capsee
CENTER FOR ANALYSIS OF POSTSECONDARY EDUCATION AND EMPLOYMENT

Labor Market Returns to Community College Awards: Evidence From Michigan

A CAPSEE Working Paper

Peter Riley Bahr*
University of Michigan, School of Education

Susan Dynarski
University of Michigan, Gerald R. Ford School of Public Policy, School of Education, and Department of Economics

Brian Jacob
University of Michigan, Gerald R. Ford School of Public Policy, School of Education, and Department of Economics

Daniel Kreisman
Georgia State University, Department of Economics

Alfredo Sosa
University of Michigan, School of Education

Mark Wiederspan
University of Michigan, School of Education

March 2015

*Authors are listed alphabetically.

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C110011 to Teachers College, Columbia University. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education. We are particularly grateful to the assistance we received from our community college partners and from Rick Waclawek and Michael Williams at the Michigan Department of Technology, Management and Budget (DTMB) for assistance in accessing UI wage record data. Joanna Frye, Francie Streich, and Chris Zbrozek provided excellent research assistance.

For information about authors and CAPSEE, visit capseecenter.org

Abstract

We examine the relative labor market gains experienced by first-time college students who enrolled in five community colleges in Michigan in 2003 and 2004. We track credentials, credits, earnings, and employment for these students through 2011. We compare labor market outcomes of those who earned a credential (associate degree or certificate) to those who enrolled but did not earn a credential. The data sources consist of administrative records data from the colleges, Unemployment Insurance earnings data from the State of Michigan, and enrollment and graduation data from the National Student Clearinghouse. Our analytic sample consists of 20,581 students. We find that students who were awarded a long-term certificate (referred to as a "diploma" in some states, including North Carolina) earned $2,500 to $3,600 more per year than did those without a credential, with the larger returns concentrated among men. For associate degrees, the estimated returns were $9,400 for women and $5,600 for men. Women saw little gain when awarded a short-term certificate, while men gained $5,200 per year. Estimated returns were highest in health-related and technical fields.

Table of Contents

1. Introduction **1**

2. Recent Research on the Returns to Community College Credentials **2**
Washington 2
Kentucky 3
California 3
North Carolina 3
National 4

3. The Michigan Context **4**
Employment and Educational Attainment in Michigan 4
Southeastern Michigan 9
Community Colleges in Michigan 13

4. Sample **15**
Measures 16
Descriptive Statistics 16

5. Estimation Strategy **20**
Cross-Sectional Analysis of Earnings 20
Cross-Sectional Analysis of Employment 21
Fixed Effects Analysis of Earnings 21
Fixed Effects Analysis of Earnings by Field of Study 23

6. Results **24**
Cross-Sectional Analysis of Earnings and Employment 24
Fixed-Effects Analysis of Earnings 25
Fixed-Effects Analysis of Earnings by Field of Study 26

7. Sensitivity Checks **28**

8. Discussion and Conclusions **30**

References **31**

Appendix A: Analysis of Non-Credit Courses and Awards **33**

Appendix B: Coding of Fields and Subfields of Study **36**

1. Introduction

Recent decades have seen a startling increase in the share of the population attending college. In 2011, nearly 70 percent of recent high-school graduates were enrolled in college; in 1980, the figure was less than 50 percent (U.S. Department of Education, 2014, Table 302.10). Yet the share of the young adults with a bachelor's degree has grown far more slowly, from 23 percent in 1980 to 32 percent in 2011 (U.S. Department of Education, 2014, Table 104.20).

As these statistics show, for many college students, the end result of their college experience is not a bachelor's degree. Some will earn a degree or certificate from a two-year college. Others will leave college with credits but without a credential.

Yet, most studies of the labor market returns to college are focused squarely on the bachelor's degree, perhaps in part because it is relatively easy to measure in surveys. Datasets widely used by labor economists tend to include information about degree completion, but little to no information on credits, certificates, or the field of study in which any credential or credits were earned.

The goal of this paper is to advance our understanding of the labor market returns to credits and credentials earned at community colleges in Michigan. As discussed below, our work complements the work of similar analyses undertaken in the states of California, Kentucky, North Carolina and Washington. We undertake this analysis using detailed administrative data from five public community colleges in Michigan. By linking student records from these institutions with quarterly unemployment insurance (UI) data, we are able to observe the changes in earnings experienced by students who were awarded a credential relative to the changes in earnings of students who enrolled in a community college but did not earn a credential.

The challenge in analyses of this sort is that students who were awarded a credential may be different from students who enrolled but were not awarded a credential in ways that are unobserved and that influence both earnings and the likelihood of completing a credential (Belfield & Bailey, 2011). To mitigate this issue, we draw on the panel nature of the data to estimate individual fixed-effects models, which allows us to isolate time-invariant student characteristics that may influence both earnings and the likelihood of completing a credential. In this sense, our analysis is similar to other recent work on this topic, including work in California (e.g., Bahr, 2014), Washington (e.g., Dadgar & Trimble, in press), Kentucky (e.g., Jepsen, Troske & Coombs, 2014), and North Carolina (Belfield, Liu & Trimble, 2014), though our study is unique in that it is the first to focus on Michigan.

In our preferred specification, we find that female students who were awarded a long-term certificate that requires 15 or more credit hours of coursework earned approximately $2,500 (adjusted for inflation to 2011-equivalent dollars) more per year, on average, than did female students who were not awarded a credential. Males who were awarded a long-term certificate earned about $3,600 more, on average, than their peers without a credential. Females who were awarded an associate degree earned an additional $9,400 more per year, on average, than did

female students who were not awarded a credential, while males who completed an associate degree earned about $5,600 more, on average, than did males without a credential. Females in our sample saw little to no earnings gains from a short-term certificate of fewer than 15 credit hours, while males with a short-term certificate earned $5,200 more per year, on average, than did males who were not awarded a credential. These results, which align with some of the previous work in other states, indicate that, in most cases, students who complete a community college credential experience significant and meaningful earnings gains. Additional analyses of earnings by field of study indicate that a large share of the realized gains are attributable to health-related fields (e.g., nursing) and technical fields.

In the sections that follow, we describe previous research on the labor market returns to community college credentials in other states, as well as the distinct sample that we use here. We then describe our estimation strategy, which aligns in many respects with other recent work on the labor market returns to community college credentials (e.g., Bahr, 2014; Belfield et al., 2014; Dadgar & Trimble, in press; Jepsen et al., 2014; Xu & Trimble, 2014). Finally, we discuss the results from our particular analyses and provide suggestions for future research.

2. Recent Research on the Returns to Community College Credentials

Washington

Drawing on community college administrative records and UI data in Washington, and using an individual fixed-effects model, Dadgar and Trimble (in press) estimated the return in hourly wages experienced by community college students who completed one or more credentials, relative to students who did not complete a credential. Among females, the authors found that a short-term certificate (requiring less than one year of full-time study to complete) decreased wages by 3 percent on average, whereas a long-term certificate or an associate degree increased wages by an average of 16 percent and 7 percent, respectively. Among males, neither short- nor long-term certificates had any effect on wages, and associate degrees increased wages by only 2 percent, on average. In additional analyses using a series of cross-sectional models, the authors tested the effects of credentials on weekly hours worked and the likelihood of being employed. They found that a long-term certificate had a positive effect on weekly hours worked for females only and a positive effect on the likelihood of employment for both females and males, while an associate degree had a positive effect on weekly hours worked and the likelihood of employment for both males and females. A short-term certificate had no effect on either weekly hours worked and the likelihood of employment regardless of the sex of the student.

Kentucky

In a similar vein, Jepsen et al. (2014) used administrative records, UI data, and an individual fixed-effects model to estimate the return in quarterly earnings experienced by community college students in Kentucky, based on their highest community college credential received, relative to students who did not complete a credential. The authors found that short-term certificates had an average return of about $300 for both males and females (in 2008-equivalent dollars), that long-term certificates (referred to as "diplomas" in their study) had an average return of about $1,300 for males and $1,900 for females, and that associate degrees had an average return of about $1,500 for males and $2,400 for females. This study differs somewhat from other recent work in that the authors included in their analysis records of quarters in which no earnings data were reported, treating these records as indicative of zero earnings in that quarter. This allowed the authors to capture changes in earnings associated with transitions in and out of the UI-covered workforce, but it complicates the comparison of findings with other similar work (e.g., Bahr, 2014; Dadgar & Trimble, in press).

California

Bahr (2014) used an individual fixed-effects model and a sample of more than three-quarters of a million students selected from administrative records in California to examine the effect on earnings of accumulated course credits and awarded credentials. Bahr's study is unique in that he estimated jointly the returns to credits in 181 distinct subfields of study and the returns to credentials in 23 fields of study, which allowed him to offer the first detailed analysis of the labor market returns both to students who complete credentials and to students who do *not* complete credentials, often described as "non-completing" students. Bahr found positive and often strong returns to the majority of credentials in career and technical education (CTE) fields (e.g., public and protective services, engineering technology, information technology, health), including short-term certificates and other short-term awards, but negative or statistically insignificant returns to credentials in the majority of non-CTE fields (e.g., physical sciences, social sciences, humanities, fine and applied arts). Interestingly, however, the returns to most credentials—both CTE and non-CTE—shrank substantially, often to statistical insignificance, once credit accumulation in the 181 subfields was taken into account. In turn, completed credits in the majority of CTE fields were associated with positive returns, while returns to credits in the majority of non-CTE fields either were negative or statistically insignificant. This finding indicates that community college students who do not complete credentials can garner earnings gains from their education that are similar to their peers who complete credentials, depending on the coursework that they complete.

North Carolina

Belfield, Liu, and Trimble (2014) explored the association between the highest credential earned by community college students in North Carolina and quarterly earnings, again using a

fixed-effects approach. The authors found that short-term certificates have a positive return of $157 (in 2010-equivalent dollars) for females and $476 for males, on average. Likewise, a long-term certificate (again referred to as a "diploma") has a positive return of $1,565 for females and $564 for males. An associate degree has a positive return of approximately $1,907 for females and $1,133 for males. As with Dadgar and Trimble's (in press) study, Belfield and his colleagues also explored the association between highest credential earned and the likelihood of employment, finding that short-term certificates have no effect, long-term certificates have a positive effect on the likelihood of employment only for females, and associate degrees have a positive effect for both males and females.

National

Marcotte, Bailey, Borkoski, and Kienzl (2005) used a cross-sectional model and data from the National Education Longitudinal Survey of 1988 to estimate the returns in hourly wages and annual salary to years of postsecondary education and highest postsecondary credential completed seven years after high school graduation, relative to individuals who did not participate in postsecondary education. The authors found that associate degrees have strong, positive effects on the hourly wages (19 percent) and annual earnings (40 percent) of females, but no effect on the annual earnings of males and a positive effect (15 percent) of marginal statistical significance ($p < .10$) on the hourly wage of males. Certificates have no effect on the wages and annual earnings of males and the wages of females, but a positive effect (20 percent) of marginal significance on the annual earnings of females. Years of community college education have no effect on hourly wages for either males or females, but a positive effect of marginal significance on the annual salaries of both males (6 percent) and females (9 percent).

3. The Michigan Context

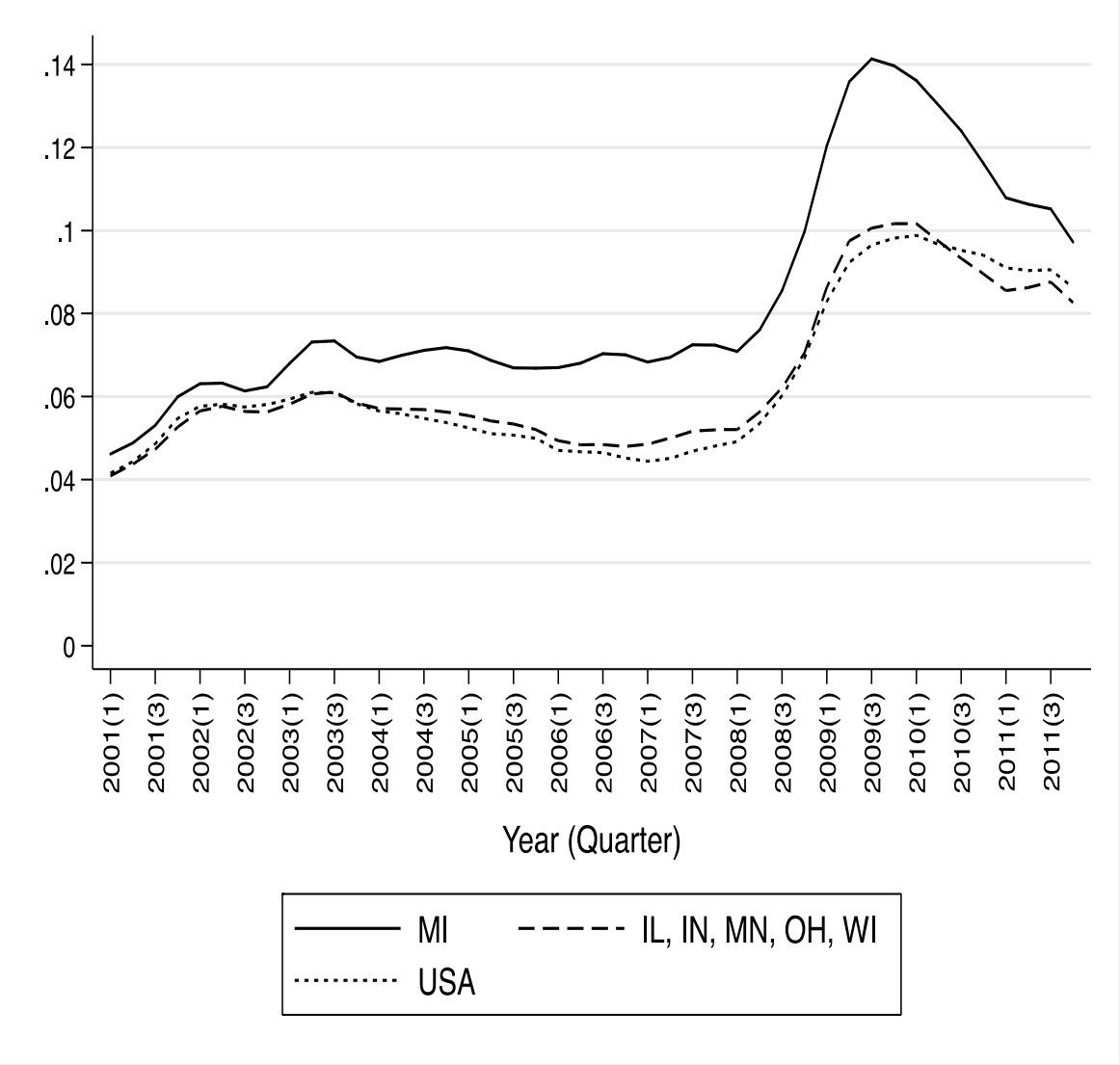
Employment and Educational Attainment in Michigan

In this section, we discuss Michigan's employment and educational trends over the past decade. For comparison, we also include national trends and trends from five "Great Lakes" states that are geographically proximate to Michigan: Illinois, Indiana, Minnesota, Ohio, and Wisconsin.

Figure 1 displays the quarterly unemployment rate from 2001 to 2011. In general, the unemployment rate for Michigan has been substantially higher than the national average and the average of the five Great Lakes states (U.S. Bureau of Labor Statistics, 2014a). In the first quarter of 2001, the unemployment rate for Michigan was 4.6 percent. It increased steadily until 2009 when unemployment peaked at 14 percent during the Great Recession. The trend is similar,

but less pronounced, at the national level and for the five Great Lakes states. While there has been a decline in unemployment since 2009, the rate is still higher than pre-recession levels.

Figure 1. Quarterly Unemployment Rate by Year and Quarter, Seasonally Adjusted

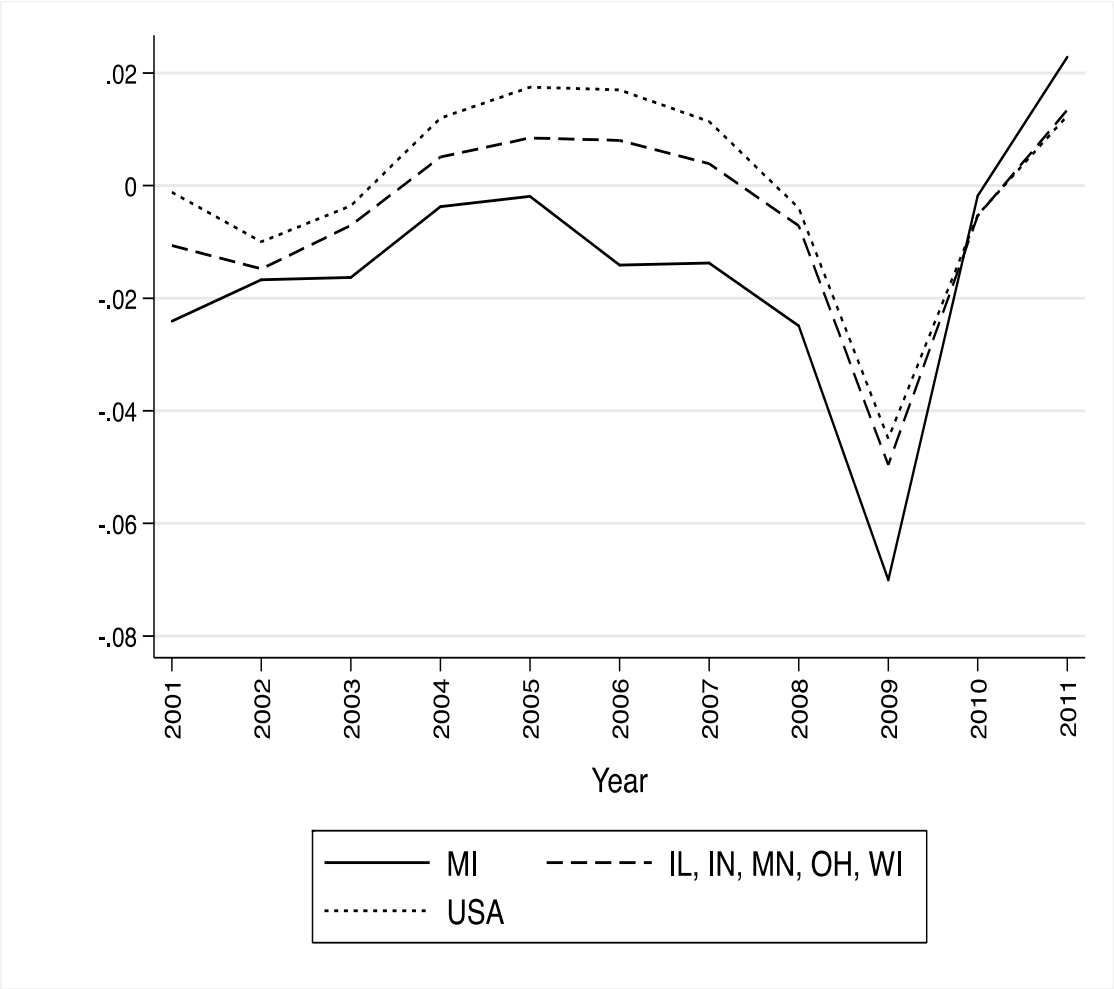


Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics.

Figure 2 presents the proportion change in total non-farm jobs. Recognizing that figures below zero indicate decreases in jobs, Figure 2 demonstrates that Michigan experienced a decline in non-farm jobs from 2001 to 2010. In comparison, the nation as a whole and the five Great Lakes states experienced an increase in non-farm jobs between 2004 and 2007. However, non-farm jobs in Michigan increased by 2.2 percent in 2011, which is greater than the 1 percent growth rate nationally and the in the five Great Lakes states (Bureau of Labor Statistics, 2014b).

Despite this increase, in 2011, Michigan's employment remained 13 percent lower than the rate of employment in 2001.

Figure 2. Annual Proportion Change in Total Non-Farm Jobs

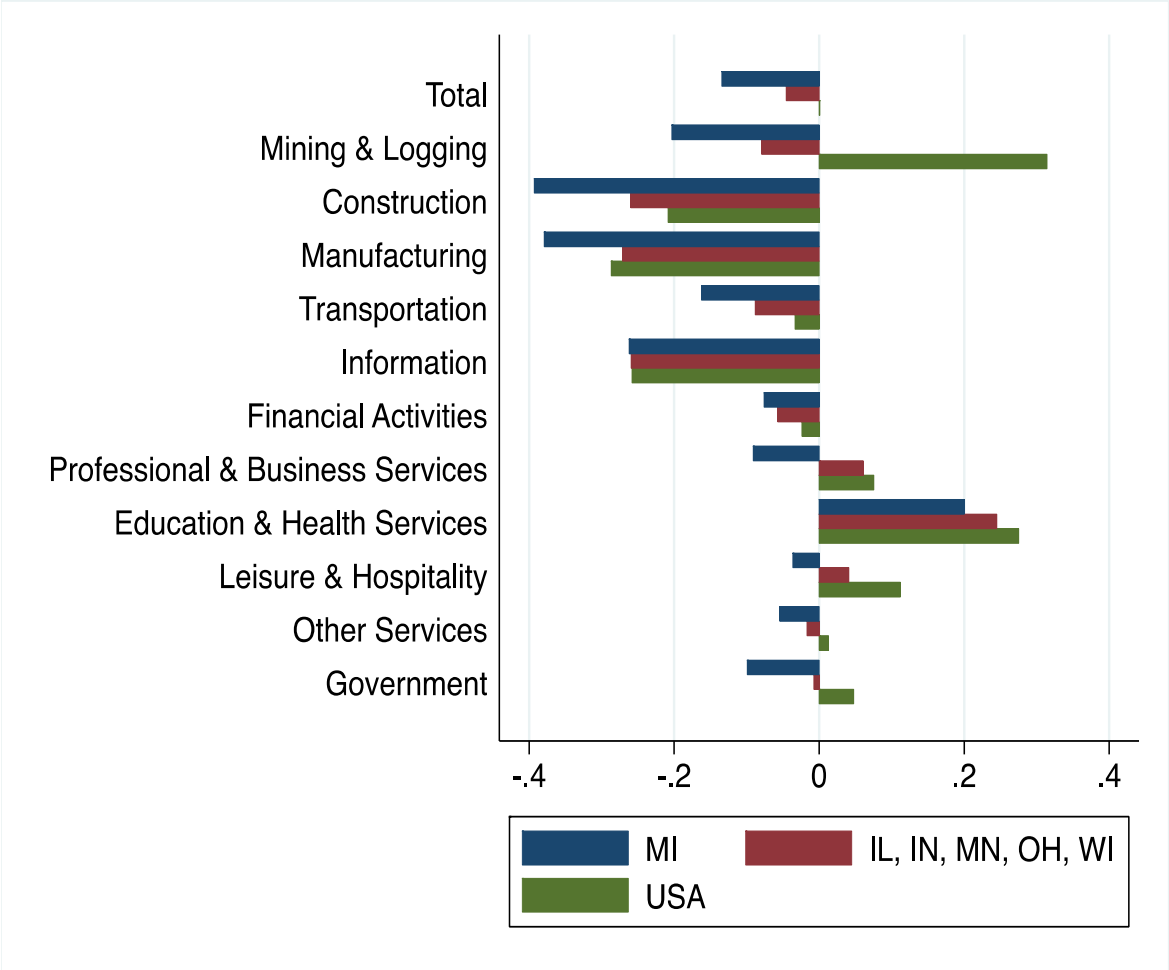


Source: U.S. Bureau of Labor Statistics, Current Employment Statistics.

The overall decline in Michigan's jobs is partially due to rapid decline in construction and manufacturing jobs. Figure 3 displays the proportion change in employment by industry from 2001 to 2011. During this period, construction employment in Michigan experienced a 39.3 percent decrease, and manufacturing declined 37.9 percent (U.S. Bureau of Labor Statistics, 2014b). While this decline was true for the nation and the five Great Lakes states as well, the decrease is especially challenging for Michigan considering that manufacturing and construction account for a large share of Michigan's jobs. In 2001, manufacturing and construction represented over 20 percent of total employment in the state, but it accounted for less than 15 percent in 2011. In contrast, the largest increase in Michigan employment occurred in education and health services, which is an occupational sector that traditionally requires a postsecondary

degree. Education and health services represented approximately 11 percent of total employment in 2001 and grew to over 15 percent in 2011.

Figure 3. Proportion Change in Employment From 2001 to 2011, by Industry

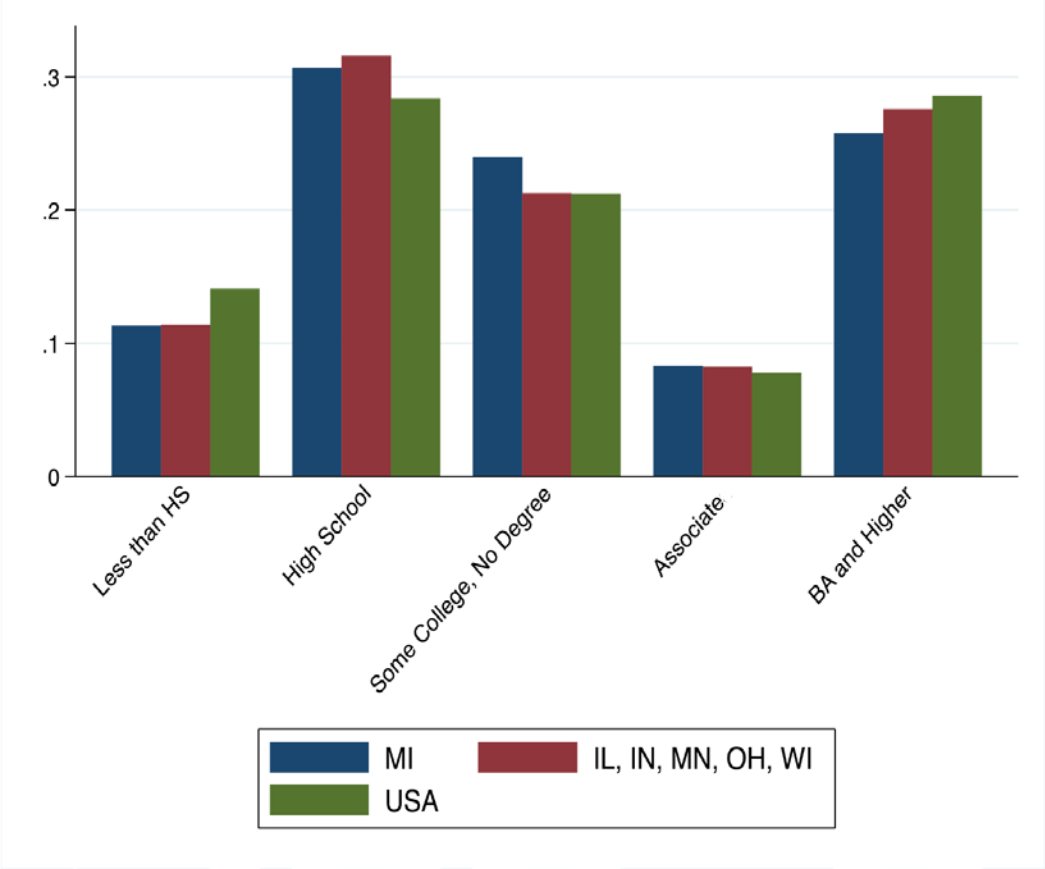


Source: U.S. Bureau of Labor Statistics, Current Employment Statistics.

Michigan has struggled over the past decade with maintaining a highly educated citizenry. Figure 4 displays the level of educational attainment for Michigan residents aged 25 and over. In 2011, roughly 31 percent of Michigan's population over the age of 24 reported a high school diploma as their highest level of education, which is the largest category of educational attainment in Michigan (Ruggles et al., 2010). Adults with some college but no degree represent the second largest category at 24 percent. Compared to the nation and the five Great Lakes states, Michigan is similar in the share of residents with an associate degree, but lags behind in the share of residents with a bachelor's degree or higher. Though, from 2001 to 2011,

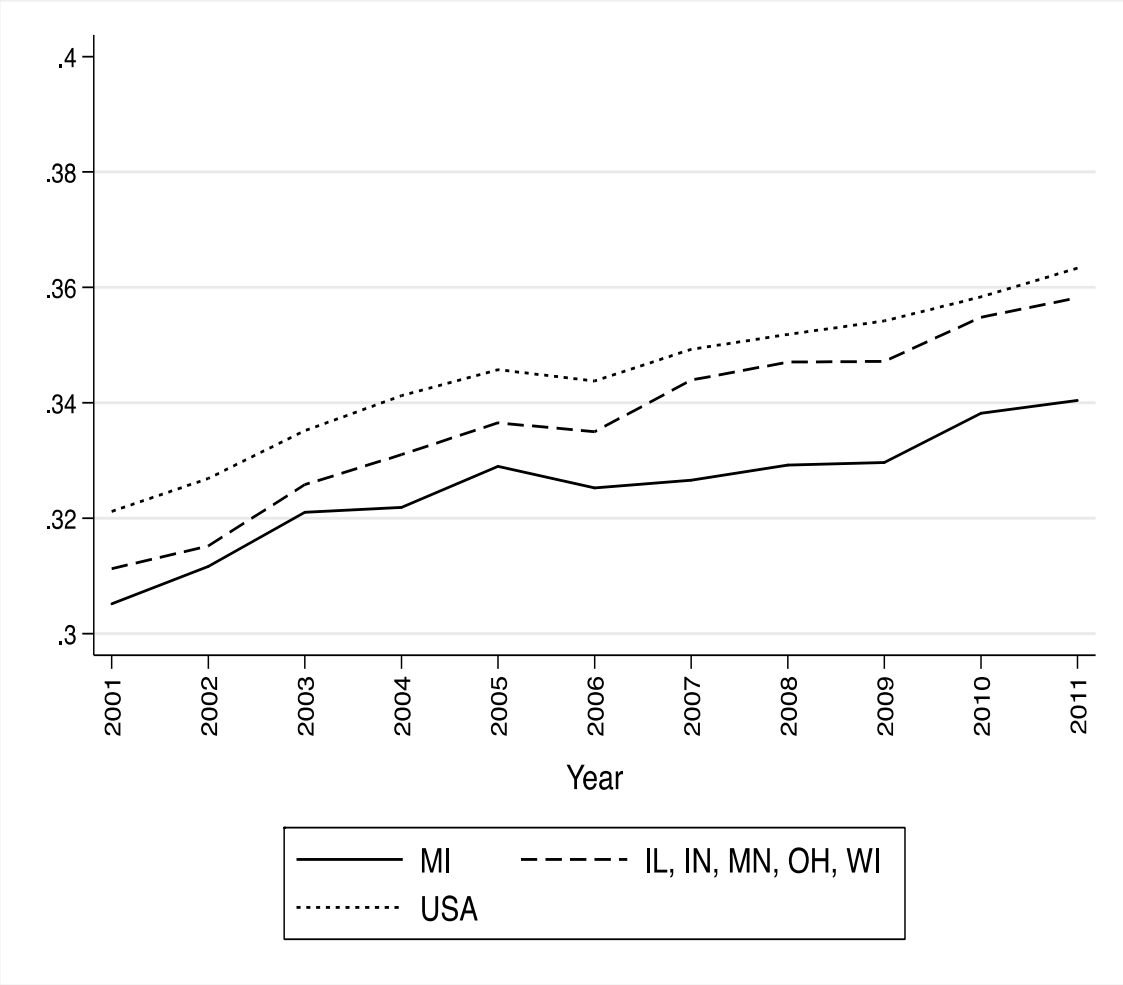
the proportion of Michigan's population with at least an associate degree increased (please see Figure 5), the gap in educational attainment between Michigan and both the nation and the five Great Lakes states is widening, rather than narrowing. In 2001, Michigan was ranked 28th in the nation in the share of the population over 24 years of age with at least an associate degree, but, by 2011, Michigan fell to 34th (Ruggles et al., 2010).

Figure 4. Educational Attainment in 2011 Among Individuals 25 Years of Age or Over



Source: Ruggles et al. (2010), Integrated Public Use Microdata Series.

Figure 5. Percentage of Population 25 Years of Age or Older With an Associate Degree or Higher



Source: Ruggles et al. (2010), Integrated Public Use Microdata Series.

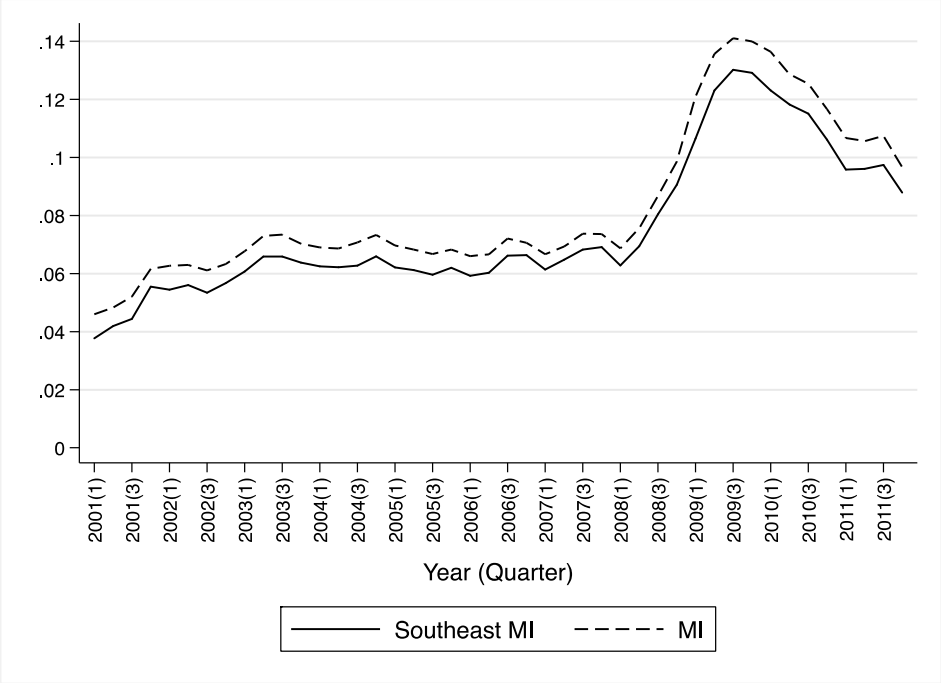
Southeastern Michigan

Of the five community colleges that are included in our analysis, four are located in Michigan's southeastern region, where almost 50 percent of all Michigan citizens reside (Ruggles et al., 2010). In this section, we describe the employment and educational context of the southeastern region.

Figure 6 displays the unemployment rate for southeast Michigan and the state of Michigan from 2001 to 2011. The trends for southeast Michigan and the state are similar, but the rate for southeast Michigan is lower than the state average. In the first quarter of 2001, southeast Michigan's unemployment was less than 4 percent and increased to over 12 percent in 2009, which reflects the downturn in the nation's economy during the Great Recession. In 2011,

southeast Michigan experienced a decrease in unemployment, but similar to the state average, the unemployment rate still remained higher than the pre-recession levels.

Figure 6. Quarterly Unemployment for Southeast Michigan by Year and Quarter, Seasonally Adjusted



Note. Southeast MI includes the Ann Arbor, Jackson, and Detroit-Warren-Livonia metropolitan areas.

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics.

Figure 7 illustrates the annual proportion change in total non-farm jobs. From 2001 to 2010, southeast Michigan experienced an annual decline in employment. Relative to the state, southeast Michigan's employment decline was higher in 2009—an 8 percent decrease compared to 7 percent for the state. Even though southeast Michigan's jobs increased over 2 percent in 2011, employment was 15 percent lower than the employment rate in 2001.

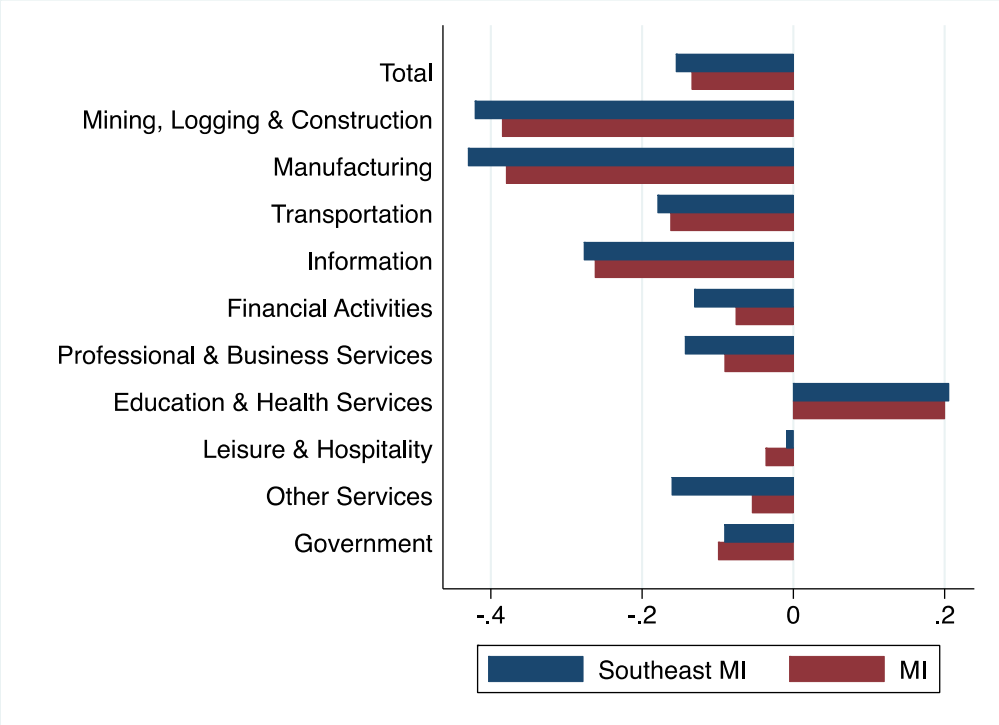
Figure 7. Annual Proportion Change in Total Non-Farm Jobs for Southeast Michigan

Note. Southeast MI includes the Ann Arbor, Jackson, and Detroit-Warren-Livonia metropolitan areas.

Source: U.S. Bureau of Labor Statistics, Current Employment Statistics.

Figure 8 demonstrates the changes in employment growth by industry from 2001 to 2011. In general, southeast Michigan has experienced employment changes that are comparable to the state. However, there are several changes worth noting. First, manufacturing in southeast Michigan decreased 43 percent, compared to 38 percent for the state. In 2001, manufacturing represented almost 18 percent of all employment in southeast Michigan. By 2011, manufacturing represented less than 12 percent. Second, both southeast Michigan and the state experienced an employment increase in the education and health services sector. In 2001, education and health services represented roughly 11 percent of total employment and increased to 16 percent in 2011.

Figure 8. Proportion Change in Employment for Southeast Michigan From 2001 to 2011, by Industry

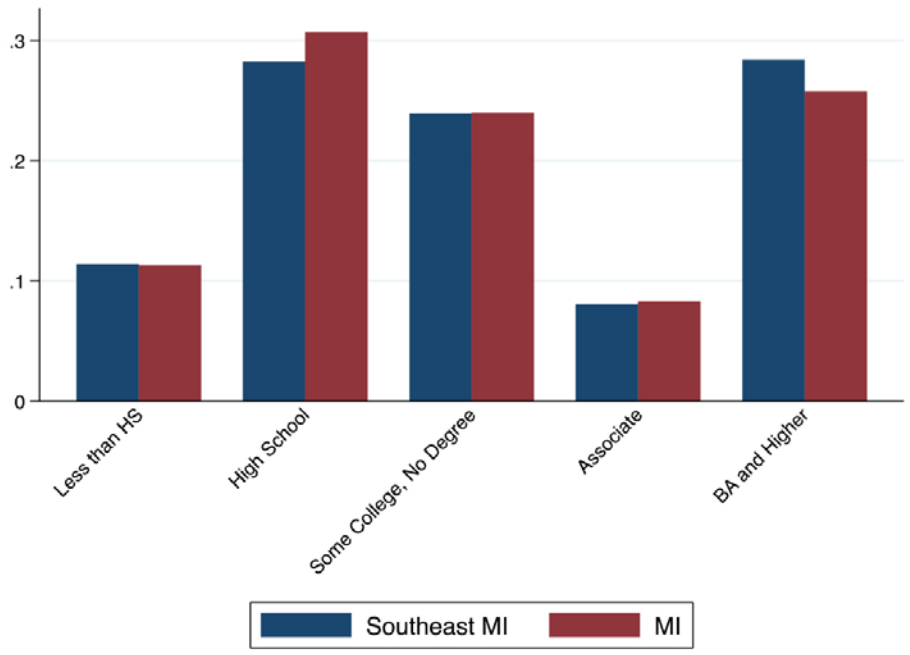


Note. Southeast MI includes the Ann Arbor, Jackson, and Detroit-Warren-Livonia metropolitan areas.

Source: U.S. Bureau of Labor Statistics, Current Employment Statistics.

Figure 9 displays the education attainment in 2011 for southeast Michigan—it is similar to the state average in the share of residents with less than a high school diploma, some college, and an associate degree. In 2011, the share of southeastern Michigan residents reporting a bachelor's degree as the highest level of education was 28 percent, which is roughly 2 percentage points lower than the state share.

Figure 9. Educational Attainment for Southeast Michigan in 2011 Among Individuals 25 Years of Age or Over



Note. Southeast MI includes the Ann Arbor, Jackson, and Detroit-Warren-Livonia metropolitan areas.

Source: Ruggles et al. (2010), Integrated Public Use Microdata Series.

Community Colleges in Michigan

There are a total of 28 public community colleges in Michigan. For the 2012–13 academic year, a total of 449,084 citizens attended a Michigan community college. Roughly 34 percent attended full-time, and a little over half enrolled for credit (MCCA, 2014).

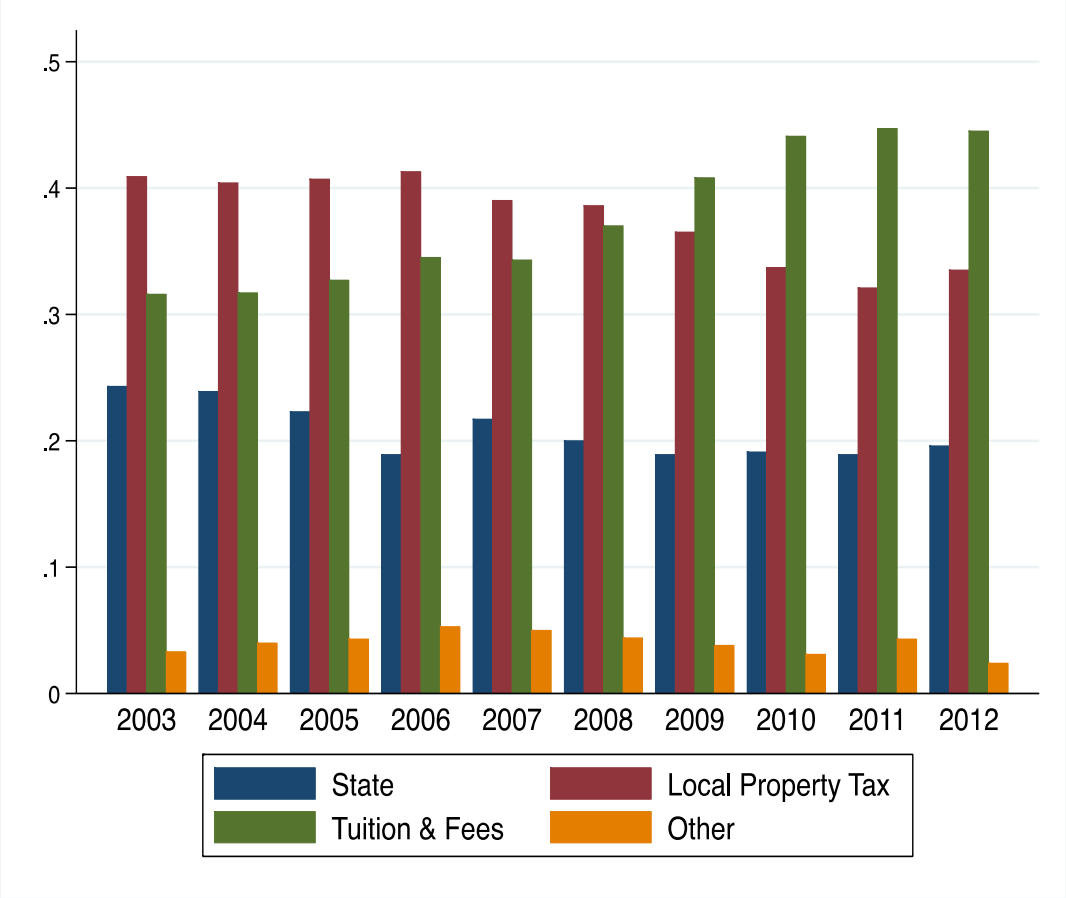
Geographically, the community colleges are spread throughout the state, but a concentration of colleges is found in the southeast region, within and near the Detroit metropolitan area. Four of the five community colleges in our study are located in the southeast region.

Michigan is one of the few states that provide postsecondary institutions with constitutional autonomy (MHEC, 2013). This means that Michigan does not have a state-level coordinating board or governing agency for postsecondary education. Each community college has a regionally elected governing board that controls the management and planning for institutional spending, the approval of academic programs, and the setting of tuition rates. Since there is no coordinating board in Michigan, the community colleges depend on the Michigan

Community College Association (MCCA) as a centralized forum to meet and discuss the challenges facing higher education.

Michigan community colleges have three primary funding sources: local property taxes, state funds, and tuition and fees (MCCA, 2014). As Figure 10 illustrates, the share of revenue coming from a combination of property taxes and state funds has decreased over the past decade, resulting in the community colleges raising tuition to generate additional revenue. From 2002–03 to 2012–13, the in-district tuition increased by an average of 4.8 percent per year (MCCA, 2014). For the fall term of 2012, in-district residents paid an average tuition of $90 per credit hour, whereas out-of-district residents paid an average of $148 per credit hour, and out-of-state residents paid an average of $203 per credit hour.

Figure 10. Revenue Sources for Michigan Community Colleges



Source: MCCA, Activities Classification Structure.

In total, Michigan community colleges offer awards in over 350 associate degree programs and 472 certificate programs (MCCA, 2014). In December 2012, Michigan's Governor

Snyder signed a bill that granted community colleges the authority to offer bachelor's degrees in occupations that are deemed to be in high demand for the state, including culinary arts, energy production technology, cement technology, and maritime technology (Martin, 2012). In 2013, Northwest Michigan College was the first Michigan community college to be approved by an accreditation agency to offer bachelor degrees (UpNorthLive.com, 2013).

4. Sample

Focusing on Michigan, the sample for our study is drawn from five community colleges in the state, which account for approximately 40 percent of all Michigan community college students. We focused particularly on first-time students who entered any of these five institutions between and including fall 2003 and fall 2004 (i.e., one year plus one semester). Status as a first-time student was determined based on administrative records from the community colleges in our sample and records from the National Student Clearinghouse (NSC). We define first-time students as those who, according to NSC records, had not enrolled previously in any postsecondary institution prior to enrolling for the first time in for-credit coursework in one of the community colleges in our sample.

Our initial sample included 29,448 students. We restricted our analysis to students who were between the ages 17 and 60 years at initial enrollment and omitted a small number of students for whom data on sex was missing, resulting in a sample of 27,887 students. These students were matched with unemployment insurance (UI) data maintained by the State of Michigan. Following this match, we further restricted our sample to include only students for whom we observed earnings both before enrolling in college and after exiting college, resulting in a final analytical sample of 20,581 students.[1]

We observed the credentials awarded to these students by the five community colleges through the fall term of 2011, and we observed student transfer to four-year institutions via NSC data through fall 2012. We observed students' quarterly UI earnings from the second quarter of 1998 (1998Q2) through the second quarter of 2011 (2011Q2), which ensured that we were able to observe students' earnings for at least seven years after initial enrollment, with the exact length of time depending upon when a student first enrolled in college.

[1] Specifically, we include a student if we observe earnings in at least one quarter prior to enrolling in one of our five community colleges and in at least one quarter after the student exits any postsecondary institution, as observed via the NSC data. The last quarter for which we have earnings data is 2011Q2. Hence, a student would have had to exit college prior to 2011Q2 and have at least one valid earnings record between college exit and 2011Q2 in order to be included in our analysis.

Measures

Of central interest in this study are credentials awarded to students by the community colleges. We classify these credential awards as either short-term certificates (requiring less than 15 credit hours), long-term certificates, or associate degrees. We focus exclusively on credit-based awards. As we discuss in Appendix A, community colleges also offer non-credit courses and awards. However, given the limitations of our data, we are not able to analyze the labor market returns to these non-credit experiences.

In addition, we further classify credentials by program of study. For the purposes of this work, we derive 14 categories from the National Center for Education Statistics (NCES) Classification of Instructional Programs (CIP) categorization scheme with a few modifications to better represent the distribution of programs offered in Michigan community colleges. In particular, we distinguish between awards in nursing and awards in non-nursing allied health fields. In the field of business, we distinguish between management-focused awards and accounting/finance-focused awards. Similarly, several industry-specific fields (e.g., protective service, personal culinary service, legal professions) were isolated from broader service categories. Lastly, remaining technical fields (e.g., construction, precision production, transportation, and mechanic) were grouped together, as were remaining professional fields (e.g., public administration, journalism, library science, and similar fields). Details regarding our adjustments to the CIP coding scheme are provided in Appendix B.

Our measure of quarterly earnings is based on UI data. On the recommendation of officials from the Michigan Department of Licensing and Regulatory Affairs, who collect and maintain the UI data, we recoded all nominal quarterly earnings equal to or less than $10 to $0 as these are likely misreported. We then converted all quarterly earnings data to 2011-equivalent dollars.

Concerning student characteristics and student patterns of engagement with the community college, we employ a number of student-level characteristics extracted from community college administrative records, including gender, self-reported race/ethnicity, and age at initial enrollment, from which we extrapolate age in each quarter. Additionally, our analyses consider the "season" in which a student first enrolled in college, whether fall, spring, or summer semester. Certain analyses also incorporate the number of remedial and non-remedial courses taken by the student in her first semester enrolled to get a proxy for enrollment "intensity."

Descriptive Statistics

Table 1 provides descriptive statistics for the students in the final sample by credential awarded, if any, and whether they transferred to a four-year institution. Note that students who were awarded more than one credential (e.g., a certificate and an associate degree), or who were awarded a credential and transferred to a four-year institution, are counted in more than one

Table 1. Student Characteristics by Type of Credential Awarded

	No Award	Short-Term Certificate	Long-Term Certificate	Associate Degree	Transfer to Four-Year	All Students
Sex						
Male	0.487	0.324	0.461	0.383	0.418	0.461
Female	0.513	0.676	0.539	0.617	0.582	0.539
Age at entry						
< 20 years	0.432	0.348	0.428	0.570	0.628	0.481
20 to 26 years	0.259	0.273	0.223	0.200	0.214	0.245
27 to 45 years	0.246	0.290	0.298	0.203	0.138	0.224
46 to 60 years	0.062	0.089	0.051	0.027	0.019	0.051
Age	25.67	27.49	26.20	23.51	22.03	24.82
Race						
White	0.734	0.573	0.751	0.813	0.762	0.752
African American	0.143	0.290	0.133	0.080	0.113	0.124
Latino/a	0.016	0.031	0.025	0.011	0.011	0.015
Asian or Pacific Islander	0.030	0.024	0.025	0.025	0.033	0.031
Other	0.058	0.078	0.055	0.054	0.062	0.059
Race missing	0.019	0.003	0.011	0.018	0.020	0.019
Enrollment intensity (1st semester)						
< 5.0 credit hours	0.360	0.451	0.235	0.195	0.317	0.340
5.0 to 11.9 credit hours	0.386	0.334	0.404	0.343	0.316	0.363
>11.9 credits hours	0.254	0.215	0.357	0.462	0.366	0.297
At least 20 credits	0.000	0.000	0.003	0.000	0.000	0.000
Proportion of all students	0.680	0.014	0.035	0.149	0.334	1.000
Count of students	13,990	293	722	3,057	6,884	20,581

Note. Students are categorized by whether an award or outcome ever was achieved in the five focal community colleges. As a result, some students are counted in more than one column.

of the columns of this table, resulting in the count of students in each column summing to a larger figure than the total number of students in the analytical sample.

Across the full sample of 20,581 students, 33 percent transferred to a four-year institution, 15 percent were awarded an associate degree, 4 percent were awarded a long-term certificate, and 1 percent was awarded a short-term certificate. In terms of demographic characteristics, 54 percent of students were female, and 48 percent were 19 years of age or younger at initial enrollment, which is comparable to the samples employed in recent work on the returns to community college credentials (e.g., Bahr, 2014; Dadgar & Trimble, in press; Xu & Trimble, 2014). A majority of the students (75 percent) were White, which is similar to the samples employed by Dadgar and Trimble (in press), Jepsen et al. (2014), and Xu and Trimble (2014), but it differs from the especially diverse sample employed by Bahr (2014) in which almost two-thirds were students of color.

About one third (34 percent) of the students in this study's sample enrolled in fewer than 5 credit hours in their first semester, which is less than two typical three-credit courses. Just over one-third (36 percent) carried a course load in their first semester of between 5.0 and 11.9 credit hours, which still places them in a category of less-than-full-time. The remaining 30 percent of students enrolled in a full-time course load of at least 12.0 credit hours in their first semester.

With respect to meaningful variation in the distribution of characteristics across the outcome types, students who were awarded a short-term certificate were more likely to be female (68 percent). Students who transferred to a four-year institution tended to be substantially younger at college entry than were their peers who did not transfer (63 percent were under 20 years of age), while students who were awarded a short-term certificate tended to be substantially older at college entry. Students who were awarded a short-term certificate were much more likely to be African American or Latino/a (32 percent) than were their peers who were not awarded a short-term certificate (e.g., 16 percent among students who did not receive an award). Students who were awarded a short-term certificate also were especially likely to enroll initially at the lowest intensity level (less than 5 credits; 45 percent of students who earned a short-term certificates), while students who completed an associate degree were especially likely to enroll initially at the highest intensity level (12 or more credits; 46 percent of students who earned an associate degree). In Table 2, we provide the share of each type of award earned in each of 14 fields of study.

Table 2 reveals that more than three-quarters of short-term certificates (programs requiring fewer than 15 credit hours) were awarded in non-nursing health-related fields. More than one third of associate degrees were awarded are in the liberal arts and sciences. Long-term certificates, on the other hand, were distributed more uniformly across fields of study, with the largest share in technical fields.

Table 2. Field of Study in Which Credentials Were Awarded

Field	Short-Term Certificate	Long-Term Certificate	Associate Degree	Any Level of Award
Liberal arts & sciences	0.0%	21.2%	40.2%	34.5%
Health (excluding nursing)	68.1%	15.1%	8.9%	15.3%
Health (nursing)	0.0%	8.5%	9.7%	8.9%
Business (excluding finance)	5.9%	8.2%	11.5%	10.3%
Accounting/finance	0.5%	3.5%	2.2%	2.2%
Computer information sciences	4.9%	2.7%	2.5%	2.5%
Engineering & science technologies	8.6%	8.2%	5.6%	6.1%
Protective services	0.5%	2.1%	5.6%	4.6%
Family consumer sciences	1.4%	2.1%	2.8%	2.5%
Personal culinary services	2.2%	3.4%	1.5%	1.7%
Legal professions & studies	0.0%	1.3%	1.4%	1.4%
Education	0.0%	0.0%	1.4%	1.1%
Other technical	7.3%	20.9%	3.7%	6.2%
Other professional	0.5%	2.8%	2.9%	2.7%
Total	100%	100%	100%	100%
Count of awards	370	708	3,045	3,770

Note. Columns do not sum to unity because some fields are unknown (for students who earned degrees in other institutions) and because some students earn multiple awards, often in different fields.

5. Estimation Strategy

Cross-Sectional Analysis of Earnings

We begin by estimating a cross-sectional ordinary least squares (OLS) regression model of earnings on credential awards and selected other variables for the purpose of providing baseline estimates that are comparable to those presented in recent prior work (e.g., Dadgar & Trimble, in press). In this specification (Model 1), we do not make use of the panel nature of our data and instead focus on students' labor market situation with respect to earnings during the period of time defined by the 25th through 28th quarters after initial enrollment, where quarter 0 is the first quarter of participation in college.

Model 1

$$\ln(Earnings)_{q25-28} = \alpha + \beta Credential_{q24} + \partial Transfer_{q24} + \omega Enrolled_{q25-28} +$$

$$\lambda\left(Credential_{q24} * Enrolled_{q25-28}\right) + \theta\left(Transfer_{q24} * Enrolled_{q25-28}\right) +$$

$$\psi(Demographics) + \xi(Intent) + \epsilon$$

The dependent variable is the natural logarithm of the sum of inflation-adjusted earnings from quarters 25 through 28. Nominal quarterly earnings of less than 10 dollars were set to zero due to concern that these records represented data reporting errors.[2] Earnings in quarters 25–28 is then the simple sum of quarterly earnings over those four quarters with earnings in any one quarter below $10 recoded to $0. That is, if earnings were $9 in each quarter the students would appear to have 0 earnings over the four quarters, but if earnings in one of these quarters was $10, then total earnings in the year would be $10. The dependent variable is then the natural log of this sum. $Credential_{q24}$ is a set of dummy variables indicating whether a student had been awarded a short-term certificate, long-term certificate, and/or an associate degree by end of the 24th quarter following initial enrollment in a community college. The variable $Transfer_{q24}$ indicates whether a student had transferred to a four-year institution by the end of the 24th quarter, and $Enrolled_{q25\text{-}28}$ addresses whether a student still was enrolled in college anywhere (as observed in NSC data) during any of the four quarters in which the dependent variable was observed (quarters 25 through 28). *Demographics* includes a measures of race/ethnicity (coded as white, nonwhite, and missing), age at initial enrollment (identity and square), and an indicator of whether a student ever received a Pell grant (a proxy for socioeconomic status). As indicators of students' *Intent,* we use a continuous variable that addresses the number of credits that a student attempted during his/her first term in community college, as well as a set of dummy variables representing the academic season in which a student enrolled initially in college (fall,

[2] Michigan officials who collect and maintain the UI earnings data indicated that extremely low values are likely to be reporting errors. Our results are not sensitive to an exclusion based on $10 versus other low values, such as $1.

spring, or summer). In addition, we include interactions between $Credential_{q24}$ and $Enrolled_{q25\text{-}28}$, and between $Transfer_{q24}$ and $Enrolled_{q25\text{-}28}$, to account for variation in the opportunity cost of continuing in college (a) after completing a credential and/or (b) in a four-year institution (Dadgar & Trimble, in press).

Cross-Sectional Analysis of Employment

We continue our baseline estimates by estimating a comparable cross-sectional OLS model of employment on credential awards and selected other variables. This specification (Model 2) differs from Model 1 in the dependent variable and in the inclusion of an additional control variable. The dependent variable is a dichotomous indicator of whether a student was employed in a UI-covered employment sector (i.e., the student had non-zero earnings) in any quarter from the 25th quarter through the 28th quarter following initial enrollment. The model is otherwise the same except that we added as a control the natural log of the sum of earnings in the four quarters prior to entering community college, where nominal quarterly earnings of $10 or less were treated as zero earnings.

Model 2

$$Employment_{q25-28} = \alpha + \beta Credential_{q24} + \gamma \ln(Earnings_{precollege}) +$$

$$\partial Transfer_{q24} + \omega Enrolled_{q25-28} + \lambda\left(Credential_{q24} * Enrolled_{q25-28}\right) +$$

$$\theta\left(Transfer_{q24} * Enrolled_{q25-28}\right) + \psi(Demographic) + \xi(Intent) + \epsilon$$

Fixed Effects Analysis of Earnings

We then proceed to our preferred specification by pooling all of our observations across quarters and estimating earnings gains using an individual fixed effects approach. This strategy estimates the average within-person earnings difference before and after earning an award, which allows us to "difference out" person-specific traits that are time-invariant, conditional on the assumption that pre-award earnings capture these fixed effects. To illustrate, imagine that there are two elements of ability: the first is ability endowed at birth that is unchanging over time (a constant), and the second is a set of learned skills that change over time (a variable). If workers' earnings at all periods reflect both sets of ability, and if the former is unchanged by schooling, a within-person comparison of pre-college and post-college earnings will "difference out" endowed ability and reflect only the change in earnings associated with the change in learned skills, assuming no random exogenous shocks (e.g., changes in labor market conditions or institutional policies). To account for the influence of such shocks, we use students who were not awarded a credential as the control group. The result is Model 3, below, which is comparable in many respects to that employed in recent work by Bahr (2014), Dadgar and Trimble (in press), and others.

Model 3

$$\ln(Earnings_{it}) =$$

$$\alpha + \beta Credential_{it} + \partial Transfer_{it} + \omega Enrolled_{it} + \lambda(Credential_{it} * Enrolled_{it}) +$$

$$\theta(Transfer_{it} * Enrolled_{it}) + \psi Time_{it} + \xi(Intent_i * Time_{it}) + \nu(Demographic_i *$$

$$Time_{it}) + \gamma Time_{it}^2 + \omega(Intent_i * Time_{it}^2) + \psi(Demographic_i * Time_{it}^2) + \rho_i + \eta_t +$$

$$\epsilon_{it}$$

The identification strategy described by Model 3 compares earnings for individuals before and after attending a community college and (in some cases) being awarded a credential. The before/after difference in earnings for students who were awarded a given level of credential is compared with the before/after difference in earnings for students who were not awarded a credential, resulting in what is essentially a multi-period difference-in-differences analysis.

The dependent variable in this model is the natural log of quarterly earnings for individual *i* in quarter *t* (adjusted to 2011-equivalent dollars), which is comparable to Bahr's (2014) analysis but differs from Dadgar and Trimble's (in press) focus on the natural log of hourly wages. This is an important difference and arises from the fact that we did not have a measure of number of hours worked in each quarter and, thus, were unable to estimate hourly wages. Like Bahr (2014) and Dadgar and Trimble (in press), but unlike Jepsen et al. (2014), we exclude from our analysis quarters in which individuals had zero earnings (with earnings of $10 or less in any quarter treated as zero earnings) or were missing earnings, meaning that we consider only quarters in which individuals were employed in a UI-covered field in the State of Michigan. As a result, our estimates do not address changes in earnings resulting from transitions in and out of the UI-covered labor force in Michigan.

The primary independent variables of interest in this study are represented by $Credential_{it}$, which encompasses the award of short-term certificates, long-term certificates, and/or associate degrees to individual *i* in quarter *t*. Each one of these time-varying components has a value of zero before the individual earned the credential and a value of one in the quarter in which the individual earned the credential and in all subsequent quarters. Like Bahr (2014) and Dadgar and Trimble (in press), we allow for the possibility that students may earn more than one level of credential at the same time or at different points in time. Thus, a student may have values of 1 on two or all three of these measures of credentials in a given quarter.[3]

[3] One noteworthy difference, however is that, in Bahr's (2014) study, the indicator for receiving an award first takes on a value of 1 in the quarter immediately after the award was received, as opposed the quarter in which the award actually was received.

Transfer$_{it}$ is a dummy variable that equals 1 starting in the quarter in which the individual enrolls in a four-year college (the variable maintains the value of 1 in each subsequent quarter, regardless of whether the individual is no longer enrolled in the four-year college). *Enrolled*$_{it}$ is a time-varying binary measure that equals 1 in quarters in which the individual was enrolled in any postsecondary institution (two- or four-year) in quarter *t*. The *Demographic*$_i$ variables include a three-category measure of a student's self-reported race/ethnicity (white, not white, and missing), a four-category measure of a student's age at initial enrollment (< 20 years, 20–26 years, 27–45 years, and 46–60 years), and a student's receipt of a Pell grant at any point in time (as an indicator of socioeconomic status). As an indicator of student's *Intent*$_i$, we include the number of remedial and non-remedial credits in a student's first term of enrollment (defined here as the first term the student attempted a credit), both interacted with the term itself (fall, winter, spring). We also include the identity and square of a time trend (*Time*$_{it}$), both of which are interacted with the demographic and intent variables to account for any time-varying relationship between student-level characteristics and earnings. The time trend is defined such that $t = 0$ exactly four quarters before the quarter of initial enrollment. Finally, we include student fixed effects (ρ_i), secular quarter fixed effects (η_t), and an error term (ϵ_{it}).

Fixed Effects Analysis of Earnings by Field of Study

Finally, in order to assess the field-specific effects of credentials on earnings, we estimate Model 4, below, which is identical to Model 3 except that we replace the simple indicators of credential award type with indications that address the combination of award type and field of study.

Model 4

$$\ln(Earnings_{it}) = \alpha + \beta(Credential * Field)_{it} + \partial Transfer_{it} + \omega Enrolled_{it} +$$

$$\lambda(Credential_{it} * Enrolled_{it}) + \theta(Transfer_{it} * Enrolled_{it}) + \psi Time_{it} +$$

$$\xi(Intent_i * Time_{it}) + \nu(Demographic_i * Time_{it}) + \gamma Time_{it}^2 + \omega(Intent_i *$$

$$Time_{it}^2) + \psi(Demographic_i * Time_{it}^2) + \rho_i + \eta_t + \epsilon_{it}$$

6. Results

Cross-Sectional Analysis of Earnings and Employment

Table 3 provides results of the cross-section OLS regression analyses of earnings (Model 1) and employment (Model 2), respectively. Results for males and females are presented separately.

Table 3. Static Estimates of the Natural Log of Earnings (Model 1) and the Probability of Employment (Model 2) in Quarters 25 Through 28, by Credentials Completed as of Quarter 24

	Model 1 ln(earnings) in q25–q28		Model 2 employment in q25–q28	
	Females	**Males**	**Females**	**Males**
Short-term certificate	–0.190	0.131	–0.00305	0.148***
	(0.146)	(0.155)	(0.0460)	(0.0483)
Long-term certificate	–0.0179	0.335***	0.0760***	0.0701**
	(0.0922)	(0.0766)	(0.0268)	(0.0321)
Associate degree	0.319***	0.272***	0.128***	0.115***
	(0.0439)	(0.0514)	(0.0140)	(0.0187)
n (students)	8,137	6,602	10,136	8,582
r-squared	0.066	0.112	—	—

Note. Robust standard errors in parentheses. The outcome in Model 1 is the natural log of the sum of earnings from quarters 25 through 28, excluding quarters in which earnings were less than $10. The outcome in Model 2 is a dummy variable that indicates whether the student worked (earnings > $0) in any quarter from quarter 25 through quarter 28. Short-term-certificate, long-term certificate, and associate degree are dummy variables equal to 1 if the student earned such credential by the quarter 24 following initial college enrollment.

*$p < .10$; **$p < .05$; ***$p < .01$

With the exception of short-term certificates for females, we see that all awards are associated with greater levels of employment roughly six years following enrollment in community college. For example, the coefficients of 0.128 and 0.115 for women and men respectively, indicate that students who received an associate degree were roughly 12–13 percentage points more likely to be employed than their peers who did not receive any award. Conditional on working, the results from the log(earnings) models indicate that receipt of an associate degree is associated with higher earnings for women and men, and that receipt of a long-term certificate is associated with higher earnings for men. In each of these cases, the coefficients suggest earnings gains of roughly 30 percent, a substantial economic return.

Fixed-Effects Analysis of Earnings

Table 4 presents the estimates of the effects of community college credentials on earnings from our preferred model (Model 3). As before, results for males and females are presented separately. The first two columns show results of models in which the outcome is the natural log of earnings. The results indicate that the return to a short-term certificate on earnings is statistically insignificant for both males and females. Likewise, the return to a long-term certificate for males is statistically insignificant. However, females experience an average 14 percent increase in earnings with the completion of a long-term certificate. Associate degrees are associated with an average 39 percent increase in earnings for females and an average 13 percent increase in earnings for males.

Table 4. Preferred Fixed Effects Estimates (Model 3) of the Natural Log of Quarterly Earnings and Quarterly Earnings (Identity), by Credentials Completed

	ln(earnings)		earnings	
	Females	**Males**	**Females**	**Males**
Short-term certificate	0.00399	0.0836	267.6	1,345**
	(0.0570)	(0.0746)	(232.2)	(572.6)
Long-term certificate	0.132***	0.0357	619.6**	918.0***
	(0.0475)	(0.0366)	(262.1)	(276.5)
Associate degree	0.327***	0.118***	2,346***	1,441***
	(0.0246)	(0.0248)	(139.0)	(162.8)
n (observations)	268,003	220,059	364,422	311,588
n (students)	11,083	9,470	11,102	9,479
r-squared	0.113	0.127	0.041	0.036

Note. Robust standard errors in parentheses.

*$p < .10$; **$p < .05$; ***$p < .01$

By discarding quarters in which zero earnings were reported, Model 3 implicitly focuses on the returns experienced by the employed, ignoring returns garnered by transitions into the workforce. To better utilize earnings information, we re-estimate our preferred model, replacing the log of earnings with a simple measure of earnings (including zero earnings). The results of this model, which are provided in Table 4, again support the conclusion that short-term certificates are not associated with a net return for females. However, in contrast to the results of the natural log of earnings, here we find that males experience an average $1,345 dollar increase in earnings following the award of a short-term certificate. Long-term certificates are associated with an average return of $620 for females and $918 for males. Associate degrees produce an estimated $2,346 increase in earnings for females and a $1,441 increase in earnings for males. Of note, in the case of males, the value of a short-term certificate is greater than that of a long-term certificate and roughly equal to that of an associate degree

The results in Tables 3 and 4 suggest that short-term certificates have a positive effect on employment for men, but, conditional on working, do not have an impact on earnings for either men or women. With respect to long-term certificates, the fixed effect results in Table 4—which we view as the preferred specification—are quite different than the cross-sectional estimates. Specifically, these results indicate that long-term certificates are positively associated with earnings for women, but not for men. The estimates of earnings gains from associate degrees are similar across the two models for females. For males, the preferred fixed effect results show notably lower returns. These patterns suggest that, for men, there is a positive correlation between receipt of long-term certificates and associate degrees and other time-invariant, unobservable factors that are positively associated with earnings, highlighting the importance of including measures of pre-award earnings.

Fixed-Effects Analysis of Earnings by Field of Study

In Table 5, we provide the results from Model 4, which estimates the returns in earnings to credentials by the field of study in which credentials were awarded. The model is specified so that the reference category includes individuals who did not receive any award. We do not show estimates for field by award combinations that include fewer than 10 students because the standard errors are often quite large and, regardless, we worry that these estimates might reflect idiosyncratic factors unique to specific individuals.

Several interesting findings emerge. The positive return for long-term certificates among women that we saw in Table 4 appears to be driven by nursing, in which we find a 115 percent increase. Interestingly, women do not experience a significant return for other health certificates. However, women who earn long-term certificates in business earn roughly 21 percent more than peers who do not earn any award.

The positive return to an associate degree we saw for both men and women in Table 4 is driven largely by awards in nursing (for both men and women) and other health fields. For women, associate degrees in personal and culinary services are also associated with large (48 percent) increase in earnings. For men, associate degrees in fields often described as more "technical" also appear to have large economic payoffs, including computer/information sciences (19 percent), engineering and science technologies (13 percent), and a collection of other small technical fields (28 percent). The field of protective services is the only "non-technical" area in which an associate degree appears to have a significant earnings payoff for men. Interestingly, the estimates for women who earn an associate degree in education are negative, although not significantly different than zero. This is consistent with the more general pattern of positive returns for more technical areas.

Table 5. Fixed Effects Estimates (Model 4) of the Natural Log of Quarterly Earnings, by Credential Completed and Field of Study of Credential

		Females			Males		
		Short-Term Certificates	Long-Term Certificates	Associate Degrees	Short-Term Certificates	Long-Term Certificates	Associate Degrees
1	Liberal Arts		–0.054	0.006		0.051	0.002
			(0.069)	(0.031)		(0.115)	(0.037)
2	Health (non-nursing)	0.019	0.057	0.657***	0.006		0.597***
		(0.058)	(0.089)	(0.060)	(0.107)		(0.133)
3	Nursing		0.766***	1.030***			0.862***
			(0.097)	(0.049)			(0.136)
4	Business (non-finance)	–0.239*	0.192**	0.035		–0.042	–0.053
		(0.141)	(0.090)	(0.043)		(0.139)	(0.057)
5	Accounting & finance		–0.118	0.107			0.188
			(0.142)	(0.094)			(0.168)
6	Computer/information sciences			0.060	0.288	0.067	0.177**
				(0.145)	(0.183)	(0.103)	(0.071)
7	Engineering & science technologies			–0.101	–0.026	–0.089	0.124**
				(0.110)	(0.127)	(0.068)	(0.050)
8	Protective services			0.017			0.146**
				(0.097)			(0.062)
9	Family & consumer sciences		0.113	0.014			
			(0.247)	(0.075)			
10	Personal & culinary services		–0.373*	0.391**			0.199
			(0.193)	(0.194)			(0.125)
11	Legal professions & studies			0.069			
				(0.156)			
12	Education			–0.117			
				(0.116)			
13	Other technical				0.146	0.032	0.249***
					(0.149)	(0.047)	(0.062)
14	Other professional		0.093	0.043			0.070
			(0.166)	(0.102)			(0.121)

Note. Cells that have fewer than 10 people in our sample are not shown. Robust standard errors in parentheses.

*$p < .10$; **$p < .05$; ***$p < .01$

7. Sensitivity Checks

In alignment with prior work (e.g., Bahr, 2014; Dadgar & Trimble, in press; Jepsen et al., 2014), we tested the sensitivity of our preferred model (Model 3) to variation in the analytical sample, first for females exclusively (Table 6) and then for males exclusively (Table 7). In these tables, S1 is a replication of our preferred model presented for the purpose of comparison. S2 excludes individuals who were less than 21 years of age at initial enrollment as we might think that earnings prior to age 21 are not representative of unobserved skill that is differenced out in the fixed effects model. S3 excludes individuals who were still enrolled in college (as observed in the NSC data) during any quarter of the last two years of observation to test whether the inclusion of these still enrolled students significantly downward biases estimates. S4 and S5 exclude the observation corresponding to one quarter before initial enrollment and two quarters before initial enrollment, respectively, to address the possibility of Ashenfelter's (1978) dip. In models S6 and S7 we reintroduce students who had no earnings prior to enrollment (S6) or after exit (S7) in order to test whether their inclusion impacts our estimates. The concern here is that the inclusion of students with no earnings prior to enrollment would overstate the impact of earning an award since we are differencing off of students with $0 earnings prior meaning they can only improve. Similarly, we are concerned that students with no post-exit earnings may have left the state, in which case we cannot observe their employment or earnings. Lastly, S8 adds to the analysis all students regardless of whether they had valid earnings records before or after enrolling in college.

Comparing the results of the various sensitivity models for males and females, the most noteworthy observation is the relative consistency of the estimated returns. Across all models, a short-term certificate has no significant effect on earnings for either males or females. For females, the effect of a long-term certificate varies from a 14 percent increase in earnings to a 17 percent increase in earnings, while, for males, the effect of a long-term certificate is never statistically significant. The effect of an associate degree for females varies from 39 percent (in the preferred model and several alternative models) to 52 percent (in Model S2, which excludes students who were less than 21 years of age). For males, the effect of an associate degree varies from 11 percent to 18 percent.

Table 6. Sensitivity Analyses of Model 3 for Females Only

	S1	S2	S3	S4	S5	S6	S7	S8
Short cert.	0.004	0.069	0.102	–0.0102	–0.0163	0.0257	–0.0137	0.009
	(0.057)	(0.073)	(0.084)	(0.058)	(0.059)	(0.056)	(0.059)	(0.057)
Long cert.	0.132***	0.158***	0.142**	0.144***	0.159***	0.141***	0.140***	0.148***
	(0.047)	(0.061)	(0.058)	(0.047)	(0.048)	(0.045)	(0.047)	(0.045)
Assoc. deg	0.327***	0.420***	0.408***	0.327***	0.326***	0.327***	0.326***	0.326***
	(0.025)	(0.037)	(0.034)	(0.024)	(0.024)	(0.024)	(0.024)	(0.023)
n (obs)	268,003	137,853	160,505	259,347	250,983	287,579	277,159	297,743
n (students)	11,083	5,801	6,746	11,083	11,081	12,344	11,906	13,359
R-squared	0.113	0.037	0.115	0.109	0.101	0.114	0.110	0.111

Note. Robust standard errors in parentheses; S1 is Model 3; S2 excludes students who were 20 years of age or younger at initial enrollment; S3 excludes individuals who were still enrolled during any term of the last two years for which data were available; S4 excludes all observations one quarter before initial enrollment; S5 excludes all observations one and two quarters before initial enrollment; S6 includes students without pre-enrollment earnings; S7 includes students without post-enrollment earnings; S8 includes students without regard to the presence of pre- or post-enrollment earnings.

*$p < .10$; **$p < .05$; ***$p < .01$

Table 7. Sensitivity Analyses of Model 3 for Males Only

	S1	S2	S3	S4	S5	S6	S7	S8
Short cert.	0.084	0.184*	0.031	0.083	0.090	0.090	0.079	0.086
	(0.075)	(0.096)	(0.092)	(0.073)	(0.075)	(0.072)	(0.075)	(0.072)
Long cert.	0.036	0.0081	0.024	0.037	0.032	0.046	0.039	0.047
	(0.037)	(0.045)	(0.043)	(0.037)	(0.037)	(0.037)	(0.036)	(0.036)
Assoc. deg.	0.118***	0.108***	0.168***	0.113***	0.108***	0.133***	0.118***	0.133***
	(0.025)	(0.039)	(0.034)	(0.025)	(0.025)	(0.024)	(0.025)	(0.024)
n(obs)	220,059	103,971	142,110	212,784	205,883	234,596	227,413	242,667
n(students)	9,470	4,430	6,169	9,467	9,466	10,427	10,222	11,324
R-squared	0.127	0.031	0.130	0.120	0.110	0.127	0.123	0.123

Note. Robust standard errors in parentheses; S1 is Model 3; S2 excludes students who were 20 years of age or younger at initial enrollment; S3 excludes individuals who were still enrolled during any term of the last two years for which data were available; S4 excludes all observations one quarter before initial enrollment; S5 excludes all observations one and two quarters before initial enrollment; S6 includes students without pre-enrollment earnings; S7 includes students without post-enrollment earnings; S8 includes students without regard to the presence of pre- or post-enrollment earnings.

*$p < .10$; **$p < .05$; ***$p < .01$

8. Discussion and Conclusions

In this paper, we examine the relative labor market gains experienced by first-time college students who enrolled in five community colleges in Michigan in 2003 and 2004. These students entered the labor market in the years leading up to and including the Great Recession, which had a severe impact on Michigan, with unemployment spiking to 14 percent in late 2009.

We track credentials, credits, earnings, and employment for these students through 2011. Using a fixed-effects approach, we compare labor market outcomes of those who earned a degree or certificate to those who enrolled but did not earn a credential. Note that our comparison group does not include individuals who never entered college, and, consequently, our estimates likely understate the earnings differential between those who were awarded a postsecondary credential and those with only a high school credential.

As was true in related studies in California (Bahr, 2014), Washington (Dadgar & Trimble, in press), North Carolina (Belfield et al. 2014), and Kentucky (Jepsen et al., 2014), we find that students earning a long-term certificate (referred to as a "diploma" in North Carolina) earn more per year than do those without a credential. In dollar terms, the returns in Michigan are considerably larger than observed in North Carolina, with Kentucky falling in the middle of these two extremes. For short-term certificates, we find no earnings gain for women, relative to students who did not earn a credential, but a substantial gain for men. This result differs from the Kentucky and North Carolina studies, which found modest gains for both sexes.

We find that returns are particularly high in health-related and technical fields, as has been found in every state for which we now have estimates: California, Kentucky, Washington and, now, Michigan. Across all of these states, a "health-related" job is a similar construct: X-ray technician, phlebotomist, nurse's aide, etc., which would explain the consistency of the finding regarding high returns to these fields. By contrast, the jobs for those who are awarded a "technical" credential vary considerably across labor markets, with manufacturing jobs dominating in Michigan. This may explain why, in the Michigan context, males see much higher returns to short-term certificates than do workers in some other states.

Our findings suggest that some community college awards offer valuable payoffs in the labor market, relative to the gains experienced by students who do not complete a credential (e.g., Bahr, 2014). At the same time, the relative returns appear to depend critically on the field of study and type of award. This highlights the importance of policies and programs that help students carefully consider their choice of field as well as provide them the support necessary to complete their credential. Moreover, these results point to the need for additional and ongoing analyses at the level of the state and local labor market, as there appear to be potentially important differences across locales in terms of the economic returns of community college awards.

References

Ashenfelter, O. (1978). Estimating the effects of training programs on earnings. *Review of Economics and Statistics, 60*, 47–57.

Bahr, P. R. (2014). *The labor market return in earnings to community college credits and credentials in California*. Retrieved from Center for the Study of Higher and Postsecondary Education website: http://www.soe.umich.edu/people/profile/peter_riley_bahr/

Belfield, C. R., & Bailey, T. (2011). The benefits of attending community college: A review of the evidence. *Community College Review, 39*, 46–68.

Belfield, C., Liu, Y. T., & Trimble, M. J. (2014). *The medium-term labor market returns to community college awards: Evidence from North Carolina*. Retrieved from Center for Analysis of Postsecondary Education and Employment website: http://capseecenter.org/medium-term-labor-market-return-to-community-college-awards/

Dadgar, M., & Trimble, M. J. (in press). Labor market returns to sub-baccalaureate credentials: How much does a community college degree or certificate pay? *Educational Evaluation and Policy Analysis*.

Jepsen, C., Troske, K., & Coomes, P. (2014). The labor-market returns to community college degrees, diplomas, and certificates. *Journal of Labor Economics, 32*, 95–121.

Marcotte, D. E., Bailey, T., Borkoski, C., & Kienzl, G. S. (2005). The returns of a community college education: Evidence from the National Education Longitudinal Study. *Educational Evaluation and Policy Analysis, 27*, 157–175.

Martin, T. (2012, December 28). Community college degrees among topics covered in latest day of Gov. Rick Snyder bill signings. *Mlive*. Retrieved from http://www.mlive.com/politics/index.ssf/2012/12/community_college_degrees_amon.html

Michigan Community College Association [MCCA]. (2014). *Activities classification structure (ACS): 2012-13 data book & companion*. Retrieved from Michigan Community College Association website: http://www.michigancc.net/acs/dt2013/book13.pdf

Michigan Higher Education Compact [MHEC]. (2013). *State constitutional provisions and higher education governance*. Minneapolis, MN: Michigan Higher Education Compact.

Ruggles, S., Alexander, J. T., Genadek, K., Goeken, R., Schroeder, M. B., and Sobek, M. (2010). *Integrated public use microdata series: Version 5.0* [Datafile]. Retrieved from University of Minnesota website: https://usa.ipums.org/usa/index.shtml

UpNorthLive.com. (2013). Northwest Michigan College set to make history with new degree. *UpNorthLive.com*. Retrieved from http://www.upnorthlive.com/news/story.aspx?id=968383#.VNF_DCmR-Iw

U.S. Bureau of Labor Statistics. (2014a). *Local area unemployment statistics (LAUS)* [Datafile]. Retrieved from Bureau of Labor Statistics website: http://www.bls.gov/data/#unemployment

U.S. Bureau of Labor Statistics. (2014b). *Current employment statistics* [Datafile]. Retrieved from Bureau of Labor Statistics website: http://www.bls.gov/data/#unemployment

U.S. Department of Education (2014). *Digest of education statistics*. Retrieved from National Center for Education Statistics website: http://nces.ed.gov/programs/digest/2014menu_tables.asp

Xu, D., & Trimble, M. J. (2014). *What about certificates? Evidence on the labor market returns to non-degree community college awards in two states* (A CAPSEE Working Paper). Retrieved from Center for Analysis of Postsecondary Education and Employment website: http://capseecenter.org/labor-market-returns-non-degree-community-college-awards-two-states/

Appendix A: Analysis of Non-Credit Courses and Awards

Of the five community colleges for which we have administrative data, only one provided detailed information about students' enrollment in non-credit courses and the conferment of non-credit awards. Unfortunately, we encountered several difficulties in trying to estimate the returns to a non-credit award or non-credit course.

At least in the college of interest, students who enroll in non-credit programs are, empirically speaking, a separate population from students enrolling in for-credit programs. Non-credit awards are a product of partnerships between the community college and local companies to offer training in select courses related to the manufacturing, construction, and health fields. At the completion of these training courses, students are conferred a certificate of completion. However, the number of students who enrolled in these non-credit training courses, even over the very lengthy time for which data were available, is very small. Additionally, these non-credit students attend the community college to receive a specific non-credit award and do not enroll in courses leading to a for-credit credential. For example, among the 155,431 students who enrolled for the first-time between 2001–2002 and 2011–2012, 1,638 were observed to have been conferred a non-credit award. For these few recipients of non-credit awards, only 7 percent enrolled in a for-credit course, yet 100 percent enrolled in at least one non-credit course.

The college also offers non-credit courses that do not lead to an award. From 2001–2002 to 2011–2012, over 4,500 non-credit courses were offered. Most of these courses were related to personal interests or life enhancement. Table A1 displays the top 10 most popular non-credit courses among students who enrolled in at least one non-credit course from 2001–2002 to 2011–2012.

Table A1. Ten Most Frequent Non-Credit Courses

Non-Credit Course	Share of Non-Credit Course Enrollment
Motorcycle basic rider course	5.89%
New student orientation	2.89%
Entry-level care giver	1.20%
Communicating through conflict	1.15%
Driver's education (Segment 1)	1.09%
Motorcycle safety	0.93%
Michigan OSHA construction	0.91%
Driver's education (Segment 2)	0.89%
Test-taking skills	0.79%
Memory skills	0.77%

Note. Sample includes only the 77,636 students who enrolled in at least one non-credit course from 2001–2002 to 2011–2012 at this single community college.

The most popular non-credit course at this community college is an introductory course on motorcycle riding, undoubtedly serving individuals who are seeking to secure a motorcycle endorsement for a driver's license, and accounting for almost 6 percent of enrollment in all non-credit courses. The second most popular personal enhancement course is care giving, representing 1 percent.

Of the 77,636 students who enrolled in a non-credit course, 58,070 never enrolled in a course for credit. We discovered that these students who enrolled only in non-credit life courses have an exceptionally low match rate to the state's unemployment insurance. For example, among students enrolling in non-credit courses only, less than 40 percent matched to the UI records. One of the reasons for this low match is that these students are not required to provide a social security number when registering for the course.

For the 20,581 students included in our analysis of the returns to awards, 5,669 were enrolled in the college for which we have detailed non-credit course-taking information. However, only 17 percent of these students (n = 981) were observed to have enrolled in at least one non-credit course, almost all of which were personal development courses or student orientation courses. In conversations with administrators at this community college, we were informed that all degree-seeking students were required to take a non-credit orientation course. These orientation courses are intended to help students adjust to college-level coursework by providing instruction in test-taking, memory skills, critical thinking, and stress management. However, based on the match with the non-credit courses reported in the administrative data, there appears to be inconsistent reporting of these non-credit orientation courses. As in the larger sample, the most popular non-credit course was introduction to motorcycle riding (see Table A2).

Table A2. Ten Most Frequent Non-Credit Courses for the Sample of Students Included in the Analysis of the Returns to Community College Awards

Non-Credit Course	Share of Non-Credit Course Enrollment
Motorcycle basic rider course	6.05%
Driver's education (Segment 1)	2.54%
Early childhood conference	1.78%
Customer service training 3	1.62%
Customer service training 2	1.40%
New student orientation	1.40%
Customer service training 1	1.35%
Reading skills	1.35%
Test-taking skills	1.35%
Memory skills	1.30%

Note. Sample includes only the 981 students who enrolled in at least one non-credit course at this single community college and who were included in the analysis of the returns to community college awards.

In conclusion, we find that, in the one community college that provided the requisite non-credit data, non-credit courses are not intended to enhance workforce skills, but rather are taken for non-career purposes or to fulfill administrative requirements of the college.

Appendix B: Coding of Fields and Subfields of Study

- Liberal Arts
  - Liberal Arts and Sciences, General Studies
  - Visual and Performing Arts (not including Design)
  - Physical Sciences
  - Multi/Interdisciplinary Studies
  - Psychology
  - Mathematics and Statistics
  - English Language and Literature/Letters
  - Biological and Biomedical Sciences
  - Social Sciences
  - Foreign Languages, Literatures, and Linguistics
  - History
  - Area, Ethnic, Cultural, Gender, and Group Studies
  - Philosophy and Religious Studies
- Health (non-Nursing)
- Nursing
- Business (non-Finance)
- Accounting and Finance
- Computer and Information Sciences
- Engineering and Science Technologies
  - Engineering Technologies
  - Engineering
  - Architecture and Related Services
  - Science Technologies/Technicians
- Protective Services
- Family and Consumer Sciences
- Personal and Culinary Services
- Legal Professions and Studies
- Education
- Other Technical
  - Mechanic and Repair Technologies
  - Construction Trades
  - Precision Production
  - Transportation and Materials Moving
- Other Professional
  - Visual and Performing Arts (Design)
  - Public Administration and Social Service
  - Communication, Journalism, and Related
  - Agriculture, Agriculture Operations, and Related Services
  - Communications Technologies/Technicians
  - Parks, Recreation, Leisure, and Fitness
  - Library Science
  - Natural Resources and Conservation