

Understanding Changes in Bachelor's Degree Attainment: A County-Level Analysis from 2005 to 2019¹

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ABSTRACT

This research examines the relationship between prior levels of college enrollment and educational attainment on changes in bachelor's degree attainment from 2005 to 2019 using data from the American Community Survey 5-year datasets. Descriptive evidence shows that counties with high levels of growth in bachelor's degree attainment had larger populations and higher levels of college enrollment than low-growth counties. Results from OLS regression models show a positive relationship between both college enrollment and bachelor's degree attainment rates in 2005-2009 and growth in bachelor's degree attainment from 2005-2009 to 2015-2019. This paper provides a detailed understanding of educational attainment in the United States and identifies characteristics associated with increases in educational attainment among counties.

¹ The U.S. Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release. CBDRB-FY23-POP001-0124.

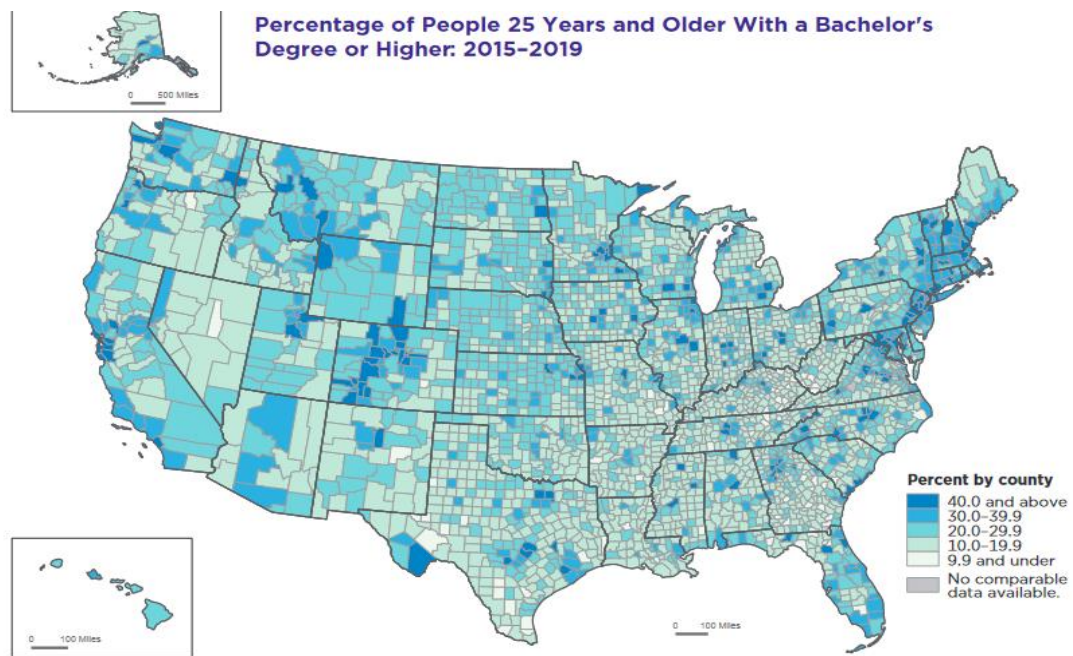
INTRODUCTION

The Great Recession in 2008 and the aftermath caused an economic shock throughout the world, leading to adverse labor market conditions that disproportionately affected young adults starting their careers. In the years that immediately followed the recession, college enrollment increased in the United States (Schmidt 2017). Previous research shows that people looked to weather harsh job markets and expand their human capital via college enrollment during this period (Barr and Turner 2015). Now, more than a decade past the recession, how have patterns of educational attainment shifted across the country?

The post-recession boom in college enrollment expanded educational attainment to current levels. Bachelor's degree attainment has increased by nearly 5 percentage points nationally since 2009 (McElrath and Martin 2021).² National growth in bachelor's degree attainment obscures significant variation in smaller geographies; for example, counties have experienced a wide array of patterns of growth during this time. (McElrath and Martin 2021). As the reproduced figure below shows, high levels of educational attainment are seen in the Northeast, in counties containing 'college towns' such as State College, PA, as well as in metropolitan areas such as Atlanta, GA. This paper seeks to further explore this variation.

² Note: The brief specified uses American Community Survey 5-year datasets, so this growth occurred between the 2005-2009 and 2015-2019 files. When referring to 'bachelor's degree attainment,' we include individuals with a bachelor's degree or higher.

Figure 1: Educational Attainment by County 2015-2019



Notes: Due to the county boundary changes that occurred within the 2005-2009 and 2010-2019 time periods, the following county equivalents appear in the "No comparable data available" category: Petersburg, Alaska; Prince of Wales-Hyder, Alaska; Hoonah-Angoon, Alaska; Bedford, Virginia; and Bedford city, Virginia.
For more information, see <www.census.gov/acs>.
Source: U.S. Census Bureau, Table S1501, 2010-2014 American Community Survey, 5-year estimates.

In this paper, we seek to expand on [previous work at the Census Bureau](#) and examine the factors associated with growth in bachelor's degree attainment across counties between 2005-2009 and 2015-2019 using data from the American Community Survey (ACS). We focus on identifying common characteristics of counties with relatively high growth in bachelor's degree attainment. We establish that both levels of college enrollment in a county and previous levels of bachelor's degree attainment in 2005-2009 are key in determining growth in bachelor's degree attainment over this period.

LITERATURE REVIEW AND HYPOTHESES

Previous Levels of Educational Attainment

Previous research indicates several factors may determine the level of growth that a county experiences in educational attainment. Firstly, counties that begin the period of transition with higher levels of attainment have been linked to higher levels of growth over that span. Table 1 below is reproduced from a recently released ACS brief and shows the average percentage-point change in bachelor's degree attainment from 2005-2009 to 2015-2019. Counties with higher levels of educational attainment (attainment above the mean county attainment) in the 2005-2009 five-year ACS data had higher levels of growth in bachelor's degrees than counties with attainment below the mean county attainment over the same period.

Table 1.

Average Percentage of the Population 25 Years and Over With a Bachelor’s Degree or Higher by County Type and Region

Characteristic	Number of counties	Mean percent with a bachelor’s degree or higher						Mean percentage-point change, 2005–2009 to 2015–2019		Percent with no significant change or significant decrease	Percent with significant increase
		2005–2009		2010–2014		2015–2019		Difference	Margin of error (±) ⁴		
		Estimate	Margin of error (±) ⁴	Estimate	Margin of error (±) ⁴	Estimate	Margin of error (±) ⁴				
National¹	3,138	18.7	0.1	20.1	0.1	22.0	0.1	3.3	0.1	42.3	57.7
Below mean in 2005–2009 ²	1,921	13.5	0.1	14.9	0.1	16.5	0.1	3.0	0.1	50.2	49.8
Above mean in 2005–2009 ³	1,217	26.9	0.2	28.3	0.1	30.6	0.1	3.8	0.2	21.4	78.6
Northeast	217	25.6	0.1	27.3	0.1	29.8	0.1	4.2	0.1	9.2	90.8
Midwest	1,055	18.4	0.1	19.9	0.1	21.9	0.1	3.6	0.1	39.1	60.9
South	1,421	16.8	0.1	18.1	0.1	19.7	0.1	3.0	0.1	46.5	53.5
West	445	22.3	0.3	23.5	0.1	25.4	0.1	3.1	0.4	52.8	47.2

¹Due to the county boundary changes that occurred within the 2005–2009 and 2010–2019 periods, the following county equivalents have been excluded from this table: Petersburg, Alaska; Prince of Wales-Hyder, Alaska; Hoonah-Angoon, Alaska; Bedford, Virginia; and Bedford city, Virginia.

²This category refers to all counties that were below the mean percent with a bachelor’s degree or higher of 18.7 in 2005–2009.

³This category refers to all counties that were above the mean percent with a bachelor’s degree or higher of 18.7 in 2005–2009.

⁴Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is at 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error. The effect of nonsampling error is not represented in this table.

Source: U.S. Census Bureau, 2005–2009, 2010–2014, and 2015–2019 American Community Survey, publicly released 5-year estimates.

These data suggest that factors associated with high educational attainment in 2005-2009 may have also played a role in greater attainment growth over the following ten years. High attainment may serve as a proxy for a number of conditions that are attractive for bachelor’s degree holders when deciding where to live and work, such as preferable labor market conditions or warm weather. Net of these factors, high levels of educational attainment may also serve as a proxy for unmeasurables that push or pull bachelor’s degree holders to some places and not others.

Following these descriptive findings, this paper examines whether initial levels of educational attainment are associated with county-level growth in attainment over time when controlling for other factors.

H1: *Counties with higher levels of bachelor’s degree attainment in 2005-2009 experienced higher levels of growth in bachelor’s degree attainment from 2005-2009 to 2015-2019.*

College Enrollment

One potential determinant of both prior levels and growth of educational attainment is the level of college enrollment in a county. Along with producing higher attainment levels by educating the local population, colleges may contribute to local economic conditions and thus attract highly educated workers to move from other counties. Indeed, research shows that colleges themselves are engines of local economic development. (Andrews 2023; Conzelmann et

al. 2022). Moreover, researchers have exploited natural experiments to show that bachelor's degree attainment is considerably higher in counties with colleges compared to similar counties without colleges (Russell, Yu, and Andrews 2022). Another potential mechanism would be for students who attended the local college to settle in the area after completing college and thereby increase bachelor's degree attainment. In this scenario, settling in the area *could* be temporary as recent graduates plan their next steps, but we do not address that in this paper as ACS data are not suitable for that type of analysis. Together, these findings suggest that higher levels of college enrollment among 18-24-year-olds is a driver of growth in bachelor's degree attainment at the county level.

H2: *Higher levels of college enrollment are associated with higher levels of growth in bachelor's degree attainment in counties from 2005-2009 to 2015-2019.*

Other Factors

Beyond prior levels of educational attainment and college enrollment, a myriad of county characteristics may be associated with and contribute to county-level changes in bachelor's degree attainment. Characteristics that cause in- or out- migration differentially across education levels cause changes in counties' levels of educational attainment. For example, the structure of local labor markets -- such as the mix of industries, available job opportunities, and the employment rate -- can attract or push away workers of different education levels (Turner 2019). Counties with ample manufacturing jobs may attract people with lower levels of education, while areas with a large number of technology sector jobs may attract more workers with college degrees. Finally, collective preferences may also affect changes in counties' bachelor's degree attainment. People with bachelor's degrees are more geographically mobile than those with lower levels of education (Amior 2019) and thus may be better able (en masse) to relocate to areas based on preferences like weather and proximity to metropolitan areas.

DATA

Data for this project come from the ACS, a nationally representative annual survey that was first administered in 2005. Over 3 million households are sampled annually, with roughly 2 million final interviews. The size of this sample allows for reliable estimates to be produced for small geographies. Specifically, this paper utilizes the ACS 5-year datasets that pool observations across 5 years of survey collection. This allows us to provide estimates for all counties in the United States regardless of population. The 5-year datasets present pooled 5-year 'period' estimates that represent data collected over a period of time and provide improved statistical reliability for counties with small populations.

The educational attainment question on the ACS asks respondents to report their highest level of schooling completed and provides options from no schooling completed to an advanced degree, such as doctorate, JD, etc. These data allow us to examine reliable estimates for all counties across the United States from 2005-2009 to 2015-2019. To explore changes in educational attainment, we look at differences in counties' shares of bachelor's degree

attainment from 2005-2009 to 2015-2019 by subtracting the percentage of people within the county with bachelor's degrees or higher in 2015-2019 from the estimate for 2005-2009.

Most of our explanatory variables come from the ACS as well and, unless mentioned otherwise, come from the 2005-2009 data. College enrollment is measured as the percentage of 18-24-year-olds enrolled in college. Prior educational attainment rate is the percentage of people within a county with a bachelor's degree or higher in the 2005-2009 dataset. We include variables that may act as *pull* or *push factors* in specific counties for individuals with higher education, specifically median income and median rent. We also control for county race and Hispanic origin shares, measured as the percentage of adults who are Black alone, Asian alone, some other race, and Hispanic (of any race). Moreover, we also control for the percentage of a county that is female, the percentage of households in a county that rent their homes, and median age. Finally, we control for 'climate desirability' of a county by using average January temperature data from the Global Historical Climatology Network Daily datasets from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information.

METHODS

We perform both descriptive and multivariate regression analyses of the county-level growth in educational attainment. First, we explore the geography of attainment growth across the United States by using a county-level map of change in bachelor's degree attainment from 2005-2009 to 2015-2019. Then, we summarize differences between counties with relatively high levels of growth in bachelor's degree attainment and all other counties across our key independent variables. For the purposes of this paper, we define 'high-growth' counties as those that have bachelor's attainment growth of 5 percentage points or more from 2005-2009 to 2015-2019 and 'low growth' as all other counties including counties that declined or did not grow.

Second, we estimate ordinary least squares regression models of county-level attainment growth using ACS 5-year data. We estimate a set of OLS linear regressions of county-level growth in bachelor's degree attainment on prior levels of educational attainment, college enrollment, and county push and pull factors. These specifications are estimated as follows:

$$Y_i = \alpha + \beta_1 A_i + \beta_2 C_i + \beta_3 D_i + \epsilon_i$$

where Y_i is the 2005-2009 to 2015-2019 attainment growth in county i , A_i is the 2005-2009 bachelor's degree or higher attainment share, C_i is the share of 18-24-year-olds enrolled in college in 2005-2009, and D_i is a vector of push and pull factors. From this model, β_1 and β_2 are the two main coefficients of interest, measuring the county-level relationship between educational attainment growth and existing attainment and college enrollment, respectively. The coefficients β_3 measure which county characteristics were potential push and pull factors associated with higher or lower attainment growth.

Higher income, lower rents, and higher temperatures may all attract mobile and highly educated people to a county. However, with the exception of temperatures, these measures

themselves may also be a function of local attainment levels and in-migration. For instance, higher rents may be due to high demand for housing in these counties.

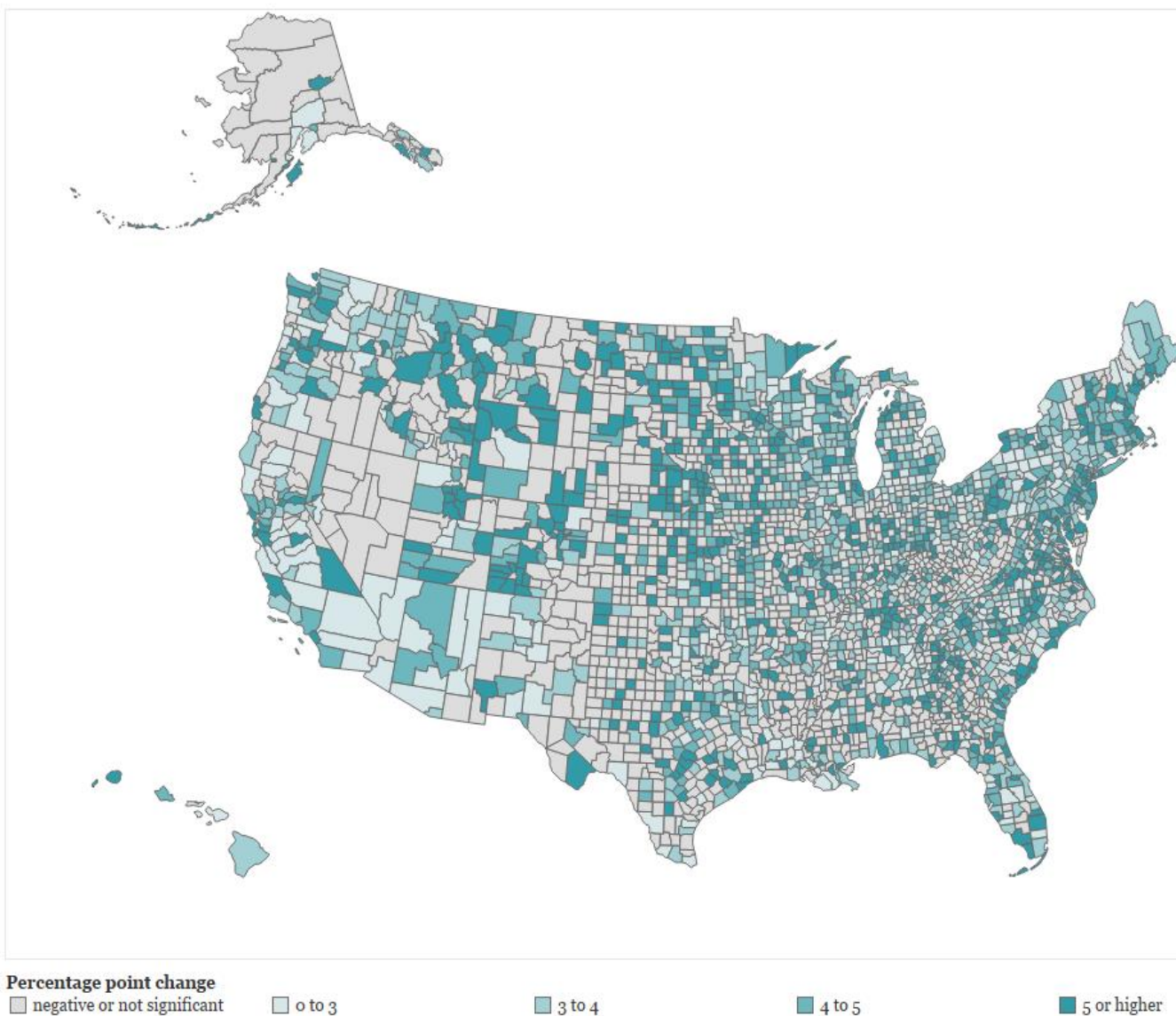
Third, to further explore the relationship between college enrollment and bachelor's degree attainment, we estimate an OLS regression model with counties' share of bachelor's degree holders that are young adults (age 18-34). This model aims to identify whether educational attainment increases in counties with higher levels of college enrollment due to large shares of recent graduates staying in the area after obtaining their degree.

RESULTS

Descriptive

Figure 2 displays a county-level map showing the percentage-point change in bachelor's degree attainment of the population 18 and over from the 2005-2009 to the 2015-2019 5-year ACS. For context, the national growth rate in bachelor's degree attainment over this period was 3.3 percentage points (McElrath and Martin 2021). High-growth counties (i.e. counties that grew at a rate of 5 percentage points or more) can be found across all regions of the United States. High growth was common in the Northeast region of the United States, particularly along the coast. Counties with low growth are found more frequently in rural areas of the country, but we do see high levels of growth in some rural areas. Given the wide geographic spread of high attainment counties, it is unlikely that geographic push and pull factors alone drive trends in attainment growth.

Figure 2: Percentage-Point Change in Bachelor’s Degree Attainment by County, 2005-2009 to 2015-2019.



Note: Due to the county boundary changes that occurred within the 2005-2009 and 2015-2019 time periods, the following counties equivalents did not have comparable data to produce an estimate of change: Petersburg Alaska, Prince of Wales-Hyder, Alaska, Hoonah-Angoon, Alaska; Bedford, Virginia; and Bedford city, Virginia.

For more information, see www.census.gov/acs

Source: U.S. Census Bureau, 2005-2009 and 2015-2019 American Community Survey, 5-year estimates.

Table 2 presents the mean value for a number of characteristics for both counties with high growth and low growth or decline between 2005-2009 and 2015-2019 and explores differences in the average characteristics for each growth profile. Here, we see that the average population in high-growth counties (99,620 in 2005-2009 and 111,700 in 2015-2019) is

considerably higher than the average population in low-growth counties (65,000 in 2005-2009 and 71,460 in 2015-2019). Coupled with the map in Figure 2, these data show that descriptively high-growth counties are more populous and perhaps in more urban areas, whereas low-growth counties may be in more rural areas. Beyond population, both the share and number of adults enrolled in college was also greater in high-growth counties than low-growth counties in 2005-2009 and 2015-2019. Median household income and median rent is also higher in high-growth counties compared with low-growth counties across both periods. There are also some smaller significant differences between the two growth profiles across racial and Hispanic origin categories, but beyond this there were small and significant differences for poverty rate, employment and mean January temperature. We do not see other major differences.³

³ For 2005-2009, the percentage of people who were some other race (non-Hispanic), percentage foreign born, and median age were not statistically different when comparing high- and low-growth counties. For 2015-2019, the percentage of people who were some other race (non-Hispanic) and median age were not statistically different when comparing high- and low-growth counties

Table 2: Mean County Characteristics by Growth in Bachelor's Degree Attainment, 2005-2019

Variable	High-Growth Counties		Low-Growth Counties	
	2005-2009	2015-2019	2005-2009	2015-2019
Percentage Point Change in bachelor degree or higher share 2009-2019	6.9%		2.2%	
Population 18 and over	99,620*	111,700*	65,000	71,460
Number of people with a Bachelor's degree or higher	30,960*	42,180*	14,720	18,690
Number of people enrolled in college	10,390*	10,870*	5,740	6,060
Percent of population 18 and over				
Female	52.2*	53.8*	52.9	55.2
Black alone (non-Hispanic)	6.0*	6.2*	7.2	7.4
Asian alone (non-Hispanic)	3.5*	4.0*	2.5	2.5
Other race (non-Hispanic)	2.1	2.6	2.4	2.7
Hispanic (of any race)	2.7*	3.4*	3.8	4.9
Foreign born	3.5	3.6*	3.3	3.3
Bachelor's degree or higher	20.5*	27.5*	16.1	18.3
Enrolled in college or graduate school (18-24 year olds)	5.0*	4.6*	3.8	3.5
Unemployed	3.7*	2.6*	4.1	3.0
In poverty	11.4*	10.9*	13.4	13.4
Median age (in years)	39.6	41.5	39.4	41.4
Median monthly household rent	\$670*	\$870*	\$590	\$750
Median annual household income	\$48,490*	\$61,800*	\$42,140	\$51,260
Mean January temperature	28.3	31.2	30.9	33.6

Note: Due to the county boundary changes that occurred within the 2005-2009 and 2015-2019 time periods, the following counties equivalents did not have comparable data to produce an estimate of change: Petersburg Alaska, Prince of Wales-Hyder, Alaska, Hoonah-Angoon, Alaska; Bedford, Virginia; and Bedford city, Virginia.

Note: Asterisks (*) denote that high growth and low growth counties' estimates for the given year are statistically different from one another.

For more information, see www.census.gov/acs

Source: U.S. Census Bureau, 2005-2009 and 2015-2019 American Community Survey, 5-year estimates.

Multivariate

Table 3 displays the results from our set of ordinary least squares linear regressions as specified above. These results further explore the characteristics of counties associated with growth in the share of the population with a bachelor's degree or higher between 2005-2009 and 2015-2019. In our baseline specification (Model 1), we consider our two main predictors: the share of the population with a bachelor's or higher education in 2005-2009 and the share of 18-24 year olds enrolled in college in 2005-2009. Both higher shares of attainment and higher shares of college enrollment in 2005-2009 are significantly associated with larger growth in attainment. A 1-percentage-point increase in the 2005-2009 share of people in a county with a bachelor's degree or higher is associated with 6.87-percentage-point greater growth in this share by 2015-

2019. Further, a 1-percentage-point increase in the share of young adults enrolled in college in 2005-2009 is associated with 5.72 percentage points more growth in attainment over the next decade.

Table 3. OLS Regression of County-Level 2005-2009 to 2015-2019 Bachelor's or Higher Share Growth

	(1)	(2)	(3)	(4)	(5)
Bachelor's or Higher Share, 2005-2009	6.865 *** (0.910)	-1.756 (1.410)	5.025 *** (1.376)	-4.618 ** (1.869)	-4.705 ** (1.949)
18-24-Year-Olds Enrolled in College Share, 2005-2009	5.715 *** (1.261)	7.583 *** (1.309)	-4.435 (4.604)	-6.588 (4.986)	-12.752 (9.473)
Log Population 18 Years and Older, 2005-2009		15.100 * (8.958)		15.760 * (8.994)	20.570 (13.543)
Median Income, 2005-2009 (thousands)		5.237 *** (1.414)		5.468 *** (1.388)	4.895 ** (2.271)
Median Rent, 2005-2009 (thousands)		0.043 (0.078)		0.04 (0.077)	0.037 (0.102)
Mean January Temperature, 2009		-2.248 *** (0.614)		-2.244 *** (0.608)	-2.808 *** (0.969)
<i>2005-2009 Share 18-24 Years Old Enrolled in College Interaction with:</i>					
Bachelor's or Higher Share, 2005-2009			0.446 ** (0.195)	0.626 *** (0.197)	0.677 *** (0.244)
Log Population 18 Years and Older, 2005-2009					-1.520 (2.950)
Median Income, 2005-2009 (thousands)					0.146 (0.321)
Median Rent, 2005-2009 (thousands)					0.001 (0.013)
Mean January Temperature, 2009					0.145 (0.149)
N	3,100	3,100	3,100	3,100	3,100
R-squared	0.050	0.094	0.052	0.098	0.100

Source: 2005-2009, 2015-2019 American Community Survey 5-year datasets, NOAA Global Historical Climatology Network Daily datasets

Note: * = $p < .1$, ** = $p < .05$, *** = $p < .01$

In our second specification (Model 2), we add additional controls for county characteristics that may act as pull or push factors for those with high educational attainment. We continue to identify a positive relationship between growth in educational attainment and college enrollment in 2005-2009. In addition, median household income in 2005-2009 is positively associated with growth in bachelor's degree attainment. However, we find no significant association between existing attainment share in 2005-2009 and attainment growth, as well as no significant association between median rent in 2005-2009 and attainment growth. Lastly, we show that every 1-degree increase in mean January temperature is associated with 2.25 percentage points lower attainment growth. This finding is counter to our assumption and may be

related to the high levels of attainment in the Northeast or more agricultural work requiring lower levels of education in warmer climates. Future analyses will explore this further and will include a regional or state variable.

The lack of a significant positive association between existing attainment shares in 2005-2009 and subsequent growth when controlling for other factors may be due to 2005-2009 levels of attainment serving as a proxy for these pull and push factors. We provide evidence for this claim in Table 4, which shows OLS regressions of county-level bachelor's degree attainment on the set of pull and push factors for both 2005-2009 and 2015-2019. We show that in both 2005-2009 and 2015-2019, higher educational attainment was associated with higher median incomes. High shares of bachelor's degree or higher attainment were also significantly correlated with high median rents; however, this correlation was quite small: a \$1,000 increase in median rent was associated with a 0.13-0.14-percentage-point growth in bachelor's degree attainment. Somewhat counterintuitively, high attainment was also associated with lower average January temperatures in both 2005-2009 and 2015-2019, which may be the result of both high levels of attainment and relatively low temperatures in the Northeast.

Table 4. OLS Regressions of County-Level Bachelor's Degree or Higher Attainment Share

	Bachelor's or Higher Share, 2005-2009		Bachelor's or Higher Share, 2015-2019	
Log Population 18 Years and Older	0.519	***	0.671	***
	(0.108)		(0.118)	
Median Income (\$1,000)	0.270	***	0.232	***
	(0.019)		(0.17)	
Median Rent (\$100)	0.013	***	0.014	***
	(0.001)		(0.001)	
January Temperature (F)	-0.058	***	-0.106	***
	(0.008)		(0.011)	
N	3,100		3,100	
R-squared	0.562		0.611	

Source: 2005-2009, 2015-2019 American Community Survey 5-year datasets, NOAA Global Historical Climatology Network Daily datasets

Note: * = $p < .1$, ** = $p < .05$, *** = $p < .01$

In Models 3-5 of Table 3, we interact 2005-2009 levels of college enrollment with 2005-2009 bachelor's or higher attainment and the set of local amenities. To the extent that local production of high attainment through college enrollment is important for county-level attainment growth, it may only be so if college graduates have a reason to remain in the county where they were attended college. That is, one might expect college enrollment to only be associated with faster attainment growth in counties that also have strong pull factors. Models 3-5 show that the interaction between college enrollment and existing high attainment shares is positively associated with greater attainment growth between 2005-2009 and 2015-2019, while

there is no significant association between college enrollment alone and attainment growth. This finding suggests that counties with high attainment growth are those that have local colleges to produce graduates but also have an existing pool of bachelor's degree holders that may be indicative of labor market conditions.

Models 4 and 5 show that 2005-2009 bachelor's or higher share alone is negatively associated with growth in attainment when controlling for other push and pull factors and the interaction between college enrollment and existing attainment. The positive association between this interaction and attainment growth remains in Models 4 and 5, even when interacting the additional factors with enrollment in Model 5.

Overall, the results in Table 3 show that both the interaction between college enrollment and existing attainment as well as 2005-2009 median income were positively associated with subsequent growth. That higher median income counties grew faster in educational attainment is not surprising, as intuitively we would expect high incomes to act as a pull factor for highly educated workers. However, the interaction between median income and college enrollment was not significantly associated with greater attainment growth, suggesting both that higher median income acted as a pull factor for workers beyond college graduates and that college graduates remained in the counties of their college for reasons independent of median income. Or, perhaps new college graduates do not earn high incomes right out of school but will increase their earnings in the future. In contrast, the positive correlation between the interaction between 2005-2009 attainment and 2005-2009 college enrollment and attainment growth suggests that more college graduates remained in a county after graduation if there were a larger population with bachelor's or higher attainment. Existing attainment may be serving as a proxy for an omitted pull factor (like labor market conditions) for college graduates independent of median income, or the high attainment share itself may be the pull factor as graduates may prefer to live and work near those with similar levels of attainment.

To further explore the relationship between attainment growth and college enrollment, we examine a set of OLS regressions in Table 5 with the percentage of bachelor's degree holders within a county that are young adults (age 18-34) as the dependent variable. We regress this share on the same set of independent variables from our baseline specifications in Table 3. We find that a high share of young adults among those with a bachelor's or higher education is positively associated with college enrollment in both 2005-2009 and 2015-2019, which may be due to local college enrollment producing graduates that remain local and therefore results in higher attainment for a county.⁴ Furthermore, Models 2 and 4 show that there is a positive association between college enrollment and shares of young adults among those with high attainment when controlling for population, income, rent, and temperature. These results provide further evidence that college enrollment may act as a boon to counties' bachelor's degree attainment with young adults staying in the area after completing their degree.

⁴ These changes may also be the result of in- or out- migration, which we aim to further explore in future drafts of the paper.

Table 5. OLS Regressions of County-Level Young Adults Bachelor's or Higher Share on County Characteristics

	2005-2009		2015-2019	
	(1)	(2)	(3)	(4)
Share of 18-24-Year-Olds Enrolled in College	0.595 *** (0.032)	0.422 ** (0.185)	0.730 *** (0.031)	0.760 *** (0.166)
Log Population 18 Years and Older		1.170 *** (0.187)		0.514 *** (0.187)
Median Income (\$1,000)		0.550 * (0.299)		0.120 *** (0.024)
Median Rent (\$100)		-0.004 ** (0.002)		-0.003 ** (0.002)
January Temperature (F)		-0.018 (0.145)		-0.051 *** (0.017)
<i>Share 18-24 Year Olds Enrolled in College Interactions:</i>				
Log Population 18 Years and Older		0.102 *** (0.038)		0.173 *** (0.031)
Median Income (\$1,000)		-0.009 ** (0.004)		-0.021 *** (0.004)
Median Rent (\$100)		0.000 (0.000)		0.000 * (0.000)
January Temperature (F)		0.001 (0.002)		-0.002 (0.003)
N	3,100	3,100	3,100	3,100
R-squared	0.141	0.209	0.180	0.255

Source: 2005-2009, 2015-2019 American Community Survey 5-year datasets, NOAA Global Historical Climatology Network Daily datasets

Note: * = $p < .1$, ** = $p < .05$, *** = $p < .01$

CONCLUSION

The share of Americans with a bachelor's degree or higher grew steadily between the Great Recession and 2019. However, not all counties grew equally. This paper explores the distribution of educational attainment in the United States using the Census Bureau's American Community Survey at the county level. Two important factors related to growth in bachelor's degree attainment were college enrollment and prior bachelor's degree attainment.

High levels of college enrollment in 2005-2009 were positively associated with growth in bachelor's degree attainment from 2005-2009 to 2015-2019. This shows that local colleges and

universities may help expand the human capital of the counties in which they are located as recent graduates start their careers in the county where they graduate. However, this was only true for counties that also had other characteristics likely to be attractive to college graduates, signified by relatively high numbers of bachelor's degree holders already living in the area. College enrollment may also help increase counties' bachelor's degree attainment by institutions of higher education positively affecting labor markets (Andrews 2023; Conzelmann et al. 2022), further attracting college graduates to the area.

Counties with high existing shares of bachelor's degree attainment in 2005-2009 saw larger increases in bachelor's degree attainment than those with lower attainment, and these counties also had higher median income and higher rent. However, some of our results (Table 3, Model 5) suggest high levels of educational attainment alone do not lead to higher levels of growth in attainment. Rather, it is the interaction between college enrollment and educational attainment that leads to positive growth in the percentage of a county's residents that have a bachelor's degree. This trend has the potential to exacerbate educational and socioeconomic inequality across counties in the United States, as those with high attainment may continue to cluster in counties with high attainment. Future research should continue to examine this trend and the implications for the study of socioeconomic inequality.

This study examines patterns of educational attainment from 2005-2009 to 2015-2019. We find that educational attainment has expanded since 2005, but not equally across counties. The time frame of this research does not allow us to identify any effects of the COVID-19 pandemic on educational attainment. Future research should explore whether the COVID-19 pandemic has affected patterns of growth in educational attainment across counties.

FUTURE RESEARCH

Future renditions of this paper will make some additions to further validate the findings of the paper through the use of additional analyses omitted from this draft to make conference deadlines. Most significantly, we intend to exploit ACS 1-year datasets to examine annual growth in counties' bachelor's degree attainment over time. This will allow us to regress annual changes in county-level educational attainment on changes in other county characteristics. For instance, lagged growth in median income may be strongly positively associated with growth in educational attainment if increasing incomes attract more highly educated workers. Additionally, we will be able to control for county-level fixed effects, which will capture unobserved time-invariant characteristics of a county and county-level time trends. In addition to these models, we intend to identify more explicit control variables for labor market conditions and rurality.

REFERENCES

- Amior, M. (2019). "Education and Geographical Mobility: The Role of the Job Surplus." *Centre for Economic Performance*
- Andrews, M. J. (2023). How do institutions of higher education affect local invention? Evidence from the establishment of US colleges. *American Economic Journal: Economic Policy*, 15(2), 1-41.
- Barr, A., and Turner, S. (2015). "Out of Work and into School: Labor Market Policies and College Enrollment During the Great Recession." *Journal of Public Economics*. 124(63-73).
- Conzelmann, J. G., Hemelt, S. W., Hershbein, B., Martin, S. M., Simon, A., and Stange, K. M. (2022). *Grads on the Go: Measuring College-Specific Labor Markets for Graduates* (No. w30088). National Bureau of Economic Research.
- McElrath, K., & Martin, M. (2021). "Bachelor's Degree Attainment in the United States: 2005 to 2019." *American Community Survey Briefs*. ACSBR-009. *US Census Bureau*.
- Russell, L. C., Yu, L., & Andrews, M. J. (2022). Higher education and local educational attainment: evidence from the establishment of US colleges. *Review of Economics and Statistics*, 1-32.
- Schmidt, E. (2017, April). "Postsecondary Enrollment Before, During, and Since the Great Recession." Paper presented at the 2017 annual meeting of the Population Association of America.
- Turner, S. (2019). "Convergence and Divergence: The Link Between Spatial Labor Market Disparities and Educational Attainment." *University of Virginia Paper draft*.