
Economic Analysis of Oregon Corrections Enterprises

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Prepared for:
Oregon Corrections Enterprises

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Executive Summary

Oregon Corrections Enterprises (OCE) provides on-the-job training for incarcerated adults across the Oregon prison system. The OCE program is unique within Oregon in that as a semi-independent public agency, they create and sell products to private and public businesses across the state. Because OCE is a public agency that sells goods in the private market, they are required to avoid job displacement in the Oregon economy.

OCE asked ECONorthwest (ECO) to evaluate the potential economic effects and job displacement that occurs from OCE operations. Additionally, OCE asked ECO to evaluate the potential social benefits the program might have for inmates. ECO assessed the broad economic and social effects OCE has in Oregon through the following questions:

What is the economic impact and the potential job displacement associated with OCE operations in a given year?

Our analysis shows that under current conditions OCE has a net positive effect on the economy. This net positive impact is due to a high share of local production and supply chain purchases that occur in Oregon.

To estimate these net impacts, ECO created three scenarios to represent the upper, mid, and lower-bound of estimates under different assumptions about how much private sector activity is displaced from current OCE operations. Overall, OCE operations result in net positive economic output in Oregon, ranging from \$2.4 million to \$38.4 million per year, depending on the scenario.

OCE's net positive short-run impact in Oregon's economy are due, in part, to the high share of Oregon businesses and labor supported by OCE supply-chain purchases. We also find that the potential job displacement is small or offset by purchases in OCE's supply chain that support local jobs.

How and to what extent does revenue from OCE programs contribute to the state costs of incarceration and the larger community?

As a semi-independent agency, OCE uses revenues from the sale of goods and services to support the program's operations. Additionally, OCE uses revenues to reimburse the Department of Corrections for some of the costs incurred from OCE's use of their staff or facilities.

All OCE programs require direct withholding for victim's assistance funds, plus other deductions as required by the implementation of the 2017 SB 844. In FY 2015, \$67,000 (5 percent) of payments to OCE participants were directed toward

victim's assistance funds. This funding helps support Oregon Department of Justice programs for victims of sexual assault, child abuse and other victim funds.

Inmates also receive financial awards for the work they perform with OCE. Inmate earnings from OCE training are transferred to an inmate's Department of Corrections account. These awards can be used for inmate costs while incarcerated. Inmates can also send the money to their families to contribute to household costs, including child support and general household expenses. Additionally, it can provide a source of savings for when an inmate is released from incarceration.

How does inmate participation in OCE programs impact labor market outcomes for inmates upon release?

ECO measured post-incarceration employment and wage outcomes using administrative data from the Oregon Department of Corrections and the Oregon Employment Department. Our analysis calculated labor market outcomes for inmates released from prison between 2005 and 2011.

Our analysis finds that OCE participants are entering prison with higher education and also improving their education at higher rates. Still, accounting for the higher entry and exit levels of education for OCE participants, we find that OCE increases post-incarceration earnings by \$155 to \$180 per quarter, or \$620 to \$720 per year.

Although not specifically analyzed in this report, an additional benefit from OCE participation is the impact on post-incarceration unemployment. The results of our analysis suggest that OCE participation may increase wages in the labor market by an average of 3.3 percent. Although labor force participation does not always equal employment, it is indicative of higher likely employment rates for program participants.

Introduction

The primary goal of establishing OCE was to meet the requirements of Oregon Ballot Measure 17 passed in 1995, which requires corrections institutions to provide and engage incarcerated adults in work, on-the-job training, or education programs for a minimum of 40 hours each week. In 1999, Oregon voted on Ballot Measure 68, which declared OCE a semi-independent agency separate from the Department of Corrections (DOC) in funding and structure yet sharing the same Director. Since then, OCE has been self-funded through sales of goods and services.

While Ballot Measure 68 allowed the development of for-profit training programs, these programs are also required to “avoid displacing or significantly reducing preexisting private enterprise.” The measure did not define how displacement is to be measured. This analysis uses examples from existing literature to quantify the inputs and potential displacement from OCE operations.

OCE currently operates in ten correctional facilities and across 24 different businesses throughout Oregon. OCE requirements for participation in the training program are more stringent than the Oregon DOC requirements under Measure 17. Eligibility to participate in an OCE program requires that inmates must have a valid tax identification number. Additionally, they must not have experienced any disciplinary infractions within six months of applying for the program. Some programs also require completion of a GED or higher. Eligible inmates within those facilities who are selected for an OCE position complete 12-month industry-specific training, depending on their assigned position. OCE also offers two Oregon Bureau of Labor and Industries (BOLI) training programs which are facilitated and tracked by OCE staff.

Although program staff train and supervise inmates in OCE positions, inmates are not considered employees. Rather, they are considered trainees with a goal of securing employment after completing their incarceration. Inmates are provided payment based on multiple performance-based systems that consider the quality and quantity of goods and services they produce, behavioral and soft-skill development progress, and team performance goals.

OCE's Dual Mandate

OCE, as a semi-independent public agency, is bound by the regulatory mandates imposed on the Department of Corrections. This means that OCE, along with the DOC under Measure 17, must engage prison inmates in full-time, meaningful work or on-the-job training programs.

OCE is also required, as part of its establishment as a semi-independent agency under Measure 68, to “*avoid displacing or significantly reducing pre-existing private enterprise*” through the work opportunities provided through their programs. This second mandate does not impose a method for assessing whether the impact of an existing or proposed OCE program imposes a significant impact on private enterprise. For OCE, this means investment in new programs imposes an additional risk of a potential stop of operations.

OCE has opportunity to assist the DOC in meeting its mandate for the engagement of inmates in meaningful full-time work and training opportunities – most of the facilities that are currently hosting OCE programs, however, did not reach or near 100 percent engagement of work eligible inmates in 40 hours of work per week.¹ This dual mandate for OCE, specifically the unclear constraints on private sector impact, may limit OCE’s ability to support DOC and the goals of Measure 17.

¹ https://www.oregon.gov/doc/RESRCH/pages/measure_17.aspx

Economic Impacts of OCE on Oregon's Economy

One of the primary requirements for the director of the OCE program is to “avoid displacing or significantly reducing preexisting private enterprise” through program operations, but Measure 68 does not provide a definitive method of quantifying the potential displacement of industry. Labor displacement is the involuntary separation from employment, or closure of businesses and is normally tied to broader structural changes in the economy over time².

The literature on the crowding out effects of prison labor is scarce, but can provide a framework for quantifying OCE's impact on the private economy in Oregon. Following a similar 2006 analysis of prison labor in Ohio, we use an input-output model to quantify the interrelationships of production in Oregon.

Because OCE is as a semi-independent agency that purchases goods and services from the private sector to support their operations, there should be no technical differences between upstream or supply chain purchases between OCE and a private industry. This similarity in purchases of intermediate goods and services provides a justification for using input-output models to compare the economic activity supported by OCE business operations and the private sector counterpart³. This is an important distinction from other forms of labor in correctional facilities.

There are differences, however, in how revenues from public agencies affect the local economy relative to private firms. For example, sales generated from OCE activities result in government transfers that help pay for victim assistance funds and institutional costs of incarceration, rather than proprietors' income. The diversion of that spending from the private to the public sector inherently leads to a crowding out effect, if that production would have otherwise been performed by a private firm.

On the other hand, if OCE goods and services were instead produced in the private sector, the associated economic activity would not necessarily occur in Oregon. In a competitive market, some production might occur outside of the state and be imported. That lost production would not only affect the final goods and services markets, but could also reduce in-state demand along the supply

² Kletzer, Lori G. 1998. Labor Displacement. *Journal of Economic Perspectives*. Vol 12, No. 1 (Winter, 1998), pp. 115-136.

³ Scott, Charles E. & Fredrick W. Derrick. 2006. *International Advances in Economic Research*. 12: 540-550.

chain for firms who supply the intermediate goods, such as milled wood, or metal alloys that go into production.

Using an input-output model, we can quantify the how much demand for final goods and services can be met by OCE relative to the private sector using industry averages. Additionally, we can look at spending patterns to measure the differences in how OCE and an average private firm in Oregon would support the local supply chain who supply the intermediate goods used for production.

To complete this analysis, ECO prepared three scenarios. One models OCE production within Oregon. The second scenario models private-sector production of the same goods and services using industry averages to calculate in-state production. These two scenarios allow us to quantify the net gain or loss of economic activity in Oregon from having some production occur in the public sector. The difference between these two scenarios is a “net” economic impact analysis, which informs us how much gain or loss of economic activity is attributable to OCE operations in Oregon.

A third scenario compares OCE production to a private-sector alternative where all OCE production would otherwise be performed in Oregon. A more reasonable assumption is that only some portion of the economic activity would remain in the state, as modeled in the scenario above. Although this scenario is unlikely, the resulting analysis provides a reasonable upper bound on the economic displacement from OCE operations in Oregon.

Overview of Economic Impacts

The most common approach for input-output analysis measures the short-run economic contributions associated with a firm’s operations expenditures in the study region for one year. This captures the effects (in terms of dollars and jobs) to the local and regional businesses, as the money is spent on local goods and services. We use specific terminology to discuss the various economic effects in Oregon for OCE operations:

- **Direct Impacts** are those associated with payroll and employment. They also include the direct output from OCE training programs.
- **Indirect Impacts** are the goods and services purchased for operations. This spending generates the first round of indirect impacts. Suppliers will also purchase additional goods and services; this spending leads to additional rounds of indirect impacts. Because they represent interactions among businesses, these indirect effects are often referred to as “supply-chain” impacts.
- **Induced Impacts** are the purchases of goods and services from household incomes. The direct and indirect increases in employment and income

enhance the overall purchasing power in the economy, thereby inducing further consumption. OCE training program staff, for example, will use their income to purchase groceries or take their children to the doctor. These induced effects are often referred to as consumption-driven impacts.

Gross vs. net impacts

Gross impacts are an upper bound estimate of the economic activity that can be traced back to OCE. Net impacts include an alternative scenario to measure the net gain or loss to the economy from an economic activity. In this case, we compare OCE operations to a similar operation being conducted in the private sector. The difference between these two scenarios results in a “net” effect.

This “net” analysis can help policymakers determine whether a program or project has a positive or negative impact on a region’s economy. Positive effects indicate that the value added from spending for a project are greater than the alternative. Typically, these positive economic effects occur when spending occurs in industries that are connected to the local supply chain, which increases economic output by supporting local income and jobs. These positive effects, however, are different than economic “benefits” that indicate a net increase in societal welfare.

While economic benefits are concerned with economic efficiency and changes in social welfare, economic impact analyses focus on the distributive effect of an economic activity. To determine if OCE operations have a positive economic effect on Oregon’s economy, this analysis has two goals: a) understand how OCE demand for purchases of intermediate goods and services affect the local supply chain, and b) provide an empirical estimate on the net local economic impact of OCE operations, compared to the private sector alternative.

Modeling Inmate Training Programs

OCE purchases raw and intermediate goods from local and non-local businesses to produce final consumer goods. OCE goods and services are not available for direct sale to consumers, but are produced on a contractual basis for businesses and government agencies. OCE services, such as call centers, also rely on the purchase of intermediate goods and services. To capture the economic effects of these activities, ECONorthwest obtained operations and capital expenditures for the 2015 calendar year, including payroll data for OCE staff and vendor purchases.

Having detailed vendor purchases allowed us to determine the percent of expenditures that remained in Oregon, which are then spent on private-sector purchases. Using these vendor purchases, ECO also developed a unique spending pattern for each of OCE’s businesses. This allowed us to calculate how

those expenditures are distributed both within Oregon and across industries who supply intermediate goods and services to OCE business functions.

Comparing OCE production to the private sector

ECO also estimated the local impact if the same goods and services were to be produced by the private sector. We multiplied the value of the OCE product for each department by regional purchasing coefficients to estimate the value of private sector production that stays in-state in the absence of inmate labor. These residual in-state expenditures are then applied to the default private-sector industry spending patterns for those businesses to calculate the output, income and employment. These spending patterns from the IMPLAN model estimate how much of a certain good or services would be purchased if consumers were to buy from private vendors.

Figure 1 summarizes these purchasing coefficients by OCE line of business. For example, 37 percent of the value of wood fabrication-related business activities are sold to Oregon consumers and 100 percent of that production occurs in Oregon. Conversely, 17 percent of the value of wood fabrication-related products purchased in Oregon come from an average Oregon private businesses. This analysis serves as the basis for estimating the net economic value added to the state from OCE operations.

Figure 1. Estimated in-state purchasing share in private sector alternative

OCE Line of Business	Percent In-State Purchase without OCE
Administration	97%
Contact Center	97%
Career Readiness Center	100%
Wood Fabrication	17%
Garment	3%
Laundry	70%
Metal	28%
Print	32%
Sign Shop	27%
Upholstery	13%

Source: ECONorthwest calculations using IMPLAN software

Results of Economic Impact Analysis

To understand how OCE operations affects private-sector industries in Oregon, ECO modeled three scenarios: no crowding effect, partial crowding effect, and total crowding effect. These three scenarios represent the lower and upper bound of potential crowding out effects from OCE under the current structure of Oregon’s economy.

- **No crowding out:** This scenario is the gross contribution of OCE's economic activities to Oregon's economy. This represents an upper bound estimate of the economic activity that can be traced back to OCE. These results are "gross" in that they assume no explicit counterfactual about potential crowding out from OCE operations. Since OCE can produce all the needed goods and services in Oregon, the local purchasing coefficients are 100 percent in this scenario.
- **Partial crowding out:** The partial crowding scenario represents the middle and most likely scenario of potential crowding out from OCE operations. In this scenario, the counterfactual is a private sector alternative, which assumes a competitive market for production of goods and services. The IMPLAN model has estimates of how much of a given good or service would be purchased if consumers were to buy from an average private vendor. In a competitive scenario, more of the goods would be imported to Oregon, rather than being produced locally by OCE.
- **Total crowding out:** The total crowding out scenario is a theoretical upper bound estimate of potential crowding out effects from OCE operations. In this scenario, all production is moved to the private sector, but requires all production occur in Oregon. This is the opposite of the no crowding out scenario in that all local OCE production is assumed to be replaced by local private sector activity. Under the current structure of Oregon's economy, this is the maximum amount of crowding out that could potentially occur from OCE operations. In order for this scenario to occur, all of the economic activity related to OCE would be replaced by private sector activities in Oregon.

It is important to note that these regional purchase coefficients represent in-state spending for a single year and may change over time as firms move into, or out of the regional economy. Additionally, these estimates of OCE's in-state share of purchases are conservative estimates. A business may have a branch that operates and supports jobs in the local economy, but its accounts payable address is located in another state. In these instances, the model would place the economic activities outside of the state, and under represent the true economic benefits to the state.

In those cases, the data show the purchase as being outside of Oregon, even if a large share of the expenditures occurred in state. For some industries, such as wholesale and retail, we assume some expenditures remain in-state using margins. However, for other industries, we are not able to discern between local and out-of-state purchases, so those dollars are calculated as "leakages" from the state's economy and have no economic impact in this analysis.

Scenario 1: No crowding out (gross economic impacts)

In 2015, OCE operations directly supported \$19.5 million in economic output, all of which was produced in Oregon. This includes \$8.9 million⁴ in payroll for 100 staff and \$10.5 million in goods and services purchased in the state. The indirect (supply chain) and induced (payroll) effects of this production supported a total of \$38.4 million in total economic output for Oregon during 2015. The resulting total economic impact of OCE's programs in 2015 are displayed below. These results are gross economic effects and do not account for any counterfactual scenarios where there is crowding out in the private sector—they are an upper bound estimate of OCE's economic contribution to the State economy.

Figure 2. Gross economic effects from OCE operations (2015\$)

Impact Area / Type of Impact	Direct	Indirect	Induced	Total
Output	\$19,527,090	\$9,467,319	\$9,411,097	\$38,405,506
Value Added	\$8,985,716	\$4,470,410	\$5,404,251	\$18,860,377
Employee Compensation	\$8,985,716	\$2,787,577	\$2,765,049	\$14,538,342
Proprietors Income	\$0	\$371,586	\$385,584	\$757,171
Other business and property income	\$0	\$1,311,247	\$2,253,618	\$3,564,865
Employment	100	73	76	249

Source: ECONorthwest calculations using IMPLAN software

OCE is public agency, so there is no proprietor income, or other royalties and dividends earned on capital. Some of the economic effects that would result in profits and royalties in the private sector, instead result in government transfers that help pay for the cost of incarceration, or are paid to victim assistance funds. This is discussed in more detail in the section on OCE program revenues.

Scenario 2: Partial in-state crowding out

This scenario represents the most realistic calculation of potential crowding out of private sector output from OCE operations. These net impacts of OCE operations are derived by calculating the difference between OCE gross impacts (Scenario 1) and the competitive private production scenario. Both scenarios are a function of the amount of in-state vendor spending and the percent of consumers who would purchase a good or service locally.

OCE is a training program for inmates, therefore the cost of production is lower than the private sector alternative for some industries. The resulting net impact is greater because businesses and consumers are more likely to purchase from out-of-state vendors under the private sector alternative. If OCE operations were to cease, some of that production would be replaced by in-state businesses (see Figure 1), while the rest would be imported to Oregon to meet the demand for

⁴ Payroll expenditures includes wages for employees who left OCE during FY2015 and are not reflected in employment counts. ECONorthwest did not have data sufficient to disaggregate wages for current and former employees during FY 2015.

those services. Those imports represent economic leakages – economic activity that is lost to Oregon.

Figure 3 displays the results of the analysis for the partial crowding out scenario. ECO estimates that, OCE operations support \$7.8 million in economic activity relative to the competitive market scenario. All else being equal, if the production of these goods and services were to occur in the private sector, 60 percent (\$11.7 million) of the value of OCE production would occur in Oregon. The remaining 40% (\$7.8 million) produced by OCE would be imported from out of state under this scenario, and is therefore a loss to the State economy.

The indirect impacts are also higher when produced by OCE because all production stays in Oregon, and the supply chain is more concentrated to in-state suppliers than the rest of the market for industries in which OCE operates. For every million dollars produced by OCE, \$690,800 is re-spent along the supply chains in the state, compared to \$346,500 for private sector counterparts in the competitive scenario.

Figure 3. Net economic impacts of OCE operations in Oregon under partial crowding out (2015\$)

Impact Area / Type of Impact	Direct	Indirect	Induced	Total
Output	\$7,813,465	\$5,397,454	\$3,513,148	\$16,724,068
Value Added	\$1,958,941	\$2,228,837	\$2,017,466	\$6,205,244
Employee Compensation	\$2,942,533	\$1,581,372	\$1,032,141	\$5,556,046
Proprietors Income	(\$149,243)	\$158,744	\$143,931	\$153,432
Other business and property income	(\$834,349)	\$488,721	\$841,394	\$495,765
Employment	8	44	28	81

Source: ECONorthwest calculations using IMPLAN software

OCE production results in higher private sector employment (up to 81 jobs). OCE direct employees are primarily management and executive-level jobs, while the private sector includes low-skill and high-skill labor. In total, OCE pays more in total wages, which has a net positive induced effect on Oregon’s economy.

OCE is deliberately more labor intensive than a private sector operation, which would require a more efficient use of labor and technology to create a profit. To make an appropriate calculation about the net change in jobs between the public and private sector production, the inmates are excluded from the direct jobs estimate, as are the stipends they are paid, which would result in induced impacts in the private sector alternative.

In addition to some labor displacement, there is also some crowding out of proprietor’s income and dividends, which would be returned to the business owner in the private sector alternative. Because wealth is created in the private sector, this loss in owner’s income represents an opportunity cost of producing the final goods and services in the public economy. All of OCE production is

local. Therefore, despite the loss in proprietor’s income, in aggregate there are still positive total effects for business owners in the markets who supply intermediate goods and services for OCE production.

Scenario 3: Total in-state crowding out

The final scenario describes what the maximum potential displacement could be from OCE operations under the current structure of Oregon’s economy. In this analysis, all OCE production occurs in the private sector and is required to be produced in Oregon. It is possible, for example, that absent OCE, some in-state production would be higher than in the current estimates used in scenario 2 to satisfy the demand for those goods and services in Oregon. This scenario pushes that logic to its upper bound by looking at the opportunity cost of not producing any goods and services in the local private economy.

Figure 4 shows the results of the total crowding out scenario. The direct net output in this case is zero, because under these assumptions the net difference between public and private production is the same. Value added, which is a measure of the contribution to GDP made by an individual producer is negative in this scenario because of the loss in proprietor’s income and royalties that go unearned by the business owner.

If all production were to occur in-state and the private sector, Oregon would see a \$1.3 million increase from value-added in the final goods and services market from proprietor’s income and dividends earned. When indirect and induced effects are considered, however, the loss in value added is closer to \$675,000. Due to the fact that OCE’s in-state purchases are larger than the private sector alternative, it reduces the impact of the loss of proprietor’s income.

Figure 4. Net economic impacts of OCE operations in Oregon under total crowding out (2015\$)

Impact Area / Type of Impact	Direct	Indirect	Induced	Total
Output	\$0	\$1,951,328	\$415,220	\$2,366,548
Value Added	(\$1,330,378)	\$417,997	\$238,636	(\$673,745)
Employee Compensation	\$397,635	\$512,302	\$121,853	\$1,031,790
Proprietors Income	(\$416,303)	\$13,681	\$16,992	(\$385,629)
Other Business and Property Income	(\$1,311,710)	(\$107,986)	\$99,791	(\$1,319,905)
Employment	(84)	22	3	(58)

Source: ECONorthwest calculations using IMPLAN software

Production in this scenario results in 84 lost direct jobs in the final goods and services market, relative to current OCE production. However, when all production is performed by the private sector, OCE’s spending pattern suggests that their in-state goods and services purchases are higher than the private sector alternative. OCE’s higher in state spending outweighs the direct losses in production, and results in a net positive effect for output in the total crowding out scenario. Due to the net positive effect of OCE spending along the supply

chain, there are an additional 25 jobs supported in the intermediate goods and services market, relative to the private sector alternative. In aggregate, the 25 additional jobs supported by indirect and induced impacts reduces the 84 direct job losses, resulting in 58 total job losses as a worse case estimate.

In this extreme scenario, the potential effect on labor displacement is small. These results are the least realistic due to competitive forces in the private sector that would incentivize businesses to import a larger share of intermediate goods from outside of Oregon. While there is a clear opportunity cost in jobs and income for those firms who would otherwise produce those final goods and services in Oregon, the discussion around potential crowding out and labor displacement should be constrained within the bounds of these results.

Limitations of approach

Input-output models are static models that measure the flow of inputs and outputs in an economy at a point in time. This type of model allows for analysis that: 1) describes an economy at one time-period, 2) introduces a change to the economy, and then 3) evaluates the economy after it has accommodated that change.

This type of “partial equilibrium” analysis permits comparison of the economy in two separate states, but does not describe how the economy moves from one equilibrium to the next. In partial equilibrium analysis, the researcher assumes that all other relationships in the economy remain the same (other than the initial economic stimulus).

Static models assume that there are no changes in wage rates, input prices, and property values. In addition, underlying economic relationships in input-output models are assumed constant; there are no changes in the productivity of labor and capital, and no changes in population migration or business location patterns. This makes it difficult to discern if a business was unable to expand their operations, for example, due to the presence of OCE in an industry.

Program Revenue Analysis

This section of the report explores quantitatively and qualitatively, how these payments, with no direct supply chain impact, add value to the Oregon economy and support individuals impacted by crime in Oregon. OCE is unique among Oregon prison inmate training programs in that it is financially self-sufficient; OCE program revenues support all the costs of operation.

The previous section of this analysis looked at how OCE operations affect the private economy in Oregon. As previously mentioned however, there is some redistribution from the private to the public economy. Benefits that help support victim's assistance funds and other costs related to incarceration were not accounted for in the previous section analysis.

This includes performance-based payments to inmate participants. Because these payments are not considered payroll expenses, and inmates do not directly participate in the private market (they cannot fully participate in the Oregon economy while incarcerated), payments made to inmates were not considered as part of the IMPLAN economic analysis.

For this analysis, OCE provided details on payments made to inmates in 2015, as well as any deductions made from inmate accounts by OCE. The extent to which these OCE revenue impacts can be explored is limited by the fact that funds are not tracked by source after they are deposited into DOC-managed inmate accounts.

Revenues that go toward victim's assistance funds

In FY 2015, \$67,000 (5 percent) of payments to OCE participants were directed to victim's assistance programs from OCE. The Department of Justice provides a variety of services to victims through these programs, including child abuse intervention, sexual assault services, and a Victims of Crime Act Fund, which provides grants to government and non-governmental grantees to provide services to victims.⁵

Revenues that contribute to the cost of incarceration

In the state of Oregon, inmates are expected to contribute to the cost of their incarceration. Local jurisdictions have their own policies and procedures for recouping these costs from inmates. In Oregon state prisons, institutions can require payments for standard daily incarceration costs and the cost of medical

⁵ <http://www.doj.state.or.us/victims/Pages/index.aspx>

services provided while incarcerated.⁶ When determining the ability to pay, current obligations such as dependent family and victims assistance payments are considered, in addition to assets and savings required to support each inmate after release. Unfortunately, it is not possible to track funds earned through participation in OCE programs to these payments, it is likely that participation in OCE programs contribute to an inmate's ability to pay.

OCE also reimburses the Department of Corrections for some of the additional cost of Corrections staff and facilities used in the operation of OCE programs. This means that the OCE program is not only self-sustaining, but it also does not place any additional burden on the DOC system.

Other relevant program revenues

Like contributions to the cost of incarceration, family support payments and inmate savings are made from commingled earnings retained through the Department of Corrections. Although we are unable to directly trace how OCE program earnings contribute to an inmate's ability to support their family, limit their need for family contributions to their expenses while incarcerated, contribute to the cost of fines, fees and legal costs, and prepare for release.

Programs participating in the Prison Industry Enhancement (PIE) certification program, a program that allows for interstate commerce of inmate-made goods, are required to make other payments from funds, which are provided to inmates. These payments include, in addition to victim's fund payments, required tax withholdings and family support payments.

⁶ http://arcweb.sos.state.or.us/pages/rules/oars_200/oar_291/291_203.html

Labor Market Outcomes Analysis

In this section, we examine the characteristics of participants in the program and compare them to the general population of inmates. Additionally, we investigate the impact that participation in the OCE program has on earnings subsequent to release from prison.

First, we examine the methods and data sources that we employ in detail. Next, we analyze the demographic profiles of untrained inmates and compare those to OCE participants. Lastly, we look at the impact that OCE participation may have on wages for inmates that are released from prison.

Methods and Data Sources

In this section, we briefly discuss the sources of data employed during our research. First, we have administrative records about sentencing, admission and release dates, and incarcerated work histories from the Oregon Department of Corrections. Second, we have wage information matched to inmates by the Oregon Department of Labor.

Methods

We base our analysis on a novel dataset comprising of administrative records from the Oregon Department of Corrections merged with data from the Oregon Department of Labor. The combined dataset allows us to see participation in Oregon Corrections Enterprises (OCE) programs, sentencing and crime information, and labor market activity for all inmates released from prison between 2005 and 2011. With the unique data set we employ statistical and multiple linear regression analysis to understand the profile of inmates that participate in the OCE programs, focusing on measuring whether OCE improves labor market outcomes for inmates.

These data provide a challenge in that it is not possible to tell whether an inmate is unemployed, employed under-the-table (within proper tax reporting), employed out of state, or deceased if they do not appear in administrative labor records. Due to this data limitation, we proceeded in two ways to overcome missing data. First, we ignore missing inmate wage data which reduces the number of observations in the sample. In the second approach, we assume that all missing wage data is representative of a period of zero earnings.

Oregon Department of Corrections Data

The Department of Corrections has furnished administrative data for inmates released from Oregon state prisons from 2005 through 2011. The data is

separated in four categories: demographics, education, sentencing, and work activities. Inmates are uniquely identified, and when applicable, multiple incarcerations are separately accounted for, which allows for analysis and incorporation of recidivism in the labor market analysis.

The demographics data contains information on each inmate's age, race, reported marital status, citizenship, and Automated Criminal Risk Score (ACRS).⁷ The education data file informs us of the education level of each inmate at entry and exit. Sentencing data contains information on each crime an inmate was convicted of, and when the sentencing began. Lastly, the work activities data records all in-prison work or work-related assignments given to each inmate. Importantly, OCE job training assignments are identified here and allows us to mark inmates that were participants in OCE training programs.

Oregon Department of Labor Data

The Department of Labor data was furnished for inmates in our sample that agreed to have their information matched across databases and used for research.⁸ DOC received DOL records for inmates represented in the DOC dataset who also agreed to release their DOL records. DOL provided by the DOC reports quarterly earnings for each inmate that was working in Oregon from Q1 2000 to Q2 2016. The data also includes the North American Industry Classification System (NAICS) code for the employer. If an employee worked for several employees in a given quarter, the earnings from each employer and the NAICS code of each employer is reported separately.

⁷ The Automated Criminal Risk Score is a composite score calculated for each inmate that is based on DOC's models for risk of reconviction of a crime within three years of being released.

⁸ Inmates were asked at admittance and at release whether they wanted to have their data available for researchers.

Demographics

Prison Population

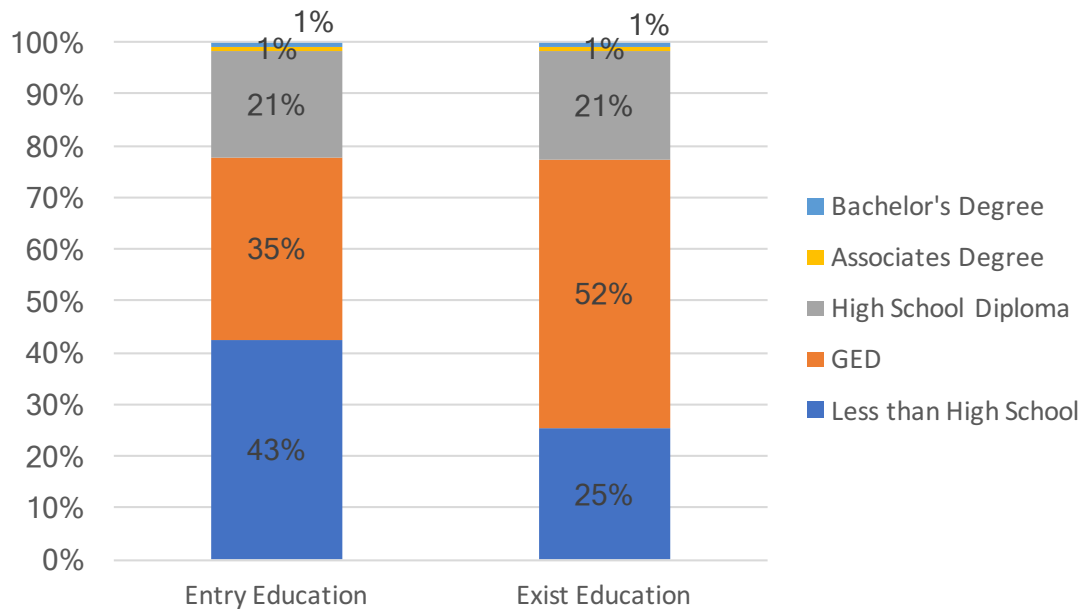
We begin our analysis by examining the characteristics of the prison population. To this end, we are using a “prison incarceration” as the unit of analysis. For example, if one inmate enters prison twice in our sample period, we consider that two separate observations. Our data contains 32,125 prison incarcerations, but only 28,285 unique inmates.

The average age at the beginning of a prison incarceration is 33.9 years old. 88 percent of prison incarcerations are completed by men and 12 percent are completed by women. 11.4 percent of inmates are married when they begin a prison incarceration, 15 percent are either divorced or separated, 33.2 percent were never married, 0.9 percent were widowed, and the remaining 39 percent had unknown marital statuses. 76.3 percent of inmates were listed as White, 11.2 percent were Hispanic, 9 percent were Black or African American, 1.1 percent were Asian, and 2.3 percent were Native Americans.

The DOC data collects educational attainment levels at entry and exit, reflecting the possibility that inmates can earn their GED or Associate’s Degree while incarcerated. Figure 5 displays the education levels of inmates at both entry and exit. At entry, only 2 percent of inmates have an Associate’s Degree or higher, while 43 percent have not completed a high school degree.

An interesting pattern evident is the amount of education that takes place inside prison. When beginning their incarceration 43 percent of inmates have no high school degree of any kind and 35 percent have GEDs. At release, only 25 percent of inmates still have no high school degree of any kind (18% of population earned a degree), while the proportion of inmates with a GED is 52 percent (an increase of 17 percentage points).

Figure 5. Entry and Exit Education



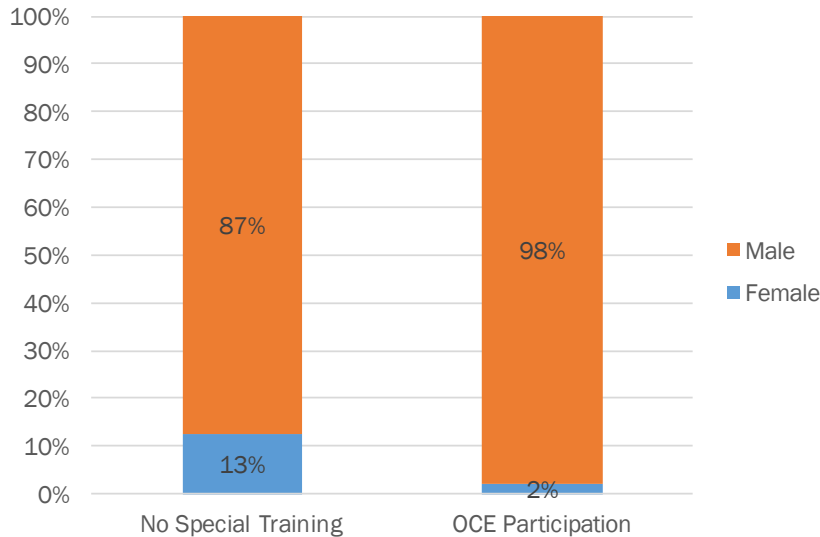
Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

OCE Participants vs. Non-participants

Next, we wish to delve into the demographic differences between participants in the OCE programs and those who do not participate. The goal of this paper is to understand whether the OCE program has real impacts on outcomes for inmates after release.

Due to the nature of the OCE program, it is possible that those inmates who gain entry to the program were already predisposed to having relatively positive outcomes, regardless of their participation (selection bias). We turn now to examining the observable characteristics of inmates, broken down by whether or not they participated in the OCE program. Differences in observable characteristics could explain differences in outcomes between participants and non-participants that are unrelated to program participation.

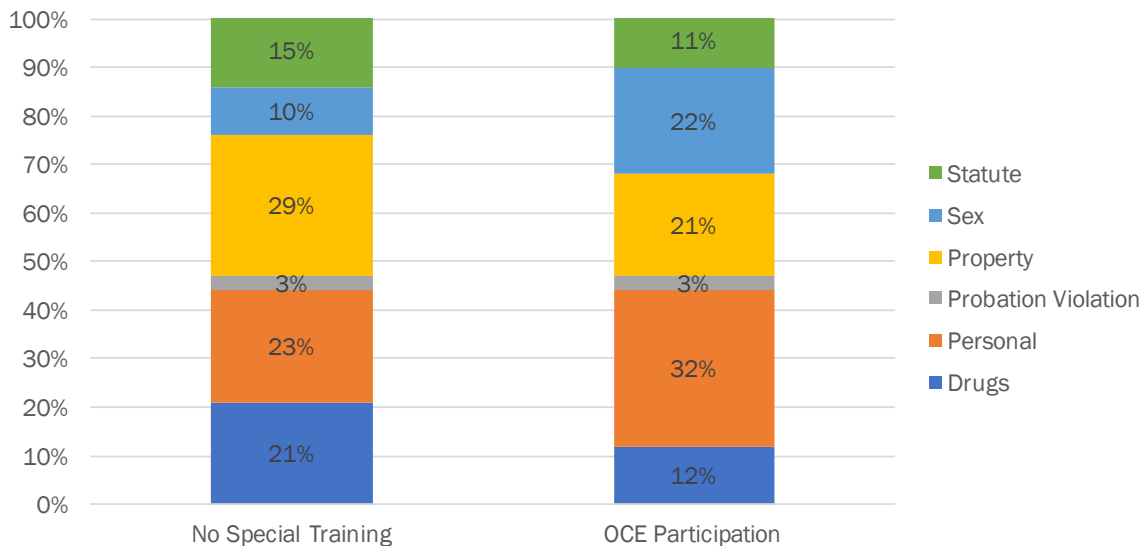
Figure 6. Gender, by OCE Participation



Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

First, we look at the gender breakdown between participants and non-participants, depicted in Figure 6. The gender balance between non-participants is skewed towards women relative to the general population. The general population is 12 percent female, but non-participants are 13 percent female. Conversely, only 2 percent of the OCE program participants are female. This is primarily due to the availability OCE programs within women’s correctional institutions.

Figure 7. Crime Category, by OCE Participation

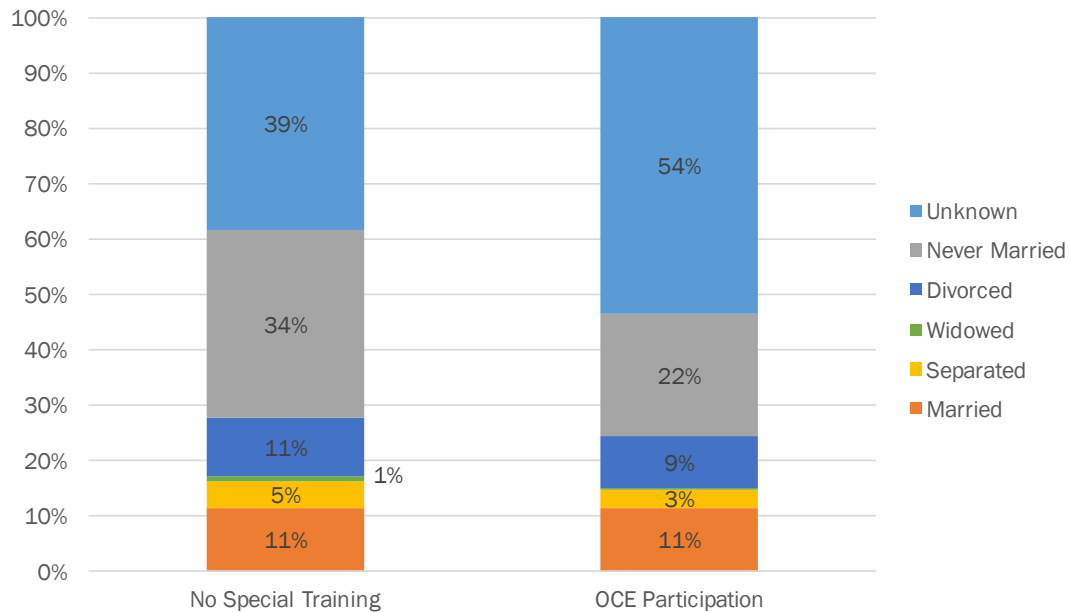


Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

Next, Figure 7 depicts the breakdown of criminal histories between the two groups. For this analysis, we first categorize crimes as either Drug, Personal,

Property, Sex, Statutory, or Probation violations. Second, for each inmate, we calculate the percentage of their crimes that fall into each category. Representing each inmate as a set of weights for each criminality type, we aggregate by OCE participation. The result is that OCE participants are less likely to have committed drug offenses, property crimes, and statutory offenses, but more likely to have committed personal crimes and sex crimes.

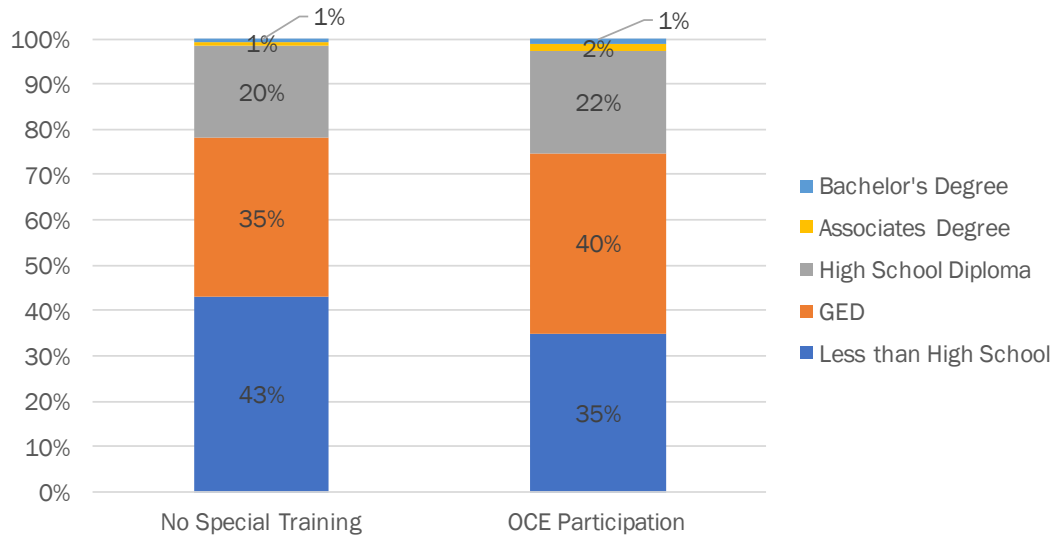
Figure 8. Marital Status, by OCE Participation



Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

Next, it is not clear that there are meaningful differences in marital status. Similar proportions of the groups are married and divorced, respectively. There are large differences in the proportions of individuals that never married (34% vs 22%) and those with a marital status of unknown or unreported (39% vs. 54%). However, as a group, never married and unknown status individuals comprise 73 percent of non-participants and 76 percent of participants.

Figure 9. Entry Educational Attainment vs. OCE Participation

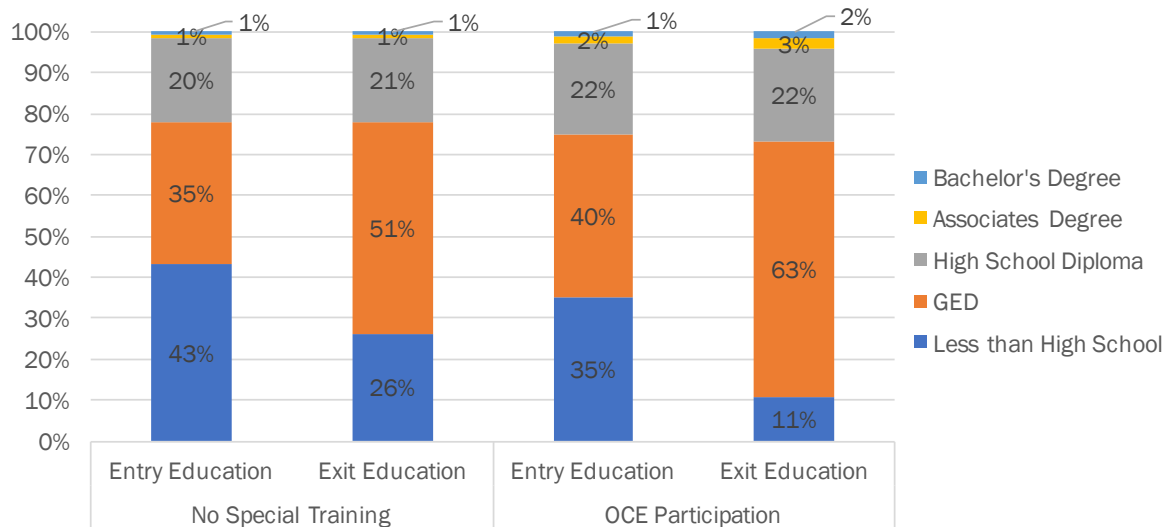


Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

Differences in educational attainment are mainly concentrated around those with no education and those with a GED. Figure 9 demonstrates that the proportion of individuals with at least a high school degree is similar between the two groups: 20 percent of non-participants have at least graduated high school, whereas 22 percent of OCE participants have.

The biggest difference is with the proportions of those with a GED and those with no high school level education. 43 percent of non-participants have no educational credentials compared to only 35 percent of OCE participants. Conversely, 40 percent of OCE participants have their GED, but only 35 percent of non-participants have a GED. Figure 9 suggests that at time of entry, those who eventually gain access to the OCE program have higher educational attainment.

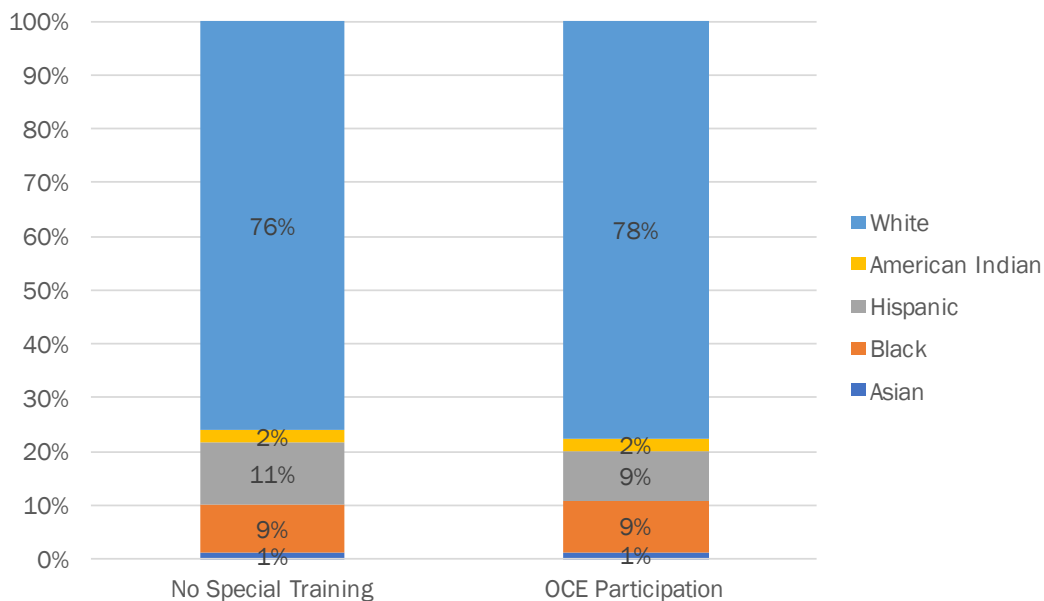
Figure 10. Change in Educational Attainment Levels, by OCE Participation



Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

OCE participants are entering prison with higher education, *ex ante*. It is also true that they are improving their education at higher rates as well. The main educational improvement option inside of prison is attainment of a GED by an inmate with no prior education credentials. 35 percent of non-participants enter prison with a GED, but 51 percent leave with one, an improvement of 16 percentage points. However, while 40 percent of OCE participants enter prison with a GED, 63 percent of them leave with one, an improvement of 23 percentage points.

Figure 11. Race/Ethnicity, by OCE Participation



Source: ECONorthwest analysis using data from Oregon Department of Corrections and Oregon Employment Department

The final demographic category looked at is race or ethnicity. There are no large racial disparities in OCE participation. The racial distribution of non-participants is close to the distribution of race seen in OCE participants. The OCE participants group has a slightly higher proportion of whites, 78 percent to 76 percent; roughly the same proportion of Black inmates, 9 percent; a slightly lower proportion of Hispanics, 9 percent to 11 percent; roughly the same proportion of American Indians, 2 percent to 2 percent; and the same proportion of Asians.

Discussion

There is evidence to suggest that individuals who participate in the OCE program are not randomly selected. In other words, participants in the program become participants in part because they have some immeasurable “higher ability.”

Participants have higher education levels at entry, and have higher rates of improvement in education than those who did not participate in the program. This difference in measurable education, and immeasurable latent “ability” suggests that the use of multiple linear regression analysis will aid in cleanly identifying the impact of the OCE program on labor market outcomes, controlling for these differences in quantifiable demographic indicators.

Labor Market Outcomes

Wage Data

The wage data employed in the labor market study provides insight into the earnings of inmates after release, and in many cases, prior to admittance into prison. We use this data below to estimate the impact that participation in the OCE program has on earnings by inmates after prison.

One key characteristic of the data is that we do not observe earnings in every quarter for every inmate. An inmate's earnings data for a given quarter will be missing if that inmate was unemployed, was employed out of state, or was deceased. Unfortunately, we cannot distinguish between those reasons due to data limitations, and therefore ignore missing quarters of earnings data. We explore a different assumption about missing data in subsequent sections.⁹

In our main analysis, we focus on inmates that are present in the earnings data before and after their incarceration. Intuitively, it helps to understand post-prison earnings by having information on pre-prison earnings. If only the "best" inmates, who would always command higher wages in the labor market, make it into the OCE program, then controlling for wage differentials prior to prison will assist in identifying the marginal impact that the OCE program has on inmate labor market outcomes. Furthermore, we drop outliers in the top and bottom 1 percent of the earnings distribution. Lastly, we adjust earnings for inflation using the Bureau of Labor Statistics' Consumer Price Index for the Portland-Salem Combined Statistical Area to control for changes in income over time.¹⁰

⁹ In their study, Minaya and Scott-Clayton conduct an analysis of community college education on earnings, with similar earnings data, under two scenarios: the first is that missing earnings data is unemployment, so earnings are 0; and the second is dropping them altogether. (Minaya, Veronica, and Judith Scott-Clayton. 2017. "Labor Market Trajectories for Community College Graduates: New Evidence Spanning the Great Recession." Center for Analysis of Postsecondary Education and Employment Working Paper 1-25.)

¹⁰ U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: All items in Portland-Salem, OR-WA (CMSA) [CUUSA425SA0], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/CUUSA425SA0>.

Figure 12. Selected Summary Statistics

Statistic	N	Mean	St. Dev.	Min	Max
WAGE.adj	228,217	4,645.56	3,933.73	49.892	20,364.75
post.release	228,217	0.546	0.498	0	1
age	228,217	34.33	10.051	11.5	75.25
acrs	228,217	0.255	0.15	0.00001	0.902
UScitizen	228,217	0.96	0.197	0	1
OCEparticipant	228,217	0.04	0.197	0	1
isfemale	228,217	0.165	0.371	0	1

Figure 12 contains summary statistics for some of the variables that are included in the analysis. First, we have 228,217 quarterly earnings observations. The average earnings per quarter is \$4,645. 54.6 percent of our observations come after an inmate is released. The average Automated Criminal Risk Score is 25.5, 96 percent of the sample are U.S. citizens, 4 percent have participated in the OCE program, and 16.5 percent of the sample observations are females.

We also include several categorical variables in our analysis: race, industry 4-digit NAICS code, inmate release location, and current educational attainment.¹¹ Our earnings sample is 86.3 percent White, 5.7 percent Hispanic, 5.6 percent Black or African-American, 1.6 percent Native American, and 0.8 percent Asian. 24.3 percent of the sample have no educational credentials, 74.2 percent have a high school degree or equivalent, and 0.7 percent have a Bachelor’s Degree or higher.

The top five industry codes for the previously incarcerated workers were Temporary Employment Services, Restaurants, Automotive Repair and Maintenance, Gasoline Stations, and Foundation, Structure, and Building Exterior Contractors. The top five release locations are local county jurisdictions of Multnomah, Marion, Lane, Washington, and Clackamas.

Regression Analysis

Multiple linear regression is an empirical technique that allows the researcher to estimate the marginal impact of an independent variables on some dependent variable, while holding the impact of the other independent variables constant.

Difference-in-Differences

We can represent the model employed in this analysis with the following linear equation:

¹¹ We match educational attainment at entry to prison to all wage observations that occur before incarceration and educational attainment at release from prison to all wage observations after incarceration. This procedure helps control for those inmates who improve their education during prison.

$$\begin{aligned}
WAGE_{it} = & \beta_0 + \beta_1 POST.RELEASE_{it} + \beta_2 OCE_{it} + \beta_3 POST.RELEASE_{it} * OCE_{it} \\
& + \beta_4 EDU_{it} + \beta_5 AGE_{it} + \beta_6 RELEASE.LOCATION_i + \beta_7 ACRS_i \\
& + \beta_8 SEX_i + \beta_9 RACE_i + \beta_{10} USCITIZEN_i + \beta_{11} NAICS4_{it} \\
& + \beta_{12} QUARTER_t + \mu_i + \epsilon_{it}
\end{aligned}$$

POST.RELEASE takes a value of one for observations that are after an inmate’s release, and zero otherwise. *OCE* equals one for inmates who participated in the OCE program, and zero otherwise. *POST.RELEASE * OCE* is the interaction between these two variables: it only equals one for observations that are after the release of an inmate that participated in the OCE program. The term μ_i in an “individual fixed effect” that controls for attributes of an individual that we cannot observe, but stay fixed over time. Including this term allows us to control for attributes of inmates that we can’t measure but stay constant over time, such as innate ability or personality.

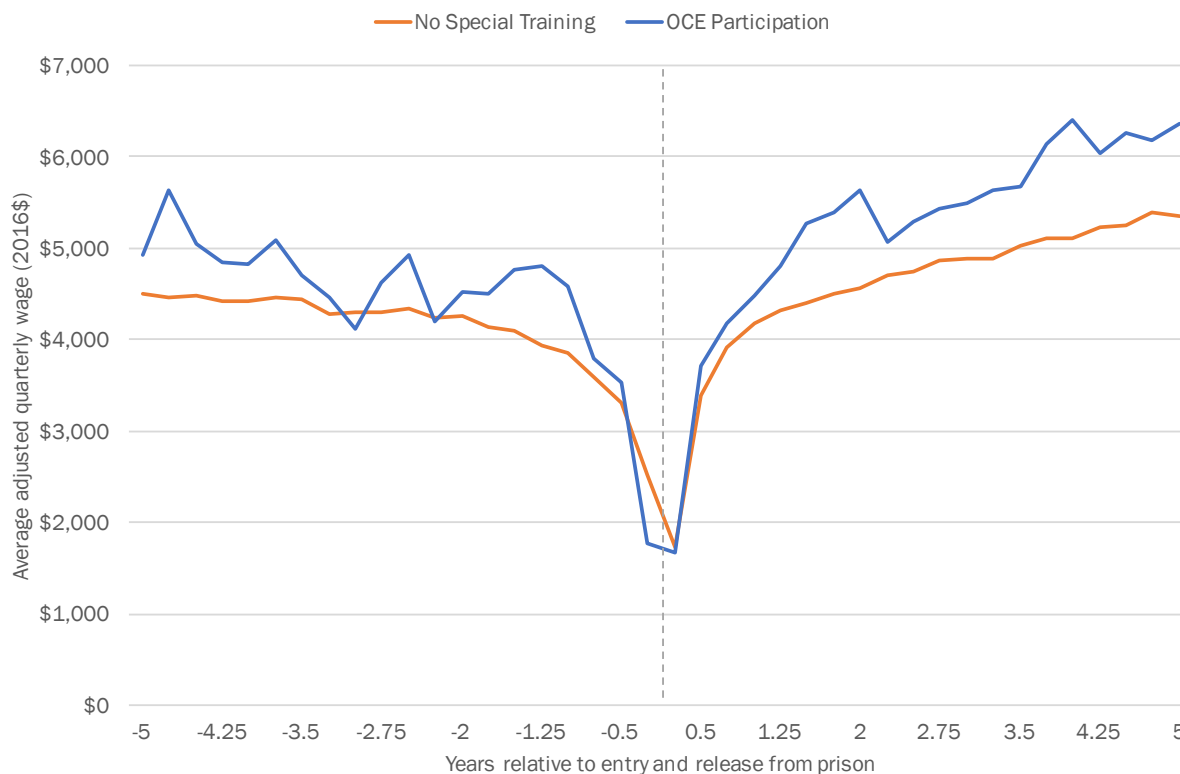
Other control variables include education, age, Automated Criminal Risk Score (ACRS), gender, race, citizenship, the 4-digit NAICS code of the employer and the quarter that the observation is from. Education, age, and the NAICS code can change over time, but gender, race, citizenship, and ACRS do not. In an individual fixed effects model, attributes that are constant overtime drop out of the model and separate estimates of their coefficients are not obtained.

This linear specification is known in the applied microeconomics literature as a “difference-in-differences” (DID) estimator. Researchers are often not afforded the luxury of controlled experiments with randomly selected control and treatment groups. To get as close to that ideal as possible, we posit a control and treatment group in the data. In the current case, our treatment group are participants in the OCE program and the control group are those who haven’t.

Unfortunately, we acknowledge that these groups are not randomly created, and there might be something about those who eventually participate in the OCE program that would lead them to higher earnings post-incarceration that are unrelated to the program.¹² A DID estimator only requires that the trajectories of wages of the two groups were the same prior to entering prison. If that is the case, we can infer the impact of the OCE program by comparing the actual wages to OCE participants to the hypothetical wages they would have received if their wage growth followed the same pattern as those who didn’t participate. If there is a difference here, then we can conclude that the OCE program had an impact.

¹² For example, more industrious or self-motivated individuals might select into the OCE program. These types of inmates would likely have higher wages than the average inmate after prison, regardless of their participation in OCE. Simply comparing the wages of OCE participants to others may be an unfair comparison.

Figure 13. Earnings Trajectory by OCE Participation



Error! Reference source not found. displays how average earnings evolved for both groups relative to their time in prison. Prior to incarceration, even though eventual OCE participants have higher wages, both groups have a downward trend to their earnings. After release, OCE participants have higher earnings and faster growth in earnings. While this figure is descriptive (does not have control variables), it does lend support to the validity of the DID estimator that we use below.

Results

Our regression results conclude that participation in the OCE program raises quarterly earnings by \$155.55 compared to inmates who do not participate.¹³ This result is statistically significant at the 5 percent level.¹⁴ Our model implies that participation in the OCE program raises the wages of inmates by \$622.20 per year. For the average inmate, this is a 3.3 percent increase in earnings, per year.

“Missing” Wage Observations

In the previous analysis, we ignored all missing earnings data. However, it is possible that the missing earnings data is representative of unemployment, or

¹³ This estimate corresponds to the estimate of β_3 in our regression model.

¹⁴ The 95 percent confidence interval is [\$19.94, \$291.18]

zero earnings—the other likely possibility is out of state earnings/residency. In this section, we proceed under the assumption that any missing quarterly earnings data is actually a zero or representative of no income earned. Given that in our dataset, OCE participants are less likely to have missing quarters of data than non-program participants, the assumption that missing data is indicative of zero earnings will increase the estimated impact of participation in the OCE program. Including missing earnings data as zero earnings increases our sample size to 811,965 observations (a 250% increase in the sample size).

Results

Our empirical model remains a Difference-in-Differences estimator with individual fixed effects. As predicted given fewer \$0 income quarters in the OCE population, the estimated impact of the OCE program increases quarterly earnings to \$180.69 for participants compared to non-participants. This result is significant at the 0.1 percent level.¹⁵ This result implies an annual gain in earnings of \$722.76. Under the assumption that missing earnings data is a quarter with zero earnings, the average quarterly earnings for our sample drops to \$1,534.32. The bump in earnings associated with OCE participation is 11.8 percent of the mean earnings amount.

Discussion

Taken together, the data and our models suggest that the OCE program increases wages on a range from 3.3 percent to 11.8 percent for the average inmate. Given the distribution of missing data favoring the OCE participants, the 11.8% is an upper bound estimate that requires further research to confirm an appropriate interpretation of missing data. A conservative estimate of OCE's positive impact on income is in the 3.3% range. A further benefit attributable to OCE participation, not specifically analyzed in this study, is the impact on unemployment, not specifically earned income. The joint results suggest that the OCE program increases participation in the labor market, irrespective of earnings. The average estimate of 3.3 percent is based on ignoring possible unemployment, whereas the 11.8 percent figure is based on an overestimate of the prevalence of unemployment. Put differently, there is a lower probability of \$0 earned in a quarter for OCE participants, which is most likely indicative of higher employment rates for program participants. The two modeling approaches allow us to bound the likely effects, and importantly, the impact of OCE participation on income level is positive and statistically different from zero.

¹⁵ The 95 percent confidence interval for the estimate is [\$135.10, \$226.29]

Appendix A: IMPLAN methodology

Input-output modeling

Input-output models are mathematical representations of the economy that show how different parts (or sectors) are linked to one another. The strengths of the input-output modeling framework include:

- A double-entry accounting framework that results in a model structure that is well ordered, symmetric, and where inputs must be equal to outputs;
- A reasonably comprehensive picture of the economic activities within a region, with mathematical equations that describe the flow of commodities between producing and consuming sectors, the flow of income between businesses and institutions, and the trade in commodities between regions;
- Model construction using secondary source data that are gathered and vetted by government agencies; and
- The ability to cost-effectively create input-output or economic impact models for any region.

Input-output models that rely on survey or primary source data are expensive to construct. Thus, special modeling techniques have been developed to estimate the necessary empirical relationships. These techniques use a combination of national technological relationships and state- and county-level measures of economic activity, and have been packaged into the IMPLAN (for IMPact Analysis for PLANning) modeling software. This is the modeling system ECONorthwest used in this analysis.

IMPLAN economic impact model

IMPLAN has been developed and distributed by the Minnesota IMPLAN Group, Inc., since 1993. The IMPLAN modeling system is widely used and well respected—there are currently more than 1,500 public and private users of the IMPLAN modeling software. The selection of IMPLAN by the United States Department of Agriculture (USDA) as its analysis framework for monitoring job creation associated with the American Recovery and Reinvestment Act (ARRA) of 2009 is a testament to its credibility.

In general terms, the IMPLAN model works by tracing how spending associated with an industry circulates through an economy or study area. Changes in one sector or multiple sectors trigger changes in demand and supply throughout the economy. Initial changes in the model propagate through the economy via supply- and demand-chain linkages, altering the equilibrium quantities of inputs

and outputs and associated jobs, income, and value-added components. These multiplier effects continue until the initial change in final demand leaks out of the economy in the form of savings, taxes, and imports.

ECONorthwest used an input-output modeling framework to measure the gross economic impacts or “contributions.” A net analysis, which compares the economic effects to a counterfactual scenario was not used for this study.

Economic impact terms and definitions

These three types of economic impacts are measured in terms of output, labor income, and employment resulting from spending in the study area:

- *Direct impacts* are the output, jobs, and income associated with the immediate effects of final demand changes.
- *Indirect impacts* are production changes in backward-linked industries caused by the changing input needs of directly affected industries. Suppliers to the directly involved industry will also purchase additional goods and services; this spending leads to additional rounds of indirect impacts. Because they represent interactions among businesses, these indirect effects are often referred to as supply-chain impacts.
- *Induced impacts* are the changes in regional household spending patterns caused by changes in household income. The direct and indirect increases in employment and income enhance the overall purchasing power in the economy, thereby inducing further spending by households. Employees in these industries, for example, will use their income to purchase groceries or take their children to the doctor. These induced effects are often referred to as consumption-driven impacts.

Total economic impacts are based on the sum of the direct, indirect, and induced impacts. These three types of economic impacts are measured in terms of output, labor income, and employment resulting from spending in the study area:

- *Output* represents the value of goods and services produced, and is the broadest measure of economic activity
- *Income* consists of employee compensation and proprietary income, and is a subset of output.
 - Employee compensation includes workers’ wages and salaries, as well as other benefits such as health, disability, and life insurance, retirement payments, and non-cash compensation.
 - Proprietary income (business income) represents the payments received by small-business owners or self-employed workers—in this case, drivers. Business income would include, for example,

income received by private business owners, doctors, accountants, and lawyers.

- *Jobs* are measured in terms of full-year-equivalents (FYE). One FYE job equals work over twelve months in each industry (this is the same definition used by the federal government's Bureau of Economic Analysis). For example, two jobs that last six months each count as one FYE job. A job can be full-time or part-time, seasonal or permanent; IMPLAN counts jobs based on the duration of employment, not the number of hours a week worked. Job impacts from operations are for one year of normal operation.