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ABSTRACT

Under more and more fiscal scrutiny because of shrinking state and local budgets, workforce development programs are being asked to estimate their return on investment (ROI). This paper introduces basic concepts of ROI in workforce development programs. It distinguishes ROIs estimated for workforce programs from those that are estimated for financial investments or capital projects. The paper furthermore exposits the basic ingredients of an ROI study—identification of the treatment and time periods of analysis, identification of the net impacts of the program, and identification of net costs. Finally, the paper presents results from the estimation of the ROI for postsecondary career and technical education in the State of Washington.

JEL Classification Codes: H43, J24, J68

Key Words: Return on investment, present value, net present value, benefit cost analysis, workforce development, postsecondary CTE, Washington state, human capital

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Return on Investment in Workforce Development Programs

INTRODUCTION

The general clamor to rein in government spending at all levels—federal, state, and local—is causing program administrators to focus on return on investment (ROI). The reason for this is that, in theory, a prudent investor or a policymaker with fiduciary responsibility for taxpayer funds should use ROIs to guide investment and budgetary decisions. Their marginal dollars should be invested in assets or programs that have the greatest ROI. Thus, program advocates want to be able to show high ROIs in order to maintain or grow their programs.

Exactly what is an ROI? An investment of resources that is made today will yield benefits that accrue to individuals and society in the future. The ROI is basically a ratio of the present value of the future benefits net of the present value of the investment cost to the present value of the cost of the investment. In other words, it is the net benefit of the investment. It can be expressed as a percentage, a percentage that is annualized, a gross return in dollars-per-dollar-invested, or as a payback period.

Related to the concept of an ROI is the internal rate of return (IRR) of an investment. The IRR is the rate of interest that equilibrates the returns from an investment to the cost of the investment. From an investor's perspective, the IRR represents the maximum interest rate that the investor would be willing to accept in order to proceed with the investment. Just as with ROI, an investor prefers larger IRRs. If the returns to the investment and the costs of the investment have been adjusted for inflation, then the IRR is a real (interest) rate; if not, then it is a nominal rate.

While the investment theory of trying to maximize ROI is conceptually easy to grasp, the actual calculations may require many assumptions and "guesstimates" about costs or benefits. This implies two things. First, since program administrators try to have as high an ROI as possible, if a "guesstimate" needs to be used in an ROI calculation, and guesstimate no. 1 yields a higher ROI than guesstimate no. 2, program administrators have an incentive to justify and use no. 1. That is to say, in many instances, ***ROI calculations can be strategically gamed***. This leads to the second implication: ***It will be very difficult to compare the ROIs from different programs if quite different assumptions are used in their calculations.***

Yahoo.com quotes a Web site called Investopedia as follows:[1]

> *Keep in mind that the calculation for return on investment can be modified to suit the situation—it all depends on what you include as returns and costs. The term in the broadest sense just attempts to measure the profitability of an investment and, as such, there is no one "right" calculation.*

[1] http://answers.yahoo.com/question/index?qid=20060810101526AAbWeVK (accessed April 23, 2012).

This flexibility has a downside, as ROI calculations can be easily manipulated to suit the user's purposes, and the result can be expressed in many different ways. When using this metric, make sure you understand what inputs are being used.

TYPES OF INVESTMENTS

An investment is a commitment to allocate resources to make a purchase or undertake an activity with the expectation of getting benefits from the purchase or activity. The costs of an investment are typically borne before the benefits are received, although both the costs and the benefits may be flows that occur over time.

There are many types of **financial investment,** but in general they may be characterized as an investor using cash (or liquidating an asset) in order to make a loan or buy an asset that is expected to appreciate in value. The purpose of the investment is to increase directly the wealth of the investor. The investor's motive is to be rewarded with loan repayments or ownership of assets that will appreciate in value. Of course, investments may be risky, and returns may not be positive. The ROIs for financial investments are typically easy to calculate because the investments and returns are denominated in dollars.

The present value of a financial investment might be stated as follows:

(1) $$\mathrm{PV}(I) = R_1/(1 + r) + R_2/(1 + r)^2 + R_3/(1 + r)^3 + \ldots + R_t/(1 + r)^t,$$

where I = investment made,
R_t = return that is received in period t, and
r = interest rate[2].

Note that, as was discussed above, sometimes the costs of an investment flow into the future—not just the benefits. In that case, the returns in Equation (1) should be net returns—i.e., benefits minus costs.

A simple example may help to explicate Equation (1). Suppose an investor lends $1,000 today to a borrower, who promises to repay the investor $600 one year from now and another $600 two years from now. Furthermore, suppose that the investor could place the money in a bank deposit that pays 2 percent in interest per year. The present value of this investment would be $\$600/(1.02) + \$600/(1.02)^2 = \$1,164.94$.

The net present value of an investment I that generates a stream of future net benefits, R, is simply the present value of R minus I. The usual decision rule that is made about investments is that an investment is rational if its net present value is greater than or equal to 0. It is irrational to invest if the net present value is negative, a sign that the payoff does not even result in a payoff that is as large as the investment. In the above example, the net present value of the

[2] A generalization of Equation (1) would have variable interest rates, r_t.

investment is \$164.94 (= \$1,164.94 − \$1,000). The ROI is 16.494 percent. Since the ROI was earned over a two-year period, one might want to report it as an annual percentage, which in this case is 7.93 percent.[3]

Another type of investment is **capital investment.** This investment takes the form of a tangible item, or items, of real property (equipment, land, buildings, infrastructure). The investments are factors of production, and the wealth motive of the investor is indirect. The investments are intended to ultimately increase profits or social benefits. The calculation of ROIs involves estimation of the extent and timing for which the capital will yield financial benefits. Benefit-cost analysis is appropriate for capital investments to model the timing of the flow of benefits.

A third type of investment, which may be thought of as a subset of capital investment, is **human capital investment**, or workforce development. Individuals, or investors on behalf of individuals, may invest resources in endeavors intended to increase their human capital—i.e., skills and knowledge that are productive in the workforce. The financial payoff for the individual comes from higher levels of earnings (through employment, hours, or wages), but there are generally substantial nonfinancial or intangible benefits as well. In many cases, the investors are not the same as the individual undertaking the human capital–enhancing endeavors. Taxpayers fund education and many workforce development programs, for example. The ROIs for human capital investments are complicated by nonfinancial benefits, by the fact that participants and investors are different audiences, and by the vagaries of the labor market, all of which add considerable uncertainty to the payoffs.

The notation that is analogous to Equation (1) for a workforce development program that provides services is as follows:

$$\text{PV}(SERV) = B_1/(1 + d) + B_2/(1 + d)^2 + B_3/(1 + d)^3 + \ldots + B_t/(1 + d)^t \, , \tag{2}$$

where $SERV$ = cost of program services provided to a client (including prorated administrative costs),
B_t = benefit received by client in period t minus costs incurred in t, and
d = discount rate in time period t.[4]

With workforce development program investments, the present value of the future benefits is discounted to reflect the fact that benefits in the future are not as valuable as payoffs today.

BENEFIT-COST ANALYSIS

An investment's ROI is essentially a restatement of the investment's benefit-cost ratio. As its name implies, it is the ratio of the present value of the future benefits of an investment to

[3] Let ROI_t be an ROI that is earned over a t-year time period. The annual ROI = $(1 + ROI_t)^{1/t} - 1$. In the example, the annual ROI = $1.16494^5 - 1 = 0.0793$, or 7.93 percent.

[4] A generalization of Equation (2) would have variable discount rates, d_t.

the present value of the costs of the investment. If the ratio is bigger than 1.0, then the investment is sound in the sense that it is not losing value. Usually, benefit-cost ratios are stated in the form of "a dollar invested in an initiative today will return \$*V* in the future." *V* equals the ratio of the value of future benefits to cost.

The essential task of a benefit-cost analysis (BCA) is to measure the benefits and costs of an action, place weights on each, and arrive at a conclusion as to the net benefits of the action.[5] To conduct a BCA, it is necessary to measure the outcome (benefits) and costs in a common unit, usually dollars. Note that the benefits and costs may differ depending on the decision-making groups whose interests are affected by the action. In workforce development, three groups should be considered: 1) the program participants, 2) employers of the program participants, and 3) the rest of society. The rest of society includes taxpayers.

Table 1 presents the components of a full BCA for a workforce development program. The final row of the table represents the net benefits to each of the parties and is derived by summing the columns. The final column of the table represents the total net benefits in society and is derived by summing across the rows. The entries in the table represent the expected costs (−) or benefits (+) to the group.

Table 1 Components of a Benefit-Cost Analysis

Benefit or cost	Participants	Employers	Rest of society	All
(1) Program costs	−	0/–	−	−
(2) Productivity of individuals who are or become employed	0	+	+	+
(3) Higher earnings	+	−	0/+	0/+
(4) Fringe benefits	+	−	0	0/+
(5) Less unemployment/lower turnover	−	+	+	+
(6) Lower income maintenance transfers	−	0	+	0
(7) Higher taxes	−	0/–	+	0
(8) Net benefits	+	+	0/+	+

Program costs are in the first row. In most publicly funded workforce development programs, participation is "free" for individuals. However, it should be recognized that participants are investing their time and effort, and thus will forego earnings as well as leisure time while they are undertaking program activities. Thus there is a cost in the "Participants" column. Furthermore, in some programs, such as community college technical training, participants may pay tuition or fees for training. Foregone earnings, especially for individuals with considerable labor market experience such as dislocated workers, may be by far the largest cost of training. The table suggests that employers may bear some costs of participation. For example, with apprenticeships they may pay for the classroom training. Alternatively, employers may enter into on-the-job training contracts (OJTs) that involve supervision or other costs. The rest of society usually pays the largest share of costs for workforce development programs that

[5] Classic literature on the use of benefit-cost analysis to guide social investments includes Gramlich (1981), Haveman and Margolis (1983), and Ray (1984).

are publicly funded through taxes. Note in the "Rest of society" column that this group also bears the cost of displacement, if any, by program participants.

Rows 2–7 of the table represent potential benefits from program participation. Participation in program services may result in placements. When individuals become employed, they become productive members of the workforce. Or, if the program participant is an incumbent worker, then program activities will improve their productivity. In row 2, we show that employers benefit because they are able to sell more and higher-quality goods and services, and society benefits from the availability of the additional goods and services. Row 3 shows that the trained workers are expected to receive higher earnings (probably in the form of increased wages and hours).[6] Those earnings represent a cost to employers. We have added a potential benefit for the rest of society in this row because of the multiplier effect that program participants' higher earnings may engender.

The fourth row shows that program participants who become employed, or who already were employed but now have higher earnings, will receive fringe benefits over and above their earnings. We indicate that the additional fringe benefits may be a net benefit to society, which assumes that workers value the fringe benefits more than what employers pay for them. This would be true if workers were risk-averse and employers were risk-neutral. In the fifth row, we show reduced levels of unemployment and turnover due to program participation. We presume that—somewhat surprisingly—this is a cost to program participants because they are losing nonwork or leisure time, plus they may be losing unemployment compensation benefits. The reductions in unemployment and turnover are a benefit to employers because they will have lower hiring costs and unemployment compensation payments. It is a benefit to society if lower levels of general taxes are needed to support unemployed individuals.

The sixth row indicates that participants are likely to receive lower income maintenance transfers. This is a cost to them,[7] but a gain to the rest of society. On net, the benefit is zero because these payments are essentially transfers from the rest of society to recipients. With higher levels of earnings and employment come higher tax liabilities. These are denoted in row 7. Workers and employers will pay higher payroll taxes. The rest of society benefits because presumably the government will either spend the money on social benefits or cut taxes.

Finally, we would expect net benefits to participants to be positive. Their increased earnings (net of taxes) will exceed their time and financial costs, if any, and their reduced transfer income. We would expect the net benefit to employers to be positive. Employers' costs for programs are generally quite small, and their return from increased productivity will exceed their wage and benefit payments. We suggest that the rest of society may have a small net benefit. This sector of the economy bears the costs of providing a program, and the sector's major return will take the form of lower transfer payments and either higher levels of government spending or lower taxes.

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[6] For newly employed participants, a full accounting of costs and benefits suggests that the value of leisure should be netted out of increased compensation.

[7] In-kind transfer income may not be valued fully by participants, which implies that such income may need to be discounted.

In the empirical implementation of a BCA for a workforce development program, the main drivers of the results for participants are the "+" in the third row and the "−" in the sixth row. The higher earnings in the third row result from increases in employment, increases in hours worked, or increases in wage rates. The costs in terms of lost public assistance are generally smaller in magnitude than increased earnings, but they may occur if program participants receive reductions in aid from Temporary Assistance for Needy Families (TANF), the Supplemental Nutrition Assistance Program (SNAP), Medicaid, or other programs because of increases in earnings. The "art" to a BCA and concomitant ROI estimation is the estimation of these benefits and costs.

Table 1 finesses the concept of time. Generally, the values in the first row—i.e., the costs of program participation— occur before the benefits represented in rows 2 through 7 are accrued. In order to add down the columns or across the rows of the table, the costs or benefits need to be converted to the same time period, which we call the base period of the analysis. Some of the costs of the program may have occurred in years prior to the base period, and so those costs need to be inflated. On the other hand, benefits will be derived in future years, so those benefits need to be discounted to the base period. Particularly important assumptions in the estimation of benefits (and therefore ROIs) are the length of time over which benefits are received, the appreciation or depreciation rate of the benefits, and the discount rate applied to future benefits. Benefits are positively related to the length of time that they are extrapolated into the future, to higher rates of appreciation (or lower rates of depreciation), and to lower discount rates.

KEY ASSUMPTIONS

One of the purposes of this paper is to identify methods of estimation and key assumptions made in calculating accurate benefit-cost analyses and therefore ROIs. The main threats to accuracy are biases that may affect estimates of benefits or costs.

Monetization. Both ROIs and benefit-cost analyses require monetization (i.e., valuation) of both the benefits and costs of an investment. For a financial investment, this requirement is not onerous because it is precisely asset value that motivates the investment. However, for investments in programs such as workforce development, many of the benefits are intangible and therefore difficult to value. For example, a program may inculcate higher self-esteem in a participant, which is undoubtedly a benefit, although it would be difficult to place a value on it. Usually it is benefits that are difficult to value; however, sometimes costs are difficult to monetize as well. For example, if a workforce development program involves on-the-job training, there may be a reduction in productivity of the trainer or trainee that is difficult to measure. Using as a rule of thumb the desire to be as conservative as possible in calculating ROIs or benefit/cost ratios suggests that nonmonetized benefits should be omitted from consideration, but every effort should be made to include full costs.

Counterfactual. Perhaps the most important consideration in estimating costs and benefits is the counterfactual that is assumed. That is, the benefit of an investment is the result of the investment relative to what would have happened if the investment had not been made. The latter situation is called the counterfactual. It is never observed, because one cannot simultaneously make the investment and not make the investment. Thus, one has to make an assumption about what would have happened without the investment—i.e., the counterfactual. The difference between the benefits that occur after an investment or receipt of program services and the (unobserved) benefits that would have occurred in the counterfactual situation are called net benefits.

In program evaluation studies, several alternative methods may be used to estimate net benefits. Randomized controlled trials (RCTs) are generally acknowledged to be the best way to estimate net benefits. Individuals are randomly assigned to receive a program intervention, whereas others are randomly denied. Because assignment is random, the individuals who do not receive the program intervention form an excellent counterfactual for those who do. If a random assignment experiment is not feasible, however, then an alternative counterfactual must be found.

Another approach to attributing outcomes to program interventions when random assignment is not feasible or desirable may be referred to as a quasi-experimental methodology. Just as in an experiment, the individuals served by the program are referred to as the treatment group. However, instead of randomly screening out potential participants to form a control group, quasi-experiments use an alternative source of data to form the control group. For example, Hollenbeck and Huang (2006) use individuals who encounter the Employment Service (ES) as a source of comparison observations for a net impact evaluation of workforce development program participants in Washington State. Statistical matching is used to identify ES clients who are most like the participants in the workforce development programs. In quasi-experiments, the observations that are used to compare outcomes to the treatment group are called members of a “comparison group,” instead of “control group.” The methodology is referred to as quasi-experimental because it is intended to emulate an experiment, with the only difference being the source of the comparison/control groups.

An evaluation methodology that is somewhat similar to the quasi-experimental evaluation technique is one in which the participants in a program themselves provide the counterfactual situation. This is accomplished by using the participants’ experiences prior to their participation in the program as the source of comparison. This is called a “post- minus pre-” approach, and is generally considered to be a weak methodology because of its reliance on two very strong assumptions. The first underlying assumption is that in the absence of the program, the participants would have experienced an outcome that is equivalent to their preprogram experience—i.e., the counterfactual is the “pre-” experience. Second, it assumes that participation in the program is the causal factor for any change in or improvement over the individual’s prior position. The former assumption is problematic because it biases the evaluation in a positive direction: Participants usually enroll in a program because their situation is deleterious. Thus the postprogram experience is likely to be an improvement. The second assumption—that the program is the causal factor—is problematic because many factors change over time in addition to program participation. Individuals’ ages, skills, and sociodemographic characteristics may change as well as the local economy and, thus, the demand side of the labor market.

The justification for randomly assigning a control group using either a quasi-experimental or a “post- minus pre-” approach is that they are techniques that allow for the identification of a treatment effect. That is, we want to have some statistical certainty that participation in the workforce development program, and not the characteristics of the participants, is what caused particular labor market outcomes (which might be positive, essentially zero, or negative). Another method of identification, if one has the appropriate data, is to estimate a regression model that includes a dummy variable for being in a program. A linear regression *controls* for all of the observable characteristics of the program participants.

Mathematically, such a model would look like the following:

(3) $Y_i = a + B'X_i + cT_i + e_i$,

where Y_i = labor market outcome for individual i,
X_i = vector of sociodemographic characteristics of individual i,
T_i = 1 if individual i participates in a program; 0 otherwise,
e_i = error term, and
a, B, c = estimated parameters.

The estimated coefficient, c, would be the net impact estimate for this particular outcome variable.

Extrapolation of benefits. No matter which of the techniques are used to identify the net impact of a program, a BCA needs to make an assumption about the time period over which benefits (and costs) may accrue. In many cases, program administrators, funders, or evaluators will want to examine periods of time that extend beyond the data. In other words, the analysis will need to extrapolate benefits or costs.

An approach that is often used in BCA is to project benefits and costs for the “average” participant. For heuristic purposes, assume that the workforce development program at issue is a training program. Figure 1 (based on Mincer 1974) shows the earnings profiles (in real dollars) for an average individual in the treatment group and in a comparison group. The darkened linear profile represents the earnings over time of the typical member of the comparison group. It is upward-sloping because of an assumption of increased productivity over time. The earnings of the workforce development program participant follow that profile prior to training, but then drop when the individual enters the program. The hypothesis used to construct these profiles is that encountering a workforce development program enhances an individual’s skills and productivity (thus increasing wage rates) and increases the likelihood of employment. Thus, after the program participation period, the treatment earnings profile will either immediately or eventually rise above the control or comparison earnings profile. (Both hourly wage and employment net impacts are positive.)

The postprogram earnings benefit is the shaded area in the graph. The problem that needs to be solved in estimating the benefits is how to compute the shaded area. In general, we will have several quarters of outcome data. In the figure, we have assumed that we have up to 12 quarters (i.e., three years) of outcome data, so we can get accurate estimates of the area up to the line denoted D12 (treatment minus comparison difference at the twelfth quarter). Because the profiles represent the *average* individual, we use the *unconditional* net earnings impacts to calculate these benefits. (They automatically control for employment, hourly-wage, and hours-worked impacts).

What is unknown (and unknowable) is the shape of the earnings profiles into the future after the D12 point. The profiles could continue to move apart from each other if the training participants continue to be more and more productive relative to the comparison group member, or the profiles eventually may converge over time if the training effect depreciates. Alternatively, the profiles may become parallel to reflect a scenario in which the training participants gain a permanent advantage, but then their productivity growth eventually matches that of the comparison group members.

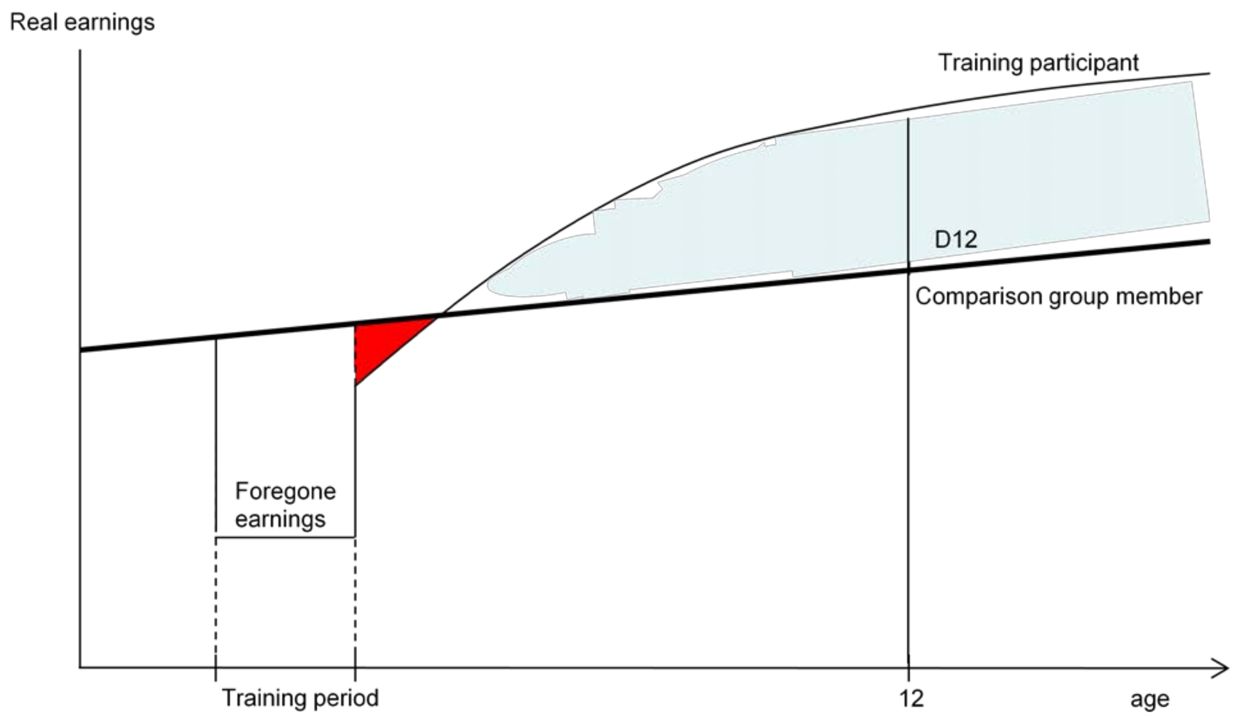

Figure 1 Age-Earnings Profiles of Average Participant and Average Comparison Group Member

EXAMPLE CALCULATION OF AN ROI[8]

The following paragraphs will demonstrate the calculation of an estimate of an IRR and an ROI for postsecondary career and technical education in the state of Washington. Postsecondary Job Prep programs represent the applied (nontransfer) training mission of community and technical colleges in Washington. For the most part, they provide training for

[8]This example is taken from Hollenbeck (2011), which embeds data from Hollenbeck and Huang (2006).

individuals to enter a variety of technical occupations that usually don't require a baccalaureate degree. In Washington, these programs are open to all high school graduates or persons over the age of 18. (Persons under 18 who have not completed high school may be admitted with the permission of their local school district.) The comparison group pool used in this study consisted of individuals aged 16 to 60 who registered for the Labor Exchange (the name of the Employment Service in Washington). Individuals who had participated in postsecondary CTE were excluded from the comparison sample pool, and then observations were chosen by statistical matching to be similar to the individuals who had participated in the postsecondary programs.

Table 2 provides the estimated short-term and longer-term net impacts of the postsecondary Job Prep programs in Washington State. The elements reported in the table show the increase in employment defined as having at least $100 in earnings, the increase in the average hourly wage rate, the increase in hours of employment, the increase in quarterly earnings, and the reduction (or increase) in the percentage of individuals receiving unemployment insurance benefits, TANF, Food Stamps, or Medicaid, on average.[9] Note that these results include all participants—those individuals who completed their education or training and those who left without completing it. Separate net impact estimates for subgroups of participants, including completers only, are reported in Hollenbeck and Huang (2006).

Table 2 Short-Term[a] and Longer-Term[b] Net Impacts of Postsecondary CTE in Washington

Outcome	Short-term	Longer-term
Employment (in percentage points)	9.2	6.7
Average hourly wage	$3.24	$2.06
Average quarterly hours	71.3	39.7
Average quarterly earnings	$1,564	$1,008
Receiving unemployment insurance benefits (in percentage points)	−1.2	−2.7
Receiving TANF benefits (in percentage points)	−0.5	0.6
Receiving Food Stamp benefits (in percentage points)	−4.1	−0.4
Enrolled in Medicaid (in percentage points)	−3.0	−0.2[†]

NOTE: Dollar figures adjusted for inflation to 2005:Q1. All entries statistically significant at the 0.01 level (two-tailed test) unless otherwise denoted.
[a]Defined as three quarters after exit.
[b]Defined as 9–12 quarters after exit.
[†]Table entry not statistically significant.

The estimates in Table 2 suggest that postsecondary CTE has positive employment and earnings outcomes in both the short term and the longer term, as defined in this study. In the short run, average wage rates are over $3 per hour higher than the comparison group and quarterly earnings greater by more than $1,500. In the longer run—shown in the second column of results—the employment and earnings impacts are still positive and significant, although the impacts for been attenuated somewhat. This may be explained by the comparison group "catching up" somewhat between the short term and the longer term. Besides the earnings

[9]The earnings and hours impacts are not conditional on individuals having earnings or hours—i.e., the means include observations with values of zero. Food Stamps was the official name of the federal food assistance program during our analysis period. The program name has been changed to SNAP.

impact, the postsecondary CTE participants tend to receive lower levels of government benefits, especially in the short run.

Earnings. Benefits and costs were projected for the "average" participant. To extrapolate earnings into the future, regression-adjusted unconditional earnings estimates were calculated for each of the 12 quarters after postsecondary CTE participants ended their programs. An exponential depreciation of approximately 1.68 percent per quarter closely fit the estimates. The initial three quarters of earnings impacts were held constant and equal to the third-quarter impact. Then earnings for the fourth through the twelfth quarters were interpolated by depreciating them exponentially at a 1.68 percent rate per quarter. Specifically, the following equations were used:

(4) $EarnImpact(q) = EarnImpact(q-1) * 0.9832$; $q = 4, \ldots, 12$, and
$EarnImpact(1) = EarnImpact(2) = EarnImpact(3) = \$1{,}132$.

To extrapolate beyond quarter 12, two different approaches were followed. First, the assumption was made that no further depreciation of the outcome would occur after the twelfth quarter, and second, it was assumed that the impact would continue to depreciate at 1.68 percent per quarter throughout the average career. For both extrapolations, it was assumed that retirement of the average worker would occur at age 65, which was 126 quarters after the average age of participants at exit: 33.4 years old. Table 3 shows the estimated earnings impact and the two interpolation/extrapolations of earnings. (Note that the entries in Table 3 are in discounted 2000 dollars, so they are not quite consistent with the estimates in Table 2). The most important thing to note about the entries in the table is how much difference the "depreciation of impact" assumption makes. When earnings impacts are assumed to continue to depreciate until

Table 3 Interpolated and Extrapolated Earnings Impacts for Community and Technical College Job Prep Participants, by Quarter

Quarter	Regression-adjusted estimate	Extrapolation no. 1 estimate used in c/b (no depreciation)	Extrapolation no. 2 estimate used in c/b (depreciation)
+1	—	1,132	1,132
+2	—	1,132	1,132
+3	1,132	1,132	1,132
+4	1,157	1,113	1,113
+5	1,068	1,094	1,094
+6	1,026	1,076	1,076
+7	869	1,058	1,058
+8	913	1,040	1,040
+9	948	1,023	1,023
+10	995	1,005	1,005
+11	874	989	989
+12	972	972	972
+13 to retirement	--	972	Depreciated at a rate of 1.71% per year
Discounted total until age 65		79,239	45,873

NOTE: Entries are in 2000$ and are discounted at an annual rate of 3.0 percent.

retirement, the lifetime discounted earnings benefit is about $46,000 (in 2000 dollars). Assuming that the earnings impact does not depreciate after three years leads to a discounted lifetime earnings impact that is almost 80 percent larger—i.e., $79,000 (in 2000 dollars).

Fringe benefits. With additional earnings, workers will also accrue additional fringe benefits in the form of paid leave, paid insurances, retirement/savings plan contributions, and other noncash benefits. Two sources of data provided estimates of the ratio of fringe benefits (defined as paid leave plus paid insurances plus retirement plan contributions plus other) to gross wages and salaries (including supplemental pay such as overtime). The Bureau of Labor Statistics (2002) reports this ratio to be 23.3 percent for "All U.S." and 20.4 percent for the "West Census Region." The U.S. Chamber of Commerce (2001) reports a ratio of 24.3 percent for the Pacific region. Under the assumption that workforce development program participants are less likely to get fringe benefit coverage than the average worker, and to be conservative in benefit estimation, the assumption that this ratio would be 20 percent was used (applied to the discounted annual earnings increments).

Tax payments. Higher earnings will lead to payment of increased payroll, sales/excise, local, state, and federal income taxes.[10] The increased taxes are a cost to participants and a benefit to the public. Average (marginal) tax rates were used for each of the taxes and were applied to the earnings changes. For example, the current rate of 7.65 percent was used to estimate the future payroll tax liabilities. IRS data for federal income tax rates, which factor in earned income tax credits, were used, as were state sources for average rates for the other types of taxes.

Unemployment compensation. Unemployment compensation benefits in the future may increase for participants if programs increase employment (and therefore the probability of receiving UI) or increase earnings (and therefore benefits), or they may decrease if programs decrease the likelihood of unemployment or decrease duration of unemployment spells. Increased UI benefits in the future would be a discounted benefit to participants and a discounted cost to the public. These benefits were interpolated and extrapolated using a similar empirical strategy as that used for earnings. In particular, the unconditional UI benefits were estimated for the first 12 quarters after exit, and these estimates functioned as the average impact for the program in those quarters. Then the estimate for the twelfth quarter after exit was used to extrapolate for 28 more quarters. In other words, it was assumed that the UI benefit gain or loss would dampen to zero after 10 years.

Income-conditioned transfers. The maintained hypothesis used in the study from which these results are taken was that participation in the workforce development programs would decrease the probability of receiving TANF and Food Stamps, as well as the probability of enrolling in Medicaid. In addition, increased earnings would result in reductions in benefit levels for TANF and Food Stamps. Finally, if individuals no longer receive TANF or Food Stamps, they would not receive any support services such as child care or other referrals.

For TANF/Food Stamps, the empirical strategy that was followed was to estimate net impacts for unconditional TANF benefits and Food Stamp benefits for the 12 quarters after

[10] Washington does not have local or state income taxes.

program exit, and to extrapolate beyond that period using the estimate from the twelfth quarter. Again it was assumed that, on average, the program participants may receive these benefits (or lose these benefits) for up to 40 quarters, even though TANF is time-limited to 20 quarters. The reason for going beyond 20 quarters is that these are averages for the entire program group, and the dynamics of recipiency were assumed to continue for up to 10 years.

A similar empirical strategy was used for Food Stamps (now called SNAP). Net impacts for unconditional benefits for the 12 quarters after program exit were estimated and extrapolated beyond that period using the estimate from the twelfth quarter. Again it was assumed that, on average, the program participants may receive these benefits (or lose these benefits) for up to 40 quarters.

The state did not make actual benefit/usage information for Medicaid available, so the net impacts of being enrolled in Medicaid were estimated. The hypothesis was that postsecondary students will tend to decrease their enrollment rates as they become better attached to the labor force over time, and will thus lose eligibility. Medicaid enrollment was converted into financial terms by multiplying the average state share of Medicaid expenditures per quarter times the average number of household members per case. As with TANF and Food Stamps, this is a benefit to the participant and a cost to the public. To interpolate and extrapolate the net impact of a program on Medicaid eligibility, the estimated enrollment net impacts were either averaged or fit using a linear-equation time series.

Costs. Two types of costs were estimated. The first was foregone earnings, which would be reduced earnings while the participants were actually engaged in the postsecondary education. The second type of cost was the actual direct costs of the training.

Foregone earnings represent the difference between what workforce development program participants would have earned if they had not participated in a program (which is unobservable) and what they earned while they did participate. The natural estimate for the former is the earnings of the matched comparison group members during the length of training. Specifically, Equation (2) was used to estimate mechanistically the foregone earnings. This equation estimates the mean treatment group earnings during the participation period as the arithmetic average of mean earnings in the period before program participation and mean earnings of the comparison group in the first quarter after program participation. Note that foregone earnings were not discounted, but were calculated in real dollars.

$$\text{(5)} \qquad Foregone = \left[0.5 \times \left(\hat{E}_1 + \overline{E}_{-1}\right) - \overline{E}_0\right] \times d \text{ ,}$$

where $\overline{E}_{-1}, \overline{E}_0$ = average quarterly earnings (unconditional) for treatment group in quarter –1 and during training period, respectively;

$\hat{E}_1$ = average quarterly earnings in first postexit period for matched comparison group; and

d = average training duration.

The costs of the postsecondary programs for students and for taxpayers were supplied by the state. Staff members of the State Board of Community Colleges provided average tuition and state subsidies for Job Prep students and average durations in institutions.

Table 4 provides the benefit-cost estimates for the postsecondary Job Prep programs. Two time frames are presented: 1) benefits and costs through the first 10 quarters (2.5 years) after the individual has completed his or her coursework and 2) benefits and costs up to when the average individual reaches age 65. Notice that the lifetime estimates are presented as a range reflecting the alternative extrapolation techniques. The table presents the estimates of benefits and costs for the average participant, and it shows the benefits and costs to the public that are associated with the average participant. For participants, the benefits include net earnings changes (earnings plus fringe benefits minus taxes) and transfer income changes (UI benefits plus TANF plus Food Stamps plus Medicaid). These changes may be positive, indicating that the additional earnings and transfer income accrue to the participant, or they may be negative if earnings or transfers are projected to decrease. For the public, benefits include tax receipts plus reductions in transfer payments. Again, these may be positive (taxes are received and transfers are reduced), or they may be negative. For participants, the costs are twofold: 1) foregone earnings during the period of training and 2) tuition and fees, if any. For the public, costs represent the state subsidy to community college students, on average.

Table 4 Participant and Public Benefits and Costs per Participant in Postsecondary CTE Programs ($)

	First 2.5 years		Lifetime (until 65)	
Benefit/cost	Participant	Public	Participant	Public
Benefits				
Earnings	10,386	0	79,239–45,873	0
Fringe benefits	2,077	0	15,848–9,175	0
Taxes	−1,792	1,792	−13,669–−7,913	13,669–7,913
Transfers				
UI	−2,137	2,137	−2,629	2,629
TANF	351	−351	933	−933
Food Stamps	107	−107	331	−331
Medicaid	45	−45	161	−161
Costs				
Foregone earnings	2,100	0	2,100	0
Program costs	3,519	6,877	3,519	6,877

NOTE: 2000 dollars. The range of estimates in the Lifetime column derives from the extrapolation assumption. The larger estimate assumes no depreciation in impact after the third year, whereas the smaller estimate assumes continued depreciation over the working lifetime.

All of the benefits are expressed as net present values: they are adjusted for inflation and discounted back to 2000 at a rate of 3.0 percent. Costs are adjusted for inflation, but they are not discounted.

Return on investment. As noted above, the internal rate of return for the investment in postsecondary Job Prep is simply the interest rate that equilibrates the (tuition and public subsidy) costs to the future stream of benefits. The return on investment is the discounted net benefit expressed as a percentage of the discounted investment costs. Table 5 displays these rates of return for participants, the public, and society as a whole (adding participants and the public together). The costs and benefits come from Table 4. Note that the internal rates of return are quarterly interest rates; they can be multiplied by 4.0 to get approximate annual rates. The ROIs are annual rates. It is interesting to note that even though the levels of lifetime benefits change quite dramatically depending on whether or not the earnings effects are depreciated after the third year, the internal rates of return and ROIs do not change too much. The calculations are dominated by the returns early in the average worker's lifetime, not by returns over the long run.

The benefits and costs in Table 5 are simply summations of the data presented in Table 4. For example, summing the benefits and the costs in the first column of numbers in Table 4 yields totals of $9,037 and $5,619, which are the first entries in Table 5. The ROI over the first 2.5 years for the participant is 60.83 percent [= (9,037 − 5,619) / 5,619]. The annualized ROI is the rate of return that equals 60.83 percent when it is compounded for 2.5 years. As noted in the table, that rate is 20.93 percent.

Table 5 Benefits, Costs, and Rates of Return for Washington's Postsecondary CTE Programs over the First 2.5 Years and Lifetime for the Average Participant

	Time frame	
Benefit/cost	First 2.5 years	Lifetime (age 65)
Participant		
Benefits ($)	9,037	46,107–81,404
Costs ($)	5,619	5,619
IRR (quarterly real rate)	9.48%	15.65%–15.95%
ROI (annualized rate)	20.93%	6.91%–8.86%
Public		
Benefits ($)	3,434	8,978–14,904
Costs ($)	6,877	6,877
IRR (quarterly real rate)	−14.81%	1.94%–3.08%
ROI (annualized rate)	−24.32%	0.85%–2.49%
Society		
Benefits ($)	12,471	55,084–96,308
Costs ($)	12,496	12,496
IRR (quarterly real rate)	0.69%	9.53%–10.06%
ROI (annualized rate)	−0.11%	4.82%–6.70%

NOTE: Table entries are for average participant. Benefits include earnings, fringe benefits, and income-related transfer payments. Costs include tuition and fees (if any), foregone earnings, and public program costs per participant. Dollar figures are in real 2000$.

In general, the participants in these programs reap substantial returns. For those participants, there are tuition costs and foregone earnings, but the economic payoffs, even in the short term, more than offset these costs. The public, on the other hand, subsidizes the average Job Prep student by about $6,900 and does not receive enough in increased taxes or reduced transfer payments in the first 2.5 years to get a positive return. However, the public does get positive returns over the participant's lifetime. Society gets very high returns from postsecondary CTE in the long run.

CONCLUSION

Calculating ROIs for workforce development programs requires considerable data and careful analyses of benefits and costs. We believe that it is folly to think that a simple, one-size-fits-all tool can be developed that can estimate a program's ROI with minimal data inputs and with quick turnaround. Even though the data and analytical burdens are great, we believe that analyses of ROIs (or, equivalently, of benefits and costs) are a tool that administrators should use to monitor their program's performance.[11]

If a workforce development administrative agency is large enough so that a reasonable sample size can support the analysis, and if it has the resources, it is entirely feasible for an agency to conduct a benefit-cost analysis. It is likely that a program's ROI is relatively stable, so that such an exercise probably need not be done frequently. For that reason, and for reasons of scale, it may make sense for an individual agency to join a consortium of agencies, or for a state to provide resources to conduct analyses for all agencies in the state or for individual agencies. The ROI estimates should be seen as diagnostic tools for individual areas and should not be used for accountability. If an administrator had evaluation resources available, then he or she should conduct sensitivity analyses to see what aspects of the agency's operations seem to provide the highest returns.

If program administrators are going to conduct ROI analyses, either as a single entity or as part of a consortium, they need to collect the following data items in order to be able to calculate reasonable ROI—i.e., benefit-cost—estimates:

►For each participant in a cohort of program participants (e.g., all applicants in a given time period, or all exiters in a given time period):

- Application date (or first date of service)
- Demographic characteristics (age, education, sex, marital status, disability status, veteran status, public assistance status, etc.)
- Preprogram labor market experience (earnings, work experience, employment and unemployment spells, turnover, and industry, for at least three years)
- Exit date
- Postprogram labor market experience (earnings, work experience, employment and unemployment spells, turnover, industry, and benefits, for at least three years)
- Postprogram participation in public assistance or unemployment compensation

►For the entire cohort:

- Program expenditures for services
- Prorated share of overhead and administrative costs for the entire cohort

[11] We do not think that ROIs or benefit-cost ratios should be used to compare programs, however, because of the arguments made at the outset of this paper—mainly, that there are too many assumptions that go into such calculations, thus making these statistics easy to game.

►For each participant in a cohort of individuals who will serve as a comparison group for the program participants (e.g., all ES applicants in a given time period, or a randomly assigned control group):

- Application date (or first date of service)
- Demographic characteristics (age, education, sex, marital status, disability status, veteran status, public assistance status, etc.)
- Preprogram labor market experience (earnings, work experience, employment and unemployment spells, turnover, and industry, for at least three years)
- Exit date
- Postprogram labor market experience (earnings, work experience, employment and unemployment spells, turnover, industry, and benefits, for at least three years)
- Postprogram participation in public assistance or unemployment compensation

This list represents a considerable data collection burden. The bottom line is that conducting a benefit-cost analysis has benefits and costs itself. The benefits include learning about what aspects of one's program seem to have the greatest returns to customers and having evidence for program funders, such as legislators, about the positive impact of a program. The costs include the resources necessary to conduct the analyses. There also must be a recognition that, in workforce development, it is often the case that many benefits received by clients are intangible and not easily monetized and that activities that are instrumental in effective programming, such as analyzing labor market information, may not lead directly to benefits. We would advise program administrators to weigh these costs and benefits carefully before investing.

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