Exploring Geographic Variation in Equitable Postsecondary Value Among U.S. Community Colleges

Final Report

Roman Ruiz, Adam Hearn

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Contents

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Introduction

A recent national opinion poll finds that approximately 70% of U.S. adults believe that education or workforce training after high school is necessary to ensure one's financial stability, but only half believe that a high-quality postsecondary education remains affordable. The same poll finds that most Americans (82%) have a favorable opinion of public community colleges, agreeing that taxpayer support of these institutions is warranted (Nguyen et al., 2023).

Community colleges serve many critical purposes for residents within their local service areas by providing relatively low-cost (Ma & Pender, 2023b), open-access postsecondary education and workforce-focused training (Jacobs & Worth, 2019). In addition, community colleges play an outsized role in serving diverse and historically marginalized student populations, including students of color, students from low-income backgrounds, adult learners, and those who work (Radwin et al., 2018).

Nationally representative survey data show that more than half of students who chose a community college pathway (i.e., a technical/vocational credential or 2-year degree) cited work-related outcomes such as increased earnings and stable employment as the primary reason they chose to pursue a higher education (Strada Education Group & Gallup, 2018). A more current national survey of previously enrolled community college students finds that "gaining skills to be successful in work" was the most frequently cited (74%) motivation for enrollment, yet only about half of career-motivated students reported meeting their work-related goals (e.g., financially support self and family, earn more money) after leaving their community college (Strada Education Foundation, 2023).[1]

In response to the public's questioning of the value of higher education, the Postsecondary Value Commission and its resulting Postsecondary Value Framework (PVF) have encouraged higher education researchers and data practitioners to quantify the value postsecondary institutions provide to students more explicitly. For example, the Institute for Higher Education Policy (IHEP) has used publicly available data to measure students' earnings against the PVF, using the resulting data to construct the Equitable Value Explorer (EVE), an interactive data tool.[2]

As their name implies, community colleges serve largely place-bound students who are spatially sensitive and select institutions based on their geographic proximity (Birnbaum et al., 2022). Given the hyperlocal enrollment of community college students and their primarily economic

[1] Survey responses were retroactively self-reported by adults age 18 and over who attended a community college in the past 10 years but were no longer enrolled. Responses were weighted by demographic characteristics and census division to maintain national representativeness.

[2] See: https://equity.postsecondaryvalue.org/

reasons for choosing to enroll in college, place-based measures of economic value are increasingly important to understand.

Research Questions

IHEP's EVE data tool provides measures of economic value based on students' post-college earnings relative to the state in which their postsecondary institution is located. Such a broad geographic unit, however, may lead to inadequate comparisons for institutions like community colleges that primarily serve students who live and work within their immediate area. This study uses data from IHEP's EVE data tool and builds on the PVF by redefining economic value thresholds based on the core-based statistical area (CBSA) in which an institution is located.

CBSAs are federally defined geographic units that reflect a "core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration" irrespective of state borders (U.S. Census Bureau, 2021). By examining postsecondary value across CBSAs, this study acknowledges that earnings outcomes vary dramatically by place, which are not necessarily bounded by state borders. For example, 61 of the 939 defined CBSAs include more than one state, with the Philadelphia-Camden-Wilmington CBSA and the Washington-Arlington-Alexandria CBSA each including portions of four states or jurisdictions.[3]

This study addresses the following research questions:

1. How do measures of postsecondary economic value (dependent variable), determined by CBSA-referenced earnings thresholds, vary among U.S. community colleges?
2. What are the institutional characteristics and CBSA characteristics of community colleges associated with economic value?

This study focuses on community colleges, which typically enroll individuals who live nearby (Jepsen & Montgomery, 2009) and produce graduates with less-than-4-year degrees who are less geographically mobile (Malamud & Wozniak, 2012). By focusing on this institutional sector, we can isolate the relationship more directly between postsecondary enrollment and earnings by reducing the likelihood that earnings are attributable to geographic mobility into and after college. In addition, this study extends the EVE data tool by moving beyond calculating measures of economic value to investigating the institution-level and community-level characteristics associated with positive (and negative) value.

[3] Authors' analysis of the 2023 CBSA delineation file. See: https://www.census.gov/geographies/reference-files/time-series/demo/metro-micro/delineation-files.html

Methods

Data Sources

We relied on publicly available federal data sources, in particular the Integrated Postsecondary Education Data System (IPEDS) from the National Center for Education Statistics and the American Community Survey (ACS) from the U.S. Census Bureau, to augment the proprietary data file that populated IHEP's EVE data tool. We combined selected variables from these different data sources using common identifiers (i.e., IPEDS UnitID and CBSA codes[4]) to construct a novel data set that includes college costs, students' post-college earnings, and institution- and community-level characteristics.

Guided by prior research, we selected predictor variables related to students' post-college earnings. Key variables include the sociodemographic characteristics (e.g., gender, race/ethnicity) of students enrolled at community colleges in our analytic sample as well as broader institutional characteristics. For example, the "gender wage gap" has persisted in the U.S. labor market for generations. Even when accounting for years of education and hours worked, women have lower earnings compared to men (Goldin, 2014). Research also documents an entrenched Black–White earnings gap even for individuals with comparable levels of education (Zhou & Pan, 2023), and a narrowing yet still present Hispanic–White earnings gap (Chetty et al., 2020). In addition, students who enter college at an older age (i.e., adult learners) are likely to have lower post-college earnings compared to their younger counterparts (Douglas & Attewell, 2019). Beyond student characteristics, the choice of college major also affects students' earnings prospects. Research finds that degrees within the fields of science, technology, engineering, and math (STEM) as well as the health sciences provide earnings premiums over other disciplines (Kim et al., 2015). Finally, measures of college quality—such as full-time instructional staff and institutional completion rates—can positively impact students' earnings (Dale & Krueger, 2014).

Recognizing that community colleges are embedded within and primarily serve their local communities, we also examined CBSA-level characteristics. Community characteristics examined include population size and density, unemployment and poverty rates, racial/ethnic demographics, educational attainment, and employment distribution within selected industries. The relationship between population density and earnings is complex. Areas of greater density may increase competition in the job market, leading to higher standards of qualification and lower wages if the supply of workers exceeds employer demand (Hendricks & Leukhina, 2018). At

[4] In IPEDS, a postsecondary institution is assigned a CBSA code based on the physical address it reports when registering for the annual data collection. In some cases, an IPEDS reporting institution may reflect the main campus in addition to branch or satellite campuses or a central administrative office for a coordinated system of institutions. Therefore, the assigned CBSA may not reflect all unique campus locations.

the same time, high-density areas may also offer more employment opportunities, which can improve individuals' earnings prospects (Hummel, 2020). Research suggests that ambient levels of educational attainment (e.g., bachelor's degree) within a metropolitan area can create "spillovers" for individuals with lower levels of attainment (e.g., high school diploma) by increasing their productivity and ultimately their earnings (Norris, 2015). In addition, the distribution of labor across industries within a CBSA may speak to the local job opportunities and related earnings available to individuals. In our analysis, we focus on the percentage of the overall workforce employed in five key industries: healthcare; construction; manufacturing; warehousing and transportation; and professional, scientific, and technical services.

Exhibit 1 summarizes the key variables included in the analysis at both the college and broader community levels. For additional details on the data sources used and variable constructs, see Appendix Exhibit A1.

Exhibit 1. Key Institution-Level and CBSA-Level Variables Included in Analysis

Variable Level	Key Variables		Data Sources
Institution level	• Economic value[1] • Number of 4-year institutions within 25 miles • Total 12-month enrollment • Percent underrepresented minority • Percent women	• Percent earn award within 4 years • Percent Pell Grant recipient • Percent degree/certificate-seeking • Percent age 25 and older	• EVE • IPEDS
CBSA level	• Population density • Unemployment rate • Poverty rate • Percent female • Percent foreign born	• Percent White • Percent Black • Percent Hispanic • Percent manufacturing • Percent healthcare • Percent bachelor's degree or higher attainment	• ACS • CBP • BLS

[1] Dependent variable. See "Analytic Approaches" section below for additional details on variable construction.

Note. CBSA = core-based statistical area; EVE = Equitable Value Explorer; IPEDS = Integrated Postsecondary Education Data System; ACS = American Community Survey; CBP = County Business Patterns; BLS = Bureau of Labor Statistics. See Appendix A for additional details about data sources and variables selected for analysis.

Analytic Sample

The analytic sample consists of publicly controlled U.S. postsecondary institutions that award credentials primarily below the baccalaureate level[5] (operationalized as community colleges) located within a CBSA[6] and in operation during the 2022–23 academic year. The focal analytic sample included 892 U.S. community colleges. However, when applying data from the EVE data tool, earnings and/or average net price values were not available for 28 institutions (3% of cases), reducing the final analytic sample to N = 864.

The 864 U.S. community colleges in our analytic sample were nearly universally open-access institutions (98%), enrolling sizeable shares of Pell Grant recipients (*Mdn* = 50%), students from historically underrepresented racial/ethnic groups (*Mdn* = 30%), and adult learners age 25 and over (*Mdn* = 30%). The median 12-month undergraduate enrollment was approximately 6,800 students. Nearly one-fifth (19%) of community colleges offered a baccalaureate program, and there was a median of three 4-year colleges or universities within a 25-mile radius of the community colleges. For additional information on the institutional characteristics of the analytic sample, see Appendix Exhibit B1.

The community colleges in our analytic sample are located within 516 CBSAs (307 metropolitan statistical areas and 209 micropolitan statistical areas). More than three quarters of CBSAs (n = 402, 78%) in our analytic sample contain only one community college. CBSAs in our sample represent a wide range of sociodemographic characteristics. Among those CBSAs, median household income ranged from a low of approximately $30,200 for the Minden, Louisiana, CBSA to a high of $130,100 for the San Jose–Sunnyvale–Santa Clara, California, CBSA. The overall median CBSA-level household income was $55,800, the median unemployment rate was 5%, and the median poverty rate was 10%. The median bachelor's degree or higher attainment rate was 24%, with Los Alamos, New Mexico, and Ann Arbor, Michigan, CBSAs leading at 68% and 57%, respectively. Overall, CBSA-level racial/ethnic composition was majority White (*Mdn* = 86%), followed by Hispanic (*Mdn* = 8%) and Black or African American (*Mdn* = 6%). Among the five industries examined, healthcare was the largest employment sector (*Mdn* = 18%). For additional information on the CBSA characteristics in which the community colleges in the analytic sample are located, see Appendix Exhibit B2.

[5] Operationalized using the IPEDS institutional category variable (INSTCAT), specifically values 3 ("Degree-granting, not primarily baccalaureate or above") and 4 ("Degree-granting, associate's and certificates"). Non-degree-granting institutions (i.e., those that do not offer at least an associate's degree) were not included.

[6] Among the 1,017 U.S. postsecondary institutions that met the baseline inclusion criteria based on the IPEDS INSTCAT variable, 125 (12%) were located outside a CBSA and therefore excluded from the analytic sample.

Analytic Approaches

This study interrogates the value of U.S. community colleges in terms of their students' earnings 10 years after initial enrollment. We operationalized economic value by calculating the difference in earnings—both in nominal dollar value and percent difference—relative to two CBSA-referenced value thresholds examined in this study: the minimum economic return threshold, or T0, and the earnings premium threshold, or T1.[7] Exhibit 2 describes how both economic value thresholds were operationalized for this analysis. Thresholds were calculated by institution, and closely mirror the methodology advanced by the Postsecondary Value Commission (2021) and included in IHEP's EVE data tool (Postsecondary Value Commission, 2023).

Exhibit 2. Economic Value Thresholds Tested in This Study

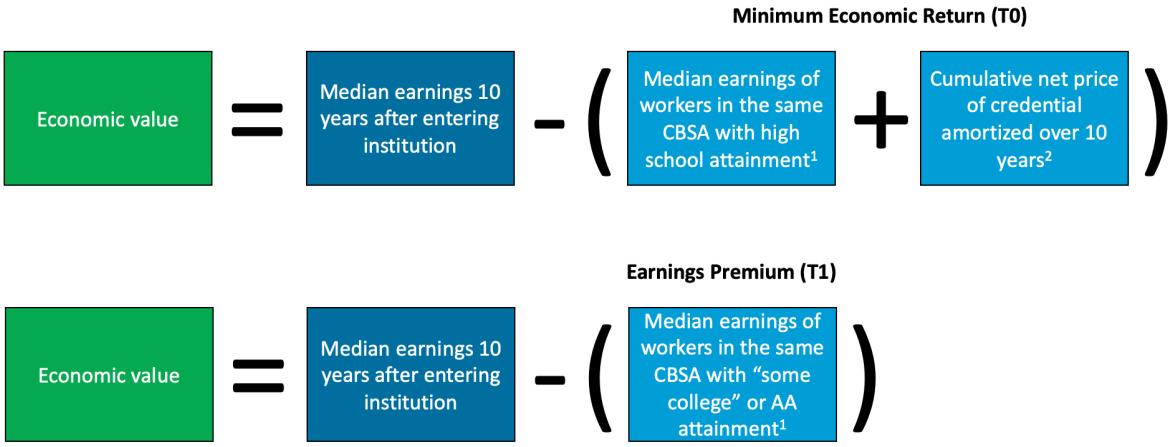
Threshold	Description
Minimum Economic Return (T0)	Median annual earnings of workers with positive earnings in the same CBSA in which the institution is located and with a high school degree (or GED) as their highest level of educational attainment, plus the yearly amortized total cost of obtaining the credential.
Earnings Premium (T1)	Median annual earnings of workers with positive earnings in the same CBSA in which the institution is located and with "some college" or an associate's degree as their highest level of educational attainment.

[1] Due to data limitations when attempting to use the Integrated Public Use Microdata Series (IPUMS) microdata samples, namely missingness of demographic and educational attainment measures in smaller CBSAs, we opted to use the National Historical Geographic Information System (NHGIS) as our data source for American Community Survey (ACS) data. While the NHGIS provides educational attainment estimates by CBSA, "some college" and associate's degrees are aggregated to the same attainment category, unlike IPUMS microdata. Therefore, our measure for T1 differs slightly from the methodology in IHEP's EVE data tool.

The economic value thresholds (i.e., T0, T1) were subtracted from students' median earnings to calculate measures of economic value by institution (Exhibit 3). Note that earnings apply to all students 10 years after initial enrollment who are employed and no longer enrolled regardless of educational attainment at the community college. Earnings greater than the economic value thresholds tested yielded positive economic values, and vice versa.

[7] The PVF also includes two additional economic value thresholds: Earnings Parity (T2) and Earnings Mobility (T3). Given the scope of this study and data limitations with publicly available sources, this study focuses only on T0 and T1. For example, T2 assesses earnings parity between individuals by race/ethnicity, gender, and income. However, College Scorecard earnings data are not disaggregated by race/ethnicity, and only average earnings (not median) are available by gender and income.

Exhibit 3. Economic Value Calculation, by Economic Value Threshold



[1] Earnings by attainment level is specified by CBSA.

[2] Cumulative net price is amortized over a 10-year period to account for the total cost of the credential, including estimated student loan interest. This value was derived by IHEP and is specified by institution.

Note. CBSA = core-based statistical area. AA = associate's degree.

With the economic value measures calculated, we then conducted descriptive analyses including summary statistics (e.g., percentile distribution) to understand how economic value varied across U.S. community colleges and by economic value threshold tested. We extended our univariate analysis of economic value measures by assessing the relationships between these measures and institution-level and community-level characteristics.

First, we categorized U.S. community colleges into three groups based on their economic value: 1) negative value (median earnings less than economic value threshold); 2) moderate value (median earnings between 0 and 9.9% above economic value threshold); and 3) large value (median earnings 10% or more above economic value threshold).[8] Based on these three institutional groups, we examined descriptively how institutional and community characteristics varied. Second, we modeled economic value (dependent variable) within a regression framework, using both institution-level and CBSA-level characteristics as covariates. Given the nested nature of institutions within CBSAs, we employed a linear mixed model to account for clustering. For additional details on the model framework and specification, see Appendix A.

Limitations

Findings from this study should be interpreted through the lens of its limitations. First, the data used are aggregated at the institution and community levels, and do not reflect student-level experiences within higher education and workforce systems. Rather, they reflect institutions as

[8] Community colleges were first categorized based on their negative or positive economic value. Second, the subset of community colleges with a positive economic value were further divided to align roughly to the median positive economic value of 11%. The 10% cut point used to categorize high value from moderate value community colleges translates to approximately $3,700.

the unit of analysis and median earnings outcomes for a pooled cohort of students, in which individual students likely vary in their personal outcomes.

The research methods employed, namely descriptive and correlational analyses, cannot speak to the causal mechanisms that drive college attendees' long-term earnings outcomes. However, our findings can provide directional evidence as to the relationships between variables that may, in fact, impact community college students' earnings.

The data are timebound and limited to a snapshot of 10-year median earnings for a composite cohort of students who first entered their community college between academic years 2008–09 and 2009–10. Given the dynamic nature of the U.S. higher education system and broader macroeconomic trends, results from a past cohort of college entrants may not necessarily reflect current or future student cohorts. For example, the cohort of community college entrants in our earnings data aligns with the height of the Great Recession, which ushered in massive unemployment and long-term earnings losses (Greenstone & Looney, 2011).

Finally, this study examines only one aspect of the value higher education institutions can provide to students, namely individual earnings. The full range of benefits afforded by higher education extends beyond earnings and includes improved personal happiness (Assari, 2019), physical and mental health (Cutler & Lleras-Muney, 2006), and broader societal benefits such as voting and volunteering (Ma & Pender, 2023a). While this study can provide evidence regarding the earnings benefit of attending a community college, it does not address the many other documented benefits of higher education.

Findings

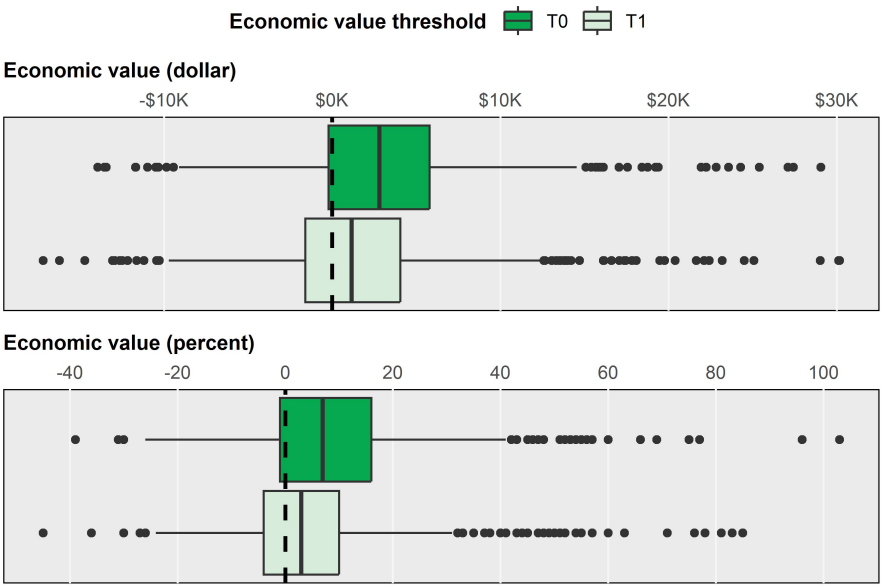
Most community colleges (n = 646, 75%) in our analytic sample demonstrated positive economic value when assessed against T0 (minimum economic return), with a median economic value of approximately $2,800, a 7% increase over workers with high school educational attainment, plus an estimate of students' college costs.

When assessing community colleges against the higher T1 (earnings premium), relative to workers with "some college" or associate's degree educational attainment, fewer institutions demonstrated positive economic value (n = 544, 63%). Community colleges had a more modest median economic value of approximately $1,200, a 3% increase over the T1 economic value

threshold (Exhibit 4).[9] This latter finding may be attributable, at least in part, to how T1 was specified in our study. A key limitation of the NHGIS data is that "some college" and associate's degrees are aggregated to the same attainment category, which likely confounds these two distinct attainment levels and deviates from the EVE data tool's methodology.[10] For this reason, for the correlation and regression analyses presented in this report, we focus on findings from the T0 economic value threshold.

Community colleges that provide positive economic value are observed throughout the country, though regional patterns emerge (Exhibit 5). For example, community colleges in the Plains[11] (n = 79) as a group have the highest median economic value (16%) when measured against T0 (minimum economic return), followed by community colleges in the Southwest[12] (n = 103), with a median economic value of 15%. In contrast, community colleges in New England[13] (n = 41) have the lowest median economic value (-2%).

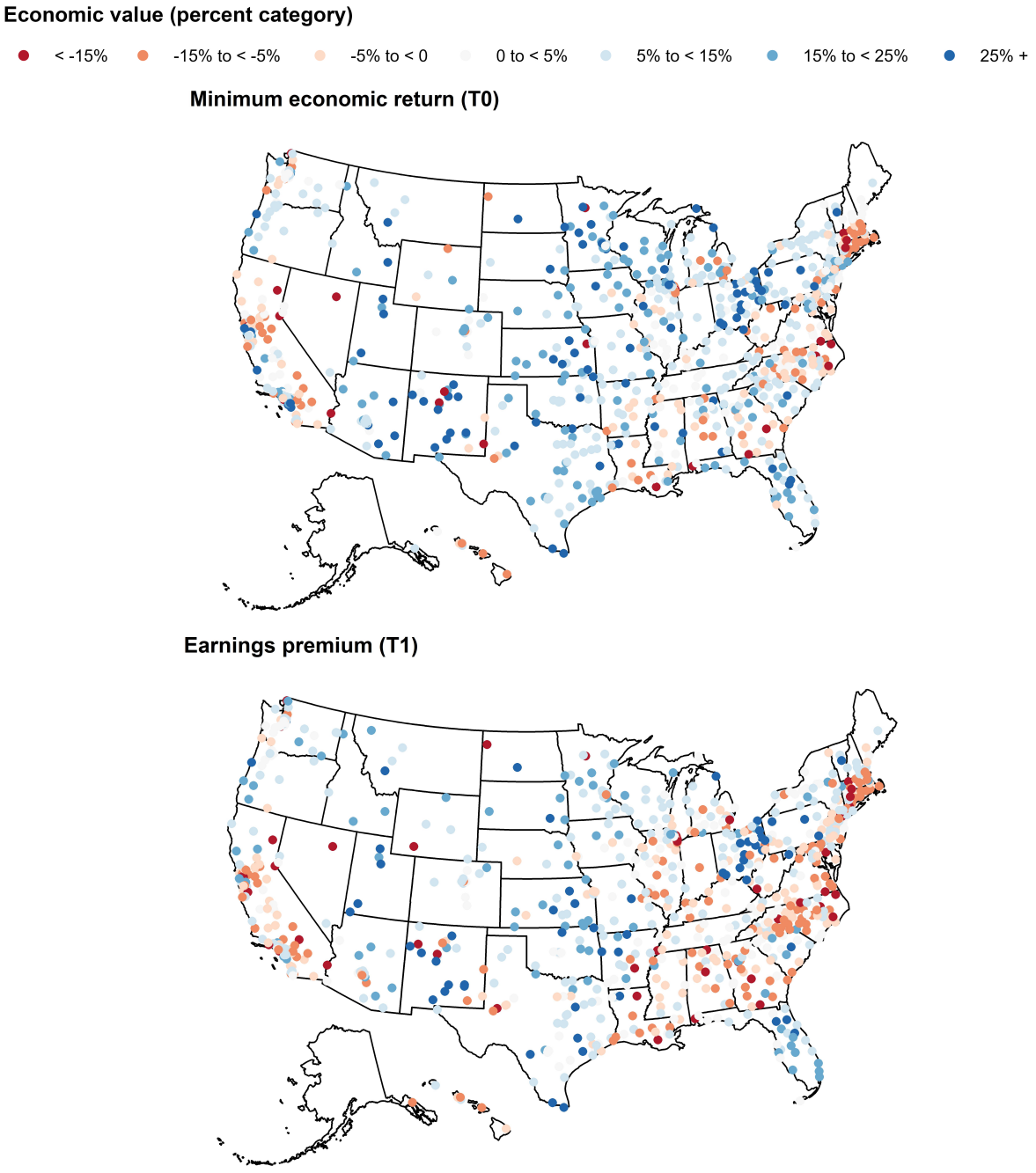
Exhibit 4. Distribution of Economic Value (Dollar and Percent), by Economic Value Threshold



Source. Analytic data file created by AIR (2023). See Appendix A for additional details.
Note. K = thousand. IHEP's EVE data tool reports earnings variables in dollars adjusted to real 2022 dollars using the Consumer Price Index for All Urban Consumers.

[9] CBSA-referenced economic value thresholds appear to differ from the state-referenced thresholds used in the EVE data tool. For example, 91% and 55% of community colleges in our sample would meet the T0 and T1 thresholds, respectively, if using EVE state-referenced earnings thresholds.
[10] Because certificate holders and associate's degree holders are aggregated to the same attainment category in our data set, it would not be statistically sound to apply the 0.89 adjustment for primarily certificate-granting institutions, as is the methodology used in the EVE data tool. The 0.89 factor is the approximate proportional difference in earnings between those with certificates versus associate's degrees, measured in the Survey of Income and Program Participation by the Georgetown Center for Education and the Workforce and later applied in the original EVE data tool.
[11] States include Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.
[12] States include Arizona, New Mexico, Oklahoma, and Texas.
[13] States include Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

Exhibit 5. Economic Value (Percent Category), by Economic Value Threshold and Community College



Source. Analytic data file created by AIR (2023).

Note. Each dot represents a community college in the analytic sample (N = 864). In IPEDS, a postsecondary institution is assigned geographic coordinates (i.e., latitude and longitude) based on the physical address it reports when registering for the annual data collection. In some cases, an IPEDS reporting institution may reflect the main campus in addition to branch or satellite campuses or a central administrative office for a coordinated system of institutions (e.g., Ivy Tech Community College in Indiana). Therefore, the assigned geographic coordinates may not reflect all unique campus locations.

When categorizing community colleges by their estimated economic value (i.e., negative, moderate, and large value) based on the T0 economic value threshold, we find significant between-group differences in their institutional and community characteristics (Exhibit 6). Community colleges that offer a baccalaureate program are more likely to demonstrate greater economic value.[14] For example, 28% of the community colleges in the large value group offered a baccalaureate program, compared to 16% in the moderate value group and 9% in the negative value group.

Institutions' enrollment size and demographics also vary substantially across levels of economic value. Community colleges in the negative value group have substantially lower 12-month undergraduate enrollment (*Mdn* = 5,825) compared to institutions in the moderate value and large value groups, each with median enrollment counts of more than 7,000 students. Community colleges that enroll larger shares of adult learners, women, students from historically underrepresented racial/ethnic groups, and Pell Grant recipients (a proxy for low-income background) are more likely to appear in the negative value group.

There are also subtle yet significant differences in the median 4-year completion rate and percentage of full-time faculty/instructional staff across groups; both variables are positively associated with greater economic value. In contrast, the percentage of undergraduate awards that are certificates (as opposed to associate's or bachelor's degrees) and the percentage of awards in a STEM discipline are not significantly different across the three categorized institutional groups.

External to the community college, we find that some CBSA-level characteristics also vary substantially based on measures of institutional economic value. CBSAs with smaller total population and relatedly lower population density are more likely to demonstrate greater economic value. The racial/ethnic and immigrant composition of the community also appears to be related to community colleges' economic value. Greater population shares of White individuals are positively associated with economic value, whereas greater shares of Black or African American and foreign-born individuals are negatively associated with economic value. The distribution of the labor force within the five industries we examined is not significantly different across the three categorized institutional groups.

[14] This finding does not speak to the number or field of study of baccalaureate programs offered. These constructs are addressed with the "Percent undergraduate awards that are certificates" and "Percent undergraduate awards in STEM" variables.

Exhibit 6. Institutional and CBSA Characteristics, by Minimum Economic Return (T0) Category (N = 864)

Characteristic	Negative value (n = 218)[1]	Moderate value 0 to < 10% (n = 276)[1]	Large value 10% + (n = 370)[1]	Significance[2]
Institutional characteristics				
Offers baccalaureate program	19 (9%)	44 (16%)	103 (28%)	***
Number of 4-year institutions within 25 miles	3	3	2	*
Total 12-month enrollment	5,825	7,244	7,121	*
Percent women	62	60	59	***
Percent underrepresented minority	40	26	26	***
Percent Pell Grant recipient	50	51	48	**
Percent age 25 or older	34	30	28	***
Percent degree/certificate-seeking	78	70	71	***
Percent earn award within 4 years	21	23	23	***
Percent undergraduate awards that are certificates	33	37	34	
Percent undergraduate awards in STEM	8	9	9	
Percent full-time faculty	37	37	39	*
CBSA characteristics				
Total population	631,436	499,594	289,640	*
Population density (per square mile)	300	234	162	**
Unemployment rate	6	5	5	***
Poverty rate	9	9	9	
Bachelor's attainment rate	31	32	29	
Percent female	51	51	50	***
Population by race/ethnicity				
Percent White (non-Hispanic)	75	81	83	***
Percent Hispanic (any race)	11	10	11	
Percent Black (non-Hispanic)	9	9	7	***

Characteristic	Negative value (n = 218)[1]	Moderate value 0 to < 10% (n = 276)[1]	Large value 10% + (n = 370)[1]	Significance[2]
Percent American Indian or Alaska Native (non-Hispanic)	1	1	1	
Percent foreign born	9	7	7	**
Employment shares by industry				
Percent healthcare	17	17	17	
Percent manufacturing	9	9	9	
Percent construction	5	5	5	
Percent technology	5	5	5	
Percent transportation	4	4	4	

[1] n (%); median

[2] *p<0.05; **p<0.01; ***p<0.001. Tests for statistical significance include the Wilcoxon rank sum test for median equivalence and Pearson's Chi-squared test for distribution of categorical variables.

Source. Analytic data file created by AIR (2023). See Appendix A for additional details.

Note. IQR = interquartile range. STEM = science, technology, engineering, and math. Column detail may not sum to 100% due to rounding. One observation has a missing value for the age variable, three observations have a missing value for full-time faculty variable, and 12 observations have a missing value for percentage of awards in STEM.

When modeling economic value as a quantitative dependent variable within a regression framework (as opposed to categorizing institutions into groups based on broad economic value ranges), our initial descriptive findings are largely corroborated. Regression results (Exhibit 7) confirm that community colleges that offer a baccalaureate program are significantly more likely to demonstrate greater economic value than those that do not offer a program at this level. In addition, having more 4-year institutions within a 25-mile radius of the community college is positively associated with economic value.

Regression results reinforce the finding that community colleges' enrollment size and demographics are associated with their estimated economic value. Specifically, larger institutions by enrollment are likely to provide greater economic value. In contrast, larger enrollment shares of adult learners, women, students of color, and Pell Grant recipients are negatively associated with economic value. A community college's overall 4-year completion rate continues to be positively associated with economic value. Unlike our descriptive results, the percentage of full-time faculty/instructional staff does not appear to be associated with community colleges' economic value when accounting for other institutional characteristics.

CBSA-level predictors remain relevant in terms of explaining variation in community colleges' economic value. Community-level bachelor's degree or higher attainment rates are positively associated with economic value. And unlike our descriptive findings, regression results suggest that larger shares of employment within the healthcare and manufacturing industries are associated with increased economic value. The percentages of Black or African American and foreign-born individuals within communities remain negative predictors of economic value.

Exhibit 7. Summary of Regression Results Predicting Economic Value (Percent) for Minimum Economic Return (T0)

Variable Level	Significant Positive Predictor	Significant Negative Predictor	Not Significant Predictor
Institution-level predictor	• Offers baccalaureate program*** • Number of 4-year institutions within 25 miles* • Total 12-month enrollment** • Percent earning award within 4 years*	• Percent women*** • Percent underrepresented minority*** • Percent Pell Grant recipient** • Percent age 25 and older***	• Percent degree/certificate-seeking • Percent undergraduate awards in STEM • Percent full-time faculty
CBSA-level predictor	• Poverty rate*** • Percent bachelor's or higher attainment*** • Percent Hispanic*** • Percent healthcare** • Percent manufacturing**	• Percent foreign born*** • Percent White* • Percent Black**	• Population density • Percent female • Unemployment rate

Source. Analytic data file created by AIR (2023). See Appendix A for additional details.
Note. *p<0.05; **p<0.01; ***p<0.001. One observation has a missing value for the age variable, three observations have a missing value for full-time faculty variable, and 12 observations have a missing value for percentage of awards in STEM. These missing values were imputed with median sample value. See Appendix Exhibit A3 for full regression results.

Discussion and Recommendations

Most community colleges in our analytic sample demonstrate positive economic value for their students, operationalized as greater annual earnings compared to working adults who hold only a high school diploma (or equivalent) even when accounting for the estimated cost of a postsecondary credential. This finding aligns with the broader research literature that consistently finds that increasing levels of educational attainment are positively associated with earnings premiums (Autor, 2014; Ma & Pender, 2023b), even for community college attendees who do not complete a degree (Marcotte, 2019). Our findings signal a clear value proposition for students to invest in education and training after high school, particularly for those who complete a credential.

Community colleges that serve larger shares of women, Pell Grant recipients, students from historically underrepresented racial/ethnic groups, and adult learners demonstrate lower levels of economic value. While this finding is supported by prior literature, community colleges are confronted with living up to their open access and community-oriented missions while also educating student populations that experience earnings penalties in the labor market. Our correlational analyses of aggregate data do not suggest a causal relationship between community college attendance and lower earnings for marginalized student populations. Lower earnings for specific student populations may be attributable to differences in their programs of study (Carnevale et al., 2014), the likelihood of program completion (Zhou & Pan, 2023), and even hiring discrimination for community college attendees (Zhu, 2023). Community colleges should be cognizant of the differences in earnings outcomes for their diverse student populations when developing and administering academic and career services. Example practices could include creating equitable pathways into the institution's financially lucrative academic programs (e.g., nursing, engineering technologies) and providing culturally responsive career advising to help students be more resilient and self-advocating in job search and hiring processes.

Community colleges that offer a baccalaureate program and/or are located within proximity to a 4-year college or university demonstrate greater increased economic value. This finding suggests that creating clear pathways for community college students to attain a bachelor's degree can improve their earnings, likely due to greater educational attainment. According to the American Association of Community Colleges (2023), public community colleges produced more than 25,000 bachelor's degrees in 2020–21. Research suggests that offering a baccalaureate program at a community college can lead to modest enrollment increases for these institutions (Wright-Kim, 2022), which may help counteract overall long-term enrollment declines within this sector (National Student Clearinghouse Research Center, 2023). Community

colleges may consider the adoption of in-demand bachelor's degree programs and/or enhance partnerships with nearby 4-year institutions to improve the ease with which students can transfer.

Our findings also suggest that community context matters. The finding that increased bachelor's degree or higher attainment is positively associated with community colleges' economic value suggests that areas with greater educational attainment may create more economic opportunity for their residents. Economic value may be enhanced directly by offering additional postsecondary education and training or indirectly via "knowledge spillover," in which highly productive individuals share their knowledge and skills and thereby increase local economic activity and wages (Norris, 2015).

In addition, larger shares of employment in healthcare and manufacturing fields are positively associated with economic value. Community colleges can play a vital economic role in their labor markets, namely by preparing high school graduates with shorter term sub-baccalaureate credentials that are more responsive to local industry needs (D'Amico et al., 2019). Institutions should consider local labor market conditions, specifically in-demand industries and jobs that pay a family-sustaining wage, when developing programs and advising students on programs of study. For example, research finds earnings premiums for health-related sub-baccalaureate credentials across all U.S. states, particularly for programs that are more vocationally focused rather than academically focused (Belfield & Bailey, 2017). Advanced manufacturing is another promising industry for which community colleges can provide workforce training, creating more employment opportunities for first-time college students as well as second-career individuals seeking to upskill (Javdekar et al., 2016).

This study adopted the Postsecondary Value Commission's framework for measuring economic value. While our findings provide a national perspective on one aspect of value community colleges provide, additional studies using student-level data likely will yield even greater insights. Leveraging administrative postsecondary and workforce data reported at the student level can better speak to individual experiences, rather than aggregate institutional outcomes. With student-level data, between-group differences by race/ethnicity and other measures of social disadvantage (e.g., first generation, English learner) can more thoroughly interrogate equity concerns in postsecondary and workforce outcomes.

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Appendix A. Technical Details

Data Sources and Variable Construction

This section provides additional details regarding the data sources used to compile our analytic data set and the variable constructs selected. The proprietary data file created by IHEP and shared with AIR included measures of students' median earnings (originally from College Scorecard) and amortized net price estimates for attaining a credential at each community college (derived by IHEP). We used these data elements in combination with newly defined CBSA-referenced economic value thresholds by attainment level to calculate economic value (dependent variable).

The following table lists the data sources and key variables used in our analysis.

Exhibit A1. Data Sources and Key Variables

Data Source	Key Variables	Description
Equitable Value Explorer	Median earnings	Students' median earnings 10 years after entering the institution.[1]
	Cost of credential	Average cumulative net price of credential, after accounting for grant aid.
	Amortized cumulative net price	Cumulative net price of credential, amortized over a 10-year period that includes estimated student loan interest accrual.
Integrated Postsecondary Education Data System	Institutional size	Total 12-month unduplicated headcount enrollment (July 1 through June 30).
	Percent Pell Grant recipients	Percentage of entering degree/certificate-seeking cohorts who received a federal Pell Grant at entry.
	Percent historically underrepresented racial/ethnic minority	Percentage of 12-month unduplicated headcount enrollment consisting of students who are Black or African American, Hispanic, and American Indian or Alaska Native.
	Percent women	Percentage of 12-month unduplicated headcount enrollment consisting of students who are women.
	Percent degree/certificate-seeking	Percentage of 12-month unduplicated headcount enrollment consisting of students who are degree/certificate-seeking.

Data Source	Key Variables	Description
	Percent certificates	Percentage of total annual undergraduate postsecondary credentials (i.e., certificate, associate's, bachelor's) awarded by the institution that are certificates.
	Percent STEM credentials	Percentage of total annual undergraduate postsecondary credentials (i.e., certificate, associate's, bachelor's) awarded by the institution that are within the fields of science, technology, engineering, and math (STEM).
	Percent full-time faculty	Percentage of faculty and instructional staff who are employed at a full-time status.
	Number of nearby 4-year institutions	Number of 4-year colleges and universities (public, nonprofit, and for-profit) within a 25-mile radius of the community college. Institutions include those classified as "degree-granting, primarily baccalaureate," do not deliver all course via distance education (e.g., online university), and enrolled at least 100 undergraduates in 2021–22.
American Community Survey	Population	Estimated total population within a given CBSA during the 5-year measurement period.
	Median household income	Median annual income of all households within the CBSA.
	Poverty rate	Percentage of the total population in the CBSA living below the federally defined poverty line.
	Percent female	Percentage of the total CBSA population that identifies as female.
	Percent race/ethnicity	Percentage of the total CBSA population that is Black or African American, Hispanic, American Indian or Alaska Native, and all other collected racial/ethnic categories.
	Percent foreign born	Percentage of the total CBSA population that is foreign born.
	Bachelor's or higher attainment rate	Percentage of the CBSA population age 25 or older holding a bachelor's degree or higher.
	Population density	Total population of the CBSA divided by its area in square miles.
County Business Patterns	Employment shares by industry	Percentage of the CBSA labor force employed in the healthcare, construction, manufacturing, transportation and warehousing, or technical services sectors.
Bureau of Labor Statistics	Unemployment rate	Percentage of the labor force in the CBSA that is unemployed and actively seeking employment.

[1] IHEP retrieved this variable from the College Scorecard data file. See: https://collegescorecard.ed.gov/data/

Institutional characteristics were retrieved from IPEDS data files, specific to the relevant survey component (e.g., enrollment demographics from the 12-month Enrollment component). Values reflect 3-year rolling averages for the three most recent data years available at the time of data set construction, typically reflecting academic years 2020–21 to 2022–23. We used rolling averages to temper volatility in the data, particularly for institutions with small enrollments and due to the effects of the COVID-19 pandemic, which likely produced deviations in variables that typically demonstrate stable trends.

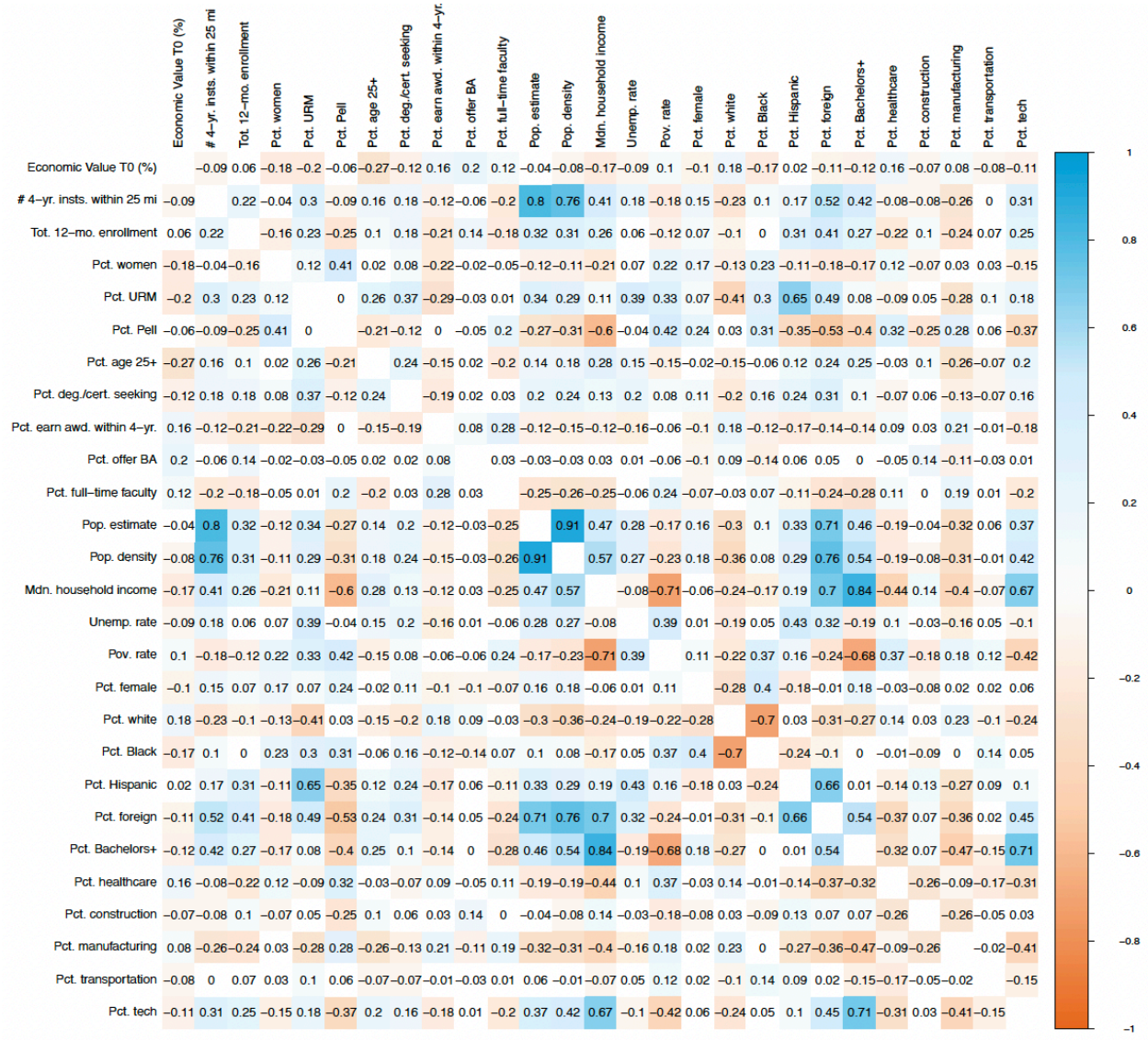
We also used 3-year rolling averages for CBSA characteristics, reflecting years 2019 through 2021. This helped moderate any factors likely to be inflated during the COVID-19 pandemic, such as unemployment and poverty rates.

Correlation and Regression Analysis

This section includes additional details about the correlations between the primary outcome variable (i.e., economic value using the T0 threshold) and predictor variables, as well as full model specification and regression results.

The following exhibit presents a correlation matrix for the key quantitative variables used in our analysis.

Exhibit A2. Correlation Matrix of Key Variables in Regression Analysis



Source. Analytic data file created by AIR (2023).

To estimate the effects of various institutional characteristics and other demographic and economic CBSA characteristics, we specify a mixed-effects regression model. This type of model is best suited for when there is some form of clustering or grouping in the data that might affect the outcome. In this case, we allow the model intercept to vary across CBSAs, thus treating the CBSA as a random effect to account for the non-independence of observations within these clusters. A simplified equation for this specification is:

$$Y_i = \beta_{0_j} + X_i\beta + \epsilon_{ij}$$

where i represents each community college and j represents a unique CBSA. The mixed-effects aspect of this model is represented by the random intercept (β_{0_j}), which is allowed to vary for each level of j to account for non-independence between colleges within the same CBSA. X contains a vector of the covariates (e.g., total 12-month enrollment, CBSA-level poverty rate) that are fixed effects.

The following exhibit presents the regression results for predicting community colleges' economic value when assessed for minimum economic return (T0).

Exhibit A3. Regression Results Predicting Economic Value (Percent) for Minimum Economic Return (T0)

	Estimate	Std. Error	Significance
Institutional characteristics			
Offers baccalaureate program	0.18	0.03	***
Number of 4-year institutions within 25 miles	0.11	0.05	*
Total 12-month enrollment	0.11	0.03	**
Percent women	-0.12	0.03	***
Percent underrepresented minority	-0.33	0.06	***
Percent Pell Grant recipient	-0.15	0.05	**
Percent age 25 and older	-0.19	0.03	***
Percent degree/certificate-seeking	0.02	0.03	
Percent earn award within 4 years	0.08	0.03	*
Percent undergraduate awards in STEM	-0.02	0.03	
Percent faculty/instructional staff that are full time	0.02	0.03	
CBSA characteristics			
Population per square mile	0.09	0.11	
Unemployment rate	-0.08	0.04	
Poverty rate	0.33	0.07	***
Percent female	-0.03	0.04	
Percent White	-0.15	0.07	*
Percent Black or African American	-0.17	0.07	**
Percent Hispanic	0.46	0.09	***
Percent foreign born	-0.55	0.12	***

	Estimate	Std. Error	Significance
Percent bachelor's or higher attainment	0.29	0.08	***
Percent healthcare	0.16	0.04	***
Percent manufacturing	0.12	0.04	**
Intercept	-0.04	0.05	
Random Effects	***Variance***	***Std. Dev***	
CBSA	0.35	0.59	
Residual	0.45	0.67	
Observations: 864 **Groups (CBSAs): 516** **REML criterion at convergence: 2,214** **Mean VIF: 2.34**			

Source. Analytic data file created by AIR (2023).

Note. Covariates are scaled for interpretability. *p<0.05; **p<0.01; ***p<0.001

Appendix B: Supplemental Analysis

Descriptive Summary Tables

The following tables provide summary statistics for the institutional characteristics of the community colleges in the analytic sample (Exhibit B1) and the CBSA characteristics in which the community colleges are located (Exhibit B2). A total of 864 community colleges in our analytic sample are located in 516 different CBSAs.

Exhibit B1. Institutional Characteristics of Community Colleges in Analytic Sample (N = 864)

Characteristic	n (%); Median (IQR)
Region	
Southeast	237 (27%)
Far West	169 (20%)
Great Lakes	121 (14%)
Southwest	103 (12%)
Mid East	86 (10%)
Plains	79 (9.1%)
New England	41 (4.7%)
Rocky Mountains	28 (3.2%)
Locale	
City	315 (36%)
Suburb	199 (23%)
Town	182 (21%)
Rural	168 (19%)
Offers baccalaureate program	166 (19%)
Carnegie Classification Basic	
Associate's Colleges	729 (84%)
Baccalaureate/Associate's Colleges	116 (13%)
Tribal Colleges	8 (0.9%)
Master's Colleges & Universities	6 (0.7%)

Characteristic	n (%); Median (IQR)
Special Focus Two-Year	3 (0.3%)
Baccalaureate Colleges	2 (0.2%)
Calendar system	
Semester	804 (93%)
Quarter	54 (6.3%)
Other	6 (0.7%)
Open admission policy	
Open admission	848 (98%)
Not open admission	16 (1.9%)
Number of 4-year institutions within 25 miles	3 (1, 9)
Total 12-month enrollment	6,787 (3,436, 12,821)
Percent women	60 (57, 63)
Percent underrepresented minority	30 (17, 46)
Percent Pell Grant recipient	50 (38, 59)
Percent age 25 and older	30 (23, 36)
Percent degree/certificate-seeking	72 (61, 82)
Percent earn award within 4 years	23 (17, 30)
Percent undergraduate awards that are certificates	34 (18, 51)
Percent undergraduate awards in STEM	8 (5, 13)
Percent faculty/instructional staff that are full time	38 (29, 47)

Source. Analytic data file created by AIR (2023).
Note. IQR = interquartile range. STEM = science, technology, engineering, and math. Column detail may not sum to 100% due to rounding. One observation has a missing value for the age variable, three observations have a missing value for full-time faculty variable, and 12 observations have a missing value for percentage of awards in STEM.

Exhibit B2. CBSA Characteristics of Community Colleges in Analytic Sample (N = 516)

Characteristic	Median (IQR)
Total population	140,005 (60,935, 408,190)
Population density (per square mile)	132 (54, 268)
Median household income	55,775 (49,010, 63,167)
Unemployment rate	5 (5, 6)
Poverty rate	10 (8, 12)
Bachelor's attainment rate[1]	24 (19, 32)
Percent female[2]	50 (50, 51)
Population by race/ethnicity[2]	
Percent White (non-Hispanic)	86 (75, 91)
Percent Hispanic (any race)	8 (4, 16)
Percent Black (non-Hispanic)	6 (2, 16)
Percent American Indian or Alaska Native (non-Hispanic)	1 (0, 2)
Percent foreign born[2]	5 (3, 9)
Employment shares by industry[3]	
Percent healthcare	18 (16, 21)
Percent manufacturing	11 (7, 18)
Percent construction	5 (4, 6)
Percent technology	4 (3, 5)
Percent transportation	3 (2, 5)

[1] Represented as a share of CBSA population age 25 and older.

[2] Represented as a share of total CBSA population.

[3] Represented as a share of all employees in the CBSA.

Source. Analytic data file created by AIR (2023).

Note. CBSA = core-based statistical area. IQR = interquartile range.

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