a population, such as “no change” in the value of a *parameter* from a previous known value or “no difference” between two groups; the other, the *alternative (or research) hypothesis* is the “interesting” statement that the person performing the test would like to conclude if the data will allow it. The p -value is the probability of obtaining the observed sample results (or a more extreme result) when the null hypothesis is actually true. If this p -value is very small, usually less than or equal to a threshold value previously chosen called the *significance level* (traditionally 5 percent or 1 percent [5]), it suggests that the observed data is inconsistent with the assumption that the null hypothesis is true, and thus that hypothesis must be rejected and the other hypothesis accepted as true.

An informal interpretation of a p -value, based on a significance level of about 10 percent, might be:

- $p \leq 0.01$: very strong presumption against null hypothesis
- $0.01 < p \leq 0.05$: strong presumption against null hypothesis
- $0.05 < p \leq 0.1$: low presumption against null hypothesis
- $p > 0.1$: no presumption against the null hypothesis

Appendix C – Environmental Career Worker Training Program Grantees³³

CPWR – The Center for Construction Research and Training

Deep South Center for Environmental Justice, Dillard University

New Jersey/New York Hazardous Materials Worker Training Center

OAI, Inc.

Western Region Universities Consortium

³³ These five organizations were the WTP ECWTP grantees at the time of the study.

Appendix D – List of Acronyms

- CPI-I Consumer Price Index for All Urban Consumers
- CPS Current Population Surveys
- CPWR CPWR-The Center for Construction Research and Training
- ECWTP Economic Career Worker Training Program
- GED General Equivalency Diploma
- MWTP Minority Worker Training Program
- PACT Pre-Apprentice Construction Program
- WRUC Western Region Universities Consortium



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Environmental Health Sciences
Worker Training Program

This publication was made possible by contract number 273201000083U from the National Institute of Environmental Health Sciences (NIEHS), NIH.