Wyoming's Hathaway Scholarship Program

A Workforce Outcomes Evaluation of a State Merit-Based Scholarship Initiative Using Administrative Records

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Who We Are

Research & Planning (R&P) functions as an exclusively statistical entity within the Wyoming Department of Workforce Services. R&P collects, analyzes, and publishes timely and accurate labor market information (LMI) meeting established statistical standards. We work to make the labor market more efficient by providing the public and the public's representatives with the information needed for evidence-based, informed decision making.

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Chapter 1: Introduction

by: Tom Gallagher, Research & Planning Manager

Research & Planning (R&P) is a separate exclusively statistical entity within the Wyoming Department of Workforce Services. R&P collects, analyzes, and publishes timely and accurate labor market information (LMI). LMI is an applied science; it is the systematic collection and analysis of data which describes and predicts the relationship between labor demand and supply.

Prediction results in informed decision making. If we can predict that a certain type of training or education results in gaining well paid employment, the effort and expense of education can clearly be justified and a return on investment realized. This report is aimed primarily at publishing information about the role of education and the value of education in the market with a focus on the job seekers' interests in informed decision making.

Informed decision making for job seekers can take many forms, from long-term career counseling to assisting groups of dislocated workers in choosing the best short-term training option to meet their financial needs. Focusing on the job seeker for this publication is not intended to disregard the full range of interests in student outcomes by other customers of LMI. Indeed, selecting one customer to focus on at the expense of others, would be inconsistent with R&P's mission which is "To establish an empirically based comprehensive understanding of the labor market: its constituent elements, systems integrating its components, and subsequent outcomes." By focusing primarily on one customer, we make this publication manageable and will return another time to focus on other constituencies who will also find this publication of substantial interest.

As the review of the literature (Chapter 2) reveals, determining the pecuniary value of training and education is a question receiving increasing attention from the perspectives of both personal investment and public policy. Since the mid-1990s, the term *earnings outcomes* has most often come to mean earnings from administrative records, and it references the Social Security Administration's annual reports on wage and salary income or the earnings of wages from the state administered Unemployment Insurance (UI) program (UI wage records). Within U.S. Department of Labor employment and training operations, quarterly UI worker earnings — or *wage records* — have become the standard for reporting earnings. R&P used wage records in the research behind this report on student outcomes. Interpreting quarterly wage records earnings is problematic; in fact, an individual is considered employed if he or she worked in only one week of the quarter or worked all three months of the quarter. Moreover, given these differences for one week and three months, the ability of workers to find steady employment is highly correlated with age, gender, seasonal opportunities in local markets, and participation in education and training programs. Chapter 3 focuses on one strategy: it measures steady work as a proportion of all work and its impact on earnings, to help the reader understand factors other than educational attainment that explain earnings change. As the report develops, we move toward a more familiar

measure of compensation by using hours worked from another employment related administrative data base to apportion earnings change among such factors as licensure attainment, maturity, establishing job commitment as well as educational attainment as explanations for earnings change.

What are Wage Records?

Many of the chapters in this publication reference wage records, specifically R&P's Wage Records database. Wage records represent an individual's wage history based on employers' quarterly wage and employment reports to the Unemployment Insurance (UI) tax section of the Wyoming Department of Workforce Services. Bullard (2015) stated that UI covered employment represents approximately 91.5% of Wyoming's total wage and salary employment.

As noted by Gosar (1995):

"Wage records are an administrative database used to calculate UI benefits for employees who have been laid-off through no fault of their own. By law, each employer who has covered employees, must submit tax reports to the state showing each employee's wage. The required information on this tax report includes social security number (SSN) for each covered employee, year, quarter, and wages earned in the quarter."

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Bullard, D. (2015). Local jobs and payroll in Wyoming in first quarter 2015: job losses appear in the oil & gas sector. *Wyoming Labor Force Trends, 52*(10). Retrieved June 6, 2016, from http://doe.state.wy.us/LMI/trends/1015/1015.pdf

Gosar, W. (1995). Wyoming unemployment insurance wage record summary statistics - a new way to look at Wyoming. *Wyoming Labor Force Trends, 32*(5). Retrieved June 6, 2016, from http://doe.state.wy.us/LMI/0595/0595a2.htm

Chapter 4 presents a longitudinal analysis of employment and postsecondary enrollment of the earliest high school 12th grade cohort for which the Hathaway Scholarship Program (HSP) was available. The senior class of 2006/07 was the first class eligible for financial support under HSP. While a minimum college entrance test score was required, there were no special high school curriculum requirements as part of Hathaway eligibility. R&P tracked these 12th grade students for seven years, or the most recent year for which wage records matches were available from 11 partner states at the time of this research. These 11 partner states are those states with which R&P has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah (see Figure 1.1, page 6).

The analysis demonstrates that gender and age play a significant role in the decision of whether or not to attend postsecondary institutions. These factors also play a role in earnings attainment and when, after leaving high school earnings changes take place in association with graduation and migration. During the seven-year

follow-up, males who never attended postsecondary institutions earned more than those who attained a bachelor's degree. Earnings for males with a bachelor's degree may exceed those males who never attain postsecondary education, but that line is crossed in an as yet examined future. On the other hand, the results also suggest that attaining a postsecondary bachelor's level award is more important for the earnings gain of females. For females to achieve this earnings gain, it is evident that they often must find employment in another state. This chapter illustrates the importance of separating the effects on earning of age and gender from the effects of educational attainment.

Chapter 5 draws the readers' attention to the range of career and family formation choices made in the years shortly after high school. It illustrates how gender is associated both with fields of academic pursuit at the University of Wyoming and labor market outcomes. Female academic pursuits focus on education, health professions, and related programs among 24 fields of study examined. For males, health professions ranked third among bachelor's graduates, while business, management marketing & related was the single largest category, and engineering second among graduates. Looking at post-graduation earnings for males and females, the results are similar for the

most frequently occurring degree types, with the exception of earnings for males graduating with business management falling slightly below the earnings of females who hold education degrees. While gender appears to be critical to education and career choices, earnings outcomes are a function of the genders being subject to different labor markets that may not share a common relationship to the business cycle. These facts need to be incorporated in future Hathaway analysis.

R&P's analysts crafted Chapter 6 to introduce the reader to the Hathaway Scholarship Program as a merit-based strategy students can use to finance their education and to describe the dominant modes of financing used by students, including earnings from work. As a financing strategy: Hathaway can be viewed as having two components, curriculum requirements and financing; neither component remains constant over time. Hathaway's success curriculum was phased in over four years and is reviewed during many legislative sessions for potential changes, while tuition at institutions of higher education is almost always responding to inflationary pressure. Analysts describe how six
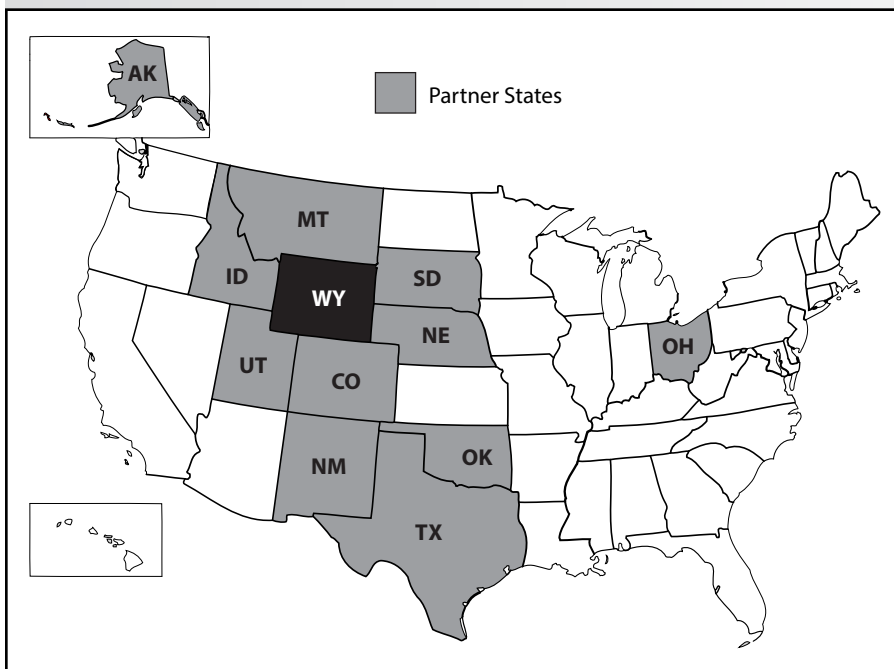
Figure 1.1: **Partner States: Those States with Which Research & Planning Has Data-Sharing Agreements**

dominant financing strategies were developed and identify how each is associated with a particular demographic and earnings pattern that may or may not be consistent with the spring high school graduation to fall enrollment in postsecondary model pursued by most Hathaway recipients. Establishing this profile of funding strategies, work strategies, and related demographic components for the population of graduates as a whole is a pre-requisite to selecting only those resident graduating students who did not use Hathaway as the predominant means of attaining graduation as the workplace outcomes comparison group. Establishing demographic and work history equivalency between Hathaway as the predominant financing strategy, in contrast to those resident graduates who used another financing strategy, is the foundation of the logic that the only difference between the two groups of students (Hathaway) affects workplace outcomes.

Chapter 7 presents a statistical analysis of the outcomes of the Hathaway Scholarship Program by focusing on statistical tests of difference in retention in Wyoming and earnings in the eight quarters following graduation. This research is also illustrated in the presentation titled, "Wyoming's Hathaway Scholarship Program and Workforce Outcomes" (see http://doe.state.wy.us/LMI/presentations/Hathaway_0616.pdf).

The graphics in this presentation follow males and females separately up to eight quarters after graduation. These graphics compare the results of different postsecondary financing strategies among groups who were, for all practical purposes, comparable in age, proportionately equal in gender mix, and comparable in work history while enrolled in postsecondary education. Tests of difference were carried out for UW and the community colleges as a group separately. The author of Chapter 7 found that for a small number of quarters in selected instances, there is a statistically significant difference upholding a positive effect of Hathaway in retention or earnings. However, on the whole, the results of statistical testing are equivocal, leaving the positive effects of Hathaway undemonstrated over the number of cohorts of students and the quarters available for testing.

Connecting field of study with credentialing specific to an occupation and measuring hours of employment and compensation are the subjects of Chapter 8. Health care occupations are among the fastest growing employment opportunities in the nation. The capacity to use gained knowledge in a field of study to obtain a particular credential, and having more complete information about working conditions can be important to career choice. Chapter 8 focuses on linking hours worked from the Workers' Compensation quarterly tax filing to Wyoming State Board of Nursing files to explore working conditions for registered nurses in long-term care in selected Wyoming locations. This effort represents an exploratory attempt to fill knowledge gaps about educational outcomes. UI wage records represent the gross amount of wages paid during a quarter leaving us uncertain as to the stability of earnings and whether or not compensation changes because of a change in the rate of compensation, the number of hours worked or both. The product of the work done in Chapter 8 demonstrates the utility value of hours worked and is certain to inform the future of outcome measures in Wyoming.

Supplemental information for each chapter is available at http://doe.state.wy.us/LMI/education_we_connect.htm.

Chapter 2: Review of the Literature
by: Katelynd Faler, Senior Economist

As critical attention on postsecondary student outcomes and program evaluation continues to increase, Research & Planning (R&P) already plays a pivotal role in producing high-quality research. Nationally, most recent studies use observational data to estimate correlations between variables such as degree level and earnings. However, the extensive data to which R&P has access allows for high quality causational studies.

This section analyzes several questions, including, "Why is program evaluation important?," "What does past research show?," "Why is research needed for Wyoming students?," and "What is the best way to evaluate student outcomes?"

Why is Program Evaluation Important?

Evaluating the effectiveness of employment and training initiatives serves both policy makers and program customers. Outcome reports can provide the information policy makers need to better direct government resources of time and money. Knowing a program's outcomes can also allow customers to make informed decisions about participation and realistic assumptions about their results.

The history of legislation regarding program evaluation goes back several decades. In 1993, the federal government passed the Government Performance and Results Act, an act that was modernized in 2011 (Lew & Zients, 2011). In 2010, the federal Office of Management and Budget released the memorandum, "Evaluating Programs for Efficacy and Cost-Efficiency," which stated that the Office had "allocated approximately $100 million to support 35 rigorous program evaluations" (Orszag, 2010). At the state level, the Wyoming Legislature's Management Audit Committee has focused on program evaluation since 1988, in "response to legislators' demands for independent, thorough analysis of program performance and related policy issues" (http://legisweb.state.wy.us/ LSOWEB/ProgramEval/ProgramEval.aspx). Currently, the Wyoming Department of Education requires institutions of higher education to report student data "for the purposes of policy analysis and program evaluation" in order to be eligible to receive state scholarship funds (WY Stat § 21-16-1308, c.(2015)).

What Does Past Research Show?

Postsecondary student outcomes is a popular research topic. Journals, including the *Economics of Education Review*, and offices such as the Center for Analysis of Postsecondary Education and Employment (http://capseecenter.org/) and the Center for Postsecondary and Economic Success (http://www.clasp.org/issues/ postsecondary) produce large amounts of research on the subject. Past studies have often used observational techniques to compare high school graduates to postsecondary graduates. Generally, observational studies have found that:

- college graduates are less likely to be unemployed;
- award completion, as opposed to an accumulation of credits, is key to higher earnings;
- youth from higher income families are more likely to go to college;
- the difference in earnings between high school graduates and college graduates

is greater for women than it is for men;
- college grads have better health; and
- self-selection limits observational studies and experiments (Oreopoulous & Petronijevic, 2013).

Observational studies can imply correlations, but many do not account for parents' education and test scores, among other factors, and therefore cannot isolate the impact of, for example, the Hathaway Scholarship Program.

When compared to observational studies of postsecondary outcomes, statistically sound causational studies require a much greater amount of high quality data than most researchers have. A thorough review of 38 academic papers titled "Summary of Research on Effects of Community College Attendance on Earnings" (Liddicoat & Fuller, 2012) found only one paper examining the causal effects of community college enrollment (Miller, 2007). The quality and extent of data to which R&P has access is difficult for other researchers to match, and R&P has been able to produce several causal impact analyses, most recently "Higher Wages and More Work: Impact Evaluation of a State-Funded Incumbent Worker Training Program" by Patrick Manning (2016). Wyoming is in a unique situation because R&P has built one of the most extensive, high quality databases in the country. R&P has data sharing relationships with 11 states, over a dozen Wyoming state health care boards, and the Wyoming Departments of Education and Transportation. More information on R&P's formal partnerships can be found at http://doe.state.wy.us/LMI/LMIinfo.htm.

Impact studies of statewide merit-based scholarships on future in-state labor force participation are even rarer than causal studies related to postsecondary student earnings. However, one analysis found that Missouri's highly selective Bright Flight Scholarship, covering about 40% of the University of Missouri-Columbia's tuition, increased labor force participation by 4.3% eight years after graduation. The authors suggest that a higher value scholarship could have a greater effect on in-state labor force participation. (Harrington et al., 2015).

Why is Research Needed for Wyoming Students?

While previous research is important to keep in mind, the extent to which other findings can be applied to Wyoming is limited because of the state's distinct population and economic characteristics, number of postsecondary institutions, and the Hathaway Scholarship Program. Wyoming is the least populated state with the second lowest population density and the 13th most rural population in the United States (U.S. Census Bureau). Wyoming's economy departs from the national average in several significant ways. First, a Wyoming resident is 17 times more likely to work in mining, quarrying, and oil and gas than the national average, and twice as likely to work in construction (Bureau of Labor Statistics, 2015). Second, manufacturing, health care & social assistance, and administration & waste services play a much smaller role in Wyoming's economy than for the nation as a whole (Bureau of Labor Statistics, 2015; see Figure 2.1, page 10). As of the 2014-2015 school year, the National Center for Education Statistics listed Wyoming as the state with the fewest postsecondary degree-granting institutions (10). Wyoming has only one public four-year university and as of 2010, is one of 14 states with a merit-based scholarship program (Zhang & Ness, 2010). These demographic and educational differences create a need for Wyoming-specific student outcome research.

What is the Best Way to Evaluate Student Outcomes?

Evaluating student outcomes is not a straightforward process. Defining student success, gathering the appropriate data, tailoring research to the local environment, accounting for all the pathways to and from postsecondary education, and creating a comparison group all compound the problem of program evaluation. Many program evaluations define a successful student as one who receives a diploma and earns higher wages following graduation (Benson, Esteva, & Levy, 2015; Belfield, Liu, & Trimble, 2014; Jepsen, Troske & Coomes, 2014; Carneiro, Heckman, & Vytlacil, 2010; Bailey, Kienzl, Marcotte, 2004), but defining success in these limited terms has drawbacks. As discussed by Oreopolos and Salvanes in their 2011 paper "Priceless: The Nonpecuniary Benefits of Schooling," students can use their education to secure a more comfortable job, reduce their risk of unemployment, work

U.S.

Mining, Quarrying, & Oil & Gas Extraction (NAICS 21), 0.6%

Manufacturing (NAICS 31-33), 10.4%

Construction (NAICS 23), 5.4%

Accommodation & Food Services (NAICS 72), 11.1%

Health Care & Social Assistance (NAICS 62), 15.5%

Administrative & Waste Services (NAICS 56), 7.4%

All Other, 49.5%

Wyoming

Mining, Quarrying, & Oil & Gas Extraction (NAICS 21), 11.0%

Manufacturing (NAICS 31-33), 4.4%

Construction (NAICS 23), 10.9%

Accommodation & Food Services (NAICS 72), 15.3%

Health Care & Social Assistance (NAICS 62), 11.2%

Administrative & Waste Services (NAICS 56), 3.8%

All Other, 43.3%

*North American Industry Classification System.
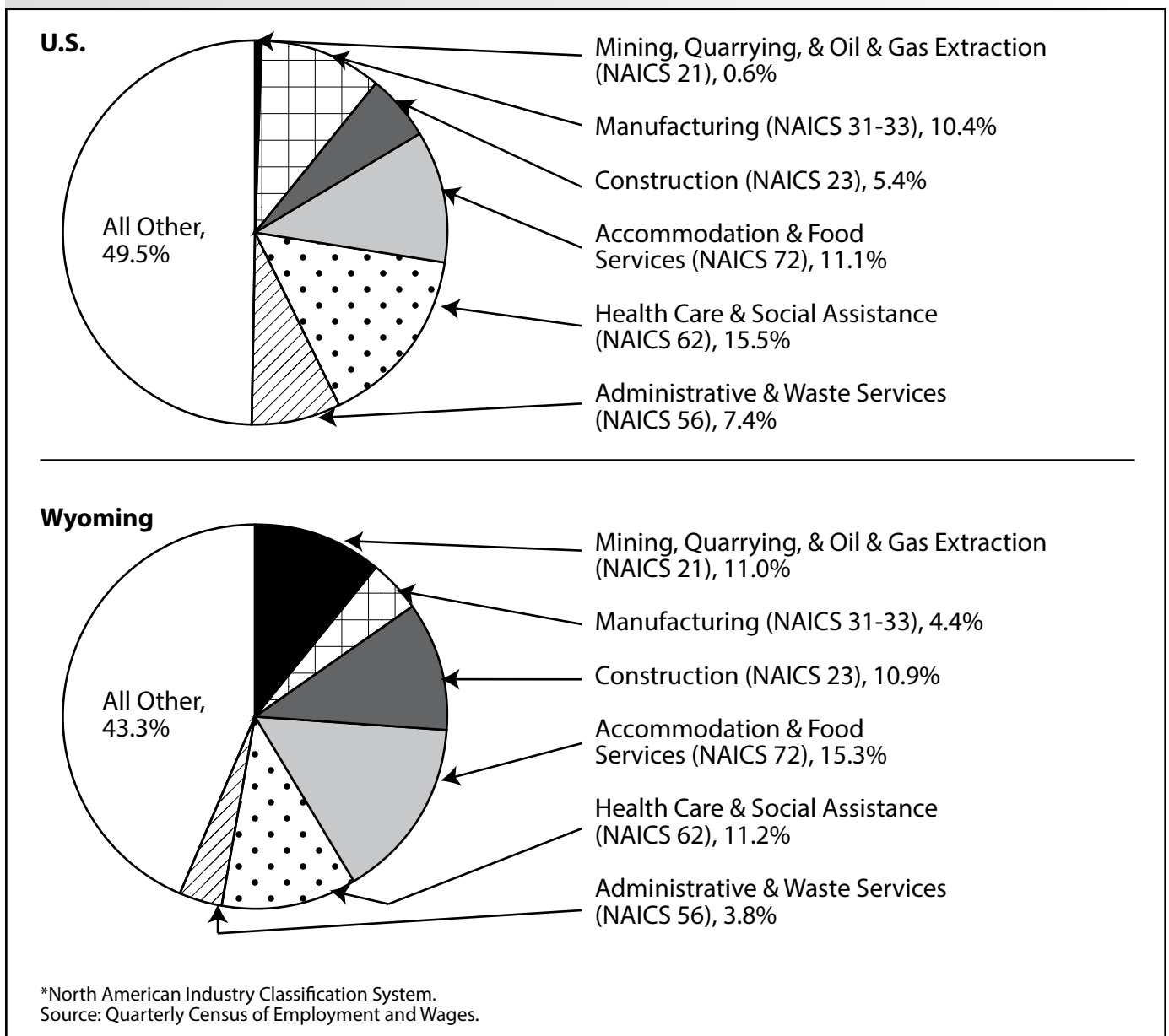Source: Quarterly Census of Employment and Wages.

Figure 2.1: **Share of Employment in Selected Private Industries for Wyoming and the U.S., 2015Q2**

fewer hours for the same pay, improve a specific skill set without receiving a diploma, or form more stable households. These alternative measures of success are more ambiguous than earnings and they are only the beginning. Papers further discussing these measures of success include the Pew Research Center's 2014 paper "The Rising Cost of Not Going to College," (Taylor, et al., 2014) and the *Annual Review of Sociology's* 2012 article "Social and Economic Returns to College Education in the United States" (Hout, 2012).

Beyond defining success, data collection is a complicated, ongoing process. Data sharing agreements with schools and other government departments require negotiations and updates; program goals and awards change over time. Data collection methods vary by institution, as do the data suppression requirements and data accuracy. R&P's preferred data comes from administrative records, which can hold biases constant throughout the data set, but even thorough administrative records cannot account for all variables. For example, unemployment insurance wage records show quarterly wages, but generally do not show how many hours one had to work for those wages — a critical part of estimating student outcomes and a variable R&P is working hard to estimate. Even with a good data set, which can take years to build, how do administrative records measure all the social benefits of a postsecondary education?

Making student outcome research relevant requires more than just a description of how many people graduated and how much money they made. Statistically sound research requires creating a comparison group and holding factors like age and program of study constant. Creating an appropriate comparison group is a priority for R&P, and the statistical processes and

software that allow for complex control group formation are evolving (Middleton & Aronow, 2012; Steiner, Cook, Shadish, & Clark, 2010; Sekhon, 2009). For more information on control groups, see R&P's 2002 article "Compared to What? Purpose and Method of Control Group Selection" by Tony Glover.

Finally, student outcomes must be put into the context of both the local economy and the program's goals (Cielinski, 2015). For example, if graduates of a program have a higher unemployment rate than the national average, is the program considered ineffective? Or does the research consider the local unemployment rate and the social need for an occupation in the area? Does the program measure success in terms of the rate of graduation? Or is it important to also access the rate at which those graduates get jobs in a certain area? How will program goals change during an economic downturn when more students enroll in postsecondary education (Fain, 2014)? While research discussed in this article can give Wyoming policy makers an example of what kind of results to expect and how results can be measured, there is no national research that can put outcomes of Wyoming students into the context of the local economy and specific program goals.

Conclusion

Program evaluation provides important information for both policy makers and the public on how to invest limited resources. Assessing student outcomes is complicated and can involve dozens of variables, but Research & Planning has the ability to measure the causal relationship between education and postsecondary outcomes.

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Chapter 3: Workforce Turnover & Continuous Employment: The Importance of the Distribution of Age & Gender

by: Matthew Halama, Economist, and Katelynd Faler, Senior Economist

This chapter provides an explanation for the labor market behavior of individuals in different age groups, with a focus on young adults. The majority of young adults between the ages of 19 and 24 are faced with important life events, such as college, employment, marriage, and birth of a first child. Based on evidence from the Wage Records administrative dataset, young adults tend to work in different industries than older adults. Also, job turnover is much higher for younger workers, and continuously employed males generally earn higher average wages than females, except in the educational & health services industry. Males in Wyoming find continuous employment largely in mining, construction, retail & wholesale trade, and educational & health services, while females find continuous employment primarily in educational & health services, leisure & hospitality, and retail & wholesale trade.

Literature Review

Many important life decisions regarding education, employment, marriage, and children are made between the ages of 19 and 24 (Harris, 2015). Harris noted that 55.4% of females and 49.5% of males in Wyoming marry while in this age group, and that 53.9% of females and 43.3% of males in Wyoming have their first child. In addition, an increasing number of Wyoming's youth are finding employment in other states.

Evans (1999) found that turnover rates are greater in industries that offer lower wages and require fewer job skills. For example, retail trade has one of the highest turnover rates of all industries. Toups (1999) found that 32.2% of youth between the ages of 18-20 were employed in the lowest paying jobs in retail trade, possibly building their skill sets. Females ages 18 to 20 were employed mainly in retail trade and services, while males tended to be employed in a wider array of industries including retail trade and services, construction, manufacturing, and mining (Toups, 1999).

Moore (2015) noted that both educators and policymakers recognize the importance of understanding the labor market choices of youth after high school. Moore found that 58.5% of Wyoming's senior class of 2010 did not enroll in postsecondary education, and by 2013, 59.1% were found working in Wyoming and 8.9% were found working in a partner state. The 2013 median and mean wages for the class of 2010 were higher in Wyoming compared to partner states. Moore suggested that individuals may be moving for family reasons or to pursue educational opportunities, instead of for higher wages.

Methodology and Definitions

Data for this chapter come from Wyoming's wage records and from 11 partner states with which Research & Planning (R&P) has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

The turnover rate, explained in Box 3.1 (see page 15), is a key indicator of labor market activity, and was defined by Glover in 2003. Turnover is calculated as the

percentage of individuals who maintain a job during a given time period, as compared to all workers, including those who begin and/or end work with an employer. For example, in first quarter 2015 (2015Q1) those ages 19 and under had an average turnover rate of 48.0%, which means that in 48.0% of workers ages 19 and under either began working for an employer, ceased working for an employer, or possibly both. Correspondingly, 52.0% of workers 19 and under had a connection with their employer before, during, and after 2015Q1. Wyoming's method for calculating workforce turnover data has been emulated by partner states, and more information regarding Wyoming's historical turnover data can be found at http://doe.state.wy.us/LMI/turnover.htm.

Box 3.1: Turnover Definitions

Hire
An individual who was not employed the prior quarter and was recently hired into an industry.

Exit
An individual who left employment in an industry who worked at least one prior quarter.

Both
An individual who was hired and exited an industry in the same quarter.

Continuous
Individuals who were found with the same employer in the prior, reference, and subsequent quarters.

Non-Continuous
The sum of individuals categorized as hire, both, and exit.

Turnover Rate

$$\frac{\text{Hires + Exits + Both}}{\text{Total (Hires + Exits + Both + Continuous)}}$$

This chapter focuses on data from 2015Q1, with a focus on those 19 and under, 20-22, and 23-24 (see Box 3.2, page 16). Analyses for all other age groups can be found online at http://doe.state.wy.us/LMI. Results are reported as a total and by gender, as the industries in which people work and their corresponding job stability vary between males and females. Weighted averages were used for total wages, meaning a greater emphasis was placed on the average wage where more individuals were employed in an industry.

Industrial categories follow the U.S. Census Bureau's North American Industry Classification System manual. *Goods-producing industries* include agriculture, forestry, fishing, & hunting; mining; construction; and manufacturing. Other industries are considered *service providing*. In agriculture, forestry, fishing, & hunting, individuals were excluded from analysis if wages were three standard deviations above the mean.

Employment, wage, and turnover data discussed in this chapter were taken from large, detailed tables, which are available online at http://doe.state.wy.us/LMI/education_we_connect.htm.

Results

Total

Individuals ages 19 and younger work primarily in leisure & hospitality, wholesale & retail trade, transportation, utilities & warehousing, and educational & health services. Youth in these industries may be working low wage jobs and developing the necessary skills as they age to transition into a job within any industry, and they may be going to school. Males are more

likely than females to work in goods-producing sectors; males made up 89.5% of the goods producing workforce for ages 20-22 in 2015Q1, while females made up 56.4% of service-providing employment.

Box 3.2: Age Groups

19 and under

Includes students in high school and post high school individuals seeking to enter the workforce or enroll in postsecondary education.

20-22

Includes those who have entered the workforce following high school, are working while enrolled in postsecondary education, or have obtained a certificate or degree from a postsecondary institution and found employment.

23-24

Includes those finishing up their bachelor's degrees and entering the workforce or working to complete a master's degree.

25-34

Includes those transitioning by completing an advanced degree program or have already transitioned into the workforce.

35-44

Those employed in a job.

45-54

The experience added while employed in a job.

55-64

Those preparing for retirement.

65+

Those who are still employed or retired.

The turnover rate decreases considerably as age increases. In 2015Q1, those ages 19 and under had an average turnover rate of 48.0% (see Table 3.1, page 17), whereas the turnover rate for those ages 23-24 was 39.8%. The 55-64 age group had the lowest turnover rate, but for those ages 65 and older, the average turnover rate was higher. Retirees may have decided to re-enter the workforce part-time to stay busy or increase their supplemental income in seasonal industries, which could explain the increase in the turnover rate.

Figure 3.1 (see page 17) shows correlations between age and turnover. There are multiple explanations for this trend. Young adults may job hop as they find a position suitable to their interests, or they may use accumulated experience as leverage for better employment opportunities. As individuals age, they may settle into a career, or a worker's value may increase with time and experience, leading to higher wages and therefore increasing a worker's incentive to maintain their connection with their employer.

Females

Female employment is concentrated in the service-providing sectors. For those ages 19 and under, 82.3% of continuous employment is concentrated in leisure & hospitality; wholesale & retail trade; transportation, utilities, & warehousing; and educational & health services. These three industries employed the greatest number of females in each age group until employment in public administration surpassed employment in leisure & hospitality in the 45-54 and 55-64 age groups. Educational & health services accounts for 13.4% of continuous employment for females ages 19 and under, but it accounts for 41.1% of continuous employment in the 25-34 age group. Females

may have entered the educational & health services field as they graduated from certificate and degree programs.

In 2015Q1, 47.0% of females in the workforce ages 19 and under gained, lost, or changed jobs. The turnover rate for this quarter decreased in every age group until it reached a low of 12.6% for females ages 55-64. Turnover for females is generally slightly lower than it is for males.

Average quarterly wage for the youngest continuously employed females, those ages

19 and under, was $1,809 in 2015Q1. The average quarterly wages for females ages 20-22 was more than double the wages for those ages 19 and under ($3,768). Females ages 23-24 earned an average of $5,219 per quarter. Wages for females peaked at $9,946 per quarter in the 45-55 age group. The steep increases for young adults may be a result of a rapid gain in human capital and completion of degrees and certificates.

Males

While males ages 19 and under with continuous employment worked primarily in leisure & hospitality; wholesale & retail trade; transportation, utilities, & warehousing; and educational & health services, the concentration of males in this age group working in the goods-producing sector (11.7%) was approximately five times the concentration of females. In the 20-22 age group,

28.8% of males worked in the goods-producing industries; this figure peaks at 38.3% in the 35-44 age group. Younger males seem to begin their careers in very similar industries as females, but diversify into mining, construction, and professional and business services as they age.

In the 19 and under age group, the turnover rate was 49.1% and reached a low of 14.9% for the 55-64 age group. The seasonality of goods-producing jobs may contribute to the relatively higher turnover rate for males.

The average quarterly earnings for males were higher than those for females in every age group and the gap initially widened as they got older. Males ages 55-64 earned the most of any age group, on average, with $17,952 per quarter. For each age group, males working in mining earned the highest average wages.

Table 3.1: Turnover Rate by Age Group for Individuals Working in Wyoming, 2015Q1

Age Group	Turnover Rate
19 and Under	48.0
20-22	47.8
23-24	39.8
25-34	27.5
35-44	20.3
45-54	17.2
55-64	13.8
65+	16.7

Source: Wage Records database.
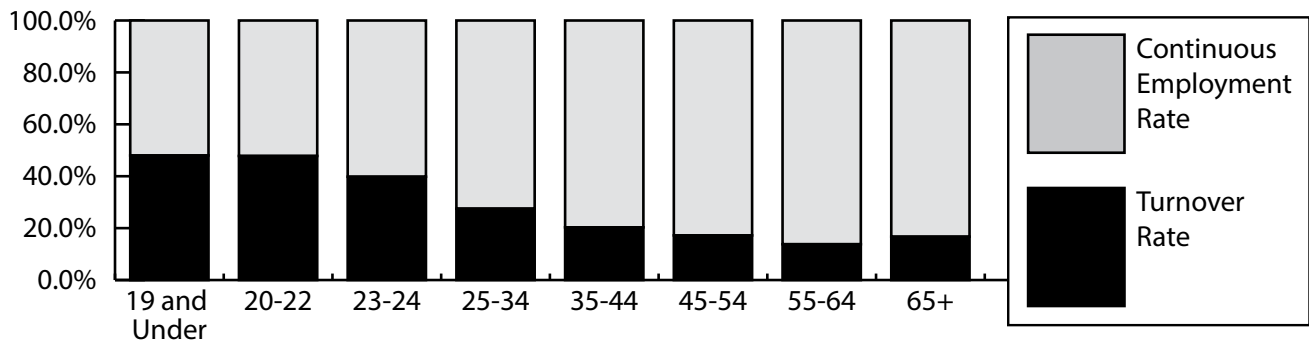
Source: Wage Records database.

Figure 3.1: Rates of Continuous Employment and Turnover in Wyoming by Age Group, 2015Q1

Discussion

As previously mentioned, males are more likely than females to be employed in goods-producing industries, which include agriculture, forestry, fishing, & hunting; mining; construction; and manufacturing. Females were more likely to be employed in the service-providing sector, primarily in educational & health services; trade, transportation, & utilities; leisure & hospitality; and public administration. In nearly every industry, for every age group, males made more on average than females, with the exception of young adults ages 24 and younger in the educational & health services field.

Several limitations are apparent. R&P compared 15 female entrants in the mining industry to 186 males, and 286 females in educational & hospitality to 75 males. The low number of entrants for each example above cannot show statistical significance. Another limitation included not comparing occupational data across gender and age. Occupational data within industries are a smaller unit than industry data and would be insightful in explaining questions regarding wage gaps between gender and age because R&P can compare wages between genders with similar time on the job.

Future studies should gravitate towards occupational research. Occupational data represent the smallest unit measurable and provide information on specific occupations that are in demand across industries. With occupational data available, questions regarding the gender wage gap in Wyoming can be better answered. A possible study on the gender wage gap would involve analyzing occupational data annually within industries by comparing the wages of all general practitioners, or all neurological surgeons

separately by gender and other variables would be appropriate. Educational data provides insight into Wyoming's labor market by analyzing graduates and their fields of study who stay or leave the state. Further, educational data coupled with wage records would provide an explanation of the effect of education on wages.

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Chapter 4: Postsecondary Education and Labor Market Behavior

by: Lynae Mohondro, Senior Research Analyst

Research & Planning (R&P) uses longitudinal analysis to study the behavior of people of different ages, gender, and educational attainment in the labor market. In Youth Transitions: Life Events and Labor Market Behavior, Harris (2015) found that major life events, such as marriage and the birth of a first child, occur for young adults in their early twenties. Harris also found that age, not gender, is a factor in the continuity of employment. As individuals in selected cohorts aged, stable work opportunities improved at similar rates for males and females. In the forthcoming paper titled, Workforce Turnover & Continuous Employment: The Importance of the Distribution of Age & Gender, Halama (in press) also found the turnover rate continued to decrease with age. In first quarter 2015 (2015Q1), individuals ages 23-24 experienced lower turnover (39.8%) than individuals ages 20-22 (47.8%). Mean quarterly wages also increased with age. In 2015Q1, individuals ages 23-24 earned an average quarterly wage that was $1,690 higher than the average quarterly wage for those ages 20-22. This chapter uses longitudinal analysis to examine the approximate age at which Wyoming high school students make major life decisions, such as enrolling in and completing postsecondary education or migrating to another state, and how those decisions affect labor market outcomes.

Upon high school completion, students may go directly into the workforce or into postsecondary education. For some, leaving high school may mean more extensive employment in the market, since many students work at some point during high school. For the purposes of this research, R&P defines students who do not enroll in postsecondary education and do not earn wages in Wyoming or one of the states with which R&P has a data sharing agreement as not found.

According to *WDQI Report No. 1* (Gallagher, T., Glover, T., Hammer, L., Holmes, M., & Moore, M., 2014), 5,598 students made up the 2007 senior cohort – students who were scheduled to graduate at the completion of the 2006/07 school year. Figure 4.1 (see page 20) shows the 2007 cohort by enrollment and work status over a seven-year period. A student's status may change for several reasons, such as enrolling in and withdrawing from postsecondary education, or leaving a job in Wyoming or a partner state to enroll in postsecondary education or for a job in a state with which R&P does not have a data sharing agreement. Each of the 5,598 students from the 2007 senior cohort is accounted for in Figure 4.1 for each quarter based on their enrollment and work status.

Students who enrolled in postsecondary education experienced more seasonality in employment than students who did not enroll in postsecondary education. Figure 4.1 shows that the number of students enrolled and working at the same time peaked in quarters two and three each year and dropped in quarters one and four. The amplitude of this seasonal pattern diminishes over time. On the other hand, the number of students enrolled and not working decreased in the second and third quarters and increased during the school

year, or in quarters one and four. Over time the number of students enrolled in postsecondary education decreased, and at the same time the number of students that fluctuated in the seasons between enrolled and working and enrolled and not working also decreased. The most substantial change in the seasonal pattern of students enrolled in postsecondary education occurred in 2011Q3, when the number of students enrolled began a downward trend as students graduated or withdrew from their postsecondary institutions. During the same period, the number of Wyoming high school students not enrolled and working or not found in R&P's database increased. The shift from postsecondary education to the workforce without postsecondary education occurs

gradually for this cohort, and then the number of students enrolled and the number of students not enrolled begins to diverge about four years after 12th grade.

The number of students who never enrolled in postsecondary education (students with no records in the National Student Clearinghouse database through 2014) and the number of students who went on to obtain a bachelor's degree varied between males and females. Figure 4.2 (see page 21) shows the number of Wyoming high school males and females who either earned a bachelor's degree or never enrolled in postsecondary education and worked in Wyoming or a state with which R&P has a data sharing agreement. The status of these individuals may

ª12 States include Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, Utah, and Wyoming.
Source: Workforce Data Quality Initiative custom extract.
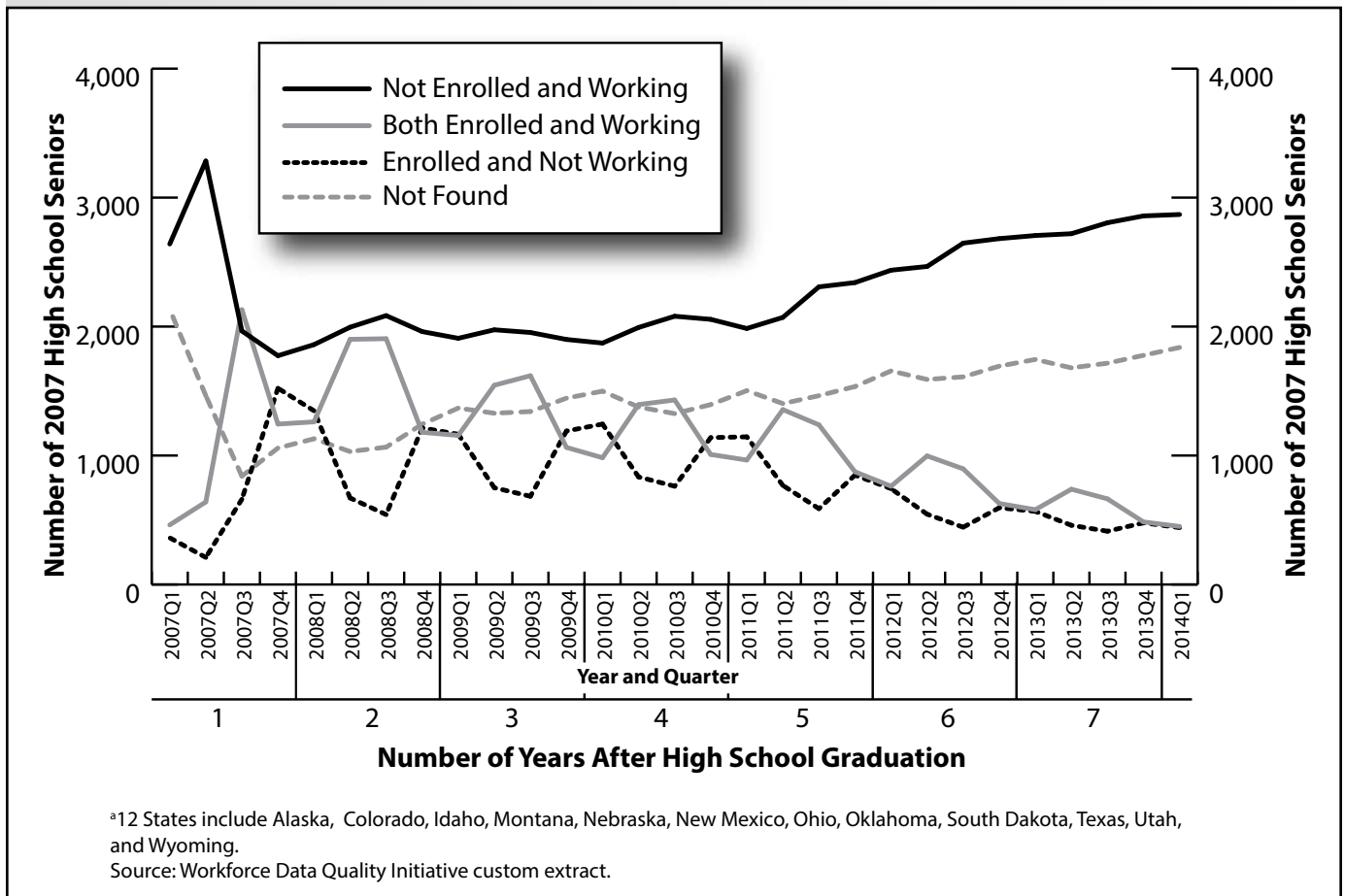
Figure 4.1: **Number of Wyoming 2007 High School Seniors Working in 12 Statesª by Enrollment and Work Status by Year and Quarter, 2007Q1 to 2014Q1**

fluctuate between working in Wyoming and working in partner states as individuals migrate in and out of Wyoming and partner states for employment. As shown in Figure 4.2a, the number of males who went on to obtain a bachelor's degree and worked either in Wyoming

or a partner state followed a seasonal pattern, indicating some instability as individuals accept and leave jobs. Around age 23, the magnitude of the seasonal fluctuations of employment of males with a bachelor's degree begins to decrease. The average number of males who obtained a

Figure 4.2a: Males (N = 2,895)

Figure 4.2b: Females (N = 2,703)

Males and Females Working in Wyoming or Partner States[a]

Working in Wyoming

— Never Enrolled in Postsecondary Education

— Obtained Bachelor's Degree from Any Institution After 2009

Working in Partner States[a]

------- Never Enrolled in Postsecondary Education

----- Obtained Bachelor's Degree from Any Institution After 2009

[a]*Partner states* are states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

[b]Predominant age of postsecondary graduation.
Source: Workforce Data Quality Initiative custom extract.

Figure 4.2: **Number of Wyoming 2007 High School Senior Males and Females Working in Wyoming or Partner States[a] by Year and Quarter, 2007Q1 to 2013Q4**

bachelor's degree and worked in Wyoming remained steady and at the same time, the average number of males who had a bachelor's degree and worked in a partner state began to increase, indicating that after obtaining their bachelor's degree, males found jobs in partner states.

The seasonal pattern in the number of males who never enrolled and worked in Wyoming decreased at an earlier age than for males who obtained a bachelor's degree. Around age 21, this seasonal pattern began to diminish, and by age 24 only about 500 out of 1000 males who never enrolled in postsecondary education from the 2007 senior cohort worked in Wyoming. The decrease in the seasonal pattern for males who never enrolled and males who obtained a bachelor's degree, and the increase of males working in a partner state, suggest that once males reach their early twenties, regardless of educational attainment, they find more continuous employment, often outside of Wyoming.

Of the 2,703 females in the 2007 Wyoming high school senior cohort, 696 never enrolled in postsecondary education. As shown in Figure 4.2b (see page 21), more females with a bachelor's degree worked in Wyoming than females who never enrolled in postsecondary education. The number of females who obtained a bachelor's degree and worked followed a seasonal pattern that diminished around age 23. A seasonal pattern also existed for the number of females with a bachelor's degree who worked in a partner state and continued an upward trend through age 24. The number of females who never enrolled in postsecondary education and worked in a partner state remained consistent through age 24, while the number of females who never enrolled and

worked in Wyoming steadily declined from age 18. These data suggest that females may be more motivated to leave the state for a better job opportunity or a job requiring their degree.

High school students in the 2006/2007 senior cohort who went directly into the workforce earned higher wages than students who enrolled in postsecondary education. According to "The Education and Work Experience of Youth in Wyoming's Counties" (Mohondro, 2016), in 2010, students from the 2007 senior class who did not enroll in postsecondary education earned an annual median wage more than double that of students who did enroll in postsecondary education. This finding corresponds with Figure 4.3a (see page 23), which shows that males who never enrolled in postsecondary education and worked in Wyoming earned higher wages than males with a bachelor's degree until about age 24.

Median quarterly wages remained low and seasonal for males who earned a bachelor's degree and worked either in Wyoming or a partner state until about age 22, when the slope of the earnings gain became more positive (see Figure 4.3a). The median quarterly earnings of males who never enrolled in postsecondary education and worked in Wyoming increased steadily with much less fluctuation between seasons than the quarterly wages of males with a bachelor's degree, indicating more continuous employment.

As shown in Figure 4.3a, males who never enrolled in postsecondary education and worked in a partner state earned wages similar to males who never enrolled and worked in Wyoming until age 20.

After age 20, males who never enrolled and worked in a partner state earned between $1,000 and $2,000 less in a quarter than males who never enrolled in postsecondary education and worked in Wyoming. Males with a bachelor's degree working in Wyoming earned wages similar to that of males with a bachelor's degree working in a partner state until age 24, but earned less than males who did not enroll in postsecondary education. By age 24, males who worked in Wyoming, whether they had a bachelor's degree or never enrolled in postsecondary

Figure 4.3a: Males (N = 2,895)

Figure 4.3b: Females (N = 2,703)

Males and Females Working in Wyoming or Partner States[a]

Working in Wyoming

— Never Enrolled in Postsecondary Education

— Obtained Bachelor's Degree from Any Institution After 2009

Working in Partner States[a]

---- Never Enrolled in Postsecondary Education

---- Obtained Bachelor's Degree from Any Institution After 2009

[a]*Partner states* are states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

[b]Predominant age of postsecondary graduation.
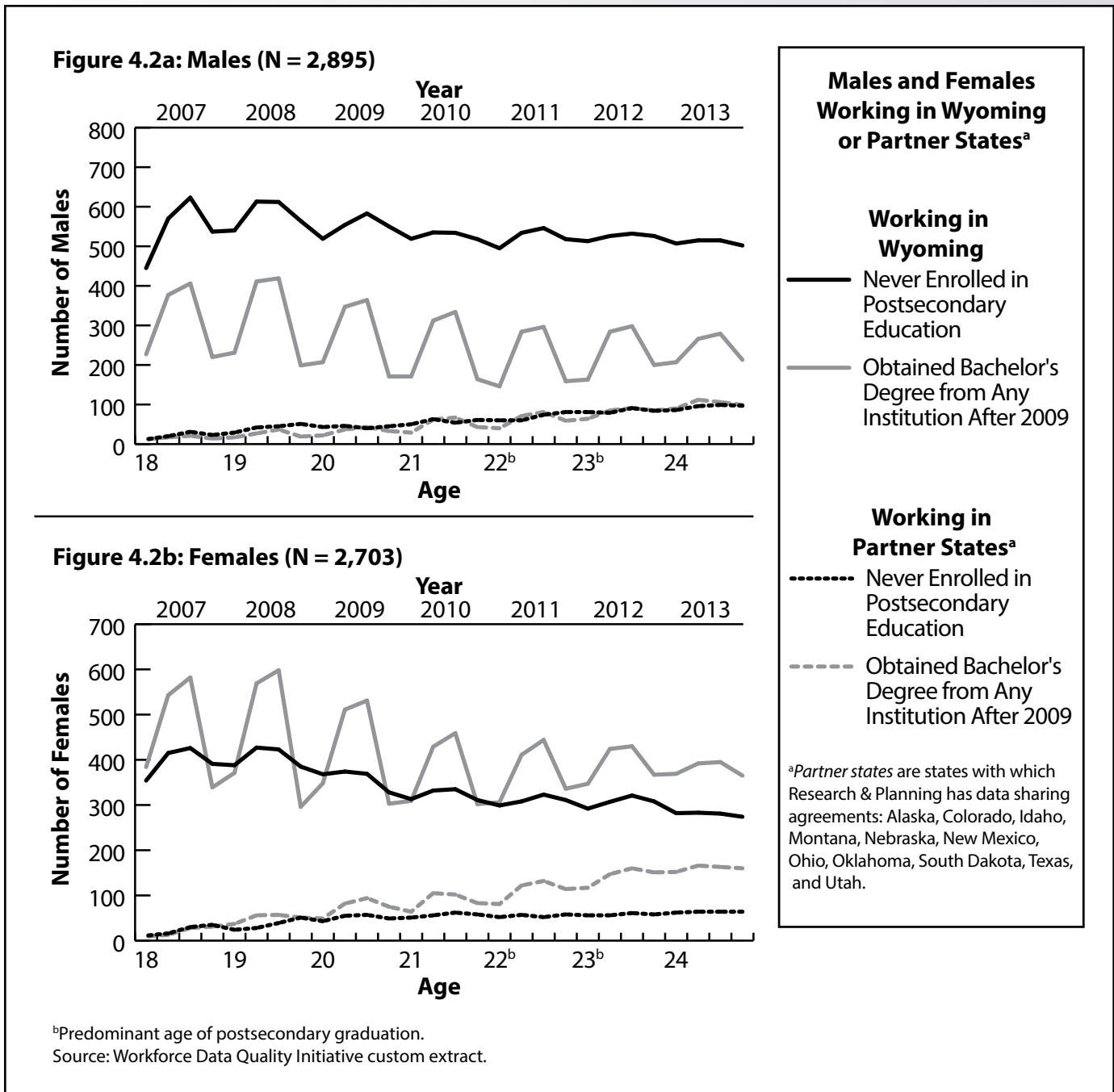Source: Workforce Data Quality Initiative custom extract.

Figure 4.3: **Mean Quarterly Earnings of Wyoming 2007 High School Senior Males and Females Working in Wyoming or Partner States[a] by Year and Quarter, 2007Q1 to 2013Q4**

education, earned more money than males working in a partner state. This suggests that something other than high wages motivates males to find employment in other states.

Similar to males, females who do not enroll in postsecondary education earn higher wages initially than females who eventually obtain a bachelor's degree (see Figure 4.3b, page 23). Females with a bachelor's degree who worked in Wyoming or a partner state experienced an increase of wages at age 22 and earned higher quarterly wages than females who, by age 23, never enrolled in postsecondary education. By age 24, females with a bachelor's degree who worked in a partner state earned about $500 more per quarter than females with a bachelor's degree who worked in Wyoming and over $2,000 more per quarter than females who never enrolled in postsecondary education (see Figure 4.3b). These data suggest that postsecondary education is more important for females to earn higher wages, and that while they may need to leave Wyoming to find jobs, they may not earn higher wages in another state.

As noted earlier, major life events occur during a young adult's early twenties and affect their labor market outcomes. Young males and females may make decisions about education that result in different outcomes; for example, obtaining a bachelor's degree may not affect earnings for males in the same way it affects females, and finding employment in their chosen field may encourage females to leave Wyoming, even if they earn less in a partner state.

Upon leaving high school, students face decisions that could influence their labor market behavior in the near future.

Longitudinal analysis and administrative databases available only to R&P allow for the unprecedented study of the different labor market behaviors and outcomes of Wyoming high school students. The different directions taken by the 2007 Wyoming high school senior class provide insight into how decisions made about postsecondary education affect earnings and migration years later. As former Wyoming high school students continue to age, R&P will continue to use longitudinal analysis to research the directions in which these students travel.

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Chapter 5: Postsecondary Academic Program Choice and Workforce Outcomes

by: Patrick Harris, Principal Economist

This study is part of a larger effort to understand the impact of postsecondary education on workforce participation and career success. R&P evaluated the importance of college major and short-term workforce outcomes. The University of Wyoming (UW) is the only public four-year degree granting institution in Wyoming. Along with seven community colleges, UW also receives financial aid through the Hathaway Scholarship Program (HSP). In order to effectively evaluate the success of the HSP, several broader research questions need to be addressed. In this article, R&P used the Classification of Instructional Programs (CIP) coding system along with data files provided by UW to evaluate workforce outcomes in Wyoming.

Literature Review

Harris (2015) examined the influences of certain life events (e.g., child birth and marriage) on young adults and their interaction with the economy. Harris found that 28.9% of females and 29.9% of males marry for the first time between the ages of 22 and 24. A similar pattern is also observed for births for this age group. The 22-24 age group is the age at which individuals graduate from four-year institutions and make important life choices, such as focusing on career or family. Further, R&P has conducted research regarding the instability of an individual's employment (Glover, 2000; Glover, 2012; & Harris, 2015). Instability is the ratio of the number of times an individual changes employers at any given point compared to continuous employment across time. A higher ratio indicates higher employment instability. Results of these studies indicate that as people age, their instability index decreases, with large drops in the early- to mid-twenties.

Gender may play a significant role in choice of academic program. Due to social norms and expectations, the influences of family and friends, and potential workforce outcomes, males and females may enter college with specific views regarding academic programs. For example, Gayles and Ampaw (2014) found that females with high achievement in science and math courses in high school were more likely than males to complete a science- and/or math-related bachelor's degree within six years.

Further, using data from the 1993 National Survey of College Graduates, Robst (2007) examined the mismatch between college major and accepted job positions. Similar to the results in this chapter, the author found that education, business management, and health professions were the most common majors among females, while engineering and business management were the highest for males. The amount of mismatch varied from 8% to 35% for females among these majors. For males, the mismatch was much smaller (11% to 14%). Females reported being mismatched mainly due to family-oriented restraints and working conditions, while males were mismatched for career-oriented reasons (e.g., promotional potential). These results indicate that workforce outcomes vary across gender and academic program choice and should be taken in account in evaluating the effectiveness of the HSP.

Methodology

CIP Codes

The Classification of Instructional Programs (CIP) code system is maintained by the National Center for Education Statistics (NCES) and is a system that categorizes two-, four-, and six-digit levels of instructional programs. For this article, R&P examined only the two-digit CIP families. For illustrative purposes, the CIP family of 45 (social sciences) includes academic programs such as anthropology, criminology, economics, and sociology. The CIP family of 13 (education) includes academic programs such as art teacher education, music, and educational psychology. A full listing of CIP codes can be found at http://nces.ed.gov/pubs2002/cip2000/.

Administrative Data

As previously stated, this article examines postsecondary and workforce outcomes in terms of age, gender, and academic program. R&P is able to accomplish this by linking administrative databases.

R&P collects and maintains quarterly wage record data through the Unemployment Insurance (UI) system from 1992 to present, which includes approximately 92% of Wyoming jobs. Also included in these data are wage records from 11 partner states (the states with which R&P has a data sharing agreement: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah). For this research, these records were linked to UW graduate data for the academic years of 2006/07 to 2012/13 using masked identification numbers. These graduation data only include those who graduated with a bachelor's degree during this period. The

wages and employment for the quarter of graduation and the four subsequent quarters were included in the analysis. It should be noted that wages have been adjusted by the Consumer Price Index (CPI) to 2015 levels due to the variability of the years of graduation in the analysis.

Table 5.1: Male University of Wyoming Graduates with Bachelor's Degrees by CIP[a] Code, 2006/07 to 2012/13

Rank	CIP[a] Title	Male Graduates	
		N	%
1	Business, Management, Marketing, & Related Support Services	1,027	16.8%
2	Engineering	1,005	16.5%
3	Education	552	9.0%
4	Biological & Biomedical Sciences	512	8.4%
5	Agriculture, Agriculture Operations, & Related Sciences	440	7.2%
6	Social Sciences	420	6.9%
7	Homeland Security, Law Enforcement, Firefighting & Related Protective Services	296	4.8%
8	Communication, Journalism, & Related Programs	256	4.2%
9	Physical Sciences	254	4.2%
10	Visual & Performing Arts	206	3.4%
11	Parks, Recreation, Leisure, & Fitness Studies	201	3.3%
12	Psychology	176	2.9%
13	History	123	2.0%
14	Computer & Information Sciences & Support Services	111	1.8%
15	Health Professions & Related Programs	103	1.7%
16	Multi/Interdisciplinary Studies	99	1.6%
17	English Language & Literature/Letters	91	1.5%
18	Mathematics & Statistics	81	1.3%
19	Foreign Languages, Literatures, & Linguistics	50	0.8%
20	Philosophy & Religious Studies	35	0.6%
21	Public Administration & Social Service Professions	26	0.4%
22	Family & Consumer Sciences/Human Sciences	21	0.3%
23	Area, Ethnic, Cultural, Gender, & Group Studies	12	0.2%
24	Liberal Arts & Sciences, General Studies & Humanities	10	0.2%
	Total	**6,107**	**100.0%**

[a]Classification of Instructional Programs.
Source: WDQI Warehouse Tabulations.

Results

As shown in Table 5.1 (see page 26), the five most frequently occurring CIP programs among male UW graduates were business,

Table 5.2: Female University of Wyoming Graduates with Bachelor's Degrees by CIP[a] Code, 2006/07 to 2012/13

Rank	CIP[a] Title	Female Graduates N	%
1	Education	1,523	18.7%
2	Health Professions & Related Programs	1,229	15.1%
3	Business, Management, Marketing, & Related Support Services	787	9.7%
4	Psychology	593	7.3%
5	Social Sciences	487	6.0%
6	Biological & Biomedical Sciences	445	5.5%
7	Agriculture, Agriculture Operations, & Related Sciences	371	4.6%
8	Communication, Journalism, & Related Programs	342	4.2%
9	Homeland Security, Law Enforcement, Firefighting & Related Protective Services	314	3.9%
10	Family & Consumer Sciences/ Human Sciences	302	3.7%
11	Visual & Performing Arts	300	3.7%
12	Parks, Recreation, Leisure, & Fitness Studies	256	3.1%
13	Public Administration & Social Service Professions	231	2.8%
14	Engineering	193	2.4%
15	Multi/Interdisciplinary Studies	167	2.1%
16	English Language & Literature/ Letters	158	1.9%
17	Physical Sciences	118	1.5%
18	Foreign Languages, Literatures, & Linguistics	91	1.1%
19	History	81	1.0%
20	Mathematics & Statistics	43	0.5%
21	Liberal Arts & Sciences, General Studies & Humanities	37	0.5%
22	Philosophy & Religious Studies	25	0.3%
23	Area, Ethnic, Cultural, Gender, & Group Studies	25	0.3%
24	Computer & Information Sciences & Support Services	12	0.1%
	Total	**8,130**	**100.0%**

[a]Classification of Instructional Programs.
Source: WDQI Warehouse Tabulations.

management, marketing, & related support services; engineering; education; biological & biomedical sciences; and agriculture, agriculture operations, & related sciences. Business, management, marketing, & related support services and engineering accounted for 33.3% of all males who graduated from UW during this period.

Among female graduates, the five most frequently occurring CIP programs were: education; health professions & related programs; business, management, marketing, & related support services; psychology; and social sciences (see Table 5.2). Education and health professions & related programs made up 33.8% of all female UW graduates during this period. These results are similar to those of Robst (2007) and reflect the differences in academic programs in which males and females choose to enroll.

Tables 5.3 and 5.4 (see page 28) show the percentage of male and female graduates, respectively, from the five most frequently occurring CIP programs who were found working in Wyoming or a partner state during the quarter of graduation and the subsequent four quarters. As shown in Table 5.3, 85.3% of those who graduated with bachelor's degrees in education were found working during the quarter of graduation, with a drop to 74.8% four quarters after graduation. Engineering, business, and biological sciences saw sharp increases in employment one quarter after the quarter of graduation, and biological sciences experienced the largest decrease over the four quarters. Just over half (50.2%) of those in the biological sciences were found working in Wyoming or a partner state four quarters after graduation.

Female graduates showed similar trends across time regardless of academic program (see Table 5.4). As with males, the largest

percentage of females who were found working in Wyoming or a partner state during the four quarters after graduation were those with a bachelor's degree in education. Both males and females from this CIP showed substantial declines in employment in the third quarter after graduation. This result may indicate that teachers and other educational staff enter educational employment and find the job does not fulfill their career goals and move elsewhere.

Table 5.5 (see page 29) shows the average quarterly wage for males from the five most frequently occurring CIP programs who were found working in Wyoming or a partner state. Males who graduated in engineering saw the largest increase in quarterly wages the first quarter after graduation (an increase of $4,385). Biological sciences experienced the smallest increase (an increase of $1,573) and experienced little fluctuation in subsequent quarters.

Table 5.6 (see page 29) shows average quarterly wages for females from the five most frequently occurring CIP programs who

Table 5.3: Number of Male University of Wyoming Graduates with Bachelor's Degrees by CIP[a] Code, 2006/07 to 2012/13, and the Percentage Found Working in 12 States[b] During the Quarter of Graduation and the Subsequent Four Quarters

| | | Percent Found Working in 12 States | | | | |
| | | | Quarter After Graduation | | | |
CIP[a] Title	Total Graduates	Quarter of Graduation	1	2	3	4
Business, Management, Marketing, & Related Support Services	1,027	58.7%	69.0%	68.3%	63.3%	62.4%
Engineering	1,005	54.4%	66.9%	64.4%	60.0%	58.9%
Education	552	85.3%	80.1%	80.4%	73.7%	74.8%
Biological & Biomedical Sciences	512	57.4%	68.0%	58.6%	51.4%	50.2%
Agriculture, Agriculture Operations, & Related Sciences	440	52.0%	57.3%	61.6%	55.2%	56.4%
Total, All Male Graduates	**6,107**	**59.5%**	**67.2%**	**64.4%**	**58.5%**	**58.4%**

[a]Classification of Instructional Programs.

[b]12 states: Wyoming and 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations.

Table 5.4: Number of Female University of Wyoming Graduates with Bachelor's Degrees by CIP[a] Code, 2006/07 to 2012/13, and the Percentage Found Working in 12 States[b] During the Quarter of Graduation and the Subsequent Four Quarters

| | | Percent Found Working in 12 States | | | | |
| | | | Quarter After Graduation | | | |
CIP[a] Title	Total Graduates	Quarter of Graduation	1	2	3	4
Education	1,523	84.1%	83.1%	82.4%	72.6%	73.1%
Health Professions & Related Programs	1,229	67.0%	77.2%	73.4%	67.9%	66.7%
Business, Management, Marketing, & Related Support Services	787	68.9%	74.1%	71.7%	67.5%	66.8%
Psychology	593	68.3%	70.2%	68.8%	65.3%	62.7%
Social Sciences	487	60.0%	65.3%	63.2%	61.2%	61.4%
Total, All Female Graduates	**8,130**	**68.6%**	**73.8%**	**70.3%**	**64.4%**	**63.4%**

[a]Classification of Instructional Programs.

[b]12 states: Wyoming and 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations.

were found working in Wyoming or a partner state. Health professions had the highest quarterly wages for each quarter examined. These individuals were likely nursing students who entered the health care field, such as in hospitals and outpatient clinics. R&P currently has access to health care licensing board files, which could be used in future research to examine the educational and career paths of nurses throughout the state.

Females who graduated with bachelor's

degrees in education saw a sharp increase in wages over the first two quarters after graduation, which may be an indication of these graduates entering the market and taking high paying teaching positions. For a more complete analysis of Wyoming's educational labor market, please see http://doe.state.wy.us/LMI/education_costs/2013/monitoring_2013.pdf.

This chapter examined the variable of academic program choice and labor market outcomes. Several limitations should

Table 5.5: Average Quarterly Wage[a] of University of Wyoming Male Graduates with Bachelor's Degrees, 2006/07 to 2012/13, Found Working in 12 States[b] During Quarter of Graduation and Subsequent Four Quarters by Five Most Frequently Occurring Graduation CIP[c] Codes

| | | Average Quarterly Wage (Real Dollars[a]) | | | | |
| | | | Quarter After Graduation | | | |
CIP[c] Title	Total Graduates	Quarter of Graduation	1	2	3	4
Business, Mgmt., Marketing, & Related Support Services	1,027	$2,594	$4,848	$5,625	$5,533	$5,960
Engineering	1,005	$2,608	$6,993	$7,912	$7,719	$7,970
Education	552	$1,778	$4,250	$6,537	$6,137	$7,504
Biological & Biomedical Sciences	512	$1,617	$3,190	$3,039	$2,897	$3,083
Agriculture, Agriculture Operations, & Related Sciences	440	$1,710	$3,961	$4,733	$4,647	$4,830

[a]Wages have been adjusted by the Consumer Price Index (CPI) to 2015 levels due to the variability of the years of graduation in the analysis.

[b]12 states: Wyoming and 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

[c]Classification of Instructional Programs.

Source: WDQI Warehouse Tabulations.

Table 5.6: Average Quarterly Wage[a] of University of Wyoming Female Graduates with Bachelor's Degrees, 2006/07 to 2012/13, Found Working in 12 States[b] During Quarter of Graduation and Subsequent Four Quarters by Five Most Frequently Occurring Graduation CIP[c] Codes

| | | Average Quarterly Wage (Real Dollars[a]) | | | | |
| | | | Quarter After Graduation | | | |
CIP[c] Title	Total Graduates	Quarter of Graduation	1	2	3	4
Education	1,523	$1,278	$3,748	$6,190	$5,618	$6,665
Health Professions & Related Programs	1,229	$5,451	$7,715	$8,720	$8,291	$8,412
Business, Mgmt., Marketing, & Related Support Services	787	$3,524	$5,151	$5,512	$5,392	$5,983
Psychology	593	$2,563	$3,348	$3,716	$3,830	$3,782
Social Sciences	487	$2,567	$3,279	$3,673	$3,672	$3,967

[a]Wages have been adjusted by the Consumer Price Index (CPI) to 2015 levels due to the variability of the years of graduation in the analysis.

[b]12 states: Wyoming and 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

[c]Classification of Instructional Programs.

Source: WDQI Warehouse Tabulations.

be noted. First, R&P did not examine individuals who earned graduate degrees (e.g., master, Ph.D., or professional) within the state. As mentioned earlier, age is a factor in terms of wages, and these individuals should be examined as a separate group. At the time of publication, R&P had wage record information through first quarter 2015. This limited the ability to track individuals in more recent years. Due to the low count of graduates with certain CIP codes, this chapter examined graduates at the two-digit CIP code only. Future research should explore more detailed academic programs where possible (e.g., education and health professions).

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Chapter 6: Employment and Wage Outcomes
by: Tom Gallagher, Research & Planning Manager, and Tony Glover, Workforce Information Supervisor

The Hathaway Scholarship Program (HSP) is a Wyoming program with a tiered financial award system based primarily on academic merit. Merit is measured in terms of grade point average (GPA) and college entrance examination scores. Scholarships are awarded to resident high school students only for attendance at Wyoming's seven community colleges or the University of Wyoming (UW). According to state statute, scholarships are intended to have a favorable impact on educational outcomes, and on employment, earnings, and retention in the state. The focus in this chapter is on these three labor market outcomes. After a brief history of HSP implementation, we illustrate labor market outcomes for higher education and a cohort of high school completers then finalize the chapter with a discussion of financial aid utilization by higher education students.

While state legislation is specific about the types of outcomes HSP was expected to impact, the narrative underlying the design and implementation of the program was expansive. Some suggested that the Hathaway Scholarship provides more than just money for postsecondary education to Wyoming high school students. Expected outcomes of the HSP included increased enrollment at the University of Wyoming and the community colleges and a higher number of college-ready high school graduates. As scholarship implementation evolved, other outcomes both expected and unexpected emerged.

During the first year of HSP, students enrolled in easier classes to boost GPA to receive the highest level award (Nordby, 2006, June 18). Beginning with the Class of 2008, HSP required students to follow a "success curriculum" to better prepare students for college and reduce enrollment in remedial courses. The full curriculum was phased in over a four-year period. Discussions of the success curriculum brought to light inconsistencies in grade point average calculations between school districts (and requirements of different postsecondary education programs).

While the scholarship provided funding to students to enroll in Wyoming postsecondary institutions, it also was believed to increase competitiveness of UW and the community colleges with larger out-of-state institutions. The scholarship also allows UW and the community colleges to offer more financial aid to nonresidents to further increase enrollment (Nordby, 2006, November 6). In fall 2006, the first year of HSP, enrollment increased 16% at UW, but declined at the community colleges (Miller, 2007). This lead to a marketing effort by the community colleges to encourage students to stay in Wyoming and earn a two-year degree or certificate instead of going to a trade school or four-year university.

Funding for the evaluation of the HSP was appropriated to the Research & Planning (R&P) section of the Department of Workforce Services under Ch. 26 of the 2012 Session Laws of Wyoming. In 2013 the US Department of Labor granted R&P the Workforce Data Quality Initiative (WDQI) with the purpose to "enable their workforce systems to be linked to existing education data systems." Specifically, one goal of the WDQI grant is to "use longitudinal data to evaluate the performance of federally

and State-supported education and job training programs." Under memoranda of understanding (MOUs) with the Wyoming Department of Education, Wyoming Community College Commission, UW, 11 partner states, and more, R&P has the ability to track Wyoming high school students into postsecondary education at UW, any community college, and any other state in the US through the National Student Clearinghouse. The large databases used by R&P and expertise of R&P staff provide an accurate evaluation of the long term effects of HSP.

From an academic standpoint and for evaluation purposes, Hathaway has been in a declining state of evolution from the first phase-in period (2008-2011) of the success curriculum and subsequent more modest modifications. At the same time, the value of Hathaway awards have not born a constant relationship to the cost of tuition. In effect, the influence on labor market outcomes is not constant; it changes over time. Therefore, if there is an impact from Hathaway one would also expect the outcomes in the labor market to change over time.

While the first scholarships were used to fund higher education for fall enrollment in 2006, the state also began a large expansion of funding for K-12. The legislature enacted "...a special appropriation in 2005 of $22,736,000 for employee bonuses" at the school district level (Supreme Court 2008, p. 9). This investment was accompanied by a further appropriation of $33.3 million in 2005 "to assist districts with increasing health insurance costs" (Supreme Court 2008, p. 9). The expansion of school district funding was largely maintained during the period of Hathaway implementation and afterward. In addition, higher education financial opportunity was rapidly expanding. Pell grant awards in Wyoming rose by 39.4% in award year (June to July) 2009/10

(from 8,099 awards in 2008/09 to 11,286) and again by 26.5% in 2010/11. From an evaluation perspective, the pre-Hathaway era was a much different world than post-Hathaway in terms of state funding for K-12, and the availability of federal financing for higher education. Comparing pre-Hathaway student outcomes in the labor market with post-Hathaway outcomes means that the overall increase in educational resources become an alternative explanation for pre- and post-Hathaway outcome change that may appear in the labor market for Wyoming high school students. Gaining control over these competing explanations is the subject of Chapter 7.

Table 6.1 (see page 33) introduces an overview of market outcomes for all graduates of higher education in Wyoming for the 2007/08 school year over a six-year period following graduation. The table displays the proportion of the 2007-08 graduating class found in the Unemployment Insurance (UI) earnings files of Wyoming and the 11 partner states with which R&P has data sharing agreements (see page 5), and then UI earnings only in partner states. The largest proportion of graduates found working across the 12 states were community college graduates who followed an occupational track (76.2%). One-fifth (20.6%) of these students were found in the 11 partner states. The graduates least likely to be found in the 12 states were individuals who obtained a graduate degree from UW; R&P was able to find 64.3% of individuals with graduate degrees six years after graduation. One-fifth (20.6%) of students with a graduate degree were found in a partner state. Table 6.1 reveals that R&P was most likely to find individuals who obtained a bachelor's degree in a partner state.

An examination of linear cohort

employment patterns clearly indicates that the level of a graduation award is associated with different post-graduation employment patterns. In addition, pre-graduation employment behavior appears to vary from one level of attainment to the next. During the years prior to graduation, students in community college environments are much more likely to be found working, than are those studying for a graduate degree at UW. Three-fourths of UW undergraduates were

employed at some point in the two years prior to graduation. To what extent access to employment plays an important role in college completion in Wyoming is unclear. What is evident is that work, at least in terms of learning how to obtain a job and maintain some level of self-sufficiency, is an important part of nearly every student's role during school years.

While Table 6.1 offers a linear description

Table 6.1: WDQI Warehouse: Postsecondary Enrollment Status, Number and Percent Found Working in Wyoming and 11 Partner States[a], and Median Annual Wages of 2007/08 Wyoming Postsecondary Graduates, 2006 to 2014

	2006	2007	2008[b]	2009	2010	2011	2012	2013	2014
UW Graduate Degree, N=613									
Number with Wages, 11 states & WY	390	386	449	430	403	397	395	396	394
Percent with Wages	63.6	63.0	73.2	70.1	65.7	64.8	64.4	64.6	64.3
Median Annual Wage	$14,994	$17,665	$30,401	$49,776	$54,109	$56,648	$58,100	$61,609	$62,748
Located in Partner State	61	53	109	118	111	119	118	112	126
Percent with Wages	10.0	8.6	17.8	19.2	18.1	19.4	19.2	19.9	20.6
Median Annual Wage	$9,673	$10,925	$29,371	$50,616	$54,243	$57,336	$72,450	$79,979	$71,602
UW Undergraduate Degree, N=1,831									
Number with Wages, 11 states & WY	1,368	1,361	1,455	1,319	1,285	1,282	1,251	1,257	1,240
Percent with Wages	74.7	74.3	79.5	72.0	70.2	70.0	68.3	68.7	67.7
Median Annual Wage	$6,312	$7,048	$14,893	$28,470	$31,429	$36,172	$42,318	$45,500	$48,571
Located in Partner State	149	126	280	329	362	409	433	447	451
Percent with Wages	8.1	6.9	15.3	18.0	19.8	22.3	23.6	24.4	24.6
Median Annual Wage	$5,421	$7,619	$15,623	$29,206	$30,375	$34,978	$42,497	$45,169	$47,704
Community College Academic Track, N=1,409									
Number with Wages, 11 states & WY	1,106	1,132	1,159	1,060	1,052	1,057	1,035	995	987
Percent with Wages	78.5	80.3	82.3	75.2	74.7	75.0	73.5	70.6	70.0
Median Annual Wage	$7,615	$9,015	$10,768	$12,948	$16,223	$21,524	$25,732	$31,200	$33,720
Located in Partner State	88	82	142	189	224	244	251	243	257
Percent with Wages	6.2	5.8	10.1	13.4	15.9	17.3	17.8	17.2	18.2
Median Annual Wage	$3,784	$4,973	$9,500	$11,077	$12,930	$18,460	$21,575	$25,268	$30,321
Community College Occupational Track, N=1,390									
Number with Wages, 11 states & WY	1,082	1,120	1,186	1,143	1,117	1,113	1,073	1,062	1,059
Percent with Wages	77.8	80.6	85.3	82.2	80.4	80.1	77.2	76.4	76.2
Median Annual Wage	$9,591	$10,541	$21,711	$31,113	$35,348	$39,274	$41,675	$44,907	$45,037
Located in Partner State	132	120	169	204	228	249	241	279	286
Percent with Wages	9.5	8.6	12.2	14.7	16.4	17.9	17.3	20.1	20.6
Median Annual Wage	$5,185	$9,011	$18,149	$21,454	$28,373	$34,038	$36,152	$36,887	$41,745

[a]Partner states are states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.
[b]Year of anticipated postsecondary completion.
Source: WDQI Warehouse Tabulations.

of student market outcomes and migration, it also demonstrates how linear description raises some intriguing questions about post-graduation engagement with the next level of education. Some of these issues will be addressed later in this chapter.

Table 6.2 reveals that the majority (n= 4,038 or 63.9%) of Wyoming students who attended 12th grade high school classes in 2007-08 attended a post -secondary institution and worked at the same time in the following five years. Well above half of these students were simultaneously working and attending school in the year of graduation and the following two years. By 2011 the proportion going to school and working at the same time dropped to less than half. Those who worked and went to school at the same time after 12th grade were much less likely to have worked while attending school.

Over one-third of 2008 12th graders

(n=2,283) failed to attend any postsecondary school in the year of graduation or five years following. These high school students were much more likely to work in the 11th grade (69.1%) and to earn more ($4,141) than students who attended postsecondary school (20.7% earning $3,417 on average in 2007). High school students who do not attend postsecondary were more mobile, with 9.3% working in a partner state five years after their 12th grade experience, compared to only 4.2% of those who were both working and attending postsecondary.

It is clearly evident from Table 6.2 that age by itself is a factor in earnings progression. Earnings tend to increase from young adulthood through 55-64 years of age and then decline. At $7,095 wages for those attending school and working in 2011 were 9% above the prior year. For those who did not enroll in postsecondary at any time between 2008 and 2013, earnings were twice that of those working and going

Table 6.2: WDQI Warehouse: Postsecondary Enrollment Status, Number and Percent Found Working in Wyoming and 11 Partner States[a], and Median Annual Wages for Wyoming High School 12th Grade Students from the Class of 2007/08 (N = 6,321), 2006 to 2013

	2006	2007	2008[b]	2009	2010	2011	2012	2013
Concurrently Enrolled Postsecondary with Wages, N=4,038								
Number with Wages, 11 states & WY	348	837	2,581	2,417	2,162	1,972	1,752	1,378
Percent with Wages	8.6	20.7	63.9	59.9	53.5	48.8	43.4	34.1
Median Annual Wage	$2,498	$3,417	$4,660	$5,635	$6,509	$7,095	$9,673	$12,237
Located in Partner State	N/D	6	30	114	169	222	296	267
Percent with Wages	N/D	0.1	0.5	1.8	2.7	3.5	4.7	4.2
Median Annual Wage	N/D	$1,530	$2,357	$3,640	$5,387	$6,146	$8,425	$11,988
Never Enrolled Postsecondary, N=2,283								
Number with Wages, 11 states & WY	1,381	1,577	1,661	1,485	1,416	1,425	1,432	1,402
Percent with Wages	60.5	69.1	72.8	65.0	62.0	62.4	62.7	61.4
Median Annual Wage	$2,607	$4,141	$7,128	$9,181	$11,766	$14,354	$16,756	$18,788
Located in Partner State	34	29	72	116	141	175	185	212
Percent with Wages	1.5	1.3	3.2	5.1	6.2	7.7	8.1	9.3
Median Annual Wage	$1,700	$1,050	$3,971	$8,026	$9,240	$10,797	$14,397	$14,712

[a]Partner states are states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.
[b]Year of anticipated high school graduation.
N/D = Not discloseable due to confidentiality.
Source: WDQI Warehouse Tabulations.

to school ($14,354) having risen by 22% from the previous year. Thus, any strategy which attempts to attribute earnings growth to educational attainment, will need a means of identifying earnings that are a function of maturing in the workforce separate from the role of education.

Tables 6.1 and 6.2 present a broad characterization of high school and postsecondary graduates' interactions with the labor markets and postsecondary educational institutions of Wyoming and its partner states. To address the issues related to the impact of the Hathaway Scholarship Program on future earnings and retention, this chapter presents a more objective and operationally definable approach to the classification of postsecondary graduates. For example, the data presented in Table 6.1 for the 2007/08 graduates in the "Community College Academic Track, All States, N=1,409" does not distinguish between the future employment outcomes of graduates who chose to continue their postsecondary education from those who went directly into the labor force. The remainder of this chapter defines mutually exclusive groups and describes their pre- and post-degree labor force earnings and retention. These groups form the foundation for the selection of statistically matched control groups in Chapter 7.

Methodology

Figure 6.1 (WDQI Warehouse Analysis; see page 36) shows the steps taken to distill the seven years of data contained in the databases to one record per student/graduate. Data were combined from the Wyoming Department of Education (WDE), the Wyoming Community College Commission (WCCC), the University of

Wyoming (UW), the National Student Clearing House (NSCH), and Wage Records from Wyoming and 11 partner states. As shown in Figure 6.1, the combined enrollment and award dataset had 3,202,652 records. Enrollment records prior to high school completion and records for those that were not Wyoming residents based on a combination of WDE data and the residency status in the WCCC and UW databases were removed, leaving 533,082 records. Table 6.3 (see page 37) shows a brief extract (33 of the 533,082 rows remaining) from the combined database for three postsecondary graduates.

Highest Academic Achievement

For this analysis, R&P selected the individuals' highest academic achievement. For example, SSN1 in Table 6.3 received an associate's degree (AA/AS) and certificate from a Wyoming Community College (WCCC) during the spring semester 2008/09 school year. SSN1 also received a bachelor's degree (BA/BS) from the University of Wyoming (UW) in the fall semester 2010/11. Therefore, the highest academic achievement for SSN1 was a BA/BS. Likewise, SSN2 had three academic achievements: a high school diploma, an AA/AS, and a BA/BS. If SSN2 had completed his academic career in the fall 2011/12 semester, then his highest academic achievement would be "some college." This is the case with SSN3 in Table 6.3. Although the individual attended nine semesters at UW, she did not receive a degree. The rank order of the academic achievements appears in Box 6.1 (see page 38).

Lastly, records are restricted to the last semester attended when the highest academic achievement was granted. There are graduates who earn multiple AA/AS or BA/BS degrees during their academic

All Enrollment and Award (Diploma & Degrees) Data for Wyoming Schools (Residents and Non-Residents)

Department of Education (WDE)

WDE Database 2,408,587

Community Colleges (WCCC)

WCCC Database 492,313

University of Wyoming (UW)

UW Database 301,752

WDE+WCCC+UW Combined

Combined Database 3,202,652

Inclusion Parameters

1) Wyoming residents only
2) Highest academic achievement
3) Last semester with highest academic achievement
4) Does not re-enroll in two years
5) Restricted to 2008/2009 to 2014/2015 school years

Academic Achievement Levels

High School Non-Completer
High School Diploma
Some Post Secondary
Certificate
Associates (AA/AS)
Bachelors (BA/BS)
Graduate Degree (MA/MS/PhD/Prof)

Highest Academic Achievement Groups (All Students)

Wyoming Department of Education

High School Non-Completers	18,696
High School Diploma	17,146

Wyoming Community Colleges

Some College	23,738
Certificate	585
Associates (AA/AS)	4,438

University of Wyoming

Some College	11,028
Certificate	140
Bachelors (BA/BS)	6,396
Graduate Degree (MA/MS/PhD/Prof)	1,951

Graduating Student Financial Strategy

Wyoming Community Colleges — Associates (AA/AS)

Hathaway 70.0%	953,	21.5%
Other 70.0% Scholarships 70.0%	943,	21.2%
Student Loans 70.0%	534,	12.0%
Hathaway 30.0% to 69.9%	424,	9.6%
Other Mix	632,	14.2%
Self Funded	952,	21.5%
Total	4,438,	100.0%

University of Wyoming — Bachelors (BA/BS)

Hathaway 70.0%	678,	10.6%
Other 70.0% Scholarships 70.0%	1,442,	22.5%
Student Loans 70.0%	1,195,	18.7%
Hathaway 30.0% to 69.9%	1,199,	18.7%
Other Mix	1,417,	22.2%
Self Funded	465,	7.3%
Total	6,396,	100.0%

These steps take all of the school and semester enrollment data and distills it down to one record per student based on the above academic levels. A student that went to high school and did not receive a diploma will be a high school non-completer. If the high school non-completer gets a GED, attends college, and earns a bachelor's degree then they are a bachelor's (BA/BS).

Multiple records per student including all enrollment by school and semester. For example, a student that starts in a Wyoming high school and transitions to a Wyoming college and the University of Wyoming will have one record per school and semester combination.
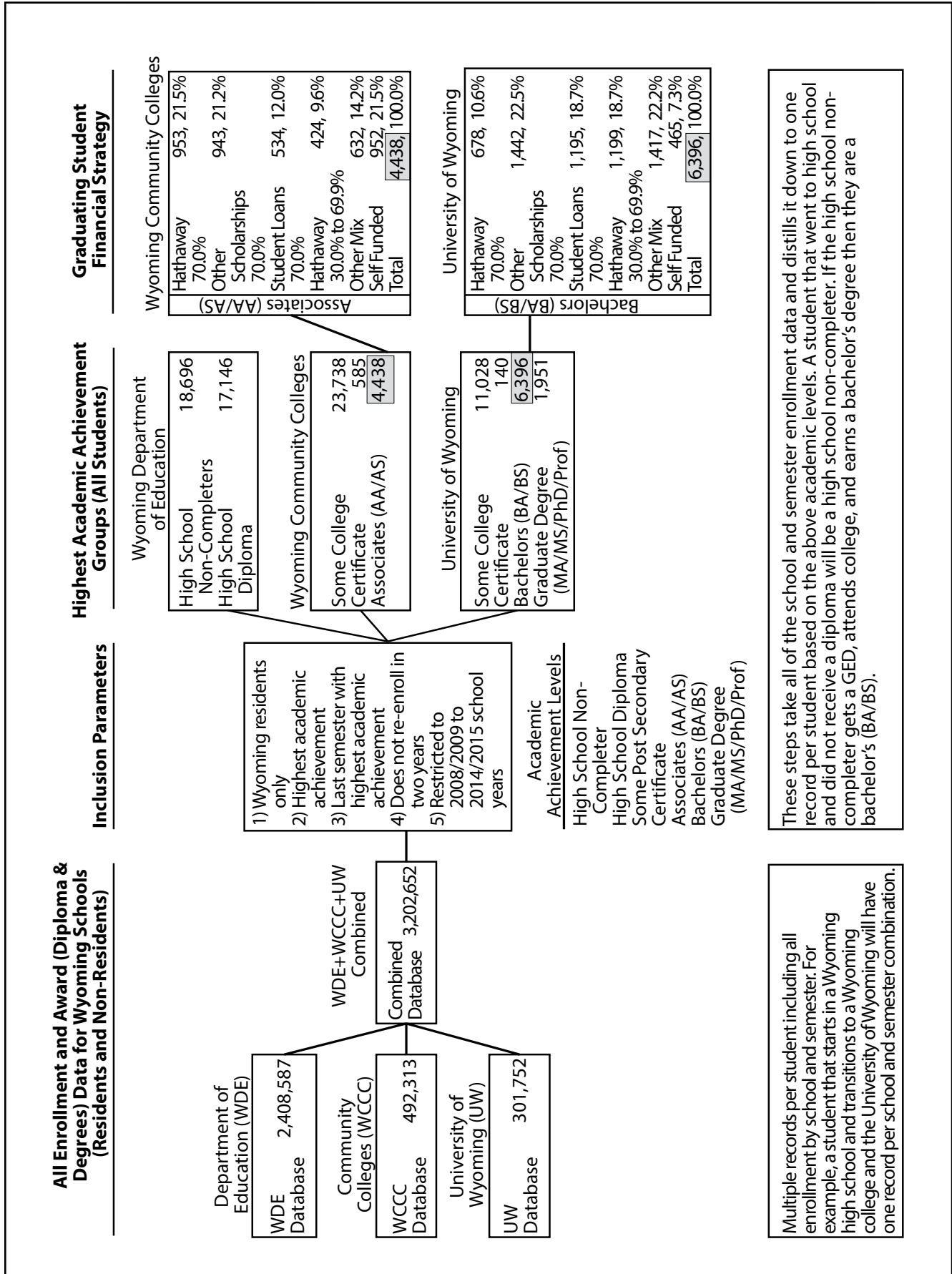
Figure 6.1: WDQI Warehouse Analysis: Financial Path to Graduation for All Students in Public Education in Wyoming, 2008/2009 to 2014/2015

(Text continued from page 35)

careers; however, this type of example does not appear in Table 6.3. The final rule that is applied to the working dataset is that the graduate does not attend any postsecondary institution in the two years following graduation, and the graduate's highest academic achievement must have occurred between the 2008/09 and 2014/15 school years. This rule uses all data from the WCCC, UW, and NSCH files. The resultant dataset is comprised of 84,118 records similar to the last row of

Table 6.3: Examples of Records Used for High Degree and Last Semester Assignment

| Semester | Semesters Skipped | School Year | School | Degree to Date | Funding to Date | | | Wages to Date | Financial Strategy |
					Hathaway	Other Scholarships	Student Loans		
SSN1									
2006 Fall	1	2006/07	WCCC[a]	Some College	$960	$300	$0	$0	Hathaway 70.0%
2007 Spring	1	2006/07	WCCC	Some College	$1,565	$600	$0	$851	Hathaway 70.0%
2007 Summer	1	2007/08	WCCC	Some College	$1,565	$600	$0	$2,199	Hathaway 70.0%
2007 Fall	1	2007/08	WCCC	Some College	$2,525	$600	$0	$2,199	Hathaway 70.0%
2008 Spring	1	2007/08	WCCC	Some College	$3,485	$600	$0	$2,766	Hathaway 70.0%
2008 Summer	1	2008/09	WCCC	Some College	$3,485	$600	$0	$3,694	Hathaway 70.0%
2008 Fall	1	2008/09	WCCC	Some College	$3,485	$600	$0	$3,694	Hathaway 70.0%
2009 Spring	2	2008/09	WCCC	AA/AS	$3,485	$600	$0	$3,694	Hathaway 70.0%
2009 Spring	2	2008/09	WCCC	Certificate	$3,485	$600	$0	$3,694	Hathaway 70.0%
2009 Fall	1	2009/10	UW[b]	Some College	$4,445	$900	$591	$4,579	Hathaway 70.0%
2010 Spring	2	2009/10	UW	Some College	$5,405	$1,200	$1,182	$4,579	Hathaway 70.0%
2010 Fall		**2010/11**	**UW**	**BA/BS**	**$6,365**	**$1,500**	**$1,182**	**$4,579**	**Hathaway 70.0%**
NO POSTSECONDARY ENROLLMENT NEXT TWO YEARS									
SSN2									
2010 Spring	2	2009/10	High School	Diploma	$0	$0	$0	$79	Zero Funding
2010 Fall	1	2010/11	WCCC	Some College	$1,200	$0	$0	$1,746	Hathaway 70.0%
2011 Spring	2	2010/11	WCCC	Some College	$2,400	$0	$0	$3,779	Hathaway 70.0%
2011 Fall	1	2011/12	WCCC	Some College	$3,600	$0	$0	$5,116	Hathaway 70.0%
2012 Spring	1	2011/12	WCCC	AA/AS	$4,800	$0	$0	$5,116	Hathaway 70.0%
2012 Summer	1	2012/13	UW	Some College	$4,800	$2,339	$0	$5,116	Hathaway 30.0% to 69.9%
2012 Fall	1	2012/13	UW	Some College	$6,000	$8,842	$0	$5,116	Hathaway 30.0% to 69.9%
2013 Spring	1	2012/13	UW	Some College	$7,200	$15,352	$0	$5,315	Hathaway 30.0% to 69.9%
2013 Summer	1	2013/14	UW	Some College	$7,200	$17,080	$0	$5,493	Other Scholarships 70.0%
2013 Fall	1	2013/14	UW	Some College	$8,400	$24,274	$0	$5,493	Other Scholarships 70.0%
2014 Spring	1	2013/14	UW	Some College	$9,600	$31,236	$0	$5,609	Other Scholarships 70.0%
2014 Summer		**2014/15**	**UW**	**BA/BS**	**$9,600**	**$32,692**	**$0**	**$5,609**	**Other Scholarships 70.0%**
NO POSTSECONDARY ENROLLMENT NEXT TWO YEARS									
SSN3									
2008 Spring	2	2007/08	UW	Some College	$1,600	$0	$3,500	$0	Hathaway 30.0% to 69.9%
2008 Fall	1	2008/09	UW	Some College	$7,777	$0	$5,100	$0	Hathaway 30.0% to 69.9%
2009 Spring	2	2008/09	UW	Some College	$13,954	$0	$5,100	$2,916	Hathaway 70.0%
2009 Fall	1	2009/10	UW	Some College	$15,554	$0	$5,100	$9,193	Hathaway 70.0%
2010 Spring	2	2009/10	UW	Some College	$17,154	$0	$5,100	$15,316	Hathaway 70.0%
2010 Fall	1	2010/11	UW	Some College	$17,154	$0	$5,100	$22,583	Hathaway 70.0%
2011 Spring	1	2010/11	UW	Some College	$18,754	$2,775	$5,100	$28,486	Hathaway 70.0%
2011 Summer	1	2011/12	UW	Some College	$18,754	$2,775	$5,100	$33,288	Hathaway 70.0%
2011 Fall		**2011/12**	**UW**	**Some College**	**$18,754**	**$2,775**	**$5,100**	**$37,686**	**Hathaway 70.0%**
NO POSTSECONDARY ENROLLMENT NEXT TWO YEARS									

Note: All three examples used in this table were Wyoming residents.
[a]WCCC = Wyoming community colleges.
[b]UW = University of Wyoming.

each SSN's record in Table 6.3. The counts by highest academic achievement appear in the fourth step of Figure 6.1.

Financial Strategies

Financial Strategy (see Table 6.3) was determined by the three columns titled Hathaway To-Date, Other Scholarships To-Date, and Student Loans To-Date. The financial strategy was assigned to each student for each semester based on the rules presented in Box 6.2.

SSN2 in Table 6.3 had four financial strategies across his academic career, beginning with zero funding at high school graduation, 70% Hathaway for his first four semesters of postsecondary enrollment, then Hathaway 30.0%-69.9%, and finishing with Other Scholarships 70%. The financial strategy during SSN2's highest academic achievement and last semester was Other Scholarships 70.0%, and this is the financial strategy used for SSN2 for the remainder of the analysis.

R&P assigned each individual to one of the 42 categories comprised of seven

levels of academic achievement and six types of financial strategy. All of the tables presented in this chapter are completed for all 42 categories and will be made available on R&P's website in the near future. The remainder of this chapter focuses on the two largest college graduate categories: associate's degree (AA/AS, N = 4,438) and bachelor's degree (BA/BS, N = 6,396). The last panel of Figure 6.1 (see page 36) shows the number and percent of each degree/financial strategy combination.

These data were merged with wage records from Wyoming and 11 partner states for the five years prior to and five years subsequent to the graduation year.

Results

Table 6.4 shows summary statistics

Box 6.1: Rank Order of Academic Achievement (lowest to highest)

1. High School Non-Completer (includes students who left the state before diploma)
2. High School Diploma
3. Some College (includes students taking one class for general interest)
4. Certificate
5. Associate's Degree (AA/AS)
6. Bachelor's Degree (BA/BS)
7. Graduate Degree (MA/MS/PhD/Professional)

Box 6.2: Financial Strategies

1. Hathaway 70.0%: The individuals' funding to date was 70.0% or more Hathaway.
2. Other Scholarships 70%: The individuals' funding to date was 70.0% or more Other Scholarships.
3. Student Loans 70.0%: The individuals' funding to date was 70.0% or more Student Loans.
4. Hathaway 30-69.9%: The individuals' funding to date was 30.0%-69.9% Hathaway.
5. Other Mix: The individuals' funding to date was some other combination of Hathaway, Other Scholarships, and/or Student Loans.
6. Self Funding: The individuals' did not receive any Hathaway, Other Scholarships, or Student Loans.

about the demographic make-up of the AA/AS & BA/BS graduates by financial strategy. The two groups with a large portion of Hathaway funds are younger, with a median age of 21 for both AA/AS - Hathaway 70.0% and AA/AS - Hathaway 30.0%-69.9%. Correspondingly, the BA/BS combinations are younger than the other financial strategies, with a median age of 23. While there are differences in the female and male distribution across the funding strategies, all have a higher portion of females. Figures 6.2 and 6.3 (see page 40) show the distribution of graduates by age group and gender across all categories.

The remainder of this chapter discusses two labor force outcomes of the graduates based on their financial strategies: retention

in Wyoming and wages. Demographic differences indicate that the groups are very dissimilar. This means that the labor market outcomes for each financial graduation strategy stand an equal chance of being attributable to demographic differences and the interaction between demographics and financing as they do to financing alone. The analysis in Chapter 7 illustrates the steps necessary to statistically control for differences in demographic composition between the financial strategies.

AA/AS

Table 6.5 (see page 42) and Figures 6.4 and 6.5 (see page 43) show summary statistics for AA/AS graduates by funding

Table 6.4: Hathaway Scholarship Analysis Summary Statistics by School, High Degree/Completion Status, and Hathaway Scholarship Funding Mixture for Individuals Who Did Not Enroll in Postsecondary Education in the Two Years Following the High Degree, 2008/09 to 2014/15

School	High Degree	Hathaway Funding Mixture	Total	Females		Males		Age at Completion of High Degree		Wages Earned While Enrolled in Postsecondary	
				N	Row %	N	Row %	Median	Mean	Median	Mean
Wyoming Community Colleges	AA/AS	Hathaway 70.0%	953	553	58.0%	400	42.0%	21	21	$18,077	$26,771
		Other Scholarships 70.0%	943	620	65.7%	323	34.3%	26	28	$19,696	$37,862
		Student Loans 70.0%	534	374	70.0%	160	30.0%	27	29	$30,667	$46,198
		Hathaway 30.0% to 69.9%	424	267	63.0%	157	37.0%	21	21	$22,013	$30,958
		Other Mix	632	467	73.9%	165	26.1%	28	29	$18,152	$35,560
		Self Funded	952	519	54.5%	433	45.5%	27	30	$35,219	$72,591
University of Wyoming	BA/BS	Hathaway 70.0%	678	348	51.3%	330	48.7%	23	23	$16,177	$27,225
		Other Scholarships 70.0%	1,442	802	55.6%	640	44.4%	24	26	$8,807	$32,976
		Student Loans 70.0%	1,195	714	59.7%	481	40.3%	26	29	$24,307	$53,339
		Hathaway 30.0% to 69.9%	1,199	670	55.9%	529	44.1%	23	23	$13,772	$21,343
		Other Mix	1,417	781	55.1%	636	44.9%	25	27	$15,306	$31,206
		Self Funded	465	288	61.9%	177	38.1%	28	32	$34,832	$86,488

Source: WDQI Warehouse Tabulations.

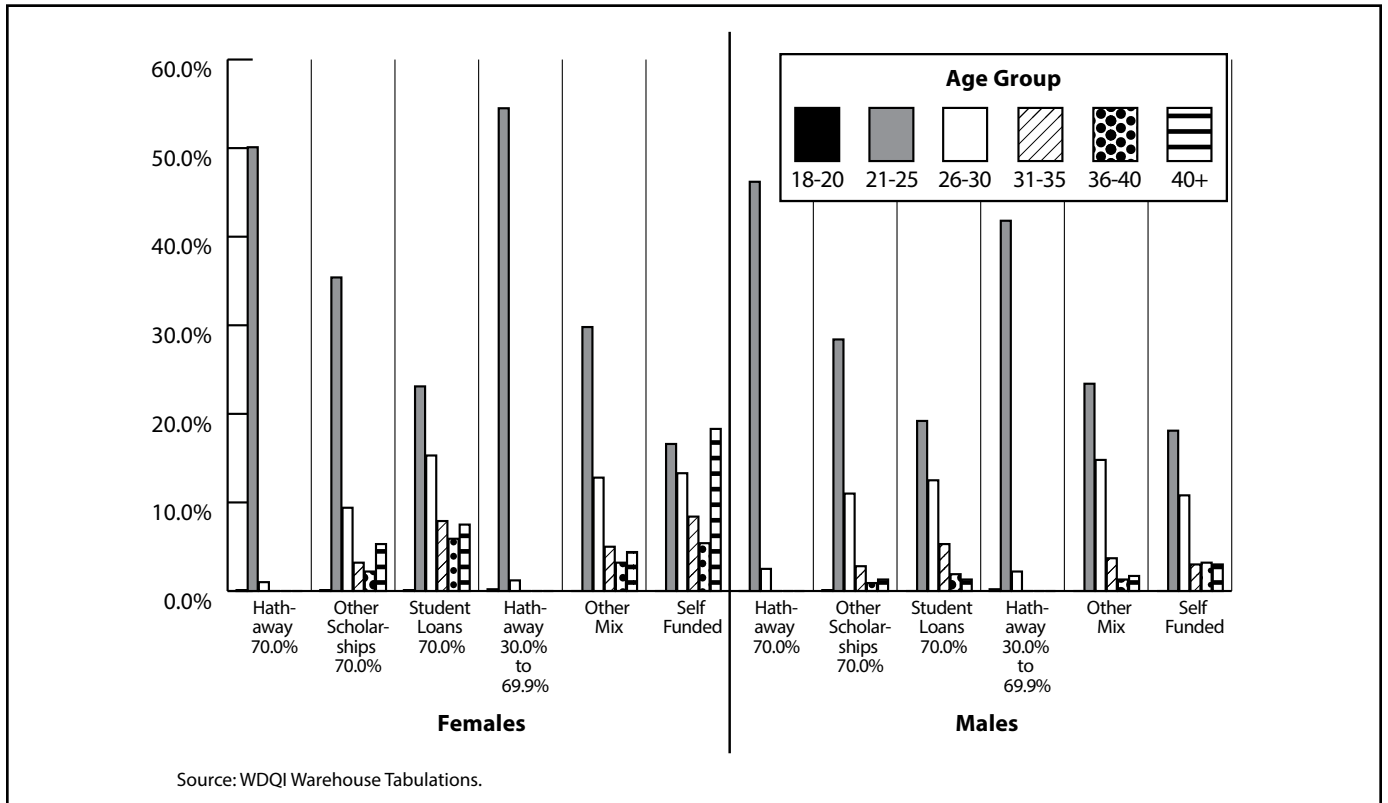Source: WDQI Warehouse Tabulations.

Figure 6.2: Demographic Distribution and Funding Sources of University of Wyoming Graduates with a Bachelor's Degree (BA/BS), 2008/09 to 2014/15 (N = 6,396)
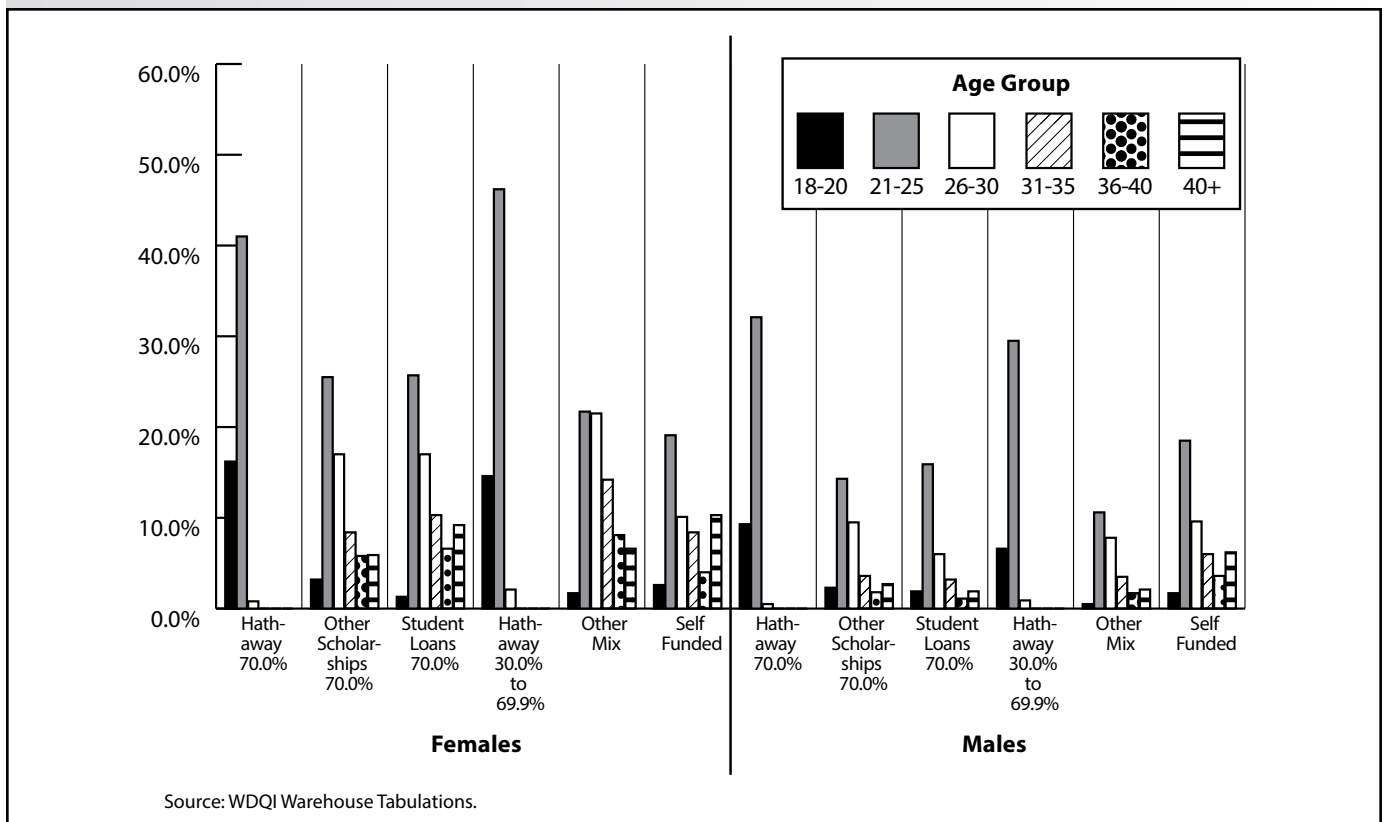

Source: WDQI Warehouse Tabulations.

Figure 6.3: Demographic Distribution and Funding Sources of Wyoming Community College Graduates with an Associate's Degree (AA/AS), 2008/09 to 2014/15 (N = 4,438)

(Text continued from page 39)

strategies in Wyoming and partner states: the number with wages, percent with wages, and the median wage. Referring to the total (N = 4,438) section, there were 3,010 of the 4,438 graduates employed in Wyoming five years prior to receiving their degrees. These 3,010 individuals had a median annual wage of $6,309 five years prior to the year of graduation (degree year -5). Two years after graduation (degree year +2), there were 71.6% of the AA/AS graduates retained in Wyoming's labor force with a median annual wage of $32,689. An additional 10.8% were found in one of Wyoming's partner states with a median annual wage of $20,741.

BA/BS

Table 6.6 (see page 44) and Figures 6.6 and 6.7 (see page 45) show summary statistics for BA/BS graduates by funding strategies in Wyoming and partner states: the number with wages, percent with wages, and the median wage. Figure 6.6 shows the percent of BA/BS graduates retained in Wyoming across the 11-year time span. In contrast to the AA/AS graduates, the BA/BS Hathaway 70% and Hathaway 30.0%-69.9% were more likely to be retained in Wyoming when compared to the total across all funding strategies. The distribution across demographic categories in Figure 6.3 suggests that the BA/BS groups are more similar to one another than the AA/AS groups. Figure 6.7 shows that the median annual wages post-degree are similar across all groups.

Conclusions

The short time frame for this study precluded analysis of the many questions raised during its course. For example, funding strategies were allocated to six broad categories. Time did not allow the consideration of academic versus athletic scholarships. While the end point of the individuals' academic career was defined, there was not time to look at whether having multiple awards impacted future earnings. The time frame for the longitudinal analysis was too short. For example, while data were presented for five years following graduation, only two completion years (2008/09 and 2009/10) actually had five years of viable outcomes data.

One of the major drawbacks of the research presented in this chapter — the controlling of demographic differences between the financial strategy groups — is addressed in Chapter 7. Selecting statistically matched control groups and conducting a quasi-experimental design will eliminate the differences in age and gender composition between the groups.

References

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Nordby, B. (2006, June 18). Outsmarting the scholarship. *Casper Star-Tribune*. Retrieved June 20, 2016, from http://tinyurl.com/hath6-2

Nordby, B. (2006, November 6). Community colleges want share of Hathaway growth. *Casper Star-Tribune*. Retrieved June 20, 2016, from http://tinyurl.com/hath6-3

Table 6.5: Descriptive Statistics for Wyoming Community Colleges, AA/AS Awards, and College Financing Strategies for Individuals Who Did Not Enroll in Postsecondary Education in the Two Years Following the AA/AS Award, Completion Years 2008/09 to 2014/15

Wage Source	Data	-5	-4	-3	-2	-1	Degree	+1	+2	+3	+4	+5
						Wage Data in Year Relative to High Degree Year						
Total (N = 4,438)												
WY Wage Records	N with Wages	3,010	3,353	3,491	3,582	3,581	3,588	2,521	1,942	1,479	1,037	646
	% with Wages	69.4	76.7	79.6	81	80.8	80.6	74.6	71.6	69.7	66.7	66.5
	Median Annual Wage	$6,309	$7,156	$8,578	$9,480	$11,110	$18,513	$29,442	$32,689	$36,201	$40,956	$43,455
PS Wage Records	N with Wages	160	136	115	116	151	304	352	290	232	157	95
	% with Wages	3.8	3.1	2.6	2.6	3.5	7.6	10.7	10.8	11.2	10.5	9.8
	Median Annual Wage	$10,403	$11,681	$11,104	$8,952	$9,631	$16,222	$18,761	$20,741	$21,807	$30,437	$27,522
Hathaway 70.0% (N = 953)												
WY Wage Records	N with Wages	537	663	726	796	802	789	446	324	246	164	102
	% with Wages	59.4	73.0	79.1	84.7	84.5	81.5	69.4	65.5	65.4	61.5	63.8
	Median Annual Wage	$2,658	$3,862	$5,385	$6,794	$8,903	$14,435	$25,137	$30,423	$32,622	$36,816	$37,182
PS Wage Records	N with Wages	13	15	16	18	32	62	86	72	51	34	18
	% with Wages	2.3	1.6	1.9	2.2	4.2	8.3	13.8	15.3	14.8	14.1	12.6
	Median Annual Wage	$1,258	$2,831	$8,751	$9,097	$12,455	$14,382	$15,794	$18,220	$20,404	$22,244	$26,527
Other Scholarships 70.0% (N = 943)												
WY Wage Records	N with Wages	629	694	719	722	724	744	556	442	330	223	141
	% with Wages	67.2	74.0	76.3	76.5	76.4	78.6	74.5	71.9	68.0	61.7	61.0
	Median Annual Wage	$7,571	$8,066	$9,203	$8,840	$10,548	$17,463	$25,702	$26,291	$30,342	$35,431	$38,318
PS Wage Records	N with Wages	53	33	25	23	34	72	66	60	48	37	27
	% with Wages	5.9	3.7	2.6	2.8	3.8	8.2	9.0	9.8	10.0	10.6	11.8
	Median Annual Wage	$8,100	$6,257	$15,944	$7,857	$10,111	$17,008	$17,755	$23,700	$23,545	$30,437	$18,015
Student Loans 70.0% (N = 534)												
WY Wage Records	N with Wages	400	429	439	457	439	434	322	242	183	126	77
	% with Wages	76.7	81.6	83.8	85.7	83	82.2	77.5	74.8	75.7	73.7	74.7
	Median Annual Wage	$9,617	$11,028	$12,050	$12,065	$11,690	$22,036	$34,245	$38,793	$43,850	$46,666	$50,035
PS Wage Records	N with Wages	29	26	20	13	14	33	46	33	24	19	7
	% with Wages	5.3	4.7	3.6	2.4	2.8	6.1	11.1	10.8	10.2	11.7	6.8
	Median Annual Wage	$17,331	$20,311	$15,965	$8,932	$9,684	$20,279	$29,411	$28,050	$38,982	$43,971	$44,175
Hathaway 30.0% to 69.9% (N = 424)												
WY Wage Records	N with Wages	264	320	332	353	345	334	192	135	104	66	29
	% with Wages	63.7	75.6	79.6	83.5	81.3	77.9	69.9	64.9	63	58.8	62.6
	Median Annual Wage	$2,702	$3,763	$5,277	$7,028	$9,554	$13,271	$24,136	$26,738	$29,403	$35,546	$30,041
PS Wage Records	N with Wages	5	5	6	11	24	31	36	26	26	13	5
	% with Wages	2.5	2.0	3.2	3.8	7.4	9.7	14.5	14.3	19.4	14.7	10.5
	Median Annual Wage	$4,198	$4,634	$3,921	$4,805	$9,325	$16,776	$14,610	$20,952	$16,019	$28,702	$33,524
Other Mix (N = 632)												
WY Wage Records	N with Wages	459	497	504	472	483	508	357	264	191	122	80
	% with Wages	73	79.3	80.3	75.1	77.1	81.2	76.9	74.8	75	73.3	75.6
	Median Annual Wage	$8,761	$9,003	$9,085	$9,879	$9,258	$19,309	$29,741	$32,710	$40,994	$43,252	$46,022
PS Wage Records	N with Wages	26	27	22	26	18	47	50	30	22	10	7
	% with Wages	4.1	4.7	4.2	4.0	2.9	8.2	11.1	8.5	9.3	9.5	6.6
	Median Annual Wage	$14,368	$11,717	$9,998	$8,557	$5,215	$16,133	$19,284	$20,738	$22,988	$46,870	$18,072
Self Funded (N = 952)												
WY Wage Records	N with Wages	721	750	771	782	788	779	648	535	425	336	217
	% with Wages	75.4	78.5	80.8	82	82.7	82.5	78.9	75.2	70.5	69.6	66.4
	Median Annual Wage	$11,768	$13,938	$15,697	$17,673	$18,839	$26,446	$36,233	$38,228	$42,142	$44,627	$44,615
PS Wage Records	N with Wages	34	30	26	25	29	59	68	69	61	44	31
	% with Wages	3.2	2.8	2.6	2.5	3.3	5.8	7.6	9.2	9.7	8.8	8.9
	Median Annual Wage	$14,181	$18,101	$11,452	$12,234	$10,336	$11,209	$20,410	$19,116	$21,273	$34,944	$38,565

PS = Partner States: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.
Source: WDQI Warehouse Tabulations.
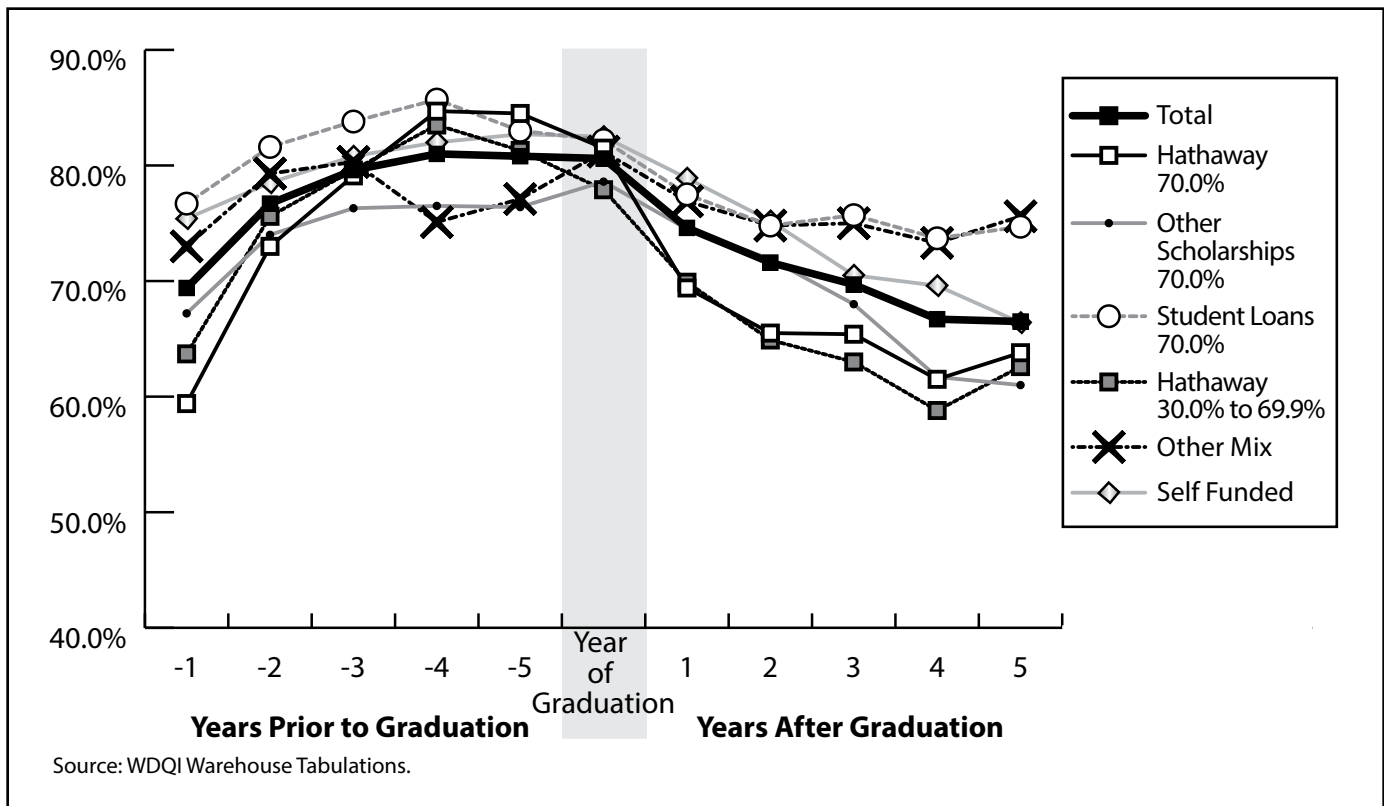
Figure 6.4: Percentage of Wyoming Community College Graduates with an Associate's Degree (AA/AS) Retained in Wyoming by Postsecondary Education Funding Source, Completion Years 2008/09 to 2014/15 (N = 4,438)
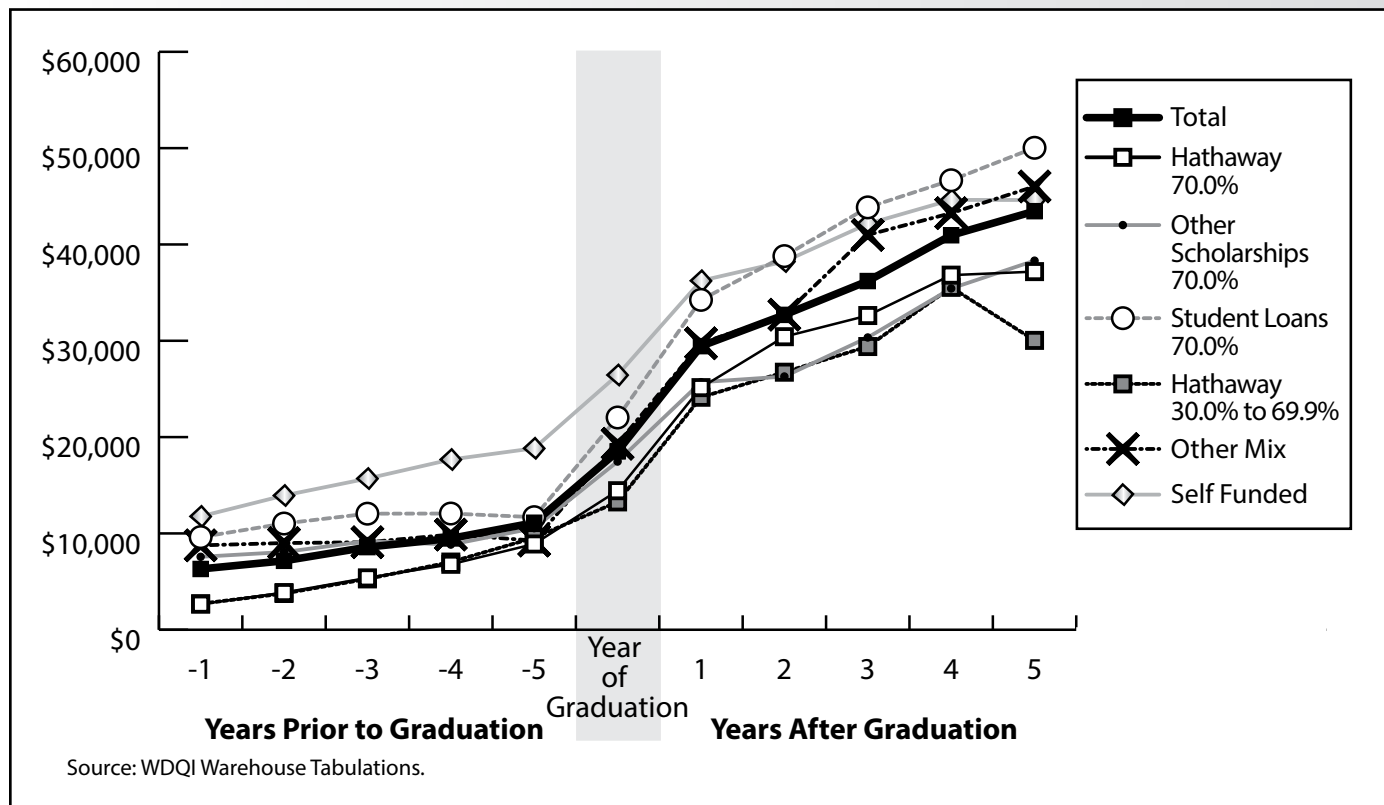
Figure 6.5: Median Annual Wage of Wyoming Community College Graduates with an Associate's Degree (AA/AS) Retained in Wyoming by Postsecondary Education Funding Source, Completion Years 2008/09 to 2014/15 (N = 4,438)

Table 6.6: Descriptive Statistics for the University of Wyoming, BA/BS Awards, and College Financing Strategies for Individuals Who Did Not Enroll in Postsecondary Education in the Two Years Following the AA/AS Award, Completion Years 2008/09 to 2014/15

Wage Source	Data	Wage Data in Year Relative to High Degree Year										
		-5	-4	-3	-2	-1	Degree	+1	+2	+3	+4	+5
Total (N = 6,396)												
WY Wage Records	N with Wages	4,842	4,999	4,967	4,725	4,622	4,658	3,204	2,387	1,808	1,273	787
	% with Wages	75.9	78.2	77.7	73.9	72.2	72.4	61.1	55.8	53.3	51.2	48.3
	Median Annual Wage	$4,675	$5,640	$6,438	$7,096	$7,928	$16,040	$29,542	$34,581	$36,519	$39,347	$42,228
PS Wage Records	N with Wages	226	229	234	255	382	775	816	700	539	382	224
	% with Wages	3.5	3.6	3.7	4.0	5.9	12.6	15.8	16.5	16.2	15.5	13.7
	Median Annual Wage	$8,132	$6,342	$6,975	$8,845	$12,574	$18,856	$27,834	$30,879	$34,527	$33,379	$36,142
Hathaway 70.0% (N = 678)												
WY Wage Records	N with Wages	517	546	554	526	517	519	335	214	139	68	16
	% with Wages	78.8	83.7	85.0	82.7	78.9	79.1	70.6	68.6	69.5	73.9	72.8
	Median Annual Wage	$3,272	$4,428	$5,476	$6,201	$6,642	$15,239	$30,185	$35,801	$36,541	$38,467	$38,884
PS Wage Records	N with Wages	12	9	10	11	30	78	75	48	18	N/D	0
	% with Wages	2.0	2.0	1.9	1.7	4.8	12.6	16.7	13.6	8.9	N/D	0
	Median Annual Wage	$3,654	$8,058	$5,222	$5,757	$9,508	$16,873	$21,830	$28,353	$39,501	$27,095	$0
Other Scholarships 70.0% (N = 1,442)												
WY Wage Records	N with Wages	1,012	1,047	1,042	977	989	1,000	689	545	462	371	264
	% with Wages	69.6	71.7	71.6	67.1	67.9	69.1	57.0	51.9	50.8	49.3	46.7
	Median Annual Wage	$4,006	$4,808	$5,700	$6,585	$7,597	$14,369	$27,657	$32,619	$35,249	$38,856	$41,511
PS Wage Records	N with Wages	48	54	57	66	79	174	196	187	156	144	88
	% with Wages	3.5	3.8	3.8	4.4	5.6	12.7	15.5	16.3	15.8	17.7	14.5
	Median Annual Wage	$5,028	$4,069	$5,657	$8,664	$9,540	$17,411	$27,720	$29,077	$33,418	$33,690	$36,535
Student Loans 70.0% (N = 1,195)												
WY Wage Records	N with Wages	939	965	973	939	881	878	677	539	419	314	206
	% with Wages	78.3	80.8	81.3	78.3	73.7	73.5	65.2	60.9	57.4	54.9	49.6
	Median Annual Wage	$8,635	$10,376	$11,290	$10,522	$11,068	$19,902	$31,404	$35,707	$38,732	$39,439	$44,035
PS Wage Records	N with Wages	69	69	61	67	90	152	153	137	112	86	58
	% with Wages	5.9	5.9	5.2	5.8	7.7	12.8	14.7	15	14.7	14	14.1
	Median Annual Wage	$17,547	$11,595	$10,496	$14,702	$15,045	$18,826	$26,769	$33,423	$34,862	$41,023	$40,410
Hathaway 30.0% to 69.9% (N = 1,199)												
WY Wage Records	N with Wages	912	955	943	906	875	895	533	332	200	103	35
	% with Wages	79.7	79.7	79	78.5	76.8	77.4	65.6	60.6	59.8	61.5	70.5
	Median Annual Wage	$3,271	$4,263	$5,160	$5,624	$6,361	$14,002	$28,273	$33,758	$35,815	$42,676	$45,720
PS Wage Records	N with Wages	15	22	30	34	68	135	132	94	72	23	5
	% with Wages	1.3	1.9	2.4	2.9	6.2	12.1	15.9	15.9	18.4	13.0	6.0
	Median Annual Wage	$4,459	$2,351	$3,986	$4,676	$12,801	$21,883	$35,025	$36,618	$38,676	$31,513	$13,629
Other Mix (N = 1,417)												
WY Wage Records	N with Wages	1,109	1,125	1,097	1,018	1,021	1,030	706	540	407	278	169
	% with Wages	78.3	79.4	77.4	72.2	72.2	72.1	60.3	55.7	53.1	50.7	48
	Median Annual Wage	$5,202	$5,835	$5,990	$6,711	$7,220	$15,491	$29,373	$34,482	$35,339	$38,752	$40,893
PS Wage Records	N with Wages	57	58	55	54	80	189	200	177	133	84	51
	% with Wages	3.9	4.0	3.8	3.7	5.5	14.0	17.3	18.5	18.0	15.8	14.3
	Median Annual Wage	$7,683	$6,045	$5,109	$6,562	$10,630	$17,140	$26,914	$30,680	$31,832	$31,648	$27,827
Self-Funded (N = 465)												
WY Wage Records	N with Wages	353	361	358	359	339	336	264	217	181	139	97
	% with Wages	74.7	76.5	76.3	76.6	72.9	72.4	63.5	59.2	58.5	56.3	53.8
	Median Annual Wage	$11,268	$14,006	$17,666	$16,534	$21,226	$28,121	$34,157	$38,846	$38,619	$38,776	$42,650
PS Wage Records	N with Wages	25	17	21	23	35	47	60	57	48	N/D	22
	% with Wages	5.3	3.7	4.6	5.0	7.3	9.6	13.2	14.5	14.6	N/D	10.5
	Median Annual Wage	$12,849	$16,032	$16,666	$29,020	$18,379	$31,367	$27,405	$30,474	$32,971	$33,425	$42,802

PS = Partner States: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.
Source: WDQI Warehouse Tabulations.   N/D = Not discloseable due to confidentiality.
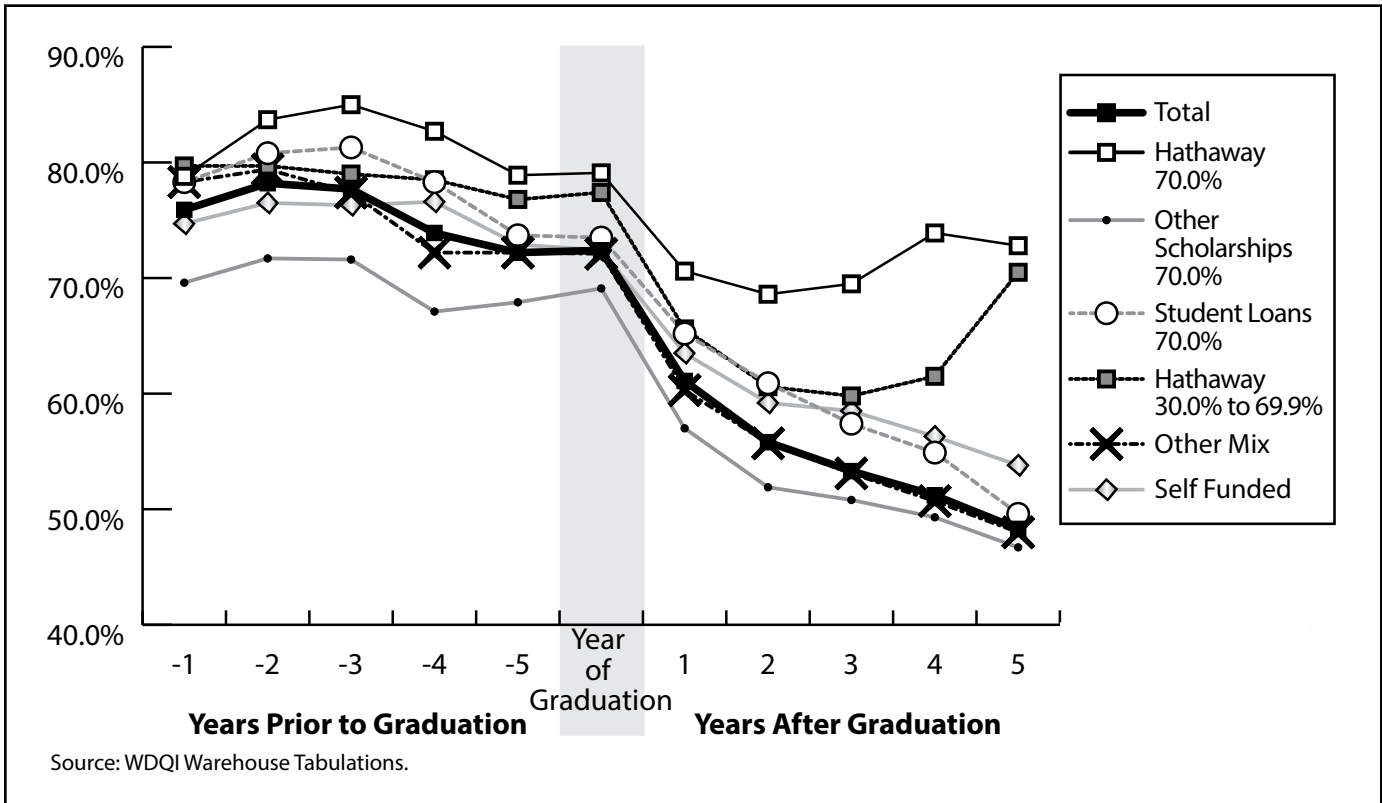
Figure 6.6: Percentage of University of Wyoming Graduates with a Bachelor's Degree (BA/BS) Retained in Wyoming by Postsecondary Education Funding Source, Completion Years 2008/09 to 2014/15 (N = 6,396)
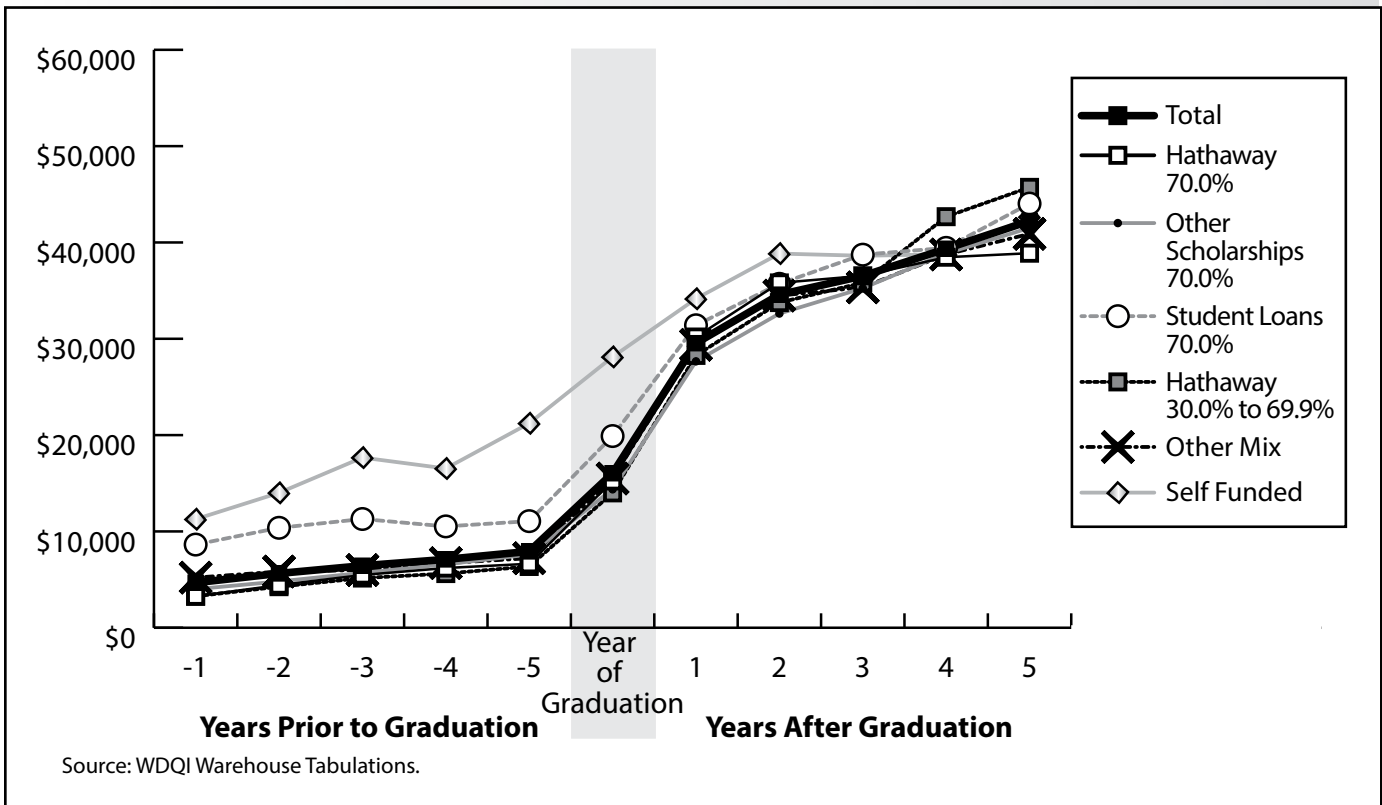

Figure 6.7: Median Annual Wage of University of Wyoming Graduates with a Bachelor's Degree (BA/BS) Retained in Wyoming by Postsecondary Education Funding Source, Completion Years 2008/09 to 2014/15 (N = 6,396)

Chapter 7: Postsecondary Employment and Wage Outcomes: Controlling for Age, Gender, and Work Experience

by: Patrick Harris, Principal Economist

The most difficult decision for many high school seniors is where to attend college. Students face several factors associated with college choice, including distance, financial costs, available financial aid, university characteristics, and economic climate. According to the National Center for Education Statistics (2011), the number of freshmen leaving their home state to attend college in another state has increased from 250,000 in 1992 to 392,000 in 2010. This presents many states with challenges regarding the loss of educated, skilled workers to other states. To assist in countering this trend, the U.S. has seen a recent shift in policy with the introduction of state merit-based student aid programs. Several reasons for this shift have been identified, including curtailing student out-migration with the hope of retraining skilled workers within a state (Dynarski, 2000).

Literature Review

The principal research areas when assessing student migration are out-migration and in-migration. In other words, the factors associated with students leaving their home state to attend an institution in another state (out-migration) and the factors associated with students coming into a state (in-migration). Tuckman (1970) analyzed data from each state and found that students are more likely to migrate out when tuition rates in a state are high even when origin-state financial aid is taken into account. Tuckman also suggested that as a state's per capita income increased students were more likely to voluntarily migrate out due to the likely increase in

financial assistance from parents. Mixon (1992) provided results similar to Tuckman, but included college quality as a variable. The results indicated that higher tuition rates in a state do lead to out-migration but that an increase in school selectivity (i.e., quality) decreased out-migration.

More recent studies suggest that other factors are influencing college choice above and beyond cost alone. The migration of students tends to be based on the price of tuition for both in-state and out-of-state schools, the overall quality of the institutions within a state, and geographic regions with greater employment outcomes after graduation. (Baryla & Dotterweich, 2001; Cooke & Boyle, 2011).

Students also face the added pressure of predicting their ability to obtain adequate employment after graduation. Hilmer (2002) analyzed data from the Baccalaureate and Beyond survey from the class of 1993 and compared the tuition rates of public and private four-year institutions both in and out-of-state to determine the effects of the type of college attended as an employment recruitment screening device. Hilmer found that students who attended private and public out-of-state institutions have a positive wage premium post-graduation over those students who graduated from similar in-state public institutions.

Funding for educational financial aid programs comes from federal, state, and local governments, and the colleges and institutions themselves. Currently, 16 states have adopted statewide merit-based student aid programs with Georgia's HOPE scholarship introduced in 1993 as the

first. Merit-based student aid programs have several proposed outcomes with the most important being educating and retaining highly skilled workers within a state (Dynarski, 2000) thus enhancing the workforce and improving economic development (and reducing brain drain). The number of states adopting merit-based aid programs is on the rise. Policymakers throughout states are looking at student migration and the loss of their well-educated individuals as a cause for concern. Several states that are considering merit-based aid programs have proposed that students who utilize these awards will be required to stay in the state for a certain number of years after graduation (Redden, 2007).

Many college students who move to an area to pursue postsecondary education will leave upon graduation. Students will often move back to their previous location or a new location entirely (Corcoran, Faggian, & Mccann, 2010; Franklin, 2003). However, some studies suggest that students will stay in the region where they attended college. Using follow-up surveys in 1994 and 1997 from the Baccalaureate and Beyond Longitudinal Study, Perry (2001) found that 84% of students attending school in their home state remained in the state for the next four years compared to 63% of students who migrated out and returned to their home state. In a similar study that tracked students for 10 to 15 years post-graduation, Groen (2004) found a more modest effect with a 10-percentage point increase for those students who attended a school in their home state who were still residing in their state compared to those who attended a school in another state.

While in school, students may develop a wide range of human capital and find ways to be productive in that region after graduation. Much research has focused on the migration of skilled, educated workers to geographic areas with more human capital. Berry and Glaeser (2005) and Waldorf (2009) suggest that areas already populated with well-educated individuals will continue to attract more well-educated people. The benefits of migrating to an area concentrated with well-educated individuals seem to stem from higher wages and a better suited labor market for skilled individuals in those areas (Chen & Rosenthal, 2008; Waldorf, 2009). Some net migration to certain areas may rest solely on the presence of an institution of higher learning. Winters (2011) analyzed a sample of 2,004 nonmetropolitan counties and the effect the presence of institutions of higher learning had on population growth and level of human capital. The results suggest that those areas considered college towns (e.g., areas where the age profile of in-migration is skewed to individuals ages 15 to 24) gained the highest net migration compared to nonmetropolitan areas where no higher education is available.

Methodology

Program evaluation is the systematic study that assesses the effectiveness of program outcomes and whether the program is operating as intended (Rossi, Freeman, & Lipsey, 1999). A survey of the literature reveals that the methods used for program evaluation have not been agreed upon by practitioners. Two main study designs have been proposed to evaluate the effectiveness of programs: experimental and non-experimental designs. In 2009, the Government Accountability Office (GAO) released a report outlining the benefits and drawbacks of both designs and gave recommendations on how to proceed with program evaluation in the future (GAO, 2009). This report can be found at http://www.gao.gov/products/GAO-10-30.

In social science research, experimental design is regarded as the only true way of inferring cause and effect. Experimental designs are those which are highly controlled and participants are randomly assigned to treatment and control groups, thus eliminating any confounding variables that interfere with the treatment outcome. Some programs are well suited to experimental design, especially when the evaluator has complete control over the program, when random assignment is ethical, and resources (e.g., time, funding) are available to conduct them.

Non-experimental designs encompass all other study designs that are not experimental in nature and include a wide range of options. LaLonde (1986) concluded that the use of non-experimental designs in program evaluation can allow biases and specification errors into the results and that experimental designs can control for these issues. However, several authors (Heckman & Smith, 1995; GAO, 2009) argue that using experimental designs in program evaluation also has its drawbacks and will eliminate the evaluation of some programs because of cost or ethical concerns.

Due to concerns regarding the use of non-experimental designs in program evaluation, research in this area has been conducted with various non-experimental methods (Rosenbaum & Rubin, 1983; Heckman & Hotz, 1989; Heckman & Smith, 1999). The research conducted has been successful in producing results similar to experimental designs using non-experimental designs. These authors conclude that there is not a single methodology that eliminates all biases or systematic errors and that the focus should be on the questions and outcomes the evaluator wants addressed in terms of program effectiveness. The authors also propose that using reliable and suitable data for both program participants and the

control groups will produce the most reliable estimates of program effectiveness.

Results

As shown in Chapter 6, the distribution of age and gender varied by student education and financing strategy (see Figures 6.2 and 6.3, page 40). In order to control for the differences in age, gender, work experience prior to graduation, and educational institution type, a stratified sample of those who received any financing source other than Hathaway Scholarship Program (HSP) was selected to match the HSP recipients. Individuals fell into the category of institutional type depending on whether or not their highest award came from a community college or UW. Graduates were excluded if they attended another postsecondary institution within two years of graduation.

Individuals in the control group were selected based on age group and matched to similar individuals in the HSP group. HSP recipients included only those individuals who had 70% or more of their educational financing provided for by the HSP. After matching and as shown in Figures 7.1 and 7.2 (see page 49), the amount of variability in age and gender was significantly reduced by financing source compared to Figures 6.2 and 6.3 in Chapter 6. Those with an associate's degree show more demographic variability than those with a bachelor's degree. Employment and wages were analyzed for each of the eight quarters after graduation. For illustrative purposes, only the eighth quarter is discussed in this chapter.

Our primary finding is that the results are in a positive direction; however, after further analyses of the eight quarters following graduation, we found no significant

differences for employment and wages for the HSP and comparison groups.

To illustrate interpretation of the results, the total numbers of potential college graduates are displayed by gender in Tables 7.1 to 7.4 (see pages 50 and 51). After combining seven academic years, R&P accounted for the loss in employment and wages in later years due to lack of wage record administrative data beyond fourth quarter 2015 (2015Q4). For example, as shown in Table 7.1, there were a total of 380 male graduates with associate's degrees, and 273 of those could be located either working in Wyoming or a partner state eight quarters after graduation. R&P could not account for the 107 graduates who did not appear in administrative datasets. These individuals are considered *not found* in the labor force for a variety of reasons, such as not working or working in a state with which R&P does not have a data sharing agreement.

For those students who graduated with an associate's degree, regardless of financing source, over 80% of both males (see Table 7.1) and females (see Table 7.2) were found working in Wyoming eight quarters after graduation. The largest percentage of students working in Wyoming eight quarters after graduation was females who earned an associate's degree and received other sources of financing (87.7%; see Table 7.2).

For those who graduated with a bachelor's degree, overall the percentage working in Wyoming was lower compared to those who graduated with an associate's degree. For example, 74.3% of males with a bachelor's degree were still working in Wyoming eight quarters after graduation (see Table 7.3, page 51) compared to 84.2% of males with an associate's degree (see Table 7.1).
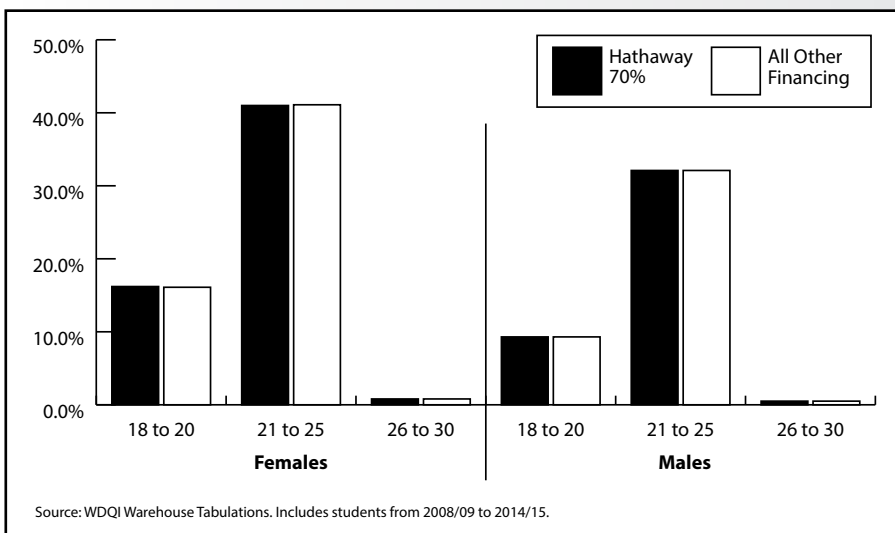
Figure 7.1: Demographic Distribution and Financing Sources of Wyoming Community College Graduates with an Associate's Degree (AA/AS) After Matching, N = 1,597 (Control Groups)
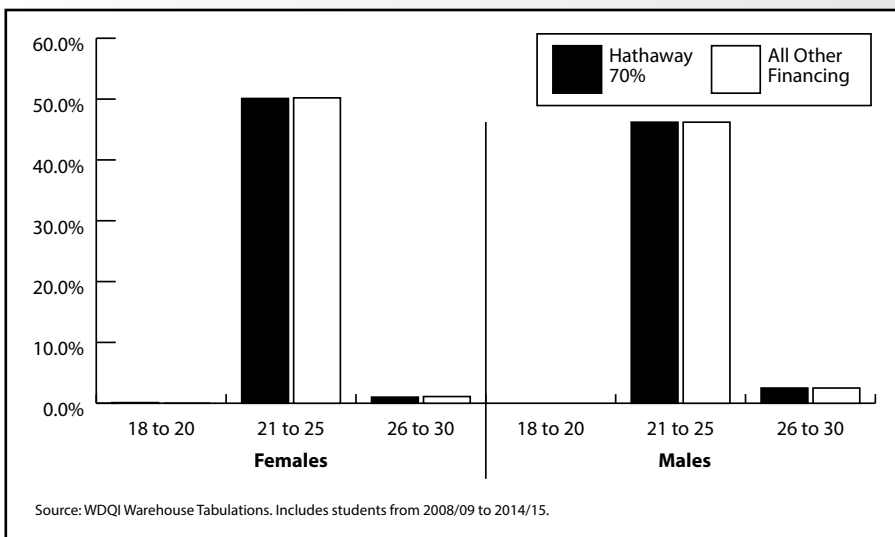
Figure 7.2: Demographic Distribution and Financing Sources of University of Wyoming Graduates with a Bachelor's Degree (BA/BS) After Matching, N = 3,049 (Control Groups)

In order to test the differences in employment, R&P conducted multiple chi-square tests for independence on the percentage employed by financing source and state of employment. The chi-square for independence is a statistical test used to test the association between two categorical variables. The chi-square (χ^2) does not tell the researcher how the variables are associated with each other, but only that there is an association between the variables. As seen in Table 7.5 (see page 52), a total of 359 males who graduated with an associate's degree were analyzed. Of those who received 70% or more of their school financing through HSP, 144 (64.3%) were working in Wyoming while 80 (35.7%) were not found working in Wyoming. For those who received other

financing, 86 (63.7%) were working in Wyoming and 49 (36.3%) were not found working in Wyoming. Comparing across financing sources, 37.4% of those who received other financing were working in Wyoming while 62.6% of those who received 70% or more of Hathaway financing were found working in Wyoming. However, the chi-square test failed to find a statistically significant difference between the two variables (χ^2 (2, N = 359) = .01, p =.92).

Females who graduated with an associate's degree working in partner states approached significance (χ^2 (2, N = 126, p =.07). As seen in Table 7.6 (see page 53), 30.0% of those who received other financing were working in partner states eight quarters after graduation

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Table 7.1: Employment and Wages for Male Wyoming Community College Graduates (AA/AS) 8 Quarters After Graduation by Location of Employment and Financing Strategy (Control Groups)

Total, All Funding
Total Graduates = 380
Not Found Working in WY or 11 Partner States = 107

Employment	N	%	Wage
Total Employed	273	100.0%	$10,294
Employed WY	230	84.2%	$10,793
Employed Partner States	43	15.8%	$7,625

Hathaway 70%
Total Graduates = 234
Not Found Working in WY or 11 Partner States = 66

Employment	N	%	Wage
Total Employed	168	100.0%	$10,292
Employed WY	144	85.7%	$10,825
Employed Partner States	24	14.3%	$7,098

All Other Financing
Total Graduates = 146
Not Found Working in WY or 11 Partner States = 41

Employment	N	%	Wage
Total Employed	105	100.0%	$10,297
Employed WY	86	81.9%	$10,740
Employed Partner States	19	18.1%	$8,290

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

Table 7.2: Employment and Wages for Female Wyoming Community College Graduates (AA/AS) 8 Quarters After Graduation by Location of Employment and Financing Strategy (Control Groups)

Total, All Funding
Total Graduates = 516
Not Found Working in WY or 11 Partner States = 145

Employment	N	%	Wage
Total Employed	371	100.0%	$6,913
Employed WY	311	83.8%	$7,157
Employed Partner States	60	16.2%	$5,650

Hathaway 70%
Total Graduates = 307
Not Found Working in WY or 11 Partner States = 82

Employment	N	%	Wage
Total Employed	225	100.0%	$6,808
Employed WY	183	81.3%	$6,999
Employed Partner States	42	18.7%	$5,978

All Other Financing
Total Graduates = 209
Not Found Working in WY or 11 Partner States = 63

Employment	N	%	Wage
Total Employed	146	100.0%	$7,075
Employed WY	128	87.7%	$7,383
Employed Partner States	18	12.3%	$4,884

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

while 70.0% of those who received HSP financing were working in partner states.

In terms of average wages, Tables 7.7 and 7.8 (see page 54) show the Analysis of Variance (ANOVA) results by gender, degree, financing source, and state of employment. Analysis of Variance was used to test mean differences between the populations due to the reduction in making a false positive (Type 1) error. An ANOVA is conceptually similar to a t-test for independent means but also tests for assumptions underlying the statistical test, such as homogeneity of variances between the groups compared.

Average quarterly wages were adjusted to 2015 levels using the Consumer Price Index (CPI). As seen in Table 7.7, wages were significantly higher for females who had 70% of their financing through HSP and graduated with a bachelor's degree working in Wyoming eight quarters after graduation compared to those who received other financing. No other significant differences were observed between financing sources in the majority of the other seven quarters.

A goal of HSP is to retain a well-educated workforce. R&P conducted a comparison of wages in Wyoming to partner states. As seen in Table 7.8, males who received 70% of their financing through HSP and graduated with an associate's degree earned significantly higher wages compared to those working in partner states. The opposite

Table 7.3: Employment and Wages for Male University of Wyoming Graduates (BA/BS) 8 Quarters After Graduation by Location of Employment and Financing Strategy (Control Groups)

Total, All Funding			
Total Graduates = 1,108			
Not Found Working in WY or 11 Partner States = 395			
Employment	**N**	**%**	**Wage**
Total Employed	713	100.0%	$10,762
Employed WY	530	74.3%	$10,269
Employed Partner States	183	25.7%	$10,714

Hathaway 70%			
Total Graduates = 194			
Not Found Working in WY or 11 Partner States = 66			
Employment	**N**	**%**	**Wage**
Total Employed	128	100.0%	$10,985
Employed WY	104	81.3%	$10,629
Employed Partner States	24	18.8%	$10,181

All Other Financing			
Total Graduates = 914			
Not Found Working in WY or 11 Partner States = 329			
Employment	**N**	**%**	**Wage**
Total Employed	585	100.0%	$10,297
Employed WY	426	72.8%	$10,740
Employed Partner States	159	27.2%	$12,141

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

Table 7.4: Employment and Wages for Female University of Wyoming Graduates (BA/BS) 8 Quarters After Graduation by Location of Employment and Financing Strategy (Control Groups)

Total, All Funding			
Total Graduates = 1,173			
Not Found Working in WY or 11 Partner States = 378			
Employment	**N**	**%**	**Wage**
Total Employed	795	100.0%	$8,613
Employed WY	626	78.7%	$8,577
Employed Partner States	169	21.3%	$8,747

Hathaway 70%			
Total Graduates = 209			
Not Found Working in WY or 11 Partner States = 66			
Employment	**N**	**%**	**Wage**
Total Employed	143	100.0%	$9,564
Employed WY	117	81.8%	$9,513
Employed Partner States	26	18.2%	$9,795

All Other Financing			
Total Graduates = 964			
Not Found Working in WY or 11 Partner States = 312			
Employment	**N**	**%**	**Wage**
Total Employed	652	100.0%	$8,405
Employed WY	509	78.1%	$8,362
Employed Partner States	143	21.9%	$8,556

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

was found in the eighth quarter after graduation for males who graduated with a bachelor's degree, although not statistically significant. The statistics reported in this chapter are available on R&P's website to conduct independent analyses.

Table 7.5: Employment Count and Percentage by State of Employment, Degree Awarded, and Financing Strategy Eight Quarters Following Graduation for Males (Control Groups)

Males AA/AS Wyoming Employment

	Employed				Employed		
	No	Yes	Total		No	Yes	Total
Other	49	86	135	Row %	36.3%	63.7%	100.0%
				Column %	38.0%	37.4%	37.6%
HSP (70%)	80	144	224	Row %	35.7%	64.3%	100.0%
				Column %	62.0%	62.6%	62.4%
Total	129	230	359	Row %	35.9%	64.1%	100.0%
				Column %	100.0%	100.0%	100.0%

$\chi^2 = .01$, $p = .92$. No statistically significant difference.

Males AA/AS Partner State Employment

	Employed				Employed		
	No	Yes	Total		No	Yes	Total
Other	11	19	30	Row %	36.7%	63.3%	100.0%
				Column %	26.2%	44.2%	35.3%
HSP (70%)	31	24	55	Row %	56.4%	43.6%	100.0%
				Column %	73.8%	55.8%	64.7%
Total	42	43	85	Row %	49.4%	50.6%	100.0%
				Column %	100.0%	100.0%	100.0%

$\chi^2 = 3.01$, $p = .08$. Approaching statistically significant difference.

Males BA/BS Wyoming Employment

	Employed				Employed		
	No	Yes	Total		No	Yes	Total
Other	405	426	831	Row %	48.7%	51.3%	100.0%
				Column %	83.3%	80.4%	81.8%
HSP (70%)	81	104	185	Row %	43.8%	56.2%	100.0%
				Column %	16.7%	19.6%	18.2%
Total	486	530	1,016	Row %	47.8%	52.2%	100.0%
				Column %	100.0%	100.0%	100.0%

$\chi^2 = 1.49$, $p = .22$. No statistically significant difference.

Males BA/BS Partner State Employment

	Employed				Employed		
	No	Yes	Total		No	Yes	Total
Other	130	159	289	Row %	45.0%	55.0%	100.0%
				Column %	80.7%	86.9%	84.0%
HSP (70%)	31	24	55	Row %	56.4%	43.6%	100.0%
				Column %	19.3%	13.1%	16.0%
Total	161	183	344	Row %	46.8%	53.2%	100.0%
				Column %	100.0%	100.0%	100.0%

$\chi^2 = 2.40$, $p = .12$. No statistically significant difference.

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

Conclusion

Hathaway impact has a positive direction for the retention of bachelor's degree graduates, and female bachelor's degree graduates who stay in Wyoming earn more than those who leave. However, the statistical test of bachelor's degree graduate retention and earnings differences for females are equivocal and unconvincing.

This chapter examined the demographic distributions of the HSP recipients and those that received other financing for their education. After controlling for age, gender, and degree awarded, the employment distributions between the two financing sources examined were not found to have statistically significant differences in terms of employment across Wyoming or partner states. However, two effects were found in terms of wage differences between educational financing source and state of employment. Females who graduated with a bachelor's degree with 70% of their financing coming from HSP and continued to work in Wyoming had a

significantly higher mean quarterly wage eight quarters after graduation than those who received other financing. This difference may be due to the higher wages teachers and similar occupations receive in the state compared to surrounding states. For more information on teacher salaries, please see http://doe.state.wy.us/lmi/education_costs/2013/monitoring_2013.pdf.

Further, males with an associate's degree financed through HSP earned significantly higher wages if employed in Wyoming compared to a partner state (see Table 7.8). These individuals may have graduated with technical degrees (e.g., welding) and began working in higher paying industries such as natural resources & mining. However, males who graduated with a bachelor's degree earned higher wages if working in a partner state, although not statistically significant. One of the goals of HSP is to retain an educated workforce within Wyoming. Due to the limited number of quarters in the follow-up for some cohorts, R&P could not conduct a complete longitudinal analysis of employment and wages in the two to five years after graduation. Another limitation is the small N associated with some groups in the

analysis. Caution should be used when comparing a small sample size with a larger sample size. Finally, the HSP has changed throughout its existence and

Table 7.6: Employment Count and Percentage by State of Employment, Degree Awarded, and Financing Strategy Eight Quarters Following Graduation for Females (Control Groups)

Females AA/AS Wyoming Employment

	Employed No	Yes	Total		Employed No	Yes	Total
Other	74	128	202	Row %	36.6%	63.4%	100.0%
				Column %	38.9%	41.2%	40.3%
HSP (70%)	116	183	299	Row %	38.8%	61.2%	100.0%
				Column %	61.1%	58.8%	59.7%
Total	190	311	501	Row %	37.9%	62.1%	100.0%
				Column %	100.0%	100.0%	100.0%

χ^2 = .24, p = .62. No statistically significant difference.

Females AA/AS Partner State Employment

	Employed No	Yes	Total		Employed No	Yes	Total
Other	30	18	48	Row %	62.5%	37.5%	100.0%
				Column %	45.5%	30.0%	38.1%
HSP (70%)	36	42	78	Row %	46.2%	53.8%	100.0%
				Column %	54.5%	70.0%	61.9%
Total	66	60	126	Row %	52.4%	47.6%	100.0%
				Column %	100.0%	100.0%	100.0%

χ^2 = 3.18, p = .07. Approaching statistically significant difference.

Females BA/BS Wyoming Employment

	Employed No	Yes	Total		Employed No	Yes	Total
Other	400	509	909	Row %	44.0%	56.0%	100.0%
				Column %	81.8%	81.3%	81.5%
HSP (70%)	89	117	206	Row %	43.2%	56.8%	100.0%
				Column %	18.2%	18.7%	18.5%
Total	489	626	1,115	Row %	43.9%	56.1%	100.0%
				Column %	100.0%	100.0%	100.0%

χ^2 = .04, p = .84. No statistically significant difference.

Females BA/BS Partner State Employment

	Employed No	Yes	Total		Employed No	Yes	Total
Other	110	143	253	Row %	43.5%	56.5%	100.0%
				Column %	78.0%	84.6%	81.6%
HSP (70%)	31	26	57	Row %	54.4%	45.6%	100.0%
				Column %	22.0%	15.4%	18.4%
Total	141	169	310	Row %	45.5%	54.5%	100.0%
				Column %	100.0%	100.0%	100.0%

χ^2 = 2.23, p = .14. No statistically significant difference.

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.

Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

different regulations and requirements were imposed on different cohorts which should be controlled for in future research. Further research should include an analysis of occupation and industry of employment after graduation. In addition, future research should focus on the interaction of college major and its influence on career trajectory and place of employment. For example,

do those who receive a more technical education continue to reside in a state that has a demand for those specific jobs? Finally, as mentioned in the introduction, further examination of the effects of college major, labor market influences, social dynamics (e.g., family vs. career prioritization), and the ability for the Hathaway Scholarship to mediate these influences regarding

employment outcomes. Student experience and employer hiring method relative to receiving a merit-based scholarship should be included in future analyses.

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Table 7.7: Analysis of Variance (ANOVA) of Mean Differences of Wages Eight Quarters after Graduation for Individuals who Received 70% Hathaway Compared to Other Financing Sources (Control Groups)

Gender & Degree Level	Location of Employment	Mean Quarterly Wage 70% Hathaway	Other Financing	df	F	p
Female AA/AS	Wyoming	$6,999	$7,383	1, 309	0.61	0.44
Female AA/AS	Partner State	$5,978	$4,884	1, 58	0.93	0.34
Female BA/BS	Wyoming	$9,512	$8,362	1, 624	5.57*	0.02
Female BA/BS	Partner State	$9,795	$8,556	1, 167	1.14	0.29
Male AA/AS	Wyoming	$10,825	$10,740	1, 228	0.01	0.92
Male AA/AS	Partner State	$7,098	$8,290	1, 41	0.30	0.59
Male BA/BS	Wyoming	$10,629	$10,181	1, 528	0.38	0.54
Male BA/BS	Partner State	$12,524	$12,141	1, 181	0.04	0.84

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.
*p < .05
Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

Table 7.8: Analysis of Variance (ANOVA) of Mean Differences of Wages Eight Quarters after Graduation for Individuals who Received 70% Hathaway who Worked in Wyoming Compared to a Partner State (Control Groups)

Gender & Degree Level	Mean Quarterly Wage Wyoming Wages	Partner State Wages	df	F	p
Female AA/AS	$6,999	$5,978	1, 223	1.83	0.18
Female BA/BS	$9,512	$9,795	1, 141	0.07	0.07
Male AA/AS	$10,825	$7,098	1, 166	7.96*	0.005
Male BA/BS	$10,629	$12,524	1, 126	1.97	0.16

Partner states: 11 states with which Research & Planning has data sharing agreements: Alaska, Colorado, Idaho, Montana, Nebraska, New Mexico, Ohio, Oklahoma, South Dakota, Texas, and Utah.
*p < .005
Source: WDQI Warehouse Tabulations. Includes students from 2008/09 to 2014/15.

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Chapter 8: Application of Hourly Wage Data: The Future of Education Outcomes Reporting

by: Katelynd Faler, Senior Economist

Understanding rates of compensation for essential occupations, like registered nurses, may help Wyoming employers attract and keep qualified workers. This analysis examines registered nurses (RNs) who worked in nursing and long term care facilities in Casper, Cheyenne, and Sheridan. Research & Planning (R&P) calculated median quarterly compensation, median hourly wages, median number of hours worked, median age, and number of RNs who were continuously employed during a given quarter. The data show that between 2011 and 2012, there was a 38.1% increase in the number of registered nurses working in long term care facilities and a corresponding decrease in median age of RNs, median number of hours worked, median hourly wage, and median quarterly wage during this time.

R&P has a long history of involvement in health care labor market analysis. In 2002 and 2003, R&P published a three-part series on retention and turnover of nurses in Wyoming (Glover, 2002a, 2002b, and 2003). A more detailed three-part analysis by R&P titled "Nurses in Wyoming: Demand, Retention, & Supply," followed in 2008 (Cowan, Jones, Knapp, Leonard & Saulcy, 2008; Harris, Jones, Knapp, & Leonard, 2008; Saulcy, 2008). R&P's Public Health Nursing: Succession Planning and Satisfaction Measures in Public Health was published in 2009; the paper discussed past nursing shortages and the potential for future nursing shortages as the demand for health care grows (Jones). Health Care Workforce Needs in Wyoming: Advancing the Study, published in 2011, presented the results of a study on the supply and demand of health care practitioners in rural areas (Glover, Knapp, Leonard, Manning, & Moore, 2011). In 2014, R&P published Nurses Returning to School, which used survey data and statistical analysis to pinpoint the factors that would lead a nurse to return to school for more education (Harris). Further details on nursing employment in Wyoming can be found at http://doe.state.wy.us/LMI/nursing.htm.

To compare quarterly wages of health care practitioners, the previously mentioned research used administrative records; R&P also used Bureau of Labor Statistics survey estimates to compare hourly and weekly wages. Unlike this analysis, none of the previously published papers by R&P used individual records to measure changes in the number of hours worked and rates of hourly compensation.

This chapter focuses on registered nurses who worked between first quarter 2006 (2006Q1) and third quarter 2015 (2015Q3) in nursing and residential care facilities, which "provide residential care combined with either nursing, supervisory, or other types of care as required by residents," according to the North American Industry Classification System (U.S. Census Bureau, 2012, p. 850). Analysis is limited to long term care facilities in Casper, Cheyenne, and Sheridan because these cities have the largest number of long term care facilities.

In order for an RN to be counted in a quarter, the individual had to have been licensed as a registered nurse, and had to have continuously earned wages from their residential care employer; that is, the RN worked for an employer before, during, and after the quarter in question.

For more information about the classification of continuous employment, see

"The Instability Index as a Measure of Labor Market Activity" by Glover & Peters (2000).

Quarterly wages and demographic data come from two administrative data sets: Wyoming Wage Records and the Wyoming State Board of Nursing Licensing Files. Details regarding R&P's data sharing agreements can be found at http://doe.state.wy.us/LMI/LMIinfo.htm. R&P estimated hourly wages and number of hours worked using a statistical process called hot-deck imputation based on the industry, employee turnover, time period, and quarterly earnings including overtime and holiday pay.

The imputation process is an evolving one and a forthcoming paper by R&P will review the specific methodology behind hot-deck imputation.

Results

Quarterly wages are an important foundation of R&P's research. Table 8.1 and Figure 8.1 show median quarterly compensation for RNs between 2006Q1 and 2015Q3. Missing data points indicate that data are non-disclosable due to confidentiality. Generally, Casper nurses earned slightly less than Cheyenne nurses per quarter ($13,302

Table 8.1: Median Quarterly Wage of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

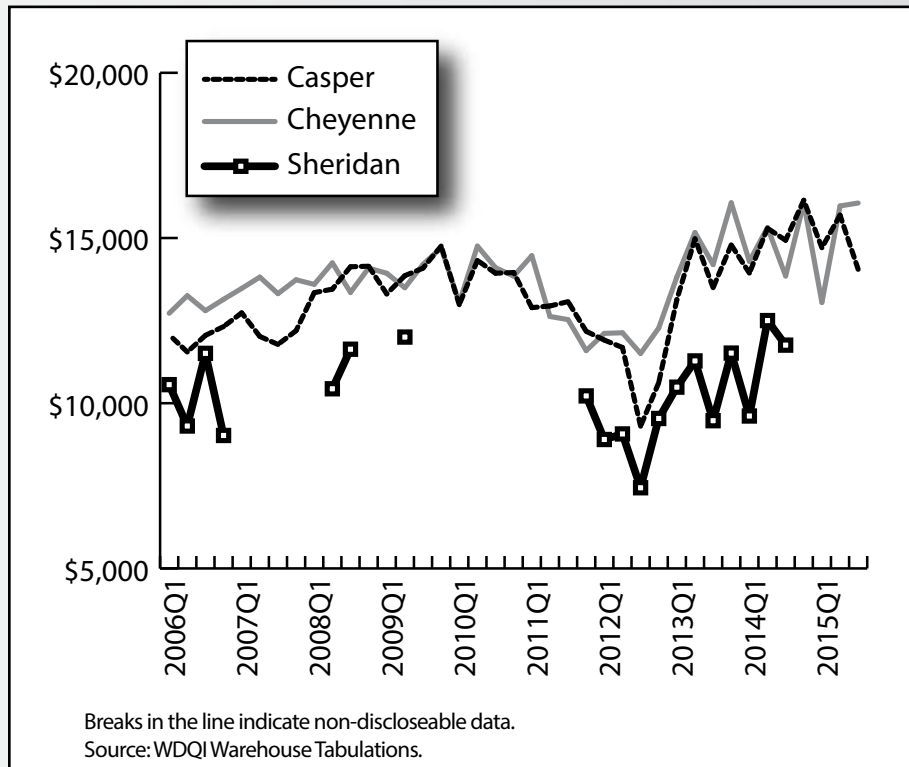| Year and Quarter	Casper	Chey-enne	Sheridan
2006Q1	$12,072	$12,721	$10,562
2006Q2	$11,551	$13,255	$9,310
2006Q3	$12,053	$12,801	$11,509
2006Q4	$12,320	$13,145	$9,024
2007Q1	$12,735	$13,474	N/D
2007Q2	$12,021	$13,817	N/D
2007Q3	$11,779	$13,316	N/D
2007Q4	$12,195	$13,736	N/D
2008Q1	$13,346	$13,597	N/D
2008Q2	$13,452	$14,247	$10,437
2008Q3	$14,130	$13,353	$11,634
2008Q4	$14,146	$14,089	N/D
2009Q1	$13,308	$13,933	N/D
2009Q2	$13,861	$13,495	$12,002
2009Q3	$14,087	$14,202	N/D
2009Q4	$14,756	$14,702	N/D
2010Q1	$12,983	$13,045	N/D
2010Q2	$14,322	$14,755	N/D
2010Q3	$13,934	$14,102	N/D
2010Q4	$13,955	$13,847	N/D
2011Q1	$12,893	$14,465	N/D
2011Q2	$12,943	$12,625	N/D
2011Q3	$13,074	$12,530	N/D
2011Q4	$12,177	$11,592	$10,221
2012Q1	$11,911	$12,114	$8,902
2012Q2	$11,687	$12,132	$9,070
2012Q3	$9,305	$11,505	$7,441
2012Q4	$10,620	$12,275	$9,538
2013Q1	$13,134	$13,819	$10,486
2013Q2	$14,975	$15,165	$11,280
2013Q3	$13,497	$14,196	$9,471
2013Q4	$14,791	$16,066	$11,517
2014Q1	$13,938	$14,294	$9,613
2014Q2	$15,294	$15,319	$12,501
2014Q3	$14,932	$13,850	$11,758
2014Q4	$16,143	$16,054	N/D
2015Q1	$14,705	$13,049	N/D
2015Q2	$15,692	$15,970	N/D
2015Q3	$14,052	$16,059	N/D

N/D = Not discloseable due to confidentiality.
Source: WDQI Warehouse Tabulations.

Breaks in the line indicate non-discloseable data.
Source: WDQI Warehouse Tabulations.

Figure 8.1: Median Quarterly Wage of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

compared to $13,762) when the median was averaged over time. Sheridan RNs had lower quarterly earnings of around $10,330. Figure 8.1 shows a dip in wages between the beginning of 2011 and the beginning of 2013. Many questions accompany this observation: Did employers change their compensation policies? Were older, higher paid nurses encouraged to retire? Without knowing hourly wages, the conclusions R&P can draw about compensation are limited, which is why new estimates about compensation rates are so important.

Figure 8.2 and Table 8.2, showing median hourly wages for RNs working in long term care facilities around Wyoming, reveal more detailed labor market information. Again, missing data points indicate that data are non-disclosable due to confidentiality. Overall, Casper nurses had the highest median hourly wages (about $27.93 per hour when the median is averaged over time), almost a dollar more per hour than Cheyenne nurses. This is an important finding because Figure 8.1 shows that Cheyenne nurses usually made slightly more per quarter than Casper nurses; only knowing total compensation would not reveal that Cheyenne nurses were offered a lower rate of compensation. In

Sheridan, nurses working in long term care facilities were paid about $24.47 per

Figure 8.2: **Median Hourly Wage of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3**

Breaks in the line indicate non-discloseable data.
Source: WDQI Warehouse Tabulations.

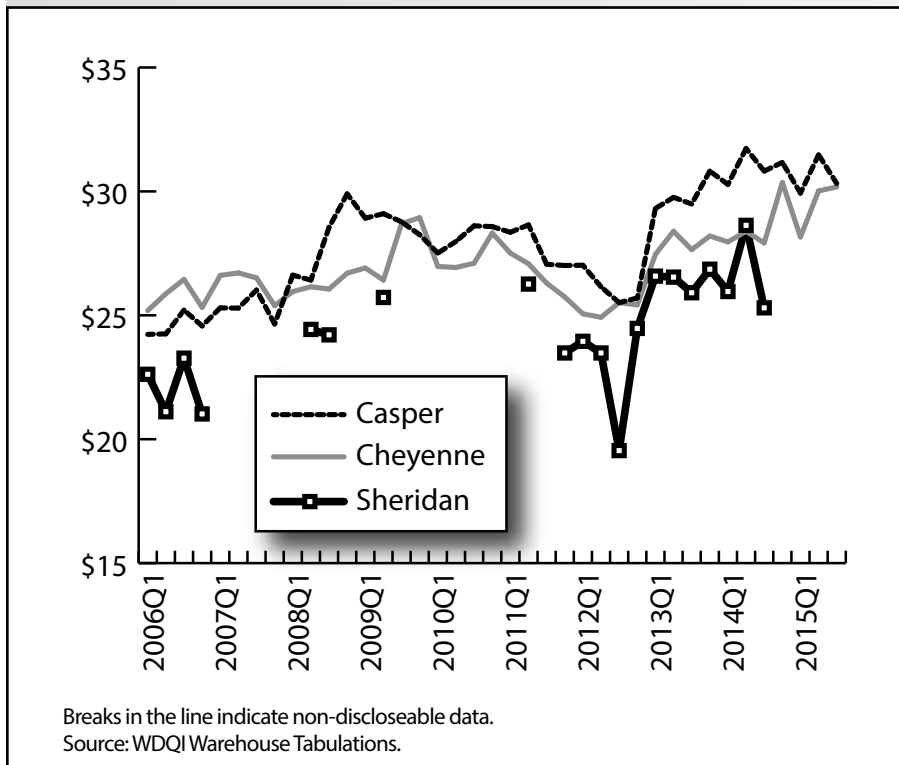Table 8.2: **Median Hourly Wage of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3**

Year and Quarter	Casper	Chey-enne	Sheridan
2006Q1	$24.23	$25.19	$22.62
2006Q2	$24.25	$25.87	$21.11
2006Q3	$25.21	$26.45	$23.27
2006Q4	$24.57	$25.32	$21.02
2007Q1	$25.30	$26.61	N/D
2007Q2	$25.29	$26.71	N/D
2007Q3	$26.02	$26.51	N/D
2007Q4	$24.65	$25.39	N/D
2008Q1	$26.62	$25.96	N/D
2008Q2	$26.42	$26.15	$24.43
2008Q3	$28.55	$26.06	$24.21
2008Q4	$29.90	$26.70	N/D
2009Q1	$28.92	$26.91	N/D
2009Q2	$29.10	$26.42	$25.72
2009Q3	$28.77	$28.70	N/D
2009Q4	$28.25	$28.94	N/D
2010Q1	$27.51	$26.97	N/D
2010Q2	$27.98	$26.93	N/D
2010Q3	$28.61	$27.10	N/D
2010Q4	$28.58	$28.32	N/D
2011Q1	$28.35	$27.51	N/D
2011Q2	$28.65	$27.08	$26.26
2011Q3	$27.06	$26.30	N/D
2011Q4	$27.01	$25.74	$23.48
2012Q1	$27.02	$25.06	$23.95
2012Q2	$26.15	$24.92	$23.48
2012Q3	$25.51	$25.51	$19.54
2012Q4	$25.70	$25.42	$24.47
2013Q1	$29.31	$27.46	$26.58
2013Q2	$29.76	$28.39	$26.54
2013Q3	$29.49	$27.65	$25.91
2013Q4	$30.82	$28.20	$26.86
2014Q1	$30.28	$27.96	$25.96
2014Q2	$31.73	$28.39	$28.63
2014Q3	$30.82	$27.92	$25.30
2014Q4	$31.17	$30.36	N/D
2015Q1	$29.93	$28.16	N/D
2015Q2	$31.48	$30.02	N/D
2015Q3	$30.32	$30.18	N/D

N/D = Not discloseable due to confidentiality.
Source: WDQI Warehouse Tabulations.

hour, or $3.46 less per hour than Casper nurses. What drives these differences in compensation rates? Do nurses work fewer hours in Sheridan and Cheyenne? Do lower rates of compensation indicate a less experienced workforce? How does the rate of compensation affect employers' ability to retain good workers?

Nurses seem to work close to full time in Casper and Cheyenne, or about 500 hours per quarter, while RNs in Sheridan worked slightly less, as shown in Figure 8.3 and Table 8.3. Given the discloseable information about Sheridan, it appears the median number of hours worked declined from 2011 until the beginning of 2014. The trends for Casper and Cheyenne were less pronounced, but the median

number of hours worked seemed to dip slightly for both cities in 2011 and 2012. The drop in the number of hours worked could explain the decline in median hourly wages, as fewer nurses worked overtime shifts. This leads to more questions: was there a statewide drop in demand for nurses? Was there a sudden influx of nurses in 2011 and 2012 which drove down nursing wages?

Administrative records contain information about the age and number of nurses working in long term care facilities around Wyoming, and during 2011 and 2012 there was a decrease in the median age of nurses (see Figure 8.4 and

Table 8.3: Median Quarterly Hours Worked by Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

Year and Quarter	Casper	Chey-enne	Sheridan
2006Q1	503	506	502
2006Q2	514	526	507
2006Q3	522	489	512
2006Q4	521	535	526
2007Q1	516	480	N/D
2007Q2	499	520	N/D
2007Q3	470	495	N/D
2007Q4	520	520	N/D
2008Q1	520	520	N/D
2008Q2	517	529	470
2008Q3	520	482	519
2008Q4	480	536	N/D
2009Q1	470	503	N/D
2009Q2	505	520	520
2009Q3	487	513	N/D
2009Q4	538	520	N/D
2010Q1	474	493	N/D
2010Q2	507	554	N/D
2010Q3	489	531	N/D
2010Q4	515	489	N/D
2011Q1	475	517	N/D
2011Q2	469	477	489
2011Q3	518	502	N/D
2011Q4	499	475	463
2012Q1	478	479	463
2012Q2	504	488	467
2012Q3	468	472	443
2012Q4	507	510	458
2013Q1	480	523	430
2013Q2	520	536	425
2013Q3	485	507	446
2013Q4	494	532	454
2014Q1	481	516	390
2014Q2	510	541	486
2014Q3	505	498	498
2014Q4	519	561	N/D
2015Q1	500	489	N/D
2015Q2	510	548	N/D
2015Q3	488	546	N/D

N/D = Not discloseable due to confidentiality.
Source: WDQI Warehouse Tabulations.

Breaks in the line indicate non-discloseable data.
Source: WDQI Warehouse Tabulations.

Figure 8.3: Median Quarterly Hours Worked by Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

Table 8.4) and an increase in the number of nurses employed in long term care facilities (see Figure 8.5, page 61). These changes correspond to the dips in median quarterly wages, median hourly wages, and the number of hours worked.

Age, as shown in Figure 8.4, is an important variable when assessing labor market outcomes, because with age come work experience and increased compensation. Using discloseable information, Casper and Sheridan nurses appeared to be about seven to 10 years older than Cheyenne nurses. From 2011Q1 until the end of 2012, the median age of RNs decreased by about 11 years in Casper and Cheyenne, and by about four years in Sheridan, before increasing sharply in 2013Q1.

The number of nurses employed in long term care facilities in Casper, Cheyenne, and Sheridan (see Figure 8.5 and Table 8.5) increased by about 38.1% between 2011Q2 and 2012Q4, before declining back down to 2010 employment levels. It is possible the increase in the number of younger nurses employed in Wyomin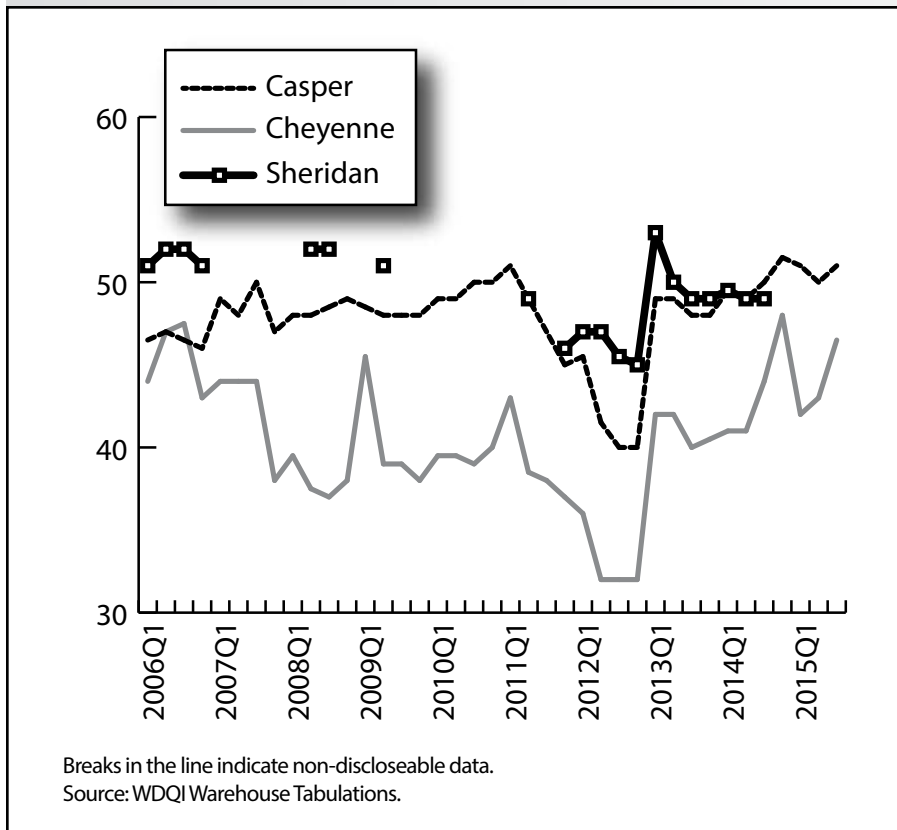g's long term care facilities depressed wages, but there are more questions. Why was there an influx of younger RNs into the long

Table 8.4: Median Age of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

Year and Quarter	Casper	Cheyenne	Sheridan
2006Q1	46.5	44.0	51.0
2006Q2	47.0	47.0	52.0
2006Q3	46.5	47.5	52.0
2006Q4	46.0	43.0	51.0
2007Q1	49.0	44.0	N/D
2007Q2	48.0	44.0	N/D
2007Q3	50.0	44.0	N/D
2007Q4	47.0	38.0	N/D
2008Q1	48.0	39.5	N/D
2008Q2	48.0	37.5	52.0
2008Q3	48.5	37.0	52.0
2008Q4	49.0	38.0	N/D
2009Q1	48.5	45.5	N/D
2009Q2	48.0	39.0	51.0
2009Q3	48.0	39.0	N/D
2009Q4	48.0	38.0	N/D
2010Q1	49.0	39.5	N/D
2010Q2	49.0	39.5	N/D
2010Q3	50.0	39.0	N/D
2010Q4	50.0	40.0	N/D
2011Q1	51.0	43.0	N/D
2011Q2	49.0	38.5	49.0
2011Q3	47.0	38.0	N/D
2011Q4	45.0	37.0	46.0
2012Q1	45.5	36.0	47.0
2012Q2	41.5	32.0	47.0
2012Q3	40.0	32.0	45.5
2012Q4	40.0	32.0	45.0
2013Q1	49.0	42.0	53.0
2013Q2	49.0	42.0	50.0
2013Q3	48.0	40.0	49.0
2013Q4	48.0	40.5	49.0
2014Q1	49.5	41.0	49.5
2014Q2	49.0	41.0	49.0
2014Q3	50.0	44.0	49.0
2014Q4	51.5	48.0	N/D
2015Q1	51.0	42.0	N/D
2015Q2	50.0	43.0	N/D
2015Q3	51.0	46.5	N/D

N/D = Not discloseable due to confidentiality.

Source: WDQI Warehouse Tabulations.

Breaks in the line indicate non-discloseable data.
Source: WDQI Warehouse Tabulations.

Figure 8.4: Median Age of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

term care labor market? Did depressed compensation rates discourage nurses

Table 8.5: Number of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

Year and Quarter	Casper	Cheyenne	Sheridan
2006Q1	86	51	38
2006Q2	88	46	35
2006Q3	88	48	35
2006Q4	83	53	39
2007Q1	67	41	N/D
2007Q2	65	35	N/D
2007Q3	67	35	N/D
2007Q4	81	44	N/D
2008Q1	86	48	N/D
2008Q2	74	44	43
2008Q3	84	55	41
2008Q4	78	50	N/D
2009Q1	86	55	N/D
2009Q2	83	55	37
2009Q3	89	53	N/D
2009Q4	97	57	N/D
2010Q1	96	55	N/D
2010Q2	93	56	N/D
2010Q3	95	57	N/D
2010Q4	90	57	N/D
2011Q1	93	59	N/D
2011Q2	95	72	35
2011Q3	80	79	N/D
2011Q4	121	90	41
2012Q1	127	88	45
2012Q2	124	88	51
2012Q3	124	85	60
2012Q4	131	84	64
2013Q1	96	64	36
2013Q2	89	68	39
2013Q3	103	73	37
2013Q4	110	70	37
2014Q1	99	67	36
2014Q2	101	65	35
2014Q3	94	59	37
2014Q4	87	51	N/D
2015Q1	97	67	N/D
2015Q2	98	59	N/D
2015Q3	100	52	N/D

N/D = Not discloseable due to confidentiality.

Source: WDQI Warehouse Tabulations.

from working in long term care facilities? The answers to these questions have important implications for initiatives that seek to retain young professionals in Wyoming, such as the Hathaway Scholarship Program.

Discussion

Knowing that a national recession occurred between 2007Q4 and 2009Q2 (National Bureau of Economic Research, 2010), and a statewide downturn occurred between 2009Q1 and 2010Q1 (Moore, 2013), it is logical to assume

that some young people left the labor market and returned to school during this time, or delayed entering the labor market until economic conditions improved. Individuals in school during the recession could have graduated as early as 2011, flooding the health care labor market, driving down median age, number of hours worked, hourly wages, and overall quarterly compensation. The trend may have been influenced by the Affordable Care Act of 2010, and the pattern may repeat itself in future economic downturns. Employers and policy makers should be aware that an increased number of post-
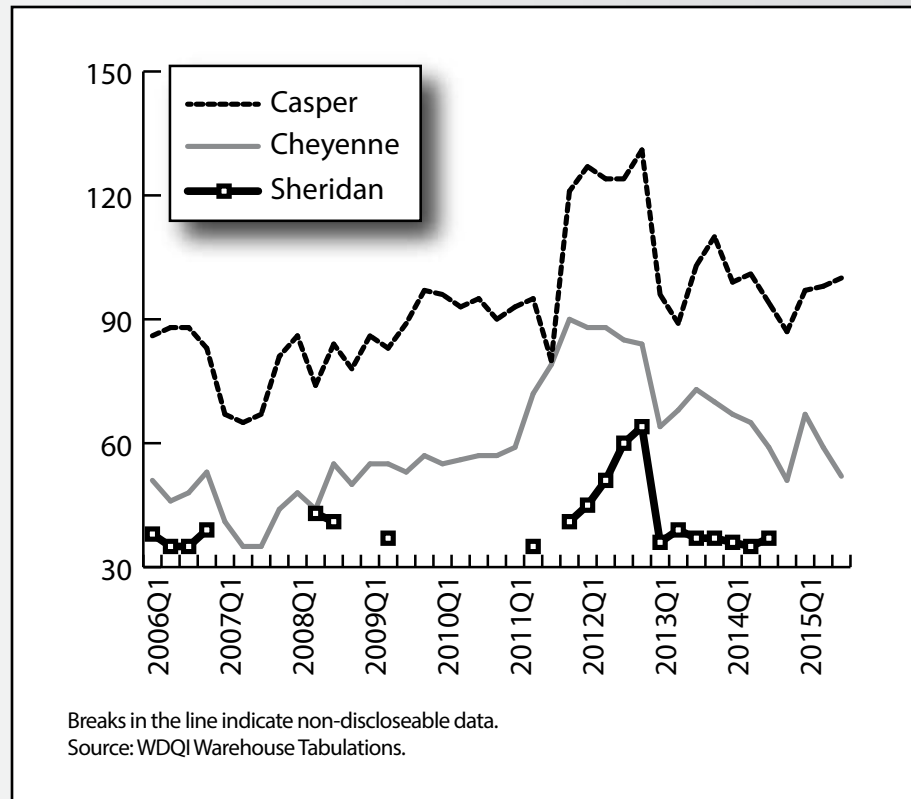

Breaks in the line indicate non-discloseable data.
Source: WDQI Warehouse Tabulations.

Figure 8.5: Number of Registered Nurses Working in Long Term Care Facilities in Casper, Cheyenne, and Sheridan, 2006Q1 to 2015Q3

recession graduates can stagnate or depress wages.

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Future Research and Limitations

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To better understand the interaction of nursing graduates in Wyoming's labor market, further studies should examine the history of enrollment and graduation rates from nursing programs at a national and local level. A further look back in time to previous recessions could help predict labor market behavior in future recessions.

This research is limited because the data do not show hourly wages and number of hours worked. This information is not part of an administrative database, which can hold errors constant and allow researchers to more easily account for bias. The process of estimating compensation will continue to evolve, likely encompassing not just the current hot deck imputation strategy, but maximum likelihood estimation, predictive modeling, and machine learning. Regardless, it is difficult to know how accurate estimates of missing data are.

Hourly wage data are available from other sources, such as the Occupational Employment Statistics program (http://www.bls.gov/oes/) run by the Bureau of Labor Statistics (BLS). Unlike R&P's administrative data, BLS data come from surveys, which go through several statistical adjustments depending on the population and the season. Hourly wage information from the Occupational Employment Statistics program is also limited because estimates are only available for an occupation across all industries. Data differentiating occupational wages by subsector are not available through the BLS.

Future research from R&P will continue to include R&P's estimates of hours worked because R&P is in a unique situation to calculate hours worked using individual records and to link findings to other data sets exclusive to Wyoming. With data on the number of hours worked, R&P will be able to draw stronger conclusions about labor supply and demand, and also:

- Distinguish change in rates of compensation from changes in overall compensation
- Provide more detailed information to employers and employees
- Monitor outcomes of possible changes in minimum wage in Wyoming
- Assess the number of hours worked by level of education
- Examine the gender-wage gap
- Offer complementary information to federal Bureau of Labor Statistics surveys
- Track wage progression of Hathaway recipients over time
- Calculate the changes of hours worked in the state during times of economic transition

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