Vocational Rehabilitation:

Return on Investment in Oregon

Northwest Economic Research Center

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Vocational Rehabilitation Services (VR) assists youth and adults with disabilities to obtain, maintain or advance in employment. VR services are designed to help participants succeed in jobs that enable them to live as independently as possible, reduce or eliminate their need for publicly funded benefits, and be fully contributing members of their local communities. VR staff members Ron Barcikowski and David Ritacco were instrumental in the completion of this report. They provided data, and feedback on the project design and write up.

NERC is based at Portland State University in the College of Urban and Public Affairs. The Center focuses on economic research that supports public-policy decision-making, and relates to issues important to Oregon and the Portland Metropolitan Area. NERC serves the public, nonprofit, and private sector community with high quality, unbiased, and credible economic analysis. The Director of NERC is Dr. Tom Potiowsky, who also serves as the Chair of the Department of Economics at Portland State University. Dr. Jenny Liu is NERC's Assistant Director, as well as an Assistant Professor in the Toulan School of Urban Studies and Planning at PSU. The report was researched and written by Jeff Renfro, Senior Economist. Research support was provided by Janai Kessi, Ayesha Khalid, Hudson Munoz, and Kyle O'Brien, NERC Research Assistants.

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Executive Summary

Oregon Vocational Rehabilitation Services (VR) assists youth and adults with disabilities to obtain, maintain, or advance employment. VR provides personalized services to program participants through its network of field offices, and partners with local businesses and organizations to create opportunities. The Northwest Economic Research Center (NERC) was asked to study the effect of program participation, and calculate the long-term return on investment of VR funding.

To study the effect of the vocational rehabilitation program on participant earnings and calculate the total return on investment for program participants and the state, we used demographic and employment data for participants who closed between 2006-2008. Closure occurs when an individual leaves the program, after opening a file with a counselor. The total sample (close to 15,000 records) was divided into two groups, the program group and the comparison (control) group. The comparison group was comprised of clients who were determined eligible but closed before entering plan. Though the two groups matched closely there were systemic differences between the groups, which were addressed through regression analysis.

The program effects for different time periods, as well as effects on public assistance were estimated using the same group of independent variables. This allowed us to create more accurate estimates of the program's long-term effect on participants. The regression results reveal that, in the first quarter after closure, program participation led to an additional $1,353 in quarterly wages above the comparison-group baseline. In the first post-closure year, program participation led to $4,941 in additional wages above the comparison group, but fell to $3,653 in the third year. This trailing off in the effect of the program over time means that the gap between program participants and the comparison group in earnings shrinks over time. The program group most likely does not experience a drop in earnings; instead, the downward movement of the line represents convergence between the two groups.

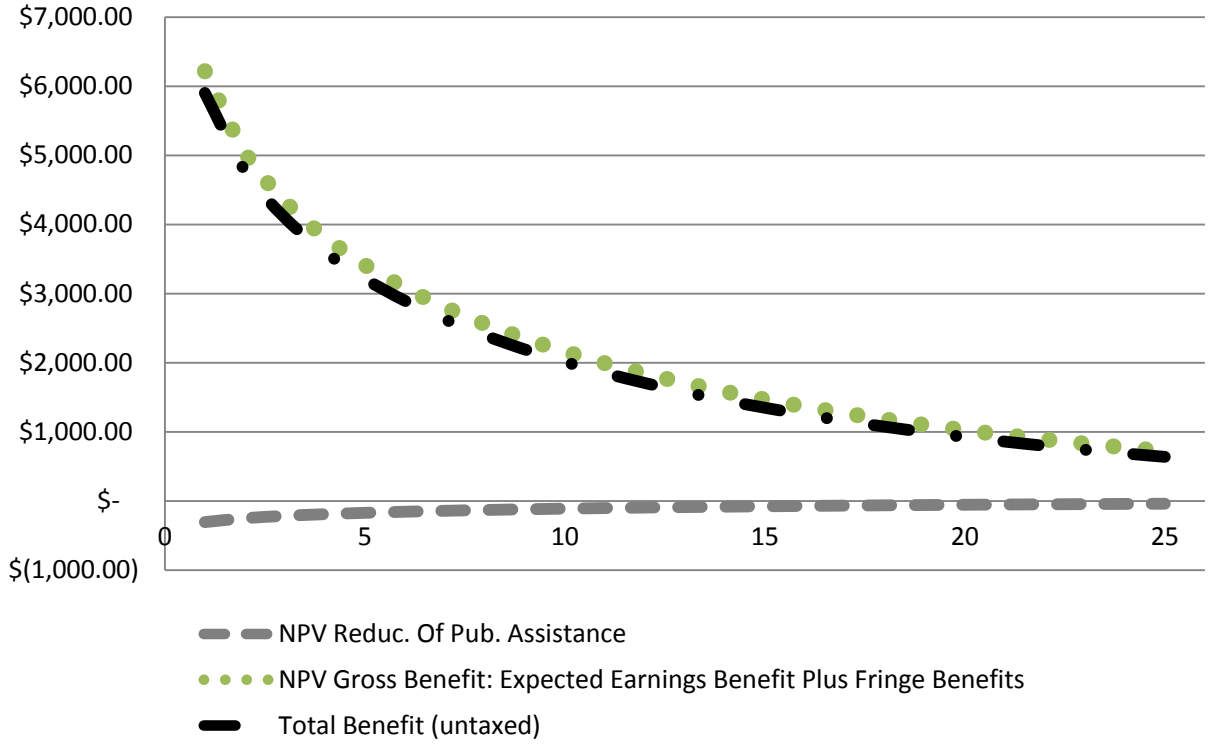
Table 1: Program Effect on Wages

Time period post-program	Wages (plan coefficient)
1st Quarter	$1,353
1st Year	$4,941
3rd Year	$3,653
Total post-program	**$12,697**

The results show that the program was helpful in finding employment for participants and not just increasing wages. We found that the program participants were 1.93 times more likely to be employed in the first quarter after closure than the control group. In the first quarter after closure, program participation led to an additional 65 hours of work, relative to the comparison baseline. There is a drop-off in program effect between the first and third year. Furthermore, the regression results suggest that the purchase of services has a positive impact on earnings, and length of time spent in the program has a negative effect on earnings. Because of disparities between service costs, it is difficult to draw definitive conclusions from this result. Although Total Purchase of Services is associated with higher after-closure wages, it could be that participants receiving more expensive services have better wage outcomes. Similarly, it could be that participants receiving job retention services are in the program for a short time, before returning to work and earning higher wages. We cannot conclude that purchasing more services and getting participants through the program quickly will necessarily lead to increased earnings, but purchasing necessary services and getting the participant to closure quickly could be part of this effect.

The lifetime benefits of program participation are shown in Figure 1, where the horizontal axis represents the projected earnings of the control group (not zero earnings). The downward movement of the line is not an indication of falling earnings for the program group, rather it represents convergence between the program and control group. There is a negative impact of net present value of program participation on public assistance i.e. program participation decreases public assistance received. This is beneficial for the public at large and the increase in individual earnings far outweighs the loss of public assistance to the recipient. The middle line (net present value of gross benefits) is the increase in earnings and fringe benefits for program participants, minus their public assistance losses and foregone earnings during the program.

Figure 1: Lifetime Benefits



The net present value of additional lifetime earnings due to program participation is $28,779 for each participating individual. Based on the mean age of participants, we use 25 years as the post-program earnings period. The net present value of the tax revenue associated with these additional wages and reduction in public assistance is $12,081 discounted over the participant's lifetime.

The total cost of the program is $48,415,317. Because the State of Oregon is reimbursed 78.2% of program costs through the Ticket to Work program, the state's share of total program costs is 21.8%, or $10,554,539. The ratio of total NPV net benefit to all program participants to total program cost is 5.2:1. The ratio of additional Oregon Income tax revenue to Oregon's share of program cost is 4.3:1.

The total economic impact of program purchase of service is that it generates 441 jobs and additional gross output of $33,254,379. Since the data is for a three-year period, the 441 jobs can be considered as 441 individuals who were each employed for one year, or 147 individuals who were employed for three years.

This report shows that Vocational Rehabilitation Services is an effective mechanism to return people with disabilities to the labor force, and increase their lifetime earnings. The benefits accrued by program participants outweigh the costs of the program. It is in interest of Oregon to expand the programs, particularly if Oregon continues to pay only 21.8% of costs. Emphasis should be placed on quickly recognizing the needs of participants, providing them the relevant services, and moving them toward closure.

Background and Program Description

When a person with a disability remains outside of the labor force, government agencies step in to support them with a variety of public assistance measures. While this public assistance is vital for some members of the community, some people with disabilities could significantly increase their lifetime earning potential with assistance in obtaining or maintaining a job. When a person with a disability is employed, the state not only pays less in public assistance but also earns more positive tax revenue from having an additional employed citizen. Clearly, it is in the interest of the individual and the government to assist people with disabilities to remain active members of the workforce.

NERC estimated the impact of these programs on the lifetime earnings of program group, and compared this to a comparison group made up of individuals deemed eligible for participation who never actually started an individualized plan or received services. These estimates were used to forecast future earning impacts, which were used to calculate the return on investment of state expenditures.

Description of Oregon Vocation Rehabilitation Services (VR)[1]

Vocational Rehabilitation Services (VR) is a section of the Oregon Department of Human Services (DHS) which assists youth and adults with disabilities to obtain, maintain or advance in employment. VR services are designed to help participants succeed in jobs that enable them to live as independently as possible, reduce or eliminate their need for publicly funded benefits, and be fully contributing members of their local communities.

VR provides services to participants through field offices across the state. To receive VR services participants must visit a regional office to establish eligibility. VR staff also work in partnership with community organizations and businesses to develop employment opportunities for people with disabilities. These activities range from live resumè events and job fairs to presenting disability awareness workshops in local businesses. VR also offers business services that include consultations with employers about diversifying their workforces by hiring people with disabilities and pre-screening services to match employers with participants who are qualified, reliable job candidates.

Services to participants are individualized to ensure that each eligible participant receives the services essential to their employment success. Vocational rehabilitation counselors work with participants to identify their needs, create a plan to address barriers to employment and implement the plan together. VR services align to the following major focus areas:

[1] Oregon State Rehabilitation Council. *2012 Annual Report*. Department of Human Services. State of Oregon. Last Accessed April 2, 2013: http://www.oregon.gov/DHS/vr/oregonrehabcncl/publications/2012_report.pdf

- **Basic Vocational Rehabilitation Services** assist individuals whose disabilities are impediments to employment. Counselors determine the participant's eligibility for services; provide vocational counseling; and identify and arrange for services, activities and accommodations needed to obtain, maintain or advance in employment. Counselors work with job developers to obtain job placements and with job coaches to provide participants with the extra supports they need to be successful in their jobs. Counselors also work with employers to accommodate incumbent workers or to recruit new employees with disabilities.

- **Youth Transition Services** prepare youth with disabilities for employment or career-related postsecondary education or training. The program bridges the gap between school and work by providing coordinated vocational rehabilitation services while the special education student is in school. OVRS partners with local school districts and other organizations to ensure students' smooth transition to adult services and employment after high school.

- **Supported Employment Services**, an evidence-based rehabilitation strategy, targets individuals with the most significant disabilities who can obtain and retain competitive employment in the community if they receive intensive training, job coaching and ongoing support. Supported Employment Services are provided in partnership with the Oregon Health Authority, Addictions and Mental Health Services, and the DHS Office of Developmental Disabilities.

VR's services include assessment services to aid participants in determining their strengths, capabilities, skills, and interests; Guidance and counseling to help the individual make good decisions throughout the rehabilitation process; Training in independent living, including self-care, money management, and using community transportation; Provision of and support services for assistive technology, such as hearing aids, visual aids, or special computer software; Vocational training for specific work required skills; And, job search and placement services.

Study Sample Description

In order to study the effect of the vocational rehabilitation program on participant earnings and work hours and calculate the total return on investment, we used data on program participants and individuals who closed between 2006 and 2008. Closure occurs after an individual leaves the program. The full sample included almost 15,000 records. After sorting and inspecting the data, we eliminated several records because of data entry errors or other irregularities. We were left with 14,972 total records representing individuals deemed eligible to receive vocational rehabilitation services.

It is impossible to create a true experiment measuring the program impact with the available data. In order to create a quasi-experimental study, the total sample was split into two groups: the program group and comparison (control) group. The program was defined as individuals who participated in a rehabilitation plan and received at least one service. The comparison group is made up of individuals who were deemed eligible to receive services during an initial meeting with a counselor, but closed prior to entering plan or receiving a service. The goal of this analysis was to find the effect of participation in the program. To do this, we need to calculate the effect of other determinants on earnings in order to isolate the program effect. When these other factors are controlled for, we can assume that the estimation for program return holding all other factors constant. Another way to look at it is that the rest of analysis eliminates all other differences between the two groups, and allows us to focus on the effects of individual variables. Without VR, we assume that the program participants would be the same as the control group.

Tables 2-5 summarize the characteristics of the whole sample, program group, and comparison group. As the tables show, the two groups are closely matched. We use regression analysis to further eliminate any selection bias or systemic differences between the two groups. Selection bias could occur if there are factors that make a person more likely to participate in VR. If the program group is more educated, more motivated, or has more work experience, when we measure the effect of the program, we would actually be measuring a mixture of program, education, and experience effects. By controlling for other factors that might introduce this bias, we isolate the program effect.

Table 2: Age and Gender

Characteristics	*Whole Sample*			
	Program Group	**Comparison Group**	**Difference**	**Whole Sample**
Total Participants	8763	6209	2554	14972
Male	56%	54%	-2%	52%
Female	44%	46%	2%	48%
Median Age	41	41	-	41
Standard Deviation	13.63	12.99	0.64	13.37
Age less than 18	2%	1%	1%	1%
Age between 18 and 22	16%	14%	2%	15%
Age between 23 and 39	30%	32%	-2%	31%
Age between 40 and 50	29%	31%	-2%	30%
Age greater than 50	24%	23%	1%	24%

Table 3: Education

Characteristics	*Whole Sample*			
	Program Group	Comparison Group	Difference	Whole Sample
Total Participants	8763	6209	2554	14972
Special Education	7%	5%	2%	6%
Secondary Education, no HS Diploma	15%	17%	-2%	16%
Post-Secondary Education, no degree	19%	20%	-1%	19%
AA Degree or VoTech Certificate	8%	7%	1%	8%
Bachelor's Degree	7%	5%	2%	6%
Elementary Education (Grades 1-8)	3%	4%	-1%	4%
HS graduate or equivalent	38%	39%	-1%	39%
Master's degree or higher	3%	1%	2%	2%
No formal schooling	0%	0%	0%	0%

Table 4: Race and Ethnicity

Characteristics	*Whole Sample*			
	Program Group	Comparison Group	Difference	Whole Sample
Total Participants	8763	6209	2554	14972
White	91%	90%	1%	91%
Black	5%	6%	-1%	5%
American Indian	4%	5%	-1%	5%
Asian	2%	1%	1%	1%
Hawaiian	1%	1%	0%	1%
Hispanic (any race)	1%	5%	-4%	6%
Total	103%	108%	-5%	108%

Table 5: Type of Disability[2]

Characteristics	*Whole Sample*			
	Program Group	Comparison Group	Difference	Whole Sample
Respiratory	1%	1%	0%	1%
Psychosocial	15%	18%	-3%	16%
Physical	12%	13%	-1%	12%
Orthopedic Disabilities	7%	8%	-1%	7%
Other Mental Impairment	14%	17%	-3%	15%
Mobility and Manipulation Impairment	11%	11%	0%	11%
General Physical Debilitation	4%	5%	-1%	4%
Hearing Impairments	8%	3%	5%	6%
Blindness and other visual impairment	1%	1%	0%	1%
Substance Abuse	3%	4%	-1%	4%
Cognitive Impairment	26%	22%	4%	25%
Communication Impairment	2%	1%	1%	1%
Deaf-Blindness	0%	0%	0%	0%
Total	103%	104%	-1%	104%

Tables 4 and 5 have columns that add up to more than 100% due to participants reporting more than one race or more than one disability type.

[2] For definitions of disabilities used in this study, download VRdatafields.pdf at www.pdx.edu/nerc/vrdatafields Last accessed April 2, 2013.

Impact on Program Participants

For this project, we had access to demographic and earnings information for each member of the study group. Because there are many factors that could contribute to the earnings potential of a person, it was important to isolate the effect of the VR program on those earnings. As we demonstrated in the previous section, the program and comparison groups were similar, but there were almost certainly systemic differences between the two groups that could impact the program evaluation. By controlling for factors other than program participation, regression analysis allows us to isolate the effect of the program on earnings.

In similar studies from other states, the analysis takes place in two parts: creating comparable groups using propensity scores and running regressions on these two groups. For our analysis we organized the data using R, a statistical program, which allowed us to perform these two steps simultaneously. For further discussion of the data organization techniques use for this study, see Appendix A: Regression Methodology (pg. 28).

Regression Specification

The combination of time-variant and -invariant variables led us to use a mixed-effects OLS regression specification. The mixed-effect functional form isolates the effect of each individual variable on earnings. We also included other variables that may have an effect on earnings. A properly specified function will include all major determinants or earnings, allowing for an unbiased estimation of the effect of program participation.

Specification refers to the functional form of the estimation equation, and includes the choice of variables. Sensitivity analysis and the boosted regression technique (see pg. 12) helped to validate our regression results. Sensitivity analysis involves making small changes to the regression specification. The way in which estimates react to small changes gives the researcher clues about the validity of the model, and can also draw attention to issues that still need to be resolved. If the estimated effect of the variable in question changes drastically due to changes in other variables, or by changing the functional form, then the estimates are not trustworthy. During the sensitivity analysis, the estimated program effect was stable, varying by a small margin.

We used the same collection of independent variables to generate coefficient estimates using dependent variables for different periods of post-program earnings, post-program public assistance, and difference-in-difference estimates of post-program earnings. Estimating program effects for different time periods, as well as effects on public assistance, allowed us to create more accurate estimates of the program's long-term effect on participants (see page 15).

The first versions of the regression models were based on the variables used in the Massachusetts study[3]. We also looked at the available data and added other variables in line with economic theory. The final model used variables that included[4]:

- Plan (binary)
- Gender
- Regional unemployment
- Program time
- Total purchase of services
- Services received
- Disability level
- Race
- Education level
- Marital status
- TANF, SSDI, & SSI
- Age at eligibility
- Year of exit

Year of exit and regional unemployment are both important control variables, particularly because of the Great Recession. Program participants entered a labor market that saw the highest level of unemployment in decades. The year of exit dummy variables control for the shock of the onset of the recession, while the regional unemployment rate controls for the geographical variation of recessionary effects. Because we are measuring the program group against the control group baseline, there could be effects of the recession on the comparison group earnings baseline, but the estimation of the gap between the two groups controls for the recession. It is likely that the control group earnings baseline was affected by the recession, but this does not alter the estimation of the additional benefits of program participation. The regression estimation controls for these recessionary effects by including the unemployment and year of exit control variables, maintaining the validity of the estimation of earnings due to program participation. Many of these variables were not significant but were kept as part of the regression equation in order to ensure proper specification. For a more detailed treatment of regression specification and results, see Appendix C: Detailed Regression Results (pg. 31).

Regression Results

Regression estimation isolates the effect of the marginal (incremental) change in a single independent variable; estimated coefficients should be interpreted as the effect of a one-unit change in the independent variable on the dependent variable (earnings), while all other variables are held constant.

[3] Uvin, Johan; Karaaslanli, Devrim; White, Gene. 2004. *Evaluation of Massachusetts' Public Vocational Rehabilitation Program: Final Report*. Massachusetts Rehabilitation Commission. Last accessed April 2, 2013: http://www.mass.gov/eohhs/gov/departments/mrc/vr-reports.html

[4] For the full Model specification, see Appendix C: Detailed Regression Results (pg. 31)

Because our variable of interest is binary, the coefficient associated with program participation is interpreted as the additional effect on earnings above the comparison group baseline case.

Table 6: Program Effect on Wages

Time period post-program	Wages (plan coefficient)
1st Quarter	$1,353
1st Year	$4,941
3rd Year (inflation adjusted)	$3,653
Total post-program (inflation adjusted)	$12,697

In the first quarter after closure, program participation led to an additional $1,353 in quarterly wages above the earnings of the participants in the comparison group (Table 6). In the first post-closure year, program participation led to $4,941 wages above the non-participant baseline, but fell to $3,653 in the third year. This trailing off in the effect of the program over time is observed for both hours and public assistance. This does not mean that program participants are earning less money. It means that the gap between program participants and the control group in earnings is shrinking over time. This effect will be discussed further later in the report. Each of these estimates is significant at the 99% level.

During the sensitivity analysis, these estimates for effect of program participation on earnings were extremely stable, varying within a small margin. This suggests that the estimates of the effect of program participation are capturing the full effect, and that other factors contributing to earnings have been controlled for.

Table 7: Program Effect on Hours

Time period post-program	Hours
1st Quarter	65
1st Year	176
3rd Year	99
Total post-program	416

For the purposes of comparison to other studies, we also used a logit regression function to estimate the increased likelihood of employment in the first quarter after closure. For this estimation, the dependent variable is binary, with a one denoting any positive hours of work on the first quarter after closure. The estimated effect of program participation is interpreted as the amount by which likelihood of employment is increased by program participation. We found that program participants were 1.93 times more likely to be employed in the first quarter after closure than the control group, which further validates our conclusion that program participation leads to greater likelihood of employment, not just higher wages.

In order to further test that the program was helping participants to find employment and not just increasing wages, we also estimated the effect of program participation on hours worked per quarter. Because the increase in wages corresponds to an increase in hours worked, we can draw the conclusion that VR program participation is increasing the likelihood of employment, rather than increasing the productivity of the already employed. Again, we see highly significant results associated with program participation, in line with the effect on earnings. In the first quarter after closure, program participation led to an additional 65 hours of work, relative to the control baseline (Table 7). We see a drop-off in program effect between the first and third year.

Other Significant Variables

Our regression specification allowed us to simultaneously estimate the effect of other variables. Not all of the variables listed previously were found to be significant. The following variables were significant at the 95% level or above, in all of our estimates. Their relationship with earnings is in parenthesis.

- **Gender** (Men have higher earnings)
- **Regional Unemployment Rate** (Higher unemployment leads to lower earnings)
- **Program Time** (Longer time in program leads to lower earnings)
- **Total Purchase of Services** (Money spent on services is positively correlated with earnings)
- **Marital Status** (Positive for married or legal union)
- **TANF, SSI, SSDI** (Recipients of public assistance earn less than those who do not)
- **Bachelors Degree, AA Degree or Equivalent, some college** (Education attainment associated with higher earnings)
- **Age at Eligibility**[5] (Age is negatively associated with earnings)
- **Most Significant Disability** (Negatively related to earnings)

[5] Age at eligibility is not significant in all estimates, but does sometimes show up as significant. It is also shown to be an important factor in the boosted regression analysis.

Notable takeaways from this list include the positive sign associated with Total Purchase of Services and the negative sign associated with Program Time. Because of disparities between service costs, it is difficult to draw definitive conclusions from this result. Although Total Purchase of Services is associated with higher after-closure wages, it could be that participants receiving more expensive services have better employment attachment and that services provided allow them to maintain employment or return to work quickly, earning higher wages. We cannot conclude that purchasing more services and getting participants through the program quickly will necessarily lead to increased earnings, but purchasing necessary services and getting the participant to closure quickly could be part of this effect.

Effect on Subgroups

Regression results show the strong positive effect of program participation, but it is also possible that these results are covering variation between subsections of the total population. In order to address this, we used a regression model to calculate the likelihood of receiving services based on past employment and demographic factors. The estimated coefficients derived from this estimation were used to give every person in the dataset a score representing the likelihood of receiving vocational rehabilitation services. Each person in the study was ranked according to this score, and the overall group was split into five equal categories. In Table 8, the 1st Quintile is made up of people least likely to receive services, while the 5th quintile is people most likely to receive services.

Table 8: Program Effects on Subgroups

Dependent Variables	Plan Coefficients				
Wages	**1st Quintile**	**2nd Quintile**	**3rd Quintile**	**4th Quintile**	**5th Quintile**
1st Quarter Post	$585	$887	$1,086	$1,062	$1,885
1st Year Post	$1,947	$3,270	$3,978	$3,768	$7,069
3rd Year Post (inflation adjusted)	$1,220	$2,682	$2,462	$2,747	$5,304
Total Post (Inflation adjusted)	$4,650	$9,007	$9,837	$9,577	$18,054
Hours					
1st Quarter Post	46	76	56	56	66
1st Year Post	114	200	156	178	168
3rd Year Post	59	156	86	100	75
Total Post	259	536	371	435	350

The people who make up the first quintile are in this group for a variety of reasons. Severe levels of disability are negatively correlated with receiving services. Participants with the most severe disabilities may face difficulties that prevent attaining employment, which separates them from their control group

counterparts. Again, neither of these cases means that the program participants are earning less money; simply that the gap between the program and control group is just smaller.

These results suggest that the vocational rehabilitation services are having the largest effects on the people most likely to receive services. Program participants still see an increase in earnings from receiving services, just not to the degree of other sample subgroups.

Difference-in-Difference Regression

Although, we believe that we have corrected for any selection bias, in order to build in another check (and to make our results comparable to other studies), difference-in-difference regressions were also run. Difference-in-difference uses the same model specification, but replaces the independent variable with a derived quantity showing the difference between two time periods. In this case, rather than using earnings as the dependent variable, we use the difference in earnings between two time periods. We are tracking the program's effect on changes in earnings over time. Table 9 shows the results.

Table 9: Difference-in-difference results

Time period post-program	Wages (plan coefficient)
1st Quarter Post-1st Quarter Pre	$331
1st Year Post-1st Year Pre	$1,249
3rd Year Post-1st Year Post (inflation)	$1,289
3rd Year Post-1 Quarter Post (inflation)	$2,300

These estimates are significant at the 99% level. Program participation widens the gap between the program and control groups over time.

Boosted Regression

The boosted regression technique originally came out of the computer science field, but has recently been applied in the social sciences. Boosting does not produce easily-interpretable coefficients like OLS; instead, it estimates the proportion of the change in the dependent variable due to changes in an independent variable. It is difficult to use these estimates to draw helpful conclusions for the vocational

rehabilitation programs on their own, but taken in the context of the study's other regression techniques they can be used to validate earlier regression results.

There are many ways to interpret the boosted regression technique, but the likelihood perspective is most closely related to the interpretation of other regression techniques in this paper. Estimates for each independent variable are fit using the average value of the dependent variable. The residuals generated during the initial estimation are fed back into the model, which is run repeatedly until the estimates converge.[6] Table 10 shows the results of the Boosted Regression process.

Table 10: Boosted Regression Results

Time period post-program	Plan influence
1st Quarter wages	7.54%
1st Year wages	7.87%
Total post wage (inflation-adjusted)	5.73%

The results of the boosted regression show that program participation is the fifth most important factor in determining wages in the first year of the program. Table 11 shows other important variables for determining variance. Again, we observe a decrease in the variation in earnings due to the program over time. Similar studies in other states have not found a decrease in benefits over time, but during each validation process, we see this shrinking in the gap between the program and control group.

[6] To fully understand this process, some knowledge of statistical theory is required. For a more detailed discussion of the process, see [STATA Journal Article]

Table 11: Boosted Regression Results for Other Variables[7]

Other Important Variables	1st Qtr.	1st Yr.	Total
Total Purchase of Services	34.98%	31.81%	37.35%
Time in Program	14.73%	14.68%	13.83%
Age at Eligibility	10.76%	10.19%	9.55%
County Unemployment	8.43%	7.54%	8.74%
Plan Influence	7.54%	7.87%	5.73%
Married	6.61%	7.26%	6.67%
SSI	6.24%	8.33%	7.07%

We also observe further validation of the importance of Total Purchase of Services and Time in the Program, the two variables most responsible for variation in earnings (Table 11). This is also further evidence of the importance of broader economic issues (County Unemployment used as proxy), and age at the start of the program. Over the three-year span following closure, program participation fell behind marital status and Social Security Insurance receipt in responsibility for variation in earnings.

[7] Other variables were included in the boosted regression estimation, but none of the others accounted for more than 2% of variation and varied more than the variables included in the table during sensitivity analysis.

Return on Investment

A significant advantage of our data organization method is the ability to use regression estimates that control for other factors in the long-term estimates of program benefits. In previous studies, regression analysis was used to calculate the effect of the program controlling for other factors, but simple earnings averages were used to calculate the long-term effects. Because we observe a decrease in the effect of the program over time, our ability to control for other factors has a major effect on our long-term estimates. When estimated earnings for multiple years are used to plot an expected lifetime earnings line, our line is based on the regression-controlled estimates for program effect, meaning that our estimated lifetime earnings should be capturing only program effects. Other studies could be introducing bias into their lifetime earnings estimates by using earnings estimates that do not control for non-program factors.

In the Vocational Rehabilitation program evaluation literature there are two methods for calculating return on investment as demonstrated in Massachusetts' program evaluation.[8] We chose to use the method first developed in the Upjohn Institute's evaluation of workforce development programs in Washington State.[9] This method is more comprehensive and includes better controls for outside factors. We use a broader calculation of benefit that includes discounted[10] lifetime earnings and fringe benefits, but also counts taxes, loss of public assistance, and foregone earnings during the program against individuals. We also calculate costs and benefits for taxpayers (government).

We chose to use this method, as opposed to the method used in the Florida[11] study because it allows us to use our regression-corrected estimates in the lifetime earnings estimates. The Florida method calculates the expected increase in earnings due to program participation, and then extends these earnings into the future. This method does not adequately control for selection bias, and the costs included in the analysis are not comprehensive. Because of this, the Florida method may overestimate the positive effect of program participation. This report takes into account a broader definition of costs.

[8] Uvin. *Evaluation of Massachusetts' Public Vocational Rehabilitation Program: Final Report*.

[9] Hollenbeck, Kevin M.; Huang, Wei-Jang. 2006. *Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State*. Upjohn Institute Technical Report No. TR06-020. Last accessed April 2, 2013: http://www.upjohninstitute.org/publications/tr/tr06-020.pdf

[10] Discounting is a process that converts future benefits into current benefit terms. People tend to place more value on current spending. $1 today is worth more than $1 tomorrow. We discount future earnings to put them in terms comparable to current earnings.

[11] Hemenway, Derek E.; Rohani, Faranak. 1999. *A Cost-Benefit Analysis of the Employment of People with Disabilities in Florida: Final Report*. Educational Services Program. Florida State University. Last accessed: April 2, 2013: http://www.cala.fsu.edu/files/cost_benefit_analysis.pdf

Calculations

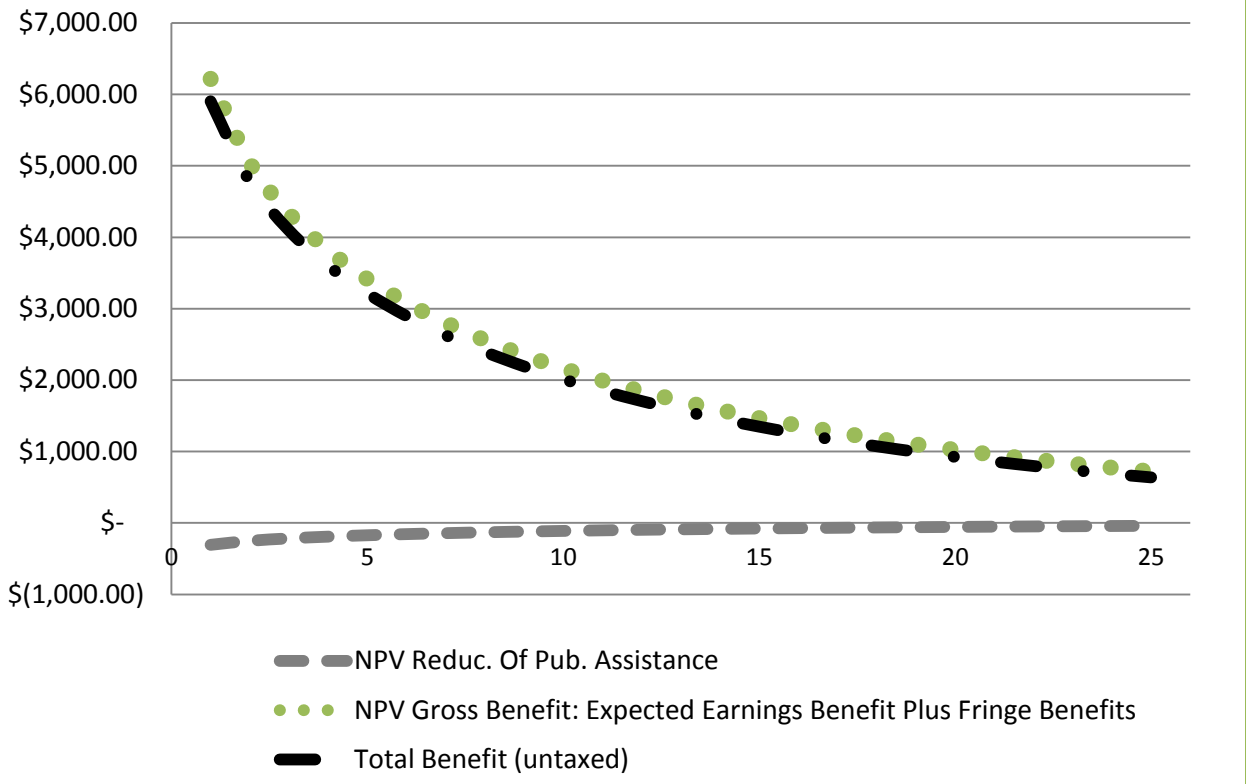
To calculate the long-term returns to program participation, we estimated the equation of a line forced through two-points: estimated regression-corrected earnings after one and three years. Following literature from the vocational rehabilitation and education fields, we chose to use a logarithmic functional form for the line (this accounts for the bow). If we assume a retirement age of 65, the mean time to retirement for program participants is 24.69 years, which we rounded up to 25. We then used the estimated line function to estimate the total benefit of program participation for the next 25 years.

Other vocational rehabilitation studies estimate a line that increases between years one and three, and continues to have a slight upward trend until retirement. Returns to education, a related field of study, normally shows a persistent positive, increasing return to educational attainment. The drop-off in program effect that we observe runs counter to expectation, but we are confident that the method we used to estimate these returns is superior to past methods. This report uses regression-controlled estimates for the long-term projections, as opposed to other studies which use simple means to calculate long-term benefit curves. While we are confident that there is a drop-off in program effectiveness between the first and third year, it is possible that this plateaus at some point in the future. We consulted educational returns literature (particularly related to technical training and community colleges) to find guidance for the placement of leveling-off points. We were unable to find corresponding, relevant research. If we were to project the data out, and alter the downward trajectory, we would just be guessing about the appropriate way to do it.

Table 12 shows the net present value of the projected lifetime earnings impact of program participation plus the estimated fringe benefits associated with employment. The Bureau of Labor Statistics National Compensation Survey finds an average fringe benefit of 29.6% of salary in the Western U.S. We chose to use a discount rate of 3%, which is consistent with other vocational rehabilitation studies[12]. The regression estimates give us the additional earnings of the program group relative to the control group. Because of this, the horizontal axis in Figure 2 does not represent zero earnings, but instead, the projected earnings of the control group. The program group does not experience falling earnings. The downward movement of the line represents the convergence between the two groups.

[12] This discount rate represents the degree of preference for current consumption. If we raised the discount rate, it would mean the theoretical person has a stronger preference for current spending.

Figure 2: Lifetime Benefits



The impact on net present value of program participation on public assistance is also included in Figure 2. These estimates were calculated with the same model specification as the earnings estimates. Program participation reduces public assistance received. This is good for the greater public and the individual's increase in earnings far outweighs the loss of public assistance, but in the lifetime benefits calculation, this loss of assistance is counted as a decrease in benefits. The middle line (net present value of gross benefits) is the increase in earnings and fringe benefits for program participants, minus their public assistance losses.

Next, taxes were calculated in order to estimate a further reduction in benefit to participants as well as the additional benefit to taxpayers (government). Contributions to Social Security and Medicare were calculated as 7.65% of wages and the effective Federal Income tax rate was 15%.[13] For the effective Oregon Income tax rate, we used 4.4% of wages.[14] These rates were applied to forecasted earnings. Finally, the foregone earnings due to program participation were calculated based on mean time in

[13] We used the Tax Policy Center's estimation of historic effective tax rates. We know that many program participants are on the lower end of income distribution, we used 15% , which is above the low-income effective rates but still below the total mean rate. Last accessed April 2, 2013: http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=456

[14] For the effective Oregon tax rate, we performed a similar calculation. The mean effective tax rate was 5.6% in 2010. We used a slightly lower rate in recognition of the lower incomes of program participants. Last accessed April 2, 2013: http://www.oregon.gov/dor/forms/personal/or-personal-income-tax-2010-statistics_101-406_2012.pdf

program and mean wages of participants. These foregone earnings are subtracted from the lifetime benefit of participants and the tax revenue associated with these foregone earnings is subtracted from taxpayer (government) benefit.

Table 12 summarizes the net lifetime benefits to participants and to taxpayers (government) associated with each program participant. Each step of the process is broken out into participant and government benefits.

Table 12: Lifetime Benefit Breakdown

Benefit/Cost Per Person	Time Period and Perspectives			
	First ten years		Lifetime (until 65)	
	Participant	Government	Participant	Government
Estimated Benefit	$27,609.74	$-	$42,040.87	$-
Fringe Benefit	$8,172.48	$-	$12,444.10	$-
Subtotal: Estimated + Fringe	$35,782.23	$-	$54,484.97	$-
Taxes	$(9,679.09)	$9,679.09	$(14,738.18)	$14,738.18
Reduction in Public Assistance	$(1,795.31)	$1,795.31	$(2,786.98)	$2,786.98
Subtotal: Taxes + reduction in public assistance	$(11,474.41)	$11,474.41	$(17,525.17)	$17,525.17
Foregone earnings and loss of fringe benefits of foregone earnings	$(8,180.35)	$-	$(8,180.35)	$-
Loss of taxes associated with foregone earnings	$-	$(2,212.79)	$-	$(2,212.79)
Subtotal: Foregone earnings and associated loss of benefits/taxes	$(8,180.35)	$(2,212.79)	$(8,180.35)	$(2,212.79)
Program cost	$-	$(3,231.35)	$-	$(3,231.35)
Subtotal: Program Cost	$-	$(3,231.35)	$-	$(3,231.35)
Total (Benefits – Costs)	**$16,127.47**	**$6,030.27**	**$28,779.45**	**$12,081.03**

The net present value of additional lifetime earnings due to program participation is $28,779 for each participating individual. The net present value of the tax revenue associated with these additional wages and reduction in public assistance is $12,081.

Overall Returns to Individuals

Table 12 (above) broke down the benefits of program participation to the level of the individual. By multiplying the return to program participation by the number of participants (8,773) during the study period, we arrive at the total benefit to individuals.

Total NPV Net Benefit to all Program Participants: $252,482,148

The total costs associated with every member of the program and control groups were included in our dataset. These costs include the total purchase of program services, administrative support, and total employee compensation. The costs for both groups are included because staff and support time will always be devoted to potential participants that never receive services.

Ratio of total NPV of net benefit to all program participants to total program cost: 5.2 to 1.

Total Program Cost: $48,415,317

Other studies show a much higher return to investment for individuals, but as explained above, their methods differ from those used in this study and most likely overestimate the impact of their programs.

The State of Oregon is reimbursed 78.2% of program costs by the Federal government for the VR program. As a result, the state's share of total program costs is 21.8%, or $10,554,539. When we compare the benefit of Oregon participants to the state's share of program costs, we get: 24:1

Ratio of total NPV net benefit to all program participants to Oregon's share of program cost: 24 to 1.

Overall Returns to Taxpayers (Government)

As we explained above, the state's share of total program costs for this period was $10,554,539. Using the lifetime benefit of program participation and applying the effective personal income tax rate to those earnings, we can calculate Oregon's ratio of new tax revenue to program costs. For every dollar that the state spends, it can expect to see $4.30 in state income tax revenues.

Ratio of additional income tax revenue to Oregon's share of program cost: 4.3 to 1.

Returns to Counselors

Vocational Rehabilitation program costs are split between purchasing services for participants, and employing the counselors and administrative staff that run the programs. These counselors interview potential participants, and once eligibility is established, design the participants' programs. If Vocational Rehabilitation services are expanded, it is important to understand the effect of adding an additional counselor.

In fiscal year 2012, the mean compensation (salary and benefits) for a counselor was $77,602. We also include the mean purchase of service budget for each counselor as a cost. The average number of annual successful rehabilitations for a counselor is 17.87, and each in-plan participant receives an average of $3,068 in services. When we apply the estimated earnings impact of program participation to a counselor's successful participants, the total increase in net present value of lifetime earnings expected annually from employing one additional counselor is $514,288. From the perspective of the taxpayer (government), the net present value of the taxpayer benefit (including taxes and reduction is public assistance) is $313,175.

For every dollar spent on an additional counselor, the government should expect to see $10.80 in benefits based on decreases in public assistance and increases in tax revenue from participant earnings.

Ratio of government benefit from one additional counselor to Oregon's share of cost: 10.8 to 1.

Program Activity Impacts

When conducting economic impact studies, it is important to differentiate between new economic activity, and economic activity that may just be replacing already existing activity. If activity is just moving from one industry to another, then no actual growth has been created. Because VR participants are out of the labor force, it is reasonable to think that without intervention, these people would remain discouraged workers. Without intervention, some of them would eventually return to the labor force and at least some level of employment, but we are considering the economic activity represented by their post-program activity to be new.

Additionally, there is activity associated with the implementation of the program. Without this program, it is likely that Oregon's share of program costs would be spent on other public programs, but the reimbursement from the federal government represents spending that would not occur otherwise. These federal dollars motivate new economic activity, which has additional positive benefits to the Oregon economy. In order to estimate the full impact of these federal funds brought by VR activity on the Oregon economy, we used IMPLAN, an input-output software recognized as an industry standard.

IMPLAN models are constructed using Social Accounting Matrices (SAM) based on spending and purchasing data from the Bureau of Economic Analysis (BEA) supplemented by data from other publicly available sources. SAMs are constructed to reflect the actual industry interactions in a region, and include government activities that are not traditionally reflected in this type of economic analysis.

SAMs create a map showing how money and resources flow through the economy. In a simulation, new economic activity is assumed to occur in an industry or group of industries. Based on past spending and purchasing activity, IMPLAN simulates the purchasing and spending necessary for this new economic activity to occur. IMPLAN tracks this new economic activity as it works its

IMPLAN Impacts

The impact summary results are given in terms of employment, labor income, total value added, and output:

Employment represents the number of annual, 1.0 FTE jobs. These job estimates are derived from industry wage averages.

Labor Income is made up of total employee compensation (wages and benefits) as well as proprietor income. Proprietor income is profits earned by self-employed individuals.

Total Value Added is made up of labor income, property type income, and indirect business taxes collected on behalf of local government. This measure is comparable to familiar net measurements of output like gross domestic product.

Output is a gross measure of production. It includes the value of both intermediate and final goods. Because of this, some double counting will occur. Output is presented as a gross measure because IMPLAN is capable of analyzing custom economic zones. Producers may be creating goods that would be considered intermediate from the perspective of the greater national economy, but may leave the custom economic zone, making them a local final good.

way through the economy. Also included in SAMs are household and government behavior. In addition to following purchasing and spending through the private sector, IMPLAN also estimates the impact of changes in disposable income and tax revenue.

A production function is constructed for each industry, reflecting its connections to other industries. Economic changes or events are propagated through this process as new economic activity motivates additional economic activity in other parts of the supply chain, and through changes in spending habits.

IMPLAN breaks out analysis results into three types: direct, indirect, and induced.

- **Direct Impacts**: These are defined by the modeler, and placed in the appropriate industry. They are not subject to multipliers. In this case, purchasing, employment, and wage data were collected from the sources described above and placed into the appropriate industry.

- **Indirect Impacts**: These impacts are estimated based on national purchasing and sales data that model the interactions between industries. This category reflects the economic activity necessary to support the new economic activity in the direct impacts by other firms in the supply chain.

- **Induced Impacts**: These impacts are created by the change in wages and employee compensation. Employees change purchasing decisions based on changes in income and wealth.

To estimate the total economic impacts of the Ticket to Work expenditures, we worked with VR staff to develop a list of all expenditures during the 2006-2008 period of the study in order to target the impacts in the modeling process. The additional benefit generated by increased economic activity varies by industry making it important to be as specific as possible when modeling. Vendors providing services are tracked, and associated with a NAICS code. These NAICS codes were converted to IMPLAN industry codes. Within IMPLAN the direct effect of the program is defined using this information, and the total effect is estimated by running scenarios with the IMPLAN model. Table 13 shows the total impacts of program purchase of services.

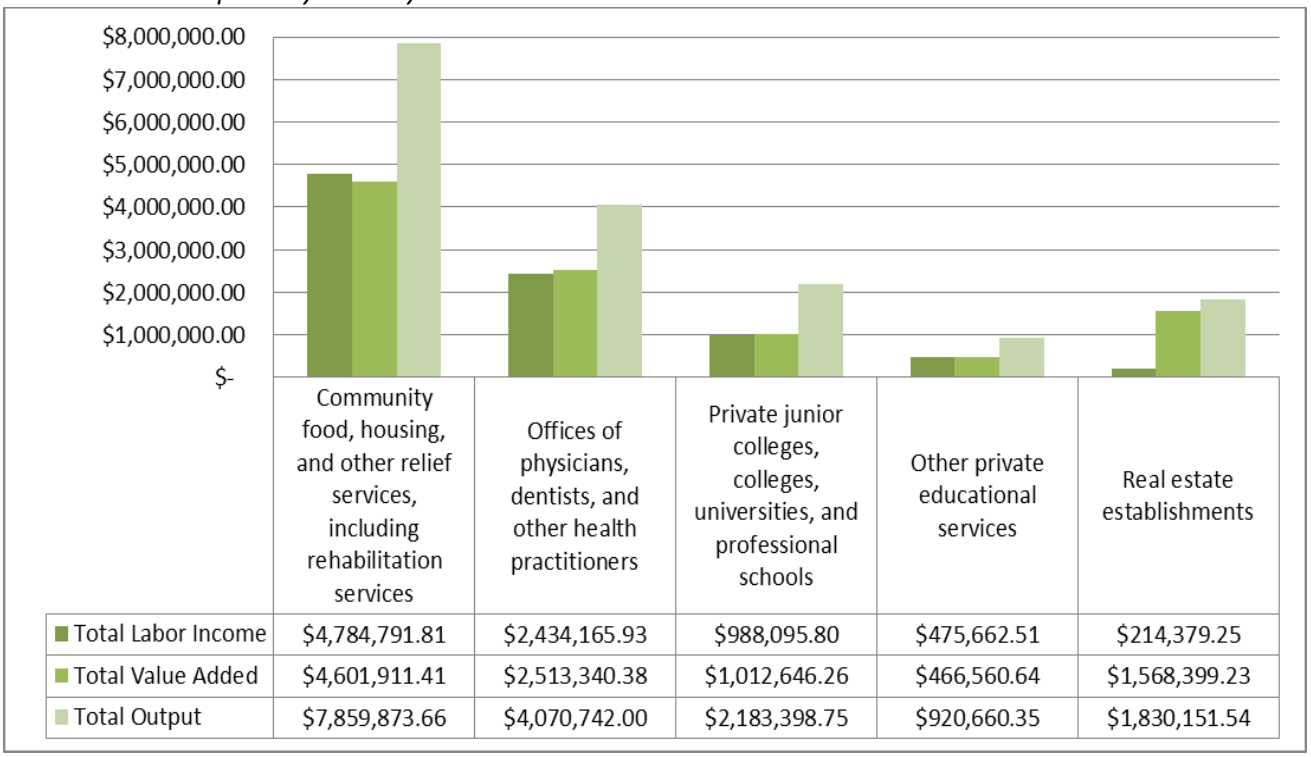
Table 13: Economic Impact Results

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	292	$9,929,909	$9,767,391	$16,267,067
Indirect Effect	49	$1,938,964	$3,586,030	$5,806,521
Induced Effect	99	$3,825,790	$6,883,557	$11,180,790
Total Effect	441	$15,694,664	$20,236,979	$33,254,379

It is important to note that these are annual employment numbers. Because this data is from a three-year period, the 441 total jobs could be thought of as 441 people who were each employed for one year, or 147 people who were employed for three years. This activity supports 147 jobs annually. This is in addition to the 200+ people employed directly by VR.

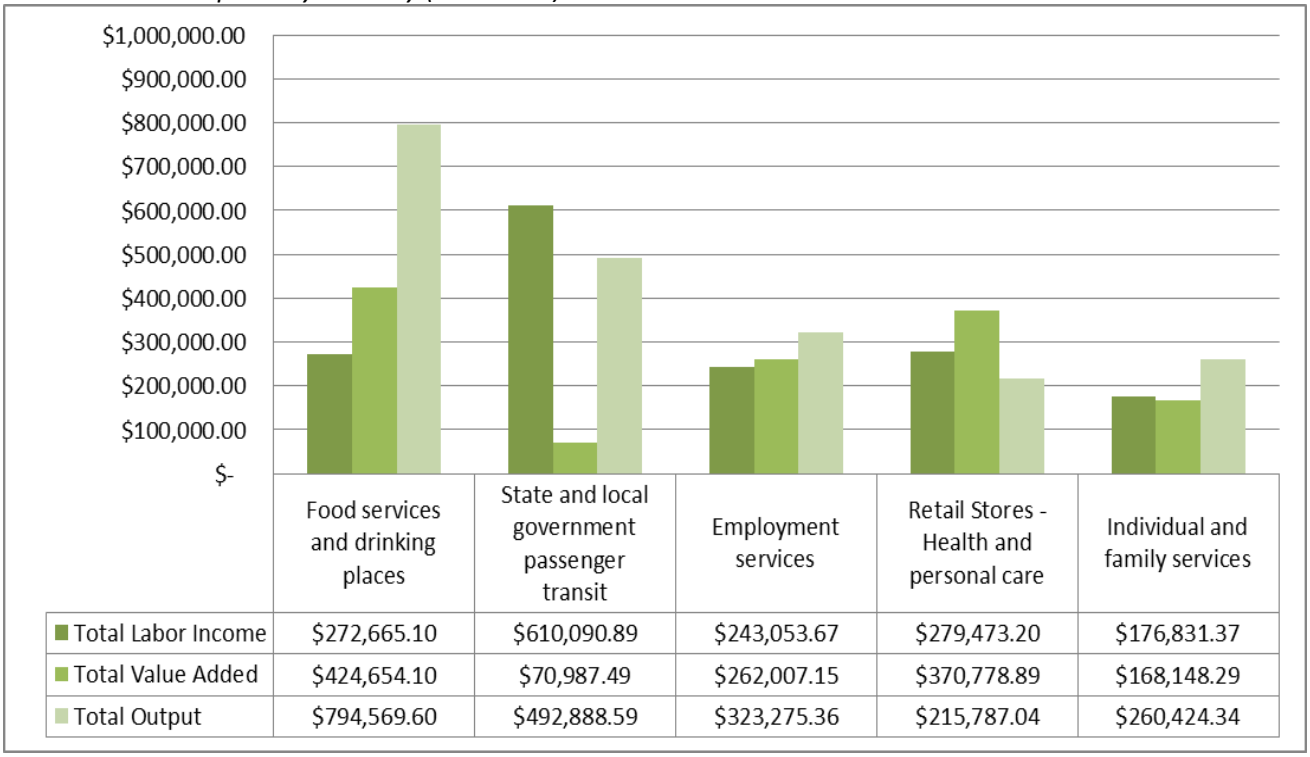
Table 14 shows these total economic impacts broken out by industry.

Table 14: Total Impacts by Industry



	Community food, housing, and other relief services, including rehabilitation services	Offices of physicians, dentists, and other health practitioners	Private junior colleges, colleges, universities, and professional schools	Other private educational services	Real estate establishments
Total Labor Income	$4,784,791.81	$2,434,165.93	$988,095.80	$475,662.51	$214,379.25
Total Value Added	$4,601,911.41	$2,513,340.38	$1,012,646.26	$466,560.64	$1,568,399.23
Total Output	$7,859,873.66	$4,070,742.00	$2,183,398.75	$920,660.35	$1,830,151.54

Table 14: Total Impacts by Industry (continued)



	Food services and drinking places	State and local government passenger transit	Employment services	Retail Stores - Health and personal care	Individual and family services
Total Labor Income	$272,665.10	$610,090.89	$243,053.67	$279,473.20	$176,831.37
Total Value Added	$424,654.10	$70,987.49	$262,007.15	$370,778.89	$168,148.29
Total Output	$794,569.60	$492,888.59	$323,275.36	$215,787.04	$260,424.34

Further Research

There are several aspects of the VR process that would be helpful to know more about. Given the scope of this project and the available data, we were unable to analyze these issues, but future versions of this study should make an effort to incorporate:

- **Drop-off in Program Effect:** While we are confident that our results showing a drop-off in program effect over time are accurate, we do not have an explanation for this. More research should be done to investigate the causes of this effect.

- **Longer Timelines:** As noted in the study, we observe a decrease in the benefits of the program over time. We modeled this trend as continuing to retirement age, but it is possible that after some number of years, the benefits plateau. It would be helpful to have data on these same participants five or ten years after program completion.

- **Employment Sector:** While we know about the earnings and hours worked of the sample population, the data on sector of employment was incomplete. It would be helpful to know common industries of employment. This could help the counselors to design training programs tailored to particular industries. Although the overall county employment rates were included in the analysis, it is possible that variations in unemployment between sectors could account for of the decrease in program effect over time.

- **Hourly Wages:** We were given data on reported wages, but there were too many missing entries meaning it could not be incorporated into the regression analysis. We also tried to calculate an effective wage based on earnings and hours, but this calculation was also problematic. It would be helpful to know more about the hourly wages of program participants.

Conclusion

The results of this study show that the services provided by VR are an effective way to return people with disabilities to the labor force, and increase their lifetime earnings. The benefits accrued by program participants outweigh the costs of the program. From the state's perspective, the increase in tax revenues and decrease in public assistance payments are greater than the program's cost.

Because the program assists people in re-entering the work force, and draws in federal dollars which are immediately spent, most of the economic activity associated with this program would not otherwise occur. These gains are not the result of encouraging substitution away from other industries or other state priorities.

Currently, VR does little promotion and relies on word-of-mouth to advertise services. The success of the program makes it an obvious candidate for expansion. Table 15 uses data from the 2009 American Community Survey to identify possible areas of expansion.

Table 15: Possible Expansion

Variable	Unemployed due to disability	People with daily activity limits
Number of people	26,000	6,000
Percent of cases closed as rehabilitation (entire sample)	13%	
Potential additional cases closed as rehabilitation	3380	780
Cost of additional closures	$(11,214,983.47)	$(2,588,073.11)
Estimated benefit for all additional participants	$99,884,289.41	$23,050,220.63
Estimated lifetime benefit minus cost of additional closures	$88,669,305.94	$20,462,147.53

The ACS identifies 514,000 (14.3% of population) Oregonians with disabilities. Disability is broadly defined, and many of these people have no need for, or would not benefit from, vocational rehabilitation services. Digging deeper into the data, we identify two groups that would benefit from program expansion. In 2009, there were 26,000 people classified as unemployed due to a disability and 6,000 people with a daily activity limitation who were unemployed.

The success of the program, combined with the unmet need for these types of rehabilitation services, make program expansion a smart option, particularly if Oregon continues to pay only 21.8% of costs. Emphasis should be placed on quickly identifying participant needs, providing them the appropriate services, and moving them toward closure.

Appendix A: Regression Methodology

A potentially limiting factor in the analysis is the way data is exported from different databases in different public agencies. Demographic data tends to have a unique identifier (in this case a number assigned to each participant) and personal information for each participant sorted into one row. Earnings information can be exported with the same unique identifier, but earnings are split out into quarters. Earnings information is also only available for quarters with positive earnings. If there were no earnings in a particular quarter, this is only obvious by observing the gap in quarters. Each participant will have multiple lines of data, each corresponding to one time period. This mismatch between data reporting methods makes it difficult to combine datasets in order to use a regression model specification that incorporates earnings information and demographic factors. To get around this, we used a combination of R and Excel, to "flatten" the earnings panel data, and eliminate the time inconsistency created by various program exit periods.

The first step in formatting the data was to combine earnings from multiple jobs by quarter for each person. Then, a value was created that measured the number of quarters between file closure and the first quarter of positive earnings. A script was written in R that created one entry for each person, followed by zeros corresponding to the number of quarters post-closure without earnings. The post-closure earnings were then added to the end of each entry. This left us with one row for each person that included their earnings history for the three years after closure. This same process was repeated for pre-application earnings, and pre- and post-program public assistance. The demographic data for each person was merged with this new data set using the unique identifier, leaving us with one master dataset that combined earnings and demographic factors in one unique record for each person. This required us to correct for inflation and include control variables for year-of-exit in the regression in order to capture changes in general economic conditions. We were left with a master data set that included one row for each individual in the sample that included all of their demographic information as well as pre- and post- program employment and public assistance information.

Appendix B: Data Definitions

Table 16: Variable Definitions

Variable	Definition
binaryplan	Member of program group (binary)
male_binary	Male (binary)
v134	Unemployment rate in county where services were received
program_time	Time between eligibility and closure
totalpos	Total purchase of services in dollars
college	Attended some college (binary)
remedial	Service- Remediation (binary)
diagnosis	Service- Diagnosis (binary)
disability~d	Service- Disability Related (binary)
inforegerral	Service- Information and Referral (binary)
interprete~s	Service- Interpreter (binary)
jobcoaching	Service- Job Coaching (binary)
jobdevpt	Service- Job Development (binary)
jobplacement	Service- Job Placement (binary)
jobplaceme~e	Service- Job Placement Assistance (binary)
jobprep	Service- Job Preparation (binary)
jobreadiness	Service- Job Readiness (binary)
jobretention	Service- Job Retention (binary)
jobsearcha~e	Service- Job Search (binary)
maintenance	Service- Maintenance (binary)
misctraining	Service- Miscellaneous Training (binary)
voctraining	Service- Vocational Training (binary)
supports	Service- Supports (binary)
otherservi~s	Service- Other Services (binary)
personalse~s	Service- Personal Services (binary)
readerserv~s	Service- Reader Services (binary)
rehabtech	Service- Rehabilitation Technology (binary)
techassist~e	Service- Technical Assistance (binary)
transporta~n	Service- Transportation (binary)
counseling	Service- Counseling (binary)
blacks	Participant is black (binary)
whites	Participant is white (binary)
hispanics	Participant is Hispanic (binary)

asians	Participant is Asian (binary)
married_bi~y	Participant is married or in legal union (binary)
bachelorsd~e	Participant earned bachelor's degree (binary)
highschool~y	High school graduate or equivalent (binary)
noformalsc~g	No formal school (binary)
aadegreeor~e	Associates degree or technical certification (binary)
program_time	
tanf	Received TANF at time of application (binary)
ssdi	Received SSDI at time of application (binary)
ssi	Received SSI at time of application (binary)
ageeligibi~y	Age when deemed eligible for services
significan~3	Significantly Disabled (binary)
disabledpr~4	Disabled- Priority 4 (binary)
mostsignif~t	Most Significantly Disabled- Priority 2 (binary)
v203	Most Significantly Disabled- Priority 1 (binary)
yr2006	Closed in 2006 (binary)
yr2007	Closed in 2007 (binary)
yr2008	Closed in 2008 (binary)
_cons	Regression constant

Appendix C: Detailed Regression Results

Below are detailed regression results for selected regression specifications[15]. If we were to include all of the regression results, this appendix would run several times the length of the report itself. NERC has detailed regression results for:

- Effect on Earnings
- Effect on Hours
- *Difference in Difference*
  - Effect on Earnings
  - Effect on Hours
- Results for Subgroups
- Boosted Regression Results[16]

Those interested in results not shown here can contact the researchers at nerc@pdx.edu. We would be happy to answer questions or provide more results.

Final Regression Equation

$$\textit{Dependent Variable} = \beta_0 + \beta_1 * \textit{binaryplan} + \beta_2 * \textit{male_binary} + \beta_3 * \textit{unemployment rate} + \beta_4 * \textit{program_time} + \beta_5 * \textit{totalpos} + \beta_6 * \textit{college} + \beta_7 * \textit{remedial} + \beta_8 * \textit{diagnosis} + \beta_9 * \textit{disability\~d} + \beta_{10} * \textit{inforegerral} + \beta_{11} * \textit{interprete\~s} + \beta_{12} * \textit{jobcoaching} + \beta_{13} * \textit{jobdevpt} + \beta_{14} * \textit{jobplacement} + \beta_{15} * \textit{jobplaceme\~e} + \beta_{16} * \textit{jobprep} + \beta_{17} * \textit{jobreadiness} + \beta_{18} * \textit{jobretention} + \beta_{19} * \textit{jobsearcha\~e} + \beta_{20} * \textit{maintenance} + \beta_{21} * \textit{misctraining} + \beta_{22} * \textit{voctraining} + \beta_{23} * \textit{supports} + \beta_{24} * \textit{otherservi\~s} + \beta_{25} * \textit{personalse\~s} + \beta_{26} * \textit{readerserv\~s} + \beta_{27} * \textit{rehabtech} + \beta_{28} * \textit{techassist\~e} + \beta_{29} * \textit{transporta\~n} + \beta_{30} * \textit{counseling} + \beta_{31} * \textit{blacks} + \beta_{32} * \textit{whites} + \beta_{33} * \textit{hispanics} + \beta_{34} * \textit{asians} + \beta_{35} * \textit{married_bi\~y} + \beta_{36} * \textit{bachelorsd\~e} + \beta_{37} * \textit{highschool\~y} + \beta_{38} * \textit{noformalsc\~g} + \beta_{39} * \textit{aadegreeor\~e} + \beta_{40} * \textit{tanf} + \beta_{41} * \textit{ssdi} + \beta_{42} * \textit{ssi} + \beta_{43} * \textit{ageeligibi\~y} + \beta_{44} * \textit{significan\~3} + \beta_{45} * \textit{disabledpr\~4} + \beta_{46} * \textit{mostsignif\~t} + \beta_{47} * \textit{v203} + \beta_{48} * \textit{yr2006} + \beta_{49} * \textit{yr2007} + \beta_{50} * \textit{yr2008} + \varepsilon$$

[15] Throughout the results, some coefficient estimates are listed as "omitted." This means that there was a high degree of correlation between this variable and another independent variable. Because it is impossible to separate out the effects of two variables with such similar variance, the estimate for one variable encompasses the joint effect while the estimate for the other variable is omitted.

[16] Boosted regression output does not include standard errors and other traditional regression outputs. The output for the Stata boosted regression plugin gives percentage variation results and details of the boosted regression specification.

Table 17: One Quarter Post-Program Earnings Results

Variable	Coefficient	Standard Error	P-value
binaryplan	1352.648	69.81702	0.0000
male_binary	229.7642	46.62593	0.0000
unemployment rate	-57.0389	19.32121	0.0032
program_time	-92.8539	10.07518	0.0000
totalpos	0.064554	0.007887	0.0000
college	348.7544	93.19443	0.0002
remedial	-218.009	152.9462	0.1541
diagnosis	208.2557	57.72786	0.0003
disability~d	212.2329	157.8772	0.1789
inforegerral	191.7246	73.95499	0.0095
interprete~s	-313.599	141.5737	0.0268
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	46.73355	59.68686	0.4337
jobprep	(omitted)		
jobreadiness	-218.212	101.7111	0.0319
jobretention	(omitted)		
jobsearcha~e	-279.419	59.46535	0.0000
maintenance	-341.345	154.0749	0.0267
misctraining	280.5406	244.3986	0.2510
voctraining	-98.319	70.14283	0.1610
supports	-162.342	80.64821	0.0441
otherservi~s	-317.348	54.5832	0.0000
personalse~s	87.96975	434.8831	0.8397
readerserv~s	1622.291	2697.58	0.5476
rehabtech	942.7845	82.9154	0.0000
techassist~e	89.28221	129.2013	0.4896
transporta~n	(omitted)		
counseling	(omitted)		
blacks	55.67696	152.8657	0.7157
whites	265.8461	124.4272	0.0327
hispanics	-71.9439	100.9674	0.4761
asians	264.5085	218.0741	0.2252
married_bi~y	693.8299	58.68955	0.0000
bachelorsd~e	896.7134	97.62121	0.0000
highschool~y	37.122	49.69625	0.4551
noformalsc~g	-61.8986	461.0057	0.8932

Table 17: One Quarter Post-Program Earnings Results (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	370.8866	89.19423	0.0000
tanf	-337.833	96.82744	0.0005
ssdi	-819.717	62.13177	0.0000
ssi	-819.096	64.22939	0.0000
ageeligibi~y	-1.79544	1.925953	0.3512
significan~3	152.3426	128.3621	0.2353
disabledpr~4	251.7338	127.8766	0.0490
mostsignif~t	-496.954	105.4852	0.0000
v203	54.08232	113.9887	0.6352
yr2006	-37.3841	76.70664	0.6260
yr2007	53.66028	51.74169	0.2997
yr2008	(omitted)		
_cons	1535.005	249.3651	0.0000

Table 18: One Year Post-Program Earnings Results

Variable	Coefficient	Standard Error	P-value
binaryplan	4941.863	263.5569	0.0000
male_binary	708.9084	176.0113	0.0001
v134	-272.681	72.93691	0.0002
program_time	-328.091	38.03347	0.0000
totalpos	0.211244	0.029774	0.0000
college	1364.354	351.8058	0.0001
remedial	-989.154	577.3666	0.0867
diagnosis	647.4564	217.9207	0.0030
disability~d	1027.947	595.9809	0.0846
inforegerral	996.2622	279.1775	0.0004
interprete~s	-1102.77	534.4358	0.0391
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	153.5722	225.3158	0.4955
jobprep	(omitted)		
jobreadiness	-802.975	383.9559	0.0365
jobretention	(omitted)		
jobsearcha~e	-1175.39	224.4796	0.0000
maintenance	-952.9	581.6274	0.1014
misctraining	697.4833	922.5963	0.4497
voctraining	-400.112	264.7868	0.1308
supports	-649.125	304.4442	0.0330
otherservi~s	-1203.13	206.0497	0.0000
personalse~s	943.4836	1641.669	0.5655
readerserv~s	-1178.87	10183.27	0.9078
rehabtech	3491.279	313.0028	0.0000
techassist~e	442.711	487.7305	0.3641
transporta~n	(omitted)		
counseling	(omitted)		
blacks	15.24592	577.0627	0.9789
whites	1172.24	469.7083	0.0126
hispanics	-152.999	381.1486	0.6881
asians	1274.193	823.2223	0.1217
married_bi~y	2729.416	221.551	0.0000
bachelorsd~e	3329.493	368.5167	0.0000
highschool~y	206.5867	187.6016	0.2708
noformalsc~g	219.3161	1740.281	0.8997

Table 18: One Year Post-Program Earnings Results (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	1235.048	336.7052	0.0002
tanf	-1351.2	365.5203	0.0002
ssdi	-3376.27	234.5453	0.0000
ssi	-3255.47	242.4637	0.0000
ageeligibi~y	-8.2646	7.270407	0.2557
significan~3	506.2363	484.5626	0.2962
disabledpr~4	1318.253	482.7298	0.0063
mostsignif~t	-1825.3	398.203	0.0000
v203	237.8059	430.3032	0.5805
yr2006	-116.421	289.5649	0.6876
yr2007	425.2773	195.3231	0.0295
yr2008	(omitted)		
_cons	6359.934	941.3446	0.0000

Table 19: Third Year Post-Program Earnings Results (inflation corrected)

Variable	Coefficient	Standard Error	P-value
binaryplan	3652.782	262.395	0.0000
male_binary	150.5096	175.2354	0.3904
v134	-260.035	72.61538	0.0003
program_time	-126.547	37.86581	0.0008
totalpos	0.174953	0.029643	0.0000
college	1048.957	350.2549	0.0028
remedial	-643.184	574.8214	0.2632
diagnosis	311.4283	216.96	0.1512
disability~d	2004.895	593.3537	0.0007
inforegerral	471.8919	277.9468	0.0896
interprete~s	-876.292	532.0798	0.0996
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	-272.454	224.3226	0.2246
jobprep	(omitted)		
jobreadiness	-401.351	382.2633	0.2938
jobretention	(omitted)		
jobsearcha~e	-1038.38	223.4901	0.0000
maintenance	-945.669	579.0634	0.1025
misctraining	801.9427	918.5292	0.3826
voctraining	-272.951	263.6195	0.3005
supports	-926.257	303.1021	0.0022
otherservi~s	-1139.26	205.1413	0.0000
personalse~s	557.4068	1634.432	0.7331
readerserv~s	-8404.91	10138.38	0.4071
rehabtech	2685.143	311.623	0.0000
techassist~e	-228.896	485.5804	0.6374
transporta~n	(omitted)		
counseling	(omitted)		
blacks	-594.363	574.5188	0.3009
whites	590.1843	467.6377	0.2070
hispanics	-33.5601	379.4684	0.9295
asians	1355.904	819.5932	0.0981
married_bi~y	2188.388	220.5744	0.0000
bachelorsd~e	2412.245	366.8922	0.0000
highschool~y	-110.696	186.7746	0.5534
noformalsc~g	1997.344	1732.609	0.2490

Table 19: Third Year Post-Program Earnings Results (inflation corrected) (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	527.4581	335.2209	0.1156
tanf	-1085.3	363.9089	0.0029
ssdi	-2803.07	233.5114	0.0000
ssi	-2753.61	241.3949	0.0000
ageeligibi~y	-33.5787	7.238357	0.0000
significan~3	1034.023	482.4265	0.0321
disabledpr~4	1626.308	480.6018	0.0007
mostsignif~t	-1044.97	396.4476	0.0084
v203	637.1214	428.4063	0.1370
yr2006	71.99779	288.2884	0.8028
yr2007	366.6797	194.462	0.0594
yr2008	(omitted)		
_cons	6671.634	937.1949	0.0000

Table 20: Total Post-Program Earnings Results (inflation corrected)

Variable	Coefficient	Standard Error	P-value
binaryplan	12696.77	733.235	0.0000
male_binary	1096.84	489.6767	0.0251
v134	-808.245	202.916	0.0001
program_time	-663.108	105.812	0.0000
totalpos	0.567404	0.082833	0.0000
college	3621.063	978.7501	0.0002
remedial	-2774.3	1606.277	0.0842
diagnosis	1278.498	606.2717	0.0350
disability~d	5286.497	1658.064	0.0014
inforegerral	2207.967	776.6929	0.0045
interprete~s	-3189.62	1486.841	0.0320
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	-183.202	626.8456	0.7701
jobprep	(omitted)		
jobreadiness	-1566.12	1068.194	0.1426
jobretention	(omitted)		
jobsearcha~e	-3319.13	624.5192	0.0000
maintenance	-2813.47	1618.131	0.0821
misctraining	1804.642	2566.732	0.4820
voctraining	-1247.24	736.6567	0.0905
supports	-2431.08	846.9867	0.0041
otherservi~s	-3387.14	573.2457	0.0000
personalse~s	2244.501	4567.246	0.6231
readerserv~s	-18724	28330.63	0.5087
rehabtech	9352.181	870.7972	0.0000
techassist~e	93.20076	1356.903	0.9452
transporta~n	(omitted)		
counseling	(omitted)		
blacks	-1083.85	1605.432	0.4996
whites	2558.125	1306.764	0.0503
hispanics	-165.891	1060.384	0.8757
asians	4249.628	2290.266	0.0635
married_bi~y	7487.214	616.3716	0.0000
bachelorsd~e	8601.222	1025.241	0.0000
highschool~y	194.8208	521.9218	0.7089
noformalsc~g	3368.091	4841.592	0.4867

Table 20: Total Post-Program Earnings Results (inflation corrected) (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	2896.255	936.7391	0.0020
tanf	-3538.82	1016.905	0.0005
ssdi	-9305.17	652.5227	0.0000
ssi	-8939.95	674.5524	0.0000
ageeligibi~y	-61.5916	20.22682	0.0023
significan~3	1944.686	1348.09	0.1492
disabledpr~4	4347.168	1342.991	0.0012
mostsignif~t	-4293.06	1107.831	0.0001
v203	1210.653	1197.136	0.3119
yr2006	-13.247	805.5914	0.9869
yr2007	1269.314	543.4035	0.0195
yr2008	(omitted)		
_cons	19654.66	2618.892	0.0000

Table 21: One Quarter Post-Program Hours Results

Variable	Coefficient	Standard Error	P-value
binaryplan	65.2598	4.7128	0.0000
male_binary	0.43837	3.1474	0.8892
v134	0.698216	1.3042	0.5924
program_time	-3.78377	0.6801	0.0000
totalpos	0.001809	0.0005	0.0007
college	7.680648	6.2908	0.2221
remedial	11.33719	10.3242	0.2722
diagnosis	0.530401	3.8968	0.8917
disability~d	6.451514	10.6571	0.5449
inforegerral	1.442858	4.9921	0.7726
interprete~s	-16.1212	9.5565	0.0916
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	15.844	4.0290	0.0001
jobprep	(omitted)		
jobreadiness	-13.6381	6.8657	0.0470
jobretention	(omitted)		
jobsearcha~e	5.89663	4.0140	0.1419
maintenance	-8.92693	10.4004	0.3907
misctraining	17.32092	16.4974	0.2938
voctraining	3.53344	4.7348	0.4555
supports	34.02891	5.4439	0.0000
otherservi~s	-4.61364	3.6845	0.2105
personalse~s	-33.7123	29.3556	0.2508
readerserv~s	281.5992	182.0925	0.1220
rehabtech	14.26991	5.5970	0.0108
techassist~e	-6.70998	8.7214	0.4417
transporta~n	(omitted)		
counseling	(omitted)		
blacks	-7.72826	10.3188	0.4539
whites	-0.63938	8.3991	0.9393
hispanics	-5.73897	6.8155	0.3998
asians	9.951503	14.7205	0.4990
married_bi~y	13.28582	3.9617	0.0008
bachelorsd~e	15.9064	6.5896	0.0158
highschool~y	3.991627	3.3546	0.2341
noformalsc~g	-15.5368	31.1189	0.6176

Table 21: One Quarter Post-Program Hours Results (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	3.915352	6.0208	0.5155
tanf	-17.4841	6.5361	0.0075
ssdi	-25.1348	4.1940	0.0000
ssi	-34.9448	4.3356	0.0000
ageeligibi~y	-0.70595	0.1300	0.0000
significan~3	11.24899	8.6647	0.1942
disabledpr~4	6.388071	8.6319	0.4593
mostsignif~t	-10.295	7.1205	0.1482
v203	9.871288	7.6945	0.1995
yr2006	5.514919	5.1779	0.2869
yr2007	7.550893	3.4927	0.0306
yr2008	(omitted)		
_cons	105.5345	16.8327	0.0000

Table 22: One Year Post-Program Hours Results

Variable	Coefficient	Standard Error	P-value
binaryplan	176.4529	13.4217	0.0000
male_binary	0.518865	8.9634	0.9538
v134	-0.64891	3.7143	0.8613
program_time	-9.51583	1.9369	0.0000
totalpos	0.004208	0.0015	0.0055
college	16.42634	17.9158	0.3592
remedial	23.54812	29.4025	0.4232
diagnosis	14.97574	11.0976	0.1772
disability~d	8.940796	30.3504	0.7683
inforegerral	8.302874	14.2172	0.5592
interprete~s	-38.1006	27.2162	0.1616
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	42.02969	11.4742	0.0003
jobprep	(omitted)		
jobreadiness	-26.1162	19.5530	0.1817
jobretention	(omitted)		
jobsearcha~e	16.90301	11.4317	0.1393
maintenance	-14.4045	29.6195	0.6267
misctraining	51.6211	46.9834	0.2719
voctraining	7.329031	13.4843	0.5868
supports	85.74849	15.5039	0.0000
otherservi~s	-14.93	10.4931	0.1548
personalse~s	-39.0257	83.6022	0.6406
readerserv~s	283.0883	518.5846	0.5852
rehabtech	41.21136	15.9397	0.0097
techassist~e	-21.0107	24.8377	0.3976
transporta~n	(omitted)		
counseling	(omitted)		
blacks	-34.7854	29.3870	0.2366
whites	-8.84737	23.9200	0.7115
hispanics	-16.0019	19.4100	0.4097
asians	13.90525	41.9227	0.7401
married_bi~y	30.54588	11.2825	0.0068
bachelorsd~e	49.59994	18.7668	0.0082
highschool~y	12.55804	9.5536	0.1887
noformalsc~g	-62.0674	88.6240	0.4837

Table 22: One Year Post-Program Hours Results (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	17.23494	17.1468	0.3148
tanf	-46.1732	18.6142	0.0131
ssdi	-78.1053	11.9443	0.0000
ssi	-112.877	12.3475	0.0000
ageeligibi~y	-2.60781	0.3702	0.0000
significan~3	61.02389	24.6764	0.0134
disabledpr~4	45.80081	24.5831	0.0625
mostsignif~t	-17.9499	20.2785	0.3761
v203	39.36787	21.9133	0.0724
yr2006	13.54757	14.7461	0.3583
yr2007	23.4788	9.9469	0.0183
yr2008	(omitted)		
_cons	373.244	47.9381	0.0000

Table 23: Third Year Post-Program Hours Results

Variable	Coefficient	Standard Error	P-value
binaryplan	99.39413	16.8227	0.0000
male_binary	-13.3605	11.2347	0.2344
v134	-4.99213	4.6555	0.2836
program_time	0.068293	2.4277	0.9776
totalpos	0.003074	0.0019	0.1058
college	6.915788	22.4556	0.7581
remedial	46.49605	36.8531	0.2071
diagnosis	29.13008	13.9098	0.0363
disability~d	-68.77	38.0412	0.0707
inforegerral	9.099127	17.8198	0.6096
interprete~s	7.687865	34.1128	0.8217
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	22.43093	14.3818	0.1189
jobprep	(omitted)		
jobreadiness	-14.4224	24.5077	0.5562
jobretention	(omitted)		
jobsearcha~e	15.98301	14.3284	0.2647
maintenance	36.95705	37.1250	0.3195
misctraining	-15.716	58.8889	0.7896
voctraining	0.374937	16.9012	0.9823
supports	56.73719	19.4325	0.0035
otherservi~s	-10.1087	13.1521	0.4421
personalse~s	55.50681	104.7870	0.5963
readerserv~s	-464.571	649.9937	0.4748
rehabtech	5.582277	19.9788	0.7799
techassist~e	0.017241	31.1316	0.9996
transporta~n	(omitted)		
counseling	(omitted)		
blacks	-47.9854	36.8337	0.1927
whites	-6.57375	29.9813	0.8264
hispanics	4.62744	24.3285	0.8492
asians	8.218353	52.5459	0.8757
married_bi~y	18.57488	14.1415	0.1890
bachelorsd~e	48.94144	23.5223	0.0375
highschool~y	7.733233	11.9745	0.5184
noformalsc~g	33.11197	111.0813	0.7656

Table 23: Third Year Post-Program Hours Results (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	25.28489	21.4917	0.2394
tanf	-35.537	23.3310	0.1277
ssdi	-64.2454	14.9709	0.0000
ssi	-96.5151	15.4764	0.0000
ageeligibi~y	-3.35228	0.4641	0.0000
significan~3	78.68176	30.9294	0.0110
disabledpr~4	48.35803	30.8124	0.1166
mostsignif~t	-10.6984	25.4171	0.6738
v203	50.84304	27.4661	0.0642
yr2006	13.50484	18.4828	0.4650
yr2007	14.6806	12.4674	0.2390
yr2008	(omitted)		
_cons	445.3642	60.0856	0.0000

Table 24: Total Post-Program Hours Results

Variable	Coefficient	Standard Error	P-value
binaryplan	416.1397	42.6460	0.0000
male_binary	-21.4278	28.4803	0.4518
v134	-10.3632	11.8019	0.3799
program_time	-12.5087	6.1542	0.0421
totalpos	0.012108	0.0048	0.0120
college	6.254485	56.9254	0.9125
remedial	72.02486	93.4233	0.4407
diagnosis	45.30569	35.2616	0.1989
disability~d	-54.2349	96.4353	0.5739
inforegerral	51.5816	45.1735	0.2535
interprete~s	-35.3666	86.4767	0.6826
jobcoaching	(omitted)		
jobdevpt	(omitted)		
jobplacement	(omitted)		
jobplaceme~e	105.3777	36.4582	0.0039
jobprep	(omitted)		
jobreadiness	-54.0457	62.1276	0.3844
jobretention	(omitted)		
jobsearcha~e	49.89914	36.3229	0.1695
maintenance	54.70918	94.1127	0.5610
misctraining	-16.8517	149.2847	0.9101
voctraining	1.240163	42.8450	0.9769
supports	215.0268	49.2619	0.0000
otherservi~s	-25.515	33.3408	0.4441
personalse~s	13.50516	265.6373	0.9595
readerserv~s	-743.306	1647.7481	0.6519
rehabtech	92.56645	50.6468	0.0676
techassist~e	-36.876	78.9193	0.6403
transporta~n	(omitted)		
counseling	(omitted)		
blacks	-124.513	93.3741	0.1824
whites	-36.655	76.0032	0.6296
hispanics	-7.23944	61.6734	0.9066
asians	-4.5773	133.2050	0.9726
married_bi~y	71.13369	35.8490	0.0472
bachelorsd~e	168.1314	59.6294	0.0048
highschool~y	37.31565	30.3557	0.2190
noformalsc~g	-76.1458	281.5936	0.7868

Table 24: Total Post-Program Hours Results (Continued)

Variable	Coefficient	Standard Error	P-value
aadegreeor~e	56.75659	54.4820	0.2975
tanf	-111.754	59.1446	0.0588
ssdi	-234.695	37.9516	0.0000
ssi	-347.825	39.2329	0.0000
ageeligibi~y	-10.044	1.1764	0.0000
significan~3	199.3473	78.4067	0.0110
disabledpr~4	140.2563	78.1102	0.0726
mostsignif~t	-65.9824	64.4329	0.3058
v203	128.4292	69.6271	0.0651
yr2006	29.55287	46.8543	0.5282
yr2007	45.25489	31.6051	0.1522
yr2008	(omitted)		
_cons	1377.894	152.3183	0.0000