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A Comparison of Pathways to Bachelor's Degrees in Washington State

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ABOUT THE ERDC

The research presented here utilizes data from the Education Research and Data Center (ERDC), located within the Washington Office of Financial Management (OFM). ERDC works with partner agencies to conduct powerful analyses of learning that can help inform the decision-making of Washington legislators, parents, and education providers. ERDC's data system is a statewide longitudinal data system that includes de-identified data about people's preschool, educational, and workforce experiences. The views expressed here are those of the author(s) and do not necessarily represent those of the OFM or other data contributors. Any errors are attributable to the author(s).

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ABSTRACT

This paper uses data from the Education Research and Data Center (ERDC) to estimate the earnings premium by gender associated with the pathway (direct from high school or associate degree) of attaining a bachelor's degree from a public university in the state of Washington, adjusting for selection bias.

We are explicitly comparing the earnings of those workers who earn an associate degree before earning a bachelor's degree with those workers who graduate from high school and then earn a bachelor's degree without the intermediate step of attending community college or achieving an associate degree. We use propensity score matching to control for selection bias. This paper is one of the first to explicitly adjust for selection bias while estimating the earnings premium for these pathways.

We find no substantial differences in the post-graduation earnings for workers who followed an associate degree to bachelor's degree pathway and those who went directly to the bachelor's degree without a stop at community college for either males or females. Nonetheless, after graduation, female college graduates earn about 80 percent of male college graduates' earnings.

JEL Classification: C23, H40, I21, J24, J31

Keywords: propensity score matching, selection bias, gender, returns to education, associate degree, bachelor's degree

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INTRODUCTION

The study demonstrates the value of connecting micro-level education data with micro-level workforce data.

This study is the fourth in a series that provides information on the economic returns to postsecondary education in Washington state using data from the Education Research and Data Center (ERDC) in the Office of Financial Management. The U.S. Department of Labor has funded state Workforce Data Quality Improvement (WDQI) grants to promote the inclusion of unemployment insurance (UI) earnings and employment data. This educational study is funded by the Washington state WDQI grant.

This study uses ERDC data for workers with a bachelor's degree who did not attend graduate school and graduated from a public high school in Washington state between 2004 and 2008. These workers did not attend any out-of-state postsecondary institution. They were employed in Washington during the follow-up period. Workers who were self-employed, worked outside Washington or were not covered by UI are excluded.

Workers with a bachelor's degree who went through a community college associate degree program may differ from those who went directly to a four-year college program in several ways, some measurable and some unmeasurable. There may be differences in family income, high school academic performance, preparation for college or motivation for success. These factors may not only differentiate between workers' college pathways, but may also differentiate their post-graduation earnings.

This study examines pre and post-graduation real[1] annual earnings for two types of workers with bachelor's degrees: (1) those who attained their degree by first earning an associate degree at a community college, and (2) those who attained a bachelor's degree without the intermediate step of earning an associate degree. We term these two pathways to the bachelor's degree "CC-BA" and "BA-Direct." This paper compares the earnings before and after graduation for workers in these two pathways to the bachelor's degree.

As with the three previous papers on the earnings premium associated with postsecondary education,[2] workers from the two pathways may differ in ways that affect both their selfselection into one of the pathways and their earnings, we use a Propensity Score Matching (PSM) methodology to match individual BA-Direct workers with CC-BA workers. The match is based on the propensity (estimated likelihood) that a bachelor's degree earner in our sample follows the CC-BA pathway rather than the BA-Direct pathway. Individual workers from

1 Bureau of Labor Statistics, Consumer Price Index-All Urban Consumers, Not Seasonally Adjusted, Seattle-Tacoma-Bremerton, WA, All Items, Series Id: CUURA423SA0.

2 See: "Earnings Premium Estimates for Bachelor's Degrees in Washington State," (http://www.erdc.wa.gov/briefs/pdf/201403.pdf), February 2014; "Postsecondary Education Assessment in Washington State: Earnings Premium Estimates for Associate Degrees" (http://www.erdc.wa.gov/briefs/pdf/201501.pdf), February 2015; and "Earnings Premium Estimates by Gender and Race Category for STEM Bachelor's Degrees in Washington State" (http://www.erdc.wa.gov/briefs/pdf/201503.pdf), July 2015.

each pathway are matched with the CC-BA being matched with replacement.

The logistic regression upon which the propensity score is derived is run separately for females and males. It includes variables on the worker's high school GPA, whether they received free or reduced price meals, the region of the state in which their high school is located, and labor market variables from their graduation year and the county in which their high school is located. Both genders have ample common support in the predicted probabilities of following the CC-BA pathway.

The multi-level data are described in more detail in the appendices to this paper. We convert nominal earnings to real, constant dollar earnings. Our inflation adjustment converts all earnings data to 2014 dollars using the CPI[3] for all urban consumers.

3 Bureau of Labor Statistics, Consumer Price Index-All Urban Consumers, Not Seasonally Adjusted, Seattle-Tacoma-Bremerton, WA, All Items, Series Id: CUURA423SA0

FINDINGS

The average difference in earnings between the two pathways for the first five years after college graduation is $547 per year.

The primary results of this research are presented below in chart form. The outcome variables are real median calendar year earnings. Each earnings year corresponds to the year before and after the bachelor's degree graduation year. Year zero (0) indicates the calendar year including graduation. All earnings are expressed in 2014 dollars. Workers are included only if they have earnings in the UI wage record in all four quarters for a given calendar year.

Figure 1 shows the before and after graduation real annual earnings for female workers from the two pathways to a bachelor's degree. In the years before graduation, the CC-BA group out-earns the BA-Direct group by an average of $2,680 per year. This difference may be due to the CC-BA cohort working more hours or for higher wage rates while enrolled in school. After graduation, the two groups' earnings are close to identical. The variation at the end of the series may be due to dramatically shrinking sample sizes; future research will determine the extent to which these fluctuations in earnings are actual results or artifacts of small sample sizes associated with the stacking procedures as we get to the end of the data series.

Figure 2 shows a similar pattern for male workers over the two college pathways. There is a small earnings advantage for the CC-BA group before college graduation. The average difference is almost identical to that for the female workers, $2,683, compared to $2,680. Similar to female workers, the post-graduation earnings for males are close to identical for the two pathway groups. Also there is an end-of-the-series fluctuation that may be due to the small sample sizes associated with the stacking procedure as the data series nears its end. The average difference between the two groups in the first five years after graduation is $1,280.

Figure 3 shows earnings results for both genders together. Again, the patterns for the two genders are very similar, but the earnings difference between the genders widens after graduation. In the years before graduation, the two groups experience a tight dispersion of

Figure 1: Earnings by pathway to degree (female)

This chart shows the earners of female workers, separated by the path that they took to obtain their degree. We can see that there is little difference in earnings based on the path taken.
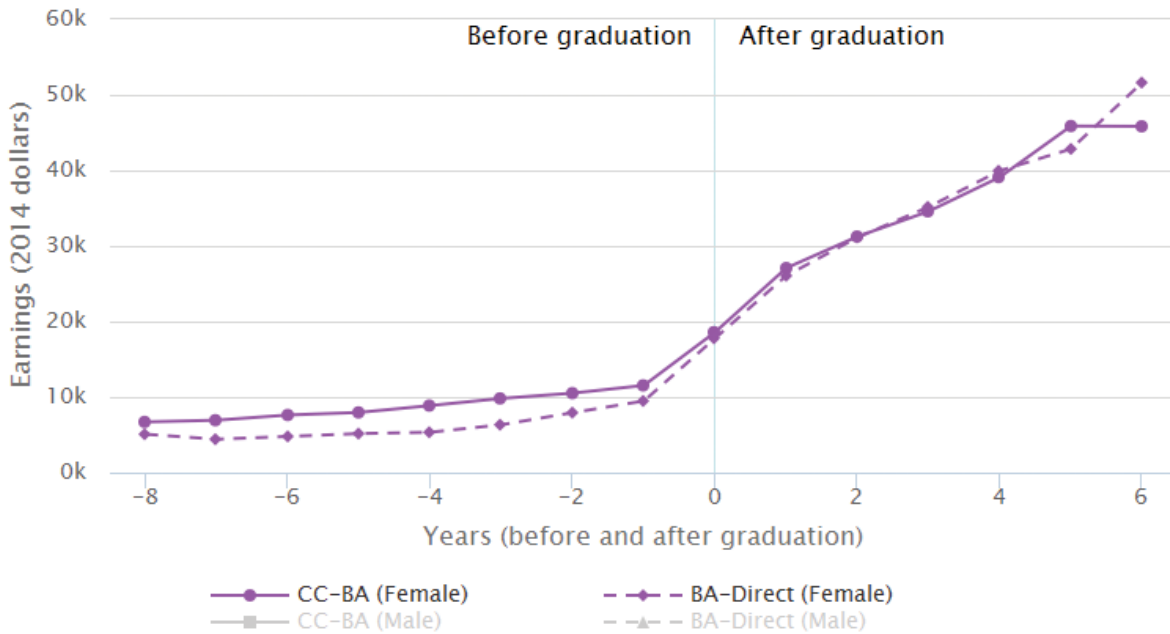

Figure 2: Earnings by pathway to degree (male)

This chart shows the earners of male workers, separated by the path that they took to obtain their degree. We can see that there is little difference in earnings based on the path taken.
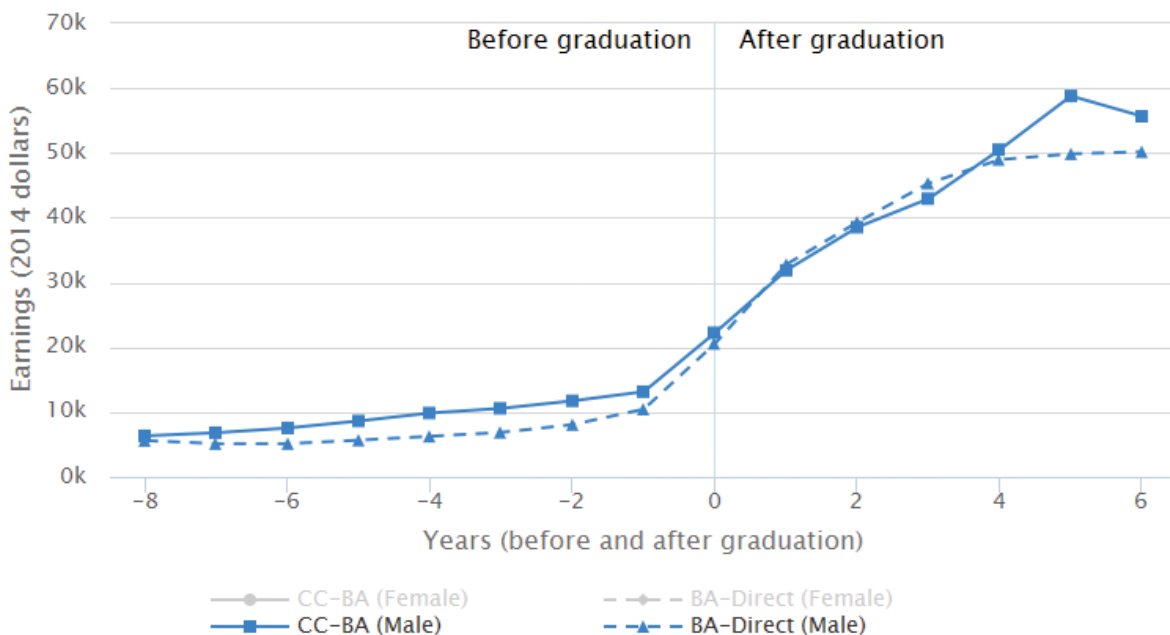
Figure 3: Earnings by pathway to degree (all workers)

This chart shows the earners of workers of each gender, separated by the path that they took to obtain their degree. We can see that while there is little difference in earnings based on the path taken, there are differences based on the gender of the worker.
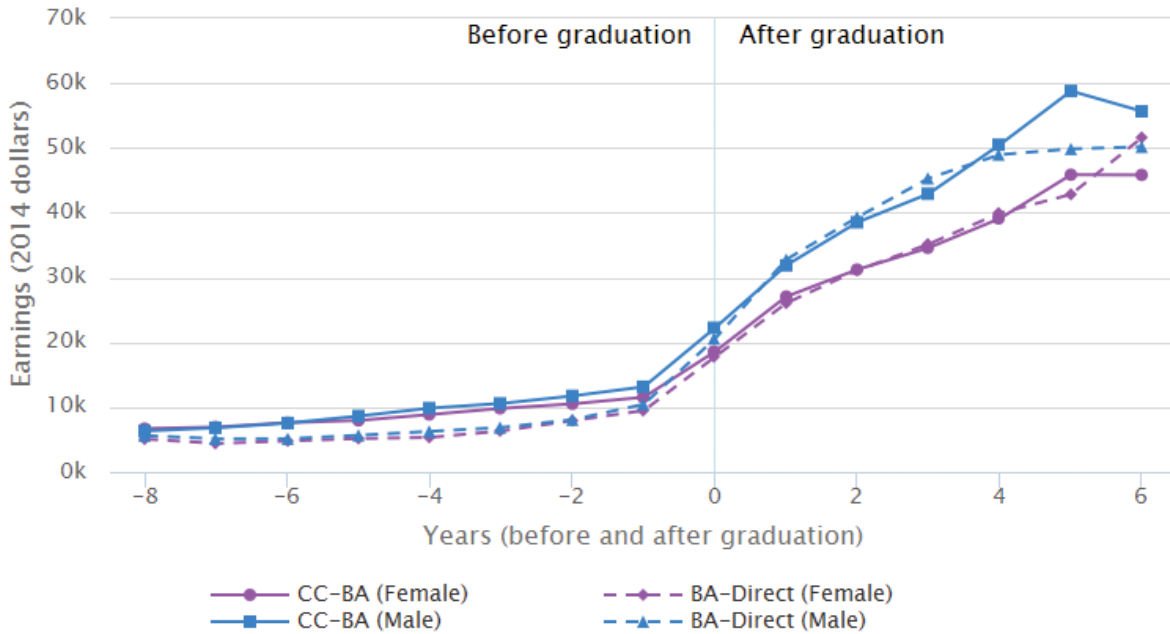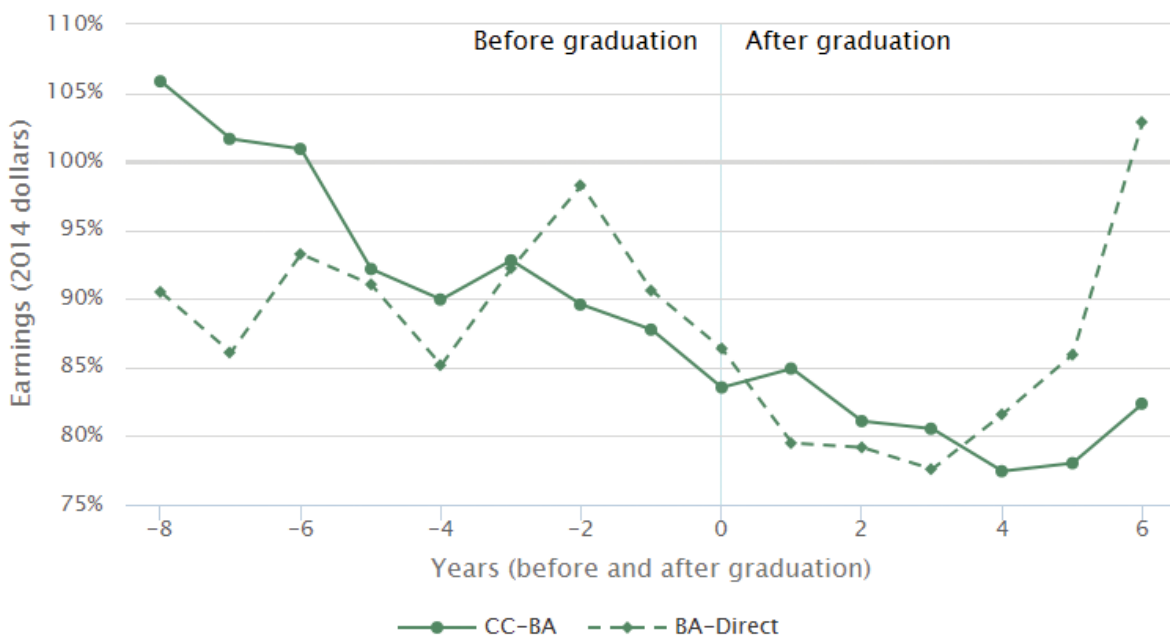

Figure 4: Male-female earnings ratios by pathway to degree

This chart shows the percentage of male earnings earned by female workers. For example, two years after graduation, female workers earned 81% of what male workers earned on the CC-BA path, and 79% on the BA-Direct path.

earnings. During the years after graduation the CC-BA group females earn an average of $589 less per year than the males, while for the BA-Direct group the average difference is $586, also favoring the male workers. During the first five years after graduation (years 1–5 in the chart), CC-BA males earn an average of $8,954 per year more than the CC-BA female workers. For the BA-Direct workers, the males earn an average of $8,221 more than females per year during these first five years after graduation. The female-to-male earnings differentials are equivalent for bachelor's degree holders, regardless of whether they attended a community college and earned an associate degree before earning a bachelor's degree.

Figure 4 shows the earnings differential in percentage terms for the CC-BA and the BA-Direct pathways. It also shows a similar pattern for both pathways to a bachelor's degree. During the years prior to enrolling and of attending college the female-to-male earnings ratio is relatively close to 1. This may be because the workers are in unskilled jobs or perhaps working while attending college. For the CC-BA group, the female-to-male earnings ratio before graduation averages 95.1 percent; the BA-Direct female-to-male earnings ratio is a little bit lower, at 90.0 percent. This may indicate a greater opportunity for work while attending a community college or less need for work while in college for the BA-Direct workers.

For the first five years after college, the CC-BA group experiences an average female-to-male earnings ratio of 80.4 percent, a female earnings deficit of 19.6 percent. For the BA-Direct group, the average female-to male earnings ratio for the first five years after graduation is 80.8 percent, a female earnings deficit of 19.2 percent.

While the CC-BA group experiences a slightly higher female-to-male earnings ratio before graduation, the post-graduation experience of the two groups is very similar. Though female graduates earn about four-fifths as much as male graduates, neither the amount of earnings nor the female earnings disparity varies appreciably between the two pathways to the bachelor's degree examined in this paper.

CONCLUSION

While there were differences in earnings of workers from the two pathways prior to graduation, earnings *after* graduation were vitually identical.

This paper reports on research comparing the earnings of bachelor's degree holders who followed one of two pathways to their degree —— directly from high school or via a community college and an intermediate associate degree. Though there are differences between the earnings of workers from the two pathways before graduation, after they graduate with a bachelor's degree, the earnings of workers from the two pathways are virtually identical. It matters less how a worker attained the degree and more what the degree represents. Furthermore, the distribution of majors (see Appendix A) between the two groups is also similar.

Nonetheless, differences in earnings between the genders persist and are similar between the two pathways studied. Female graduates earn about 20 percent less than male graduate, regardless of the pathway to their bachelor's degree.

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APPENDICES

Appendix A: Majors of graduates

Table A1. Top 10 majors for female CC-BA workers	Count	Percentage
Business, management, marketing and related programs	374	13.8%
Social sciences	333	12.2%
Education	276	10.2%
Psychology	252	9.3%
Health professions and related programs	190	7.0%
Undeclared	173	6.4%
Biological and biomedical sciences	162	6.0%
English language and literature/letters	151	5.6%
Liberal arts and sciences, general studies	121	4.5%
Multi/interdisciplinary studies	119	4.4%

Table A2. Top 10 majors for female BA-Direct workers.	Count	Percentage
Business, management, marketing and related programs	586	11.9%
Social sciences	571	11.6%
Undeclared	446	9.1%
Psychology	370	7.5%
Visual and performing arts	366	7.5%
Education	360	7.3%
Biological and biomedical sciences	324	6.6%
Health professions and related programs	266	5.4%
English language and literature/letters	229	4.7%
Multi/interdisciplinary studies	228	4.6%

Table A3. Top 10 majors for male CC-BA workers.	Count	Percentage
Business, management, marketing and related programs	440	21.6%
Social sciences	262	12.9%
Engineering	161	7.9%
Psychology	116	5.7%
Biological and biomedical sciences	107	5.3%
Computer and information sciences	95	4.7%
Undeclared	92	4.5%
Liberal arts and sciences, general studies	84	4.1%
Multi/interdisciplinary studies	79	3.9%
Visual and performing arts	72	3.5%

Table A4. Top 10 majors for male BA-Direct workers.	Count	Percentage
Business, management, marketing and related programs	761	17.6%
Social sciences	592	13.7%
Engineering	404	9.4%
Biological and biomedical sciences	275	6.4%
Visual and performing arts	224	5.2%
Undeclared	211	4.9%
Physical sciences	197	4.6%
Computer and information sciences	193	4.5%
Multi/interdisciplinary studies	188	4.4%
Liberal arts and sciences, general studies	184	4.3%

Appendix B: Matching

This study uses a one-to-many matching with replacement algorithm. This approach permits BA-Direct group members to be matched to more than one CC-BA group member. We found this approach minimized the total distance between treatment and comparison group propensity scores.

Appendix C: Enrollment Data Sources & Definitions

Enrollment data for this study came from the following sources:

- **High school graduates:** Annual summary data files (P-210) for high school enrollment and completion from the Washington State Office of Superintendent of Public Instruction. This file identifies regular high school graduates, their graduation date, school district and school, low-income status, gender, grade point average and race/ethnicity.

- **Washington community and technical college enrollment:** Enrollment data from the State Board for Community and Technical Colleges, which include student enrollment status, by term, for the 34 colleges in the state system. Community and technical college enrollment includes students preparing for both certificates and degrees leading to careers as well as students preparing for transfer to academic programs in four-year institutions.

- **Washington public four-year higher education enrollment:** Enrollment data for the state's six public baccalaureate higher education institutions from the Public Centralized Higher Education Enrollment System maintained by OFM.

- **Enrollment data for private and out-of-state higher education institutions:** Enrollment data for institutions other than the Washington public institutions was obtained from the National Student Clearinghouse, which captures 92 percent of postsecondary enrollment nationally. At this time, it is the best source of information about postsecondary enrollment in private higher education institutions in Washington and for all out-

of-state institutions.

■ **Administrative data from Washington state's UI program:** Provided by the Washington State Employment Security Department. This data source is described in Appendices D and E.

Appendix D: Unemployment Insurance

The UI program is a federal-state program financed by payroll taxes paid by employers. The U.S. Department of Labor sets broad criteria for eligibility and coverage, but states determine the specifics of the implementation. In Washington, the Employment Security Department is responsible for the administration of the UI program.

Employers must participate in the UI program if they pay wages to employees, regardless of the dollar amount. Participating employers are called "covered employers." Participation includes registering, reporting wages and paying unemployment taxes or reimbursing the department for benefits paid for all part-time or full-time employees. There are exceptions to this, including the following:

■ Small farm operators —those with payroll less than $20,000 and fewer than 10 employees — do not cover spouse, children under 18 or student workers.

■ Employees performing domestic services in a private home, college club, fraternity or sorority are not covered if the total wages paid are less than $1,000 per quarter. If payroll exceeds $1,000 in any quarter, wages must be reported for the entire year and the following year.

■ Nonprofit preschool staff if fewer than four.

■ Business owners are not reported. Sole proprietors do not report their spouses or unmarried children under 18.

■ Corporate officers are required to cover themselves for UI unless they opt out by Jan. 15 each year.

■ There are additional types of employees that an employer may not be required to report, depending upon the circumstances. Those most pertinent to this study include the following:

● self-employed workers
● religious employees
● Work-Study students, as long as the employer is a nonprofit 501(c)(3), state government or local government

More information on the UI program is available from the Employment Security Department. In addition to the above categories, federal civilian employees and both active duty and retired military are not reported in the state-level UI program administrative records. Nationally, the UI program includes 98 percent of all employers (ERDC, 2011).

Appendix E: Data Elements and Timing

In Washington state, employers file a quarterly wage detail report that includes the following elements:

- year
- quarter
- employer account number
- employee Social Security number
- name
- wages paid during quarter
- hours worked during quarter

Employer characteristics can be added to the wage record. These are:

- industry — North American Industry Classification System code
- ownership —private or public (federal, state, local governments)
- size of firm (monthly)

There is a lag between the time the employer files the report and the time the associated administrative data become available for research use. Both UI tax payments and wage reports are due by the last day of the month following the last day of each quarter. Incorporating the wage data in administrative databases takes the remaining two months of the quarter. Data are ready for use for research purposes early in the subsequent quarter. The process is summarized in Figure E-1:

Figure E-1: Timing of collection and availability of UI wage data

Current Year											
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Quarter 1			Quarter 2			Quarter 3			Quarter 4		
Prior year Quarter 4 data submitted by employer and processed by ESD			Current year Quarter 1 data submitted by employer and processed by ESD			Current year Quarter 2 data submitted by employer and processed by ESD			Current year Quarter 3 data submitted by employer and processed by ESD		
Prior year Quarter 3 data available for research			Prior year Quarter 4 data available for research			Current year Quarter 1 data available for research			Current year Quarter 2 data available for research		