a broader perspective on

UNIVERSITY CITIES

From Lexington, to Knoxville, to Syracuse: a framework for understanding how college towns grow

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Executive Summary

In 2017, a team of researchers out of Lexington, KY ran a statistical analysis that identified a new type of college town dubbed "University City." The researchers identified six candidate cities (Durham, Lexington, Ann Arbor, Lincoln, Fort Collins, Madison), all of whom had grown beyond the constraints of typical college towns to support more diverse and innovative economies, yet who sustained many of the key benefits of college towns, such as affordability and economic resiliency. This paper is both a response to and an extension of this research. It proposes that the concept of a University City should not serve to describe an exclusive club of six cities, but that the concept should encompass a broader framework for understanding shared and unique trends of how college towns grow.

We identified 26 University City candidates that met our baseline criteria for analysis: they must be a mid-sized city 100,000 within an MSA between 250,000 and 1,000,000 people; the city must contain a major masters or doctoral institution, with a student and employee population that would equate to >=10% of the population of the city. We collected a wealth of socio-economic data for each city across four main categories: population change and growth; economic competitiveness and resiliency; quality of life; affordability. Since we conceive of a University City as college town that has grown into a mid-sized city, we also collected the same data for 70 smaller college towns and 50 mid-sized without major universities. Comparing trends across these datasets allowed us to identify variables that were near-universal in college towns and/or mid-sized cities and to better quantify how University Cities aligned with or rejected these patterns.

Through the analysis we identified several key variables across which college towns track universally in the same direction with limited variation. These include:

- **Crime:** College towns have median violent crime rate 3 incidences per 1,000 people
- **Affordability:** College towns have a median 2BR rent of $820 and a median income to cost of living ratio of 1.2 ($1.20 of income for every $1 of cost)
- **Graduate Retention:** College towns on average retain only 12% of all graduates after 10 years
- **Company Retention:** College towns retain only 4% of alumni-created companies within their respective cities

- **Education of Job Market:** College towns have a median 45% of residents over 25 with bachelors degrees or higher; however, college towns have very low annual growth in jobs that require college degrees

Taken together these variables confirm the view of college towns as safe and affordable communities that struggle to retain alumni due to limited opportunities. It was across these variables where we saw the largest differentiation in our sample of University Cities, and where we could most clearly identify common trends and outliers. Some of the most salient findings from the research include:

- **Highly Challenged University Cities** – Three candidate cities (Syracuse, Akron, New Haven) under-perform across every metric, due largely to the historic deindustrialization and population loss that have created economic conditions not felt in other college towns or University Cities.

- **Challenges of Under-Employment** – Overall University Cities retain 25% of their respective students after 10 years, and approximately 10% of alumni created companies. We identified a sample of University Cities (i.e Gainesville, Tallahassee) that tracked well below these numbers with outputs that aligned more closely with college towns. These cities also failed to create a number of jobs requiring college degrees commensurate to the demand of their educated populations.

- **How Important is Violent Crime** – University Cities look like two different samples when analyzing violent crime rates. Roughly half cluster around 3 incidences per 1,000 people (aligned with college towns); the remainder cluster around a median of 9.5 incidences per 1,000 residents, more akin to violent crime rates in mid-sized or major American cities. Excepting the outliers discussed above (Akron, Syracuse, New Haven), these crime rates do not seem to impact quality of life in these cities, which still feature high amenity creation and population growth. All of these cities are in the American south and our research suggests that this variable may feature a geographic bias that makes it unfair to compare across all cities.

- **Affordability for Those who Can Afford It** – Overall University cities track closely to college towns in terms of relative (income ratio) and absolute (rents) measures of affordability. However there are a few key outliers. Cities like Ann Arbor, Madison, Boulder and others have objectively high median incomes – but they also had very high housing prices that were more similar to major American cities than to college towns. The cities are also the strongest in terms of quality of life and economic metrics. These findings challenge the assumption that University Cities can fully adopt high-innovation economies without sacrificing affordability. This is especially salient given the high numbers of students in these cities that may struggle more than others to afford the high costs of living

We drew from these and other findings to propose a reconfiguration University Cities into five key cohorts, each of which shared common metrics around their historic growth, economic competiveness, quality of life, and/or affordability. Our research outlines the specific conditions that generate each cohort and proposes several key considerations, challenges, and opportunities shared by each. Our hope is that these five cohorts can form the basis for continued research on University Cities.

FIVE COHORTS

1. **Highest Value/Highest Price (Ann Arbor)** – University Cities with the most innovative and diverse economies but that are also the most expensive. In this regard they behave more like major American cities than they do college towns.

2. **Maturing College Towns (Lexington)** – University Cities that are not as innovative as some of their peers, but who have stable and inclusive economies, who are safe and growing, and who have retained affordability levels commensurate with college towns.

3. **Stunted College Towns (Gainesville)** – University Cities that are growing and creating jobs, but are not doing so at a rate commensurate with the needs of their educated populations. This leads to lower rates of retention for alumni and creates climate of under-employment.

4. **More Mid-Sized than College Town (Knoxville)** – University Cities that retain some elements associated with college towns, but track more closely to other cities of this size. A recurring problem here is that the cost of living is low, but the incomes are too depressed to fully capitalize.

5. **Default University Cities (Syracuse)** – University Cities that deindustrialized and declined in population over time leaving serious socio-economic challenges. Their respective universities have emerged as the dominant economic presence more recently in history.

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CONTEXT

Lexington, KY and Knoxville, TN are two cities that seem like they would have a lot in common. To begin with, a dedicated pedestrian could walk the distance between the two in under three days. Demographically speaking, each city has a population at or above ~200,000[i] and is the home of a major research university with over 30,000 students[ii] , that is also the flagship institution of their respective state. If you crowd-source information on Lexington or Knoxville from Google, you would find that former students and non-residents often refer to them as "college towns," and data from LinkedIn shows that following the first two years of graduation, roughly 55% of alumni remain within the respective region for each university[iii] .

However, across other metrics typically associated with college towns, the two cities diverge considerably. In Lexington violent crime is below the national average[1] at a rate of 3.2 incidences per 1,000 residents; in Knoxville the violent crime rate is 8.7, a rate that rivals that of Philadelphia[iv] . Though each city can claim a low cost of living[v] compared to major American cities, Lexington's residents are far more likely to capitalize on this benefit with a median income that is 145% the average cost of living. In Knoxville, the median family income is only 95% the median cost of living[vi] .

Lexington and Knoxville are two competing examples within a group of approximately 25 cities that share a common thread – all could

1 National average for violent crime is 3.8 incidences per 1,000 residents.

The term 'University City' would better serve as a framework for assessing and categorizing common trends that appear across college towns as they grow

be colloquially referred to as "college towns" and yet all have grown beyond this definition. In 2017, a team of researchers out of Lexington ascribed a new name to these types of college towns – The University City[vii] . They reserved this definition, however, for a subgroup of only six cities – Durham, Lexington, Madison, Fort Collins, Ann Arbor, and Lincoln – who cluster across a range of positive socio-economic indicators, such competitive and vibrant economies, access to diverse amenities, and a low cost of living.

While this paper does not fully refute the successes of these cities, it seeks to question the suggestion that the concept of a University City should serve only to describe an exclusive club of six members. We feel that the term University City would better serve as a framework for assessing and categorizing common trends that appear across college towns as they grow to support larger populations. For example, some cities can accommodate accelerated growth while retaining the positive externalities of smaller college towns and avoiding some of the

negative externalities of mid-sized cities; some cities track in the opposite direction, struggling to capture any of the benefits associated with college towns and sometimes failing even to measure up against cities of the same size. We have even mapped some variation in the original six University Cities relating to how affordable they actually are when additional variables are considered.

To build this framework, this paper will grade a cohort of 26 "University City candidates" (referred to as University Cities henceforth) across a range of socio-economic metrics that can be used to benchmark how cities perform against one another, such as affordability or economic resiliency. We will compare each University City to one another and also across a sample of traditional college towns and a sample of other cities of the same size that do not contain a proportionately large university. By plotting University Cities against these cohorts we can conclusively identify across which variables they most behave like college towns and/or mid-sized cities, and, more importantly, across which variables they behave in novel or unexpected ways.

As we proceed through the analysis we will regularly highlight individual cities or small groups that exhibit key trends. We will return to some of these cities more frequently than others, especially those that best exemplify emerging sub-cohorts of University Cities. Along the way we will attempt to shed preliminary insight into some of the more significant reasons that may explain the clustering of some cities and the variation of others. Our findings suggest that a good portion of what unites and differentiates individual University Cities can be explained by historical or spatial circumstances that gave competitive advantages or disadvantages to particular cities. However, a historical-spatial perspective alone cannot fully explain all of the variation and there are some indications that the ways in which universities integrate within their respective metropolitan economies plays a role as well.

We recognize that no single variable (or even grouping of variables) can conclusively explain every twist and turn that brought these college towns into their current configurations. Nor can these cities be neatly folded into equally size packets. Still, we feel this research is valuable for a few reasons. First, as we will show, the parameters that people use to define college towns are broad and often lump cities that are quite different into the same category. By calling attention to a broader subset of larger, growing college towns, we will carve out the analytical space needed to study these types of cities in the future. In addition, by analyzing common patterns shared across cities, as well as isolating those variables that cause the greatest differentiation, we can provide a framework to guide policy makers and university officials in identifying the appropriate levers to navigate new complexities that arise as their college towns grow.

METHODOLOGY

Defining University Cities

A preliminary way to conceive of a University City is to imagine a traditional college town that has grown large enough to support a more diverse economy and to sustain accelerated rates of population growth. As in a college town, the university still continues its role as one of the

6 ORIGINAL UNIVERSITY CITIES

Ann Arbor, MI	Lexington, KY
Durham, NC	Lincoln, NE
Ft Collins, CO	Madison, WI

premier cultural and economic driver of the city; it simply does so for more people.

In the article titled New Species of City Discovered: University City (hereby referred to as New Species of City) author Scott Shapiro proposed that University Cities share at least three common attributes: they are the central city in a metropolitan area between 250,000 and 1,000,000; they have an R1 research institution in their core; the student population must equal approximately 10% of the city's population.[viii] For the most part we accept this classification structure, with a few small but critical differences:

1. **The City is over 100,000:** Without this distinction, cities like Fayetteville, AR, Kalamazoo, MI, Santa Cruz, CA, and Chapel Hill, NC would all technically meet the criteria. Yet all of these towns are between 50,000 and 70,000 and thus function more as smaller towns and cities, even as they anchor (or co-anchor) broader metropolitan areas.

2. **Proportional Impact Considers Students & Employees:** The % of population metric should incorporate both students and employees. Without this distinction, Duke's students would only represent 6% of Durham's population – a rate that would put Durham below Chattanooga, Greensboro, and Dayton in terms of proportional impact. Yet Duke's employees, researchers, fellows, and affiliates of the health system are as much a driver as the students in concentrating impact in Durham.

3. **Research Institution :** We have broadened the criteria to permit any doctoral research institution or sizeable masters Institution with significant research funding. We feel that an institution's research spending is better served as an analytical test of why some cities outperform others, rather than a definitive criterion for membership.

This list may cause some readers to do a brief double take: Waco, Akron, and Reno as university cities/college towns? We feel it is important not to get lost in colloquial definitions or expectations of what a college town or a University City should be, and to instead include any city that meets the base conditions and let the data

26 CANDIDATE CITIES

Akron, OH	Lafayette, LA
Ann Arbor, MI	Lexington, KY
Baton Rouge, LA	Lincoln, NE
Boise, ID	Lubbock, TX
Boulder, CO	Madison, WI
College Station, TX*	New Haven, CT
Columbia, SC	Provo, UT
Durham, NC	Reno, NV
Eugene, OR	Springfield, MO
Fargo, ND**	Syracuse, NY
Ft Collins, CO	Tallahassee, FL
Gainesville, FL	Tuscaloosa, Al**
Knoxville, TN	Waco, TX

Approximately 26 candidate cities meet this base definition for analysis. Broader description of each provided within the appendix.

*College Station just emerged due to highly accelerated recent growth

**Fargo, Tuscaloosa – are just below the threshold for metropolitan area. However, population modeling suggests that both will surpass the 250,000 mark by 2020, and so we have chosen to include them as emerging university cities.

speak for itself. In this case cities like Reno, New Haven, or Akron would actually have proportionally equal if not higher student to population ratios than Durham, Lincoln, and Lexington and should therefore merit inclusion.

Assessing & Categorizing University Cities

Defining Cohorts for Comparison: Part College Town, Part Mid-Sized City

A central hypothesis of the New Species Discovered is that University Cities have grown to support more robust and inclusive economies, while retaining many of the benefits of college towns without incorporating certain negative externalities that typically affect mid- to large-sized cities.[ix] We will test this assumption by grading several target metrics (reviewed in detail in the following section) for University Cities against two cohorts: mid-sized cities and college towns.

Without a detailed comparison of the 26 University Cities against these cohorts it would be difficult to fully understand the degree of significance to place on how they compare to one another. To use the example from earlier, it is significant that Lexington outranks Knoxville across a variety of socio-economic metrics. However, if both cities were already outperforming other mid-sized cities by wide margins, then the differences between the two might seem less important than these other revelations.

Identifying the first cohort is straightforward; comparison cities are those that meet the population criteria, but within whom a university has a lower proportional impact (Fort Wayne, IN, Spokane, WA Montgomery, AL) or where there is no university [2] (Amarillo, TX, Oxnard, CA). Identifying the second cohort is a bit trickier and raises an important question – what does it actually mean to be a college town? This and other related research share the unique position of advancing the definition of a University City while there is still no uniform, publicly accepted, or formalized definition of a college town. Given this fact we turned to other researchers, writers, and the general public for inspiration.

One interesting pattern that emerges when reviewing content is that a healthy number of people who define college towns (whether through informal lists or more quantitative research) are agnostic about the size. Some lists[x] (like this, for example), grade Vermillion, SD; Berkley, CA; and Pittsburgh, PA as some of America's best college towns despite the fact that one is a city of over 300,000, one is in a metropolitan area of only 14,000 and the other is one of the principle cities within a metropolitan area of over 4,500,000 people.[xi]

Our research requires an approach advocated in other forums[xii] , which uses population size as a requirement for segmenting college towns. Since University Cities can be imagined as potential outgrowths of college towns, it would be logical to compare them to the types college towns that could one day grow to become University Cities. To arrive at this sample we used population data and student/employment data from IPEDS[xiii] to identify a short-list over 250 cities of around 100,000 people or below that had a student/employee-to-population ratio at least 10%. From this sample we factored out the following types of college towns:

- **College towns in big MSAs *(Berkeley, College Park, New Brunswick)*:** While the name college town may accurately describe each of these cities in iso-

2 Excluding community colleges, for-profit colleges, or specialty schools (i.e beauty schools)

lation, we cannot separate them from the influence of their far more massive metropolitan areas. This is best evidenced if you examine things like housing prices, where the prices of apartments skews more to what it costs to live within the major city of each respective MSA.

- **Small Towns *(Clemson, Boone, Vermillion, Storrs)***: These cities/towns may meet the criteria on the size of the study body, but the towns and (almost always) the encompassing metro areas are so small that it would not be fair to compare. We used cut offs of 30,000 and 75,000 for city and MSA population, respectively.

- **Less Impactful Universities *(University of North Alabama)***: Finally there are a number of remaining cities that we removed since they would serve as "false comparisons." Each of these cities may meet the "10% threshold" but their respective institutions do not offer doctorate or even masters degrees, or they have no research capacity, or they have nominally small student body (in this case we used a cut off of 10,000 students)

Using these criteria we narrowed the list down to a sample of 63 college towns, with examples ranging from Ithaca, NY to Charlottesville, VA to State College, PA to Lawrence, KS. [3]

Comparing University Cities Across Key Metrics

New Species of City focused extensively on a few variables that best conformed the six initial University Cities to one another and distinguished them from other cities of the same size. These included: the educational and entrepreneurial composition of the cities' workforces, the abilities of the cities to weather economic downturns, and the high qualities of life and relatively low costs of living within the cities. We opted to adhere closely to these categories in benchmarking the fuller cohort of University Cities to ensure consistency. Beyond that, each of these variables is an important determinant for why people choose to live and remain where they do, as demonstrated reputable surveys. [xiv] The specific variables that we will measure are as follows:

Population Change

- Population change 1930 – 2016 (Census)[xv]
- Alumni retention (LinkedIn)

Economic Competitiveness and Resiliency

- Educational attainment of residents (Census)
- Educational requirements by job creation (Bureau of Labor Statistics)
- Unemployment levels (Bureau of Labor Statistics)
- Start-Ups created and retained by university alumni (CrunchBase)

Affordability

- Ratio of incomes to cost of living (Census; MIT Living Wage Calculator)
- Absolute costs of renting and owning (Census; Apartments.Com; Zillow)

Quality of Life

- Violent crime levels (FBI Uniform Crime Statistics)
- Access to cultural and entertainment amenities (InfoGroup; ESRI Business Analyst)

The majority of these variables are identical to those used for clustering in New Species of City.

3 A full list of all college towns is available in the appendix.

However, we have made a few additions and modifications that bear mention.

We pulled data for each variable primarily at the city level. In some instances data was only available for MSAs, or it was more appropriate to pull data from that geographic vantage. We also pulled data from IPEDS across a variety of attributes for each university included within this study. We have provided a full description of each variable, including origin sources, our methodology for accessing and cleaning the data, and any assumptions or irregularities within the appendix.

ADDITIONS TO VARIABLES

- **Population Change:** While New Species of City touches on the propensity of University Cities to grow at faster rates and to retain more alumni than college towns, we felt it was important to define these assumptions in more quantitative terms.
- **Educational Attainment:** We felt that in addition to benchmarking the educational composition of a city's population, we also needed to assess the educational requirements for the types of jobs that have been created in the last five years
- **Start Up Creation/Retention (University Focused)**: Pulling data from CrunchBase allows us to simultaneously assess the entrepreneurial capacity of each university, but also the tendency of their home city to capture this entrepreneurial activity.
- **Affordability**: In addition to relative affordability (the comparison of income to cost of living), we felt that we owed equal attention to absolute measures of affordability, such as rental prices.

Tracing Growth Patterns: How did University Cities Emerge?

The 26 candidates cities that we analyze in this paper all classify as mid-sized cities. However, the definition of a mid-sized city is broad and all 26 do not occupy the same spatial configuration. (UC Scatter) below plots each city's population (x) against the metro area population (y), with the size of the circle scaled by the % of students and employees relative to the city's population. Running a k-means clustering algorithm on those three variables reveals four loosely clustered classes that we can use as a starting point for understanding these cities. They are:

1. **Big Universities in Smaller City/MSA (Ann Arbor, Boulder, Gainesville, College Station, Tuscaloosa):** These are the smallest candidate cities, anchored by some of the largest universities. This pairing produces the most noticeable "college to city ratio," and these cities are most closely related to traditional college towns in terms of their overall size.
2. **Moderate Universities/Cities/MSAs (Fargo, Waco, Fort Collins, Eugene, Lafayette, Springfield, Tallahassee):** This is the most loosely connected grouping of cities. Each city sits within an MSA under 450,000 and a city under 200,000. Most have more moderate-sized universities between 15,000 and 30,000, with the exception of Florida State in Tallahassee.

3. **Moderate Cities in Big MSAs (Provo, Syracuse, Akron, Columbia, New Haven, Knoxville, Boise):** These cities are relatively small or moderate compared to the others but they anchor the largest metropolitan areas in the cohort. Similar to the first grouping, these cities tend to have higher "student to city ratios." The larger size of some of these MSAs is attributable to historic growth (New Haven); within other MSAs the population has shifted more regularly as counties and parishes are added or subtracted from the aggregate boundary each decade (Knoxville, Columbia, Baton Rouge).

4. **Biggest Cities (Madison, Durham, Reno, Lexington, Lincoln, Lubbock):** The final grouping includes the largest of the University Cities, with city populations of over 200,000. Due to their relative size, some of these cities also account for over 50% of the entire population of their respective MSA.

These four classifications provide a gateway to understanding the different University Cities. The next logical step is to graph the historical population change of University Cities and compare these growth patterns to the cities within our sample of college towns.

The Growth of University Cities and College Towns[4]

A few things become clear when plotting population changes in University Cities and college towns since 1930 (*see Population Change*). First, it is visibly apparent that University Cities have sustained more accelerated patterns of historical growth than college towns, even as there are a few larger college towns that may catch up in the next decade. Second, there are three cities that jump out immediately: Akron, Syracuse, and New Haven. Each of these cities had over 150,000 residents by 1930 and experienced their peak population at some point between 1950 and 1970. Since that point, the population within each city has declined between 21% and 35%. While Knoxville tracks a similar industrial legacy, this city has been able to diversify and sustains population growth better than these others. College towns are not immune to this effect, with cities like Binghamton, Muncie, Huntington, Kalamazoo, and Terre Haute experiencing similar, albeit less intense, declines since the 1950s.

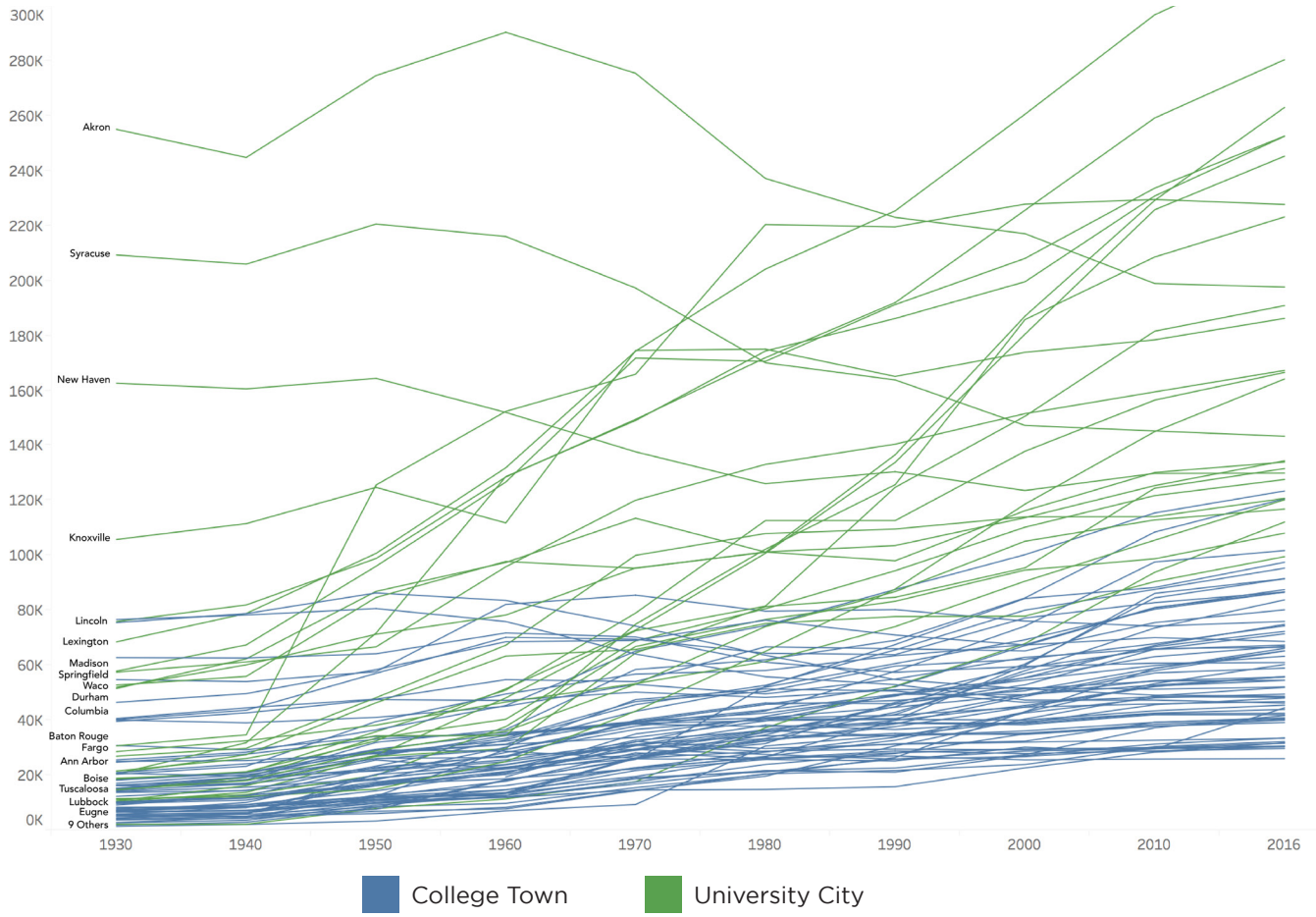
It would not be too far of a stretch to classify these three as University Cities by default rather than by design. Each has experienced an inverted version of how a University City emerges; their population declining during a period of time when the size and influence of their respective institutions increased.[5] Because these levels of decline (20 to 35%) are so intense it is likely that the residual impacts on poverty, segregation, crime, vacancy, and deindustrialization will make it difficult for these cities to fully integrate the benefits of their Universities across the entire city.

A third observation is that University Cities are not altogether a new emergence. In fact 11[6] out of the 23 cities that did not decline had populations over 50,000 by 1950, with cities like Madison, Lexington, Lincoln, Columbia and Knoxville already exceeding 100,000 residents by this point. No college towns outside of those

4 Lexington, KY and Athens, GA have had historical populations normalized to that of their respective counties to avoid spikes in 1980 and 2000, respectively, as these cities merged into consolidated governments.

5 This is particularly evident in Syracuse. In the years following World War II Syracuse had an approximate population of 215,000 with fewer than 2,500 students attending the university. Accessed through web archive (https://web.archive.org/web/20080724105418/http://www.syracuse.edu/aboutsu/chronology/1931.html)

6 In order of descending population in 1950 these cities are: Baton Rouge, LA; Knoxville, TN; Lexington, KY; Lincoln, NE; Madison, WI; Columbia, SC; Waco, TX; Lubbock, TX; Durham, NC; Springfield, MO; Ann Arbor, MI (Ann Arbor was just below but passed quickly after)

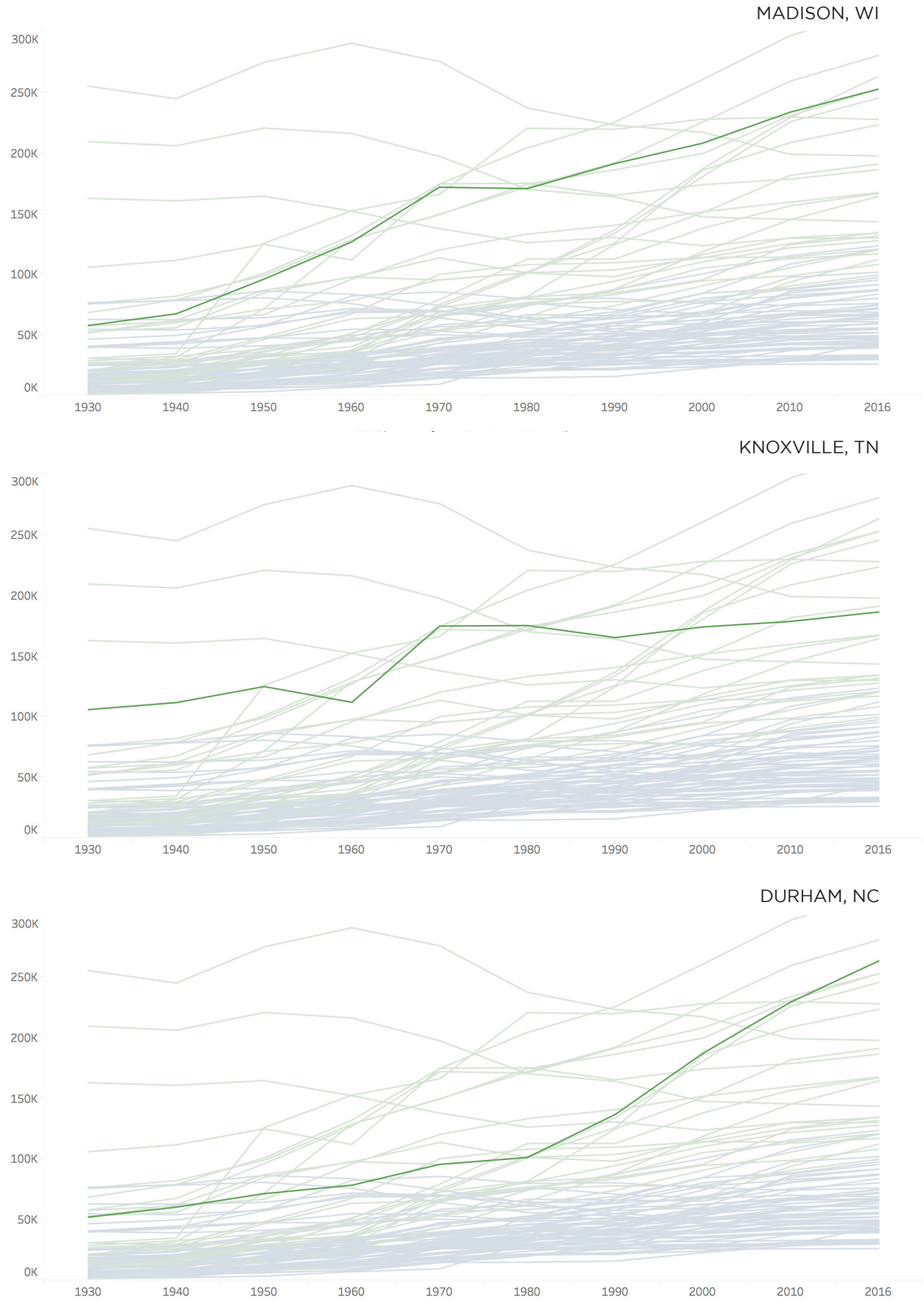


Population Change 1930-2016.

few that would eventually deindustrialize had reached this milestone by this time. 1950 is also the first of two inflection points that shed light on how University Cities have grown differently than college towns. At the start of the 1950s, the other 12 University Cities were roughly indistinguishable from college towns of the time. However, these 12 grew at median rates of 4.4%, 6.4% and 4% per year in the 1950s, 1960s, and 1970s. College towns grew at median rates of 2.8%, 3.5%, and 1.7% across the same time periods.

College towns are also more likely to experience stagnant growth than University Cities, which we define as when a city's population reached 85% or more of its current 2016 population by 1980. Since that point these cities have experienced annual growth rates of no more than .4% (to put this in context, the US as a whole grew by an average rate of 1.2% annually since 1980). The best examples of these sorts of cities are Ithaca, Charlottesville, and Burlington. Stagnation in recent population growth does afflict a few University Cities as well – Knoxville, Baton Rouge, and, surprisingly, Ann Arbor. However, despite the lack of growth in all three cities since 1980, each of their metropolitan areas grew at more stable rates.

1980 marks the second inflection point from which we can observe the final population climbs of those cities that become the most recent inductees into the club of University



Population Growth in Madison, Knoxville, & Durham, 1930-2016.

Cities. Twelve cities surged[7] in population after 1980, either through average annualized growth between 3.5% and 5.5% or with sharp single-decade population spikes at some point. This trend is also evident in a few college towns (Chico, Greenville, Las Cruces, Columbia (MO), and Fayetteville), potentially offering some insight into which University Cities are on the horizon (*see Growth charts previous page*).

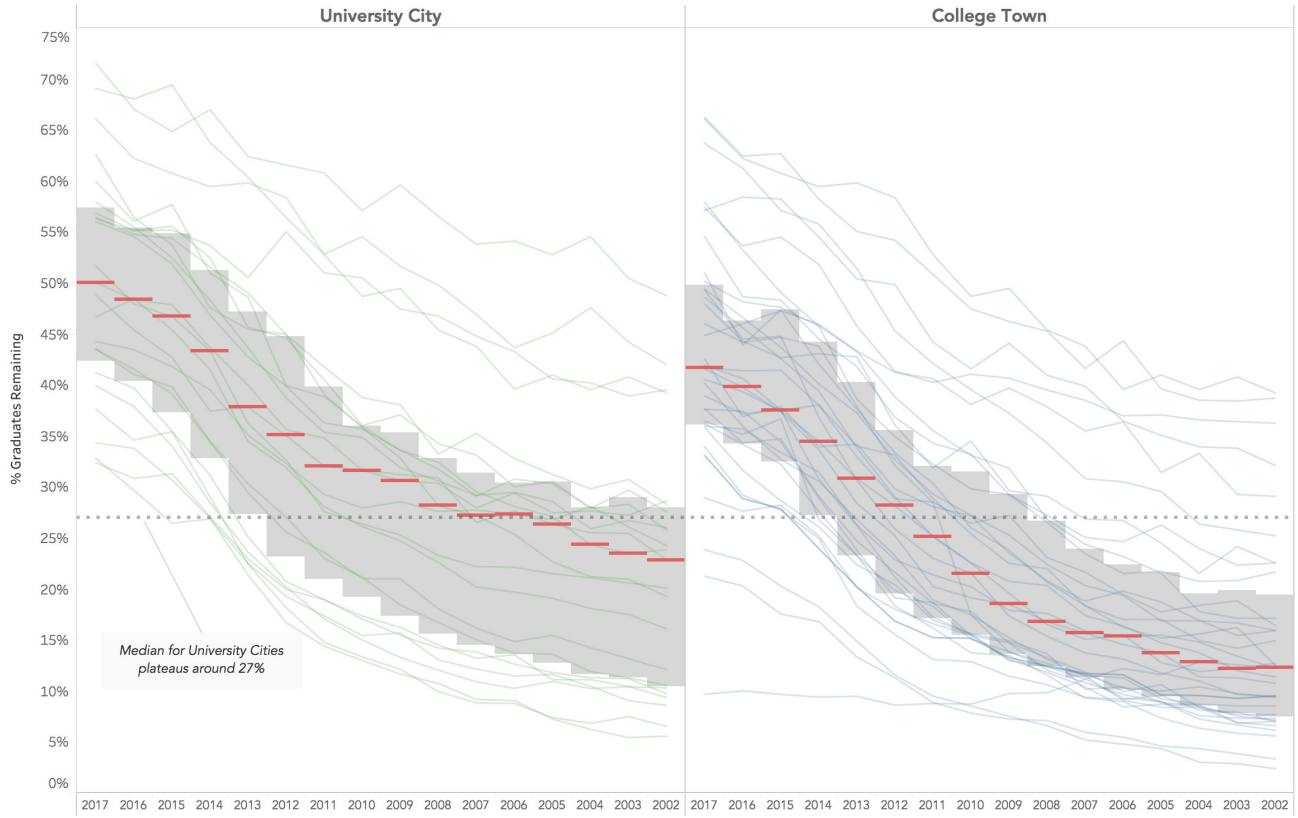
How Alumni Retention Can Further Explain Growth

LinkedIn[8] provides another dataset that is useful in highlighting the ways in which University Cities grow compared to college towns. We accessed alumni data tracked by LinkedIn to demonstrate the percentage of each graduating class between 2002 and 2017 that still resides in the metropolitan area of their respective school today (*see LinkedIn chart*) The accompanying graphic plots the rates of local MSA retention for each graduating class between 2017 and 2002, sectioning University Cities on the left and college towns on the right. For each year within its respective cohort we plotted a moving median, highlighted in red, and middle percentiles (25% to 75%), highlighted in grey, to help visualize overall trends.

What is most fascinating is that while both University Cities and college towns, on average, have high rates of local retention for recently graduated classes (49% and 42% in 2017, respectively), they take divergent paths around the class of 2009. After this point the median retention for University Cities continues to hover

7 College Station, Fort Collins, Boulder, Gainesville, Tallahassee, Provo, Reno, Lafayette, Boise, Fargo, Tuscaloosa, and Durham

8 A few notes on LinkedIn: 1) There is evidence to suggest that LinkedIn has reached a point of market saturation that would obviate any concerns of self-reporting bias. For example, The University of South Carolina had approximately 8,700 graduates from their class of 2016-2017 (according to internal reporting), and the LinkedIn alumni page lists 8,000 alumni for this same period – over 90% of the true number; 2) LinkedIn reports geographic retention at the MSA-level, and merges other cities to their larger Core-Based Statistical Area. The result is that some cities (Ann Arbor & Boulder) cannot be compared here, since their output would include "Greater Detroit" or "Greater Denver." We have only included cities that report retention for their inclusive MSA.



Percent of Graduates Remaining, University City vs. College Towns, according to LinkedIn.

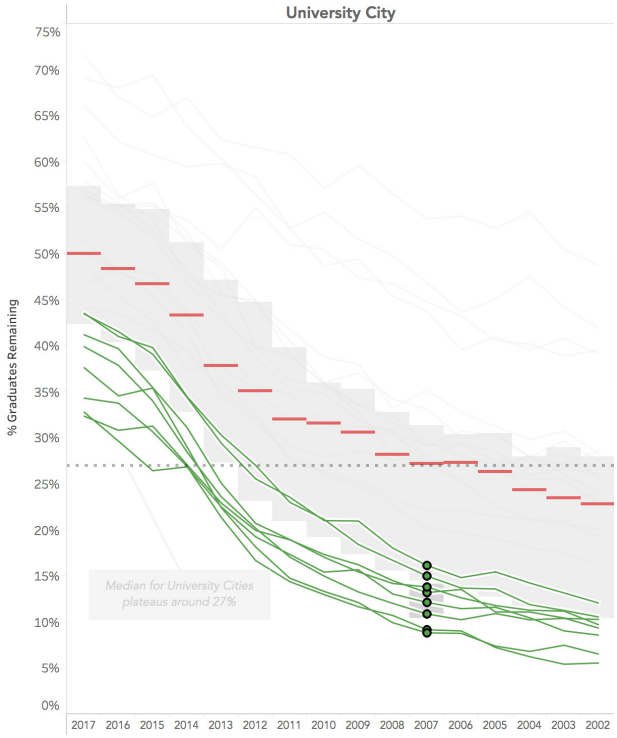
at around 25% to 28%, while the rate for college towns drops to 15% in 2008 and continues to decline until around 11% for the class of 2002. This is clear evidence that while both University Cities and college towns attract graduates, University Cities on the whole seem to have an advantage in retaining them for longer periods of time[9].

Looking for variation among the University Cities reveals a sub-cohort of cities that behave far more like college towns when it comes to student retention: Eugene, OR; Gainesville, FL; Tuscaloosa, AL; Tallahassee, FL; Waco, TX, Syracuse, NY; Lubbock, TX; College Station, TX. (*see LinkedIn Outliers*). Private school status and non-local enrollment may explain some of the low retention levels of Syracuse and Waco and the low levels in College Station may be an artifact of its recent population surge, as College Station was technically a college town for much of the 2000s. The other five cities seem to genuinely struggle to retain students after sustaining high levels for the first few years; this is a trend we will further evaluate in the next section.

Variation in Universities, College Towns, and Mid-Sized Cities Across Key Metrics

Graphing population change allowed us to establish the historical context that differentiates University Cities from college towns. It also helped identify and segment two potential sub-cohorts (post-industrial declining UCs; low alumni retention UCs) that may be useful in drawing preliminary conclusions conclusions as to why certain University Cities behave differently across other metrics.

9 The dataset can only follow each alumni the current retention rate as of 2018 for each alumni class. There is no way to see, for example, if the class of 2008 had high or low retention in 2009. Therefore an alternative, if less plausible, interpretation of the data could be that across all University Cities things are better in 2016 than they were in 2002-2008, and that is why so few are retained from those years.



LinkedIn Outliners. Percent of Graduates Remaining In University Cities. These include Eugene, OR; Gainesville, FL; Tuscaloosa, AL; Tallahassee, FL; Waco, TX, Syracuse, NY; Lubbock, TX; College Station, TX.

The next step is to evaluate each of 26 University Cities across our chosen indicators for economic competitiveness and resiliency, quality of life, and affordability and to determine key patterns that emerge across the sample.

ECONOMIC COMPETITIVENESS, OPPORTUNITY, AND RESILIENCY

We have selected to examine each University City from three distinct but inter-related economic perspectives:

- **Education:** The educational composition of the population and of the workforce
- **Resiliency**: The historical rates of unemployment experienced during the recession
- **Innovation/Entrepreneurship**: The en-

trepreneurial output of the university and its impact on the city.

We feel that assessing all three of these variables in unison can offer a balanced picture of each University City's economic strengths and weakness and help identify the clearest patterns of variation between the cities.

Educated Populations vs Educated Workforces

New Species of City established that educational attainment of the population is an important variable in understanding the competiveness of cities[xvi] . We feel that in addition to analyzing the educational composition of a city's population, we also need to assess educational composition of job opportunities as well. To understand why, imagine a city where an above-average rate of the population has college degrees, but a below-average rate of its economic growth is accounted for by jobs that require college degrees. This imbalance could lead to an over-supply of post-graduates. Without getting too far ahead of the data, a good example of this is Gainesville where, as data will show, there is a disparity between educational attainment levels of the city's residents and the kinds of employment opportunities that are growing the fastest.

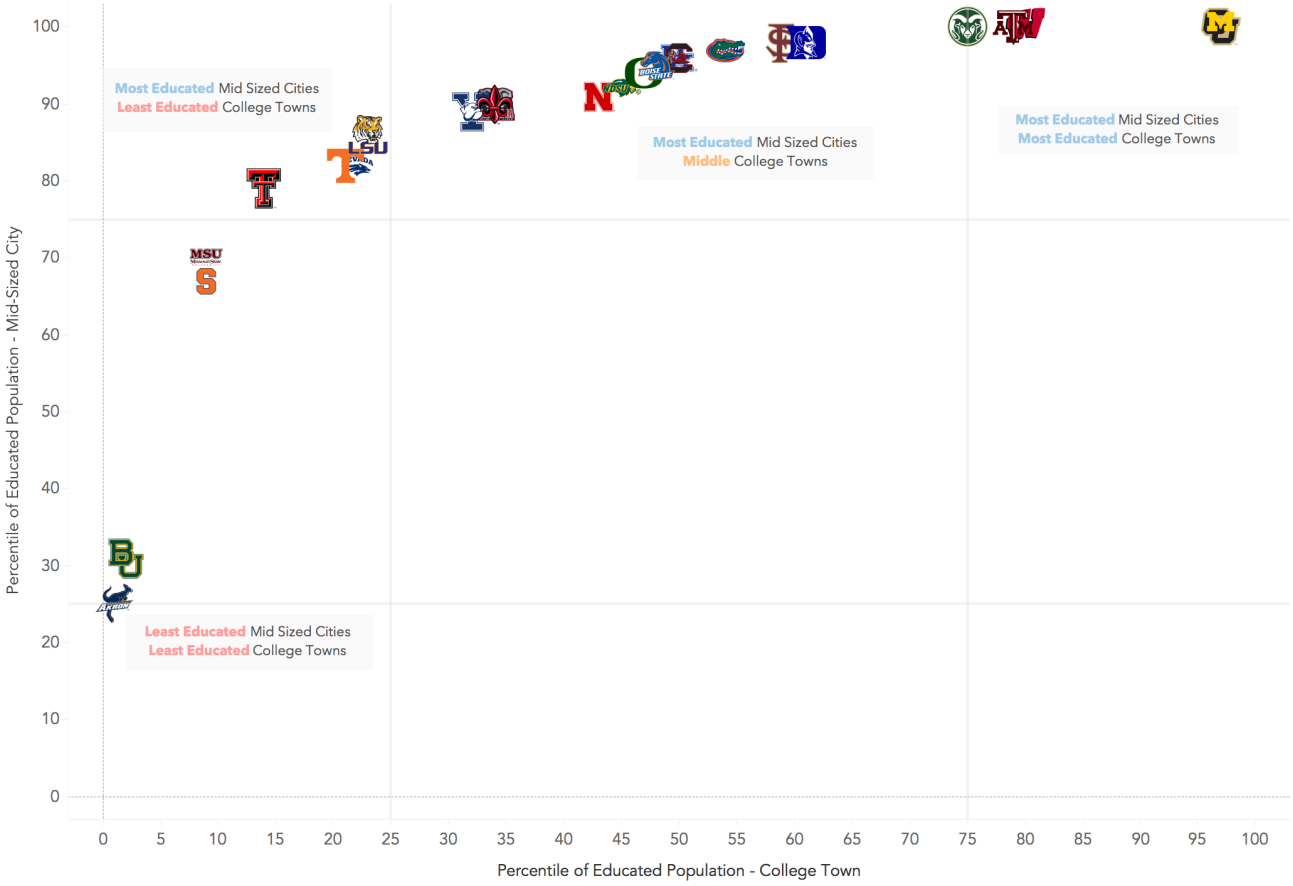
The chart[xvii] below[10] plots all cities included in this analysis by the % of their respective populations over the age of 24 that have a bachelors degree or higher[xviii] . This chart makes it clear that college towns are quite educated, with an average of 44% and a standard deviation of 13%. [xix] Mid-sized cities do not perform as strongly, with an average rate of only 25% and a high degree of clustering around the mean (standard deviation of 8%).

To further demonstrate this point we have created a standard visualization that we will use throughout this research to show how University Cities compare to college towns and mid-sized cities. For the sake of definition, we will call these "Comparative Matrices." Each matrix displays percentiles from 0-100 for any variable for college towns on the x-axis and percentiles from 0-100 for any variable for mid-sized cities on the y-axis. Each University City is plotted along this scale so that we can quickly visualize what percentile a University City would occupy if it were a college town or if it were a mid-sized city, and how the University Cities compare to one another.

The accompanying graphic *(above)* shows the results of this comparative matrix for educational attainment of residents. Almost all University Cities track well above what is expected for cities of this size. Where University Cities exhibit the greatest variation from one another is in how they compare to traditional college towns. Some retain the highest levels or even exceed the highest levels of college towns (Mad-

10 This chart type will recur throughout the analysis. The box plot shows the median, interquartile range (25-75 percentile), and the whiskers extend to 1.5 times the interquartile range. A note on calculations for the national average and major cities is included in the endnotes.

Bachelors Degree Distribution



Educational Attainment of Residents, Mid-Sized Cities and College Towns.

ison, Boulder, Ann Arbor). Most fall squarely within the middle percentile. Some, like Baton Rouge, Knoxville, Lubbock, and Syracuse still have relatively high educational attainment compared to mid-sized cities, but are tracking towards the bottom percentile of college towns. At the bottom are Waco and Akron; two cities that behave nothing like college towns for this measure and who also track alongside the lowest performing mid-sized cities.

Next, we compared this data against the growth of educated jobs within each city. To accomplish this we downloaded data from the Bureau of Labor Statistics (BLS) on Occupational Employment Statistics for 2017 and 2012. This dataset tracks the total number of jobs within each MSA for a given year, and is also broken down by the number of jobs within each occupation type. We joined this data to a table of Education and Training Assignments by Detailed Occupations[xx] from the BLS to obtain a proxy for the number of jobs within each metro area in 2017 and 2012[xxi] that would require at least a bachelor's degree (we will refer to these as "educated jobs.")

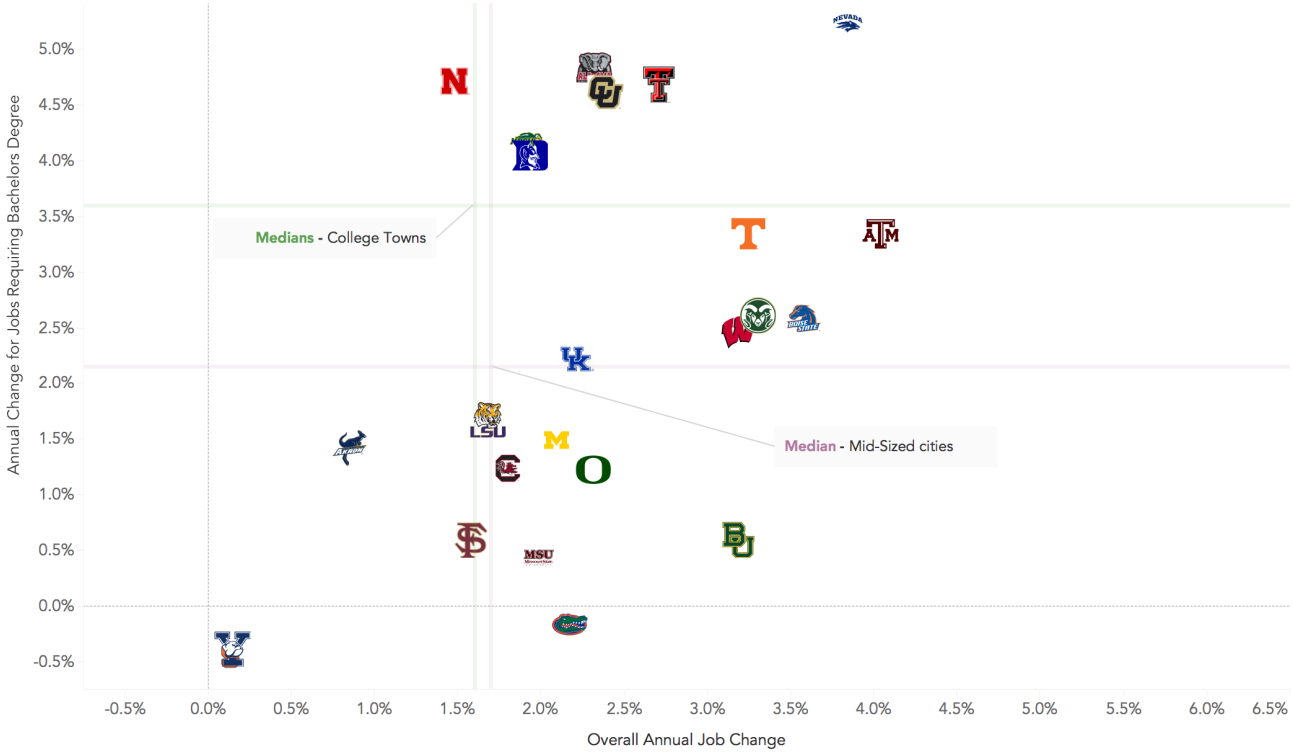
There are actually two ways to look at this dataset. If we look at only the % of jobs that require at least a bachelor's degree in 2017, then Gainesville, for example, appears to be doing pretty well. It has a rate of 26.9%, which would rank it 9th among its University City peers and place it squarely within the highest percentiles for both college towns and mid-sized cities. Make no mistake – there are jobs for college graduates in Gainesville (especially when you compare it to cities like Lubbock or Waco, where only 18% of all jobs require a bachelors degree or higher).

However, if we put this in historical context the narrative changes. In 2012 there were a total of 118,930 jobs in Gainesville's MSA, of which ~30.1% likely required at least a bachelors degree for entry (~35,769). By 2017, Gainesville's MSA had grown to house 131,830 jobs – but only 26.9% required a bachelors degree or higher (~35,483). In absolute terms, this means that while jobs in the Gainesville region grew by 2.1% annually, jobs that require a bachelors degree or higher did not see a net growth during this time period.

Bach Job Growth) The accompanying graphic plots each University City by its respective annual job change on the x-axis and overall change in educated jobs on the y-axis. From this vantage it is easy to see that Gainesville is not alone – New Haven, Syracuse, Tallahassee, Columbia, Eugene, Springfield, and Baylor all experienced lower levels of growth for educated jobs than overall jobs. Interestingly, within four of these cities (Tallahassee, Eugene, Columbia, and Gainesville) the respective rate of high educational attainment is at least 40%, suggesting a potential imbalance between the demand of college graduates and the supply of commensurate employment opportunities. Further evidence of this disconnect is seen in the rates alumni retention within these cities – especially Gainesville, Eugene, and Tallahassee, all of whom drop below 13% retention after the class of 2008.

Economic Resiliency

Standing at the far edge of the recession affords us the perspective to peer back across the last eight years and assess how well University Cities weathered the economic downturn. To do so, we plotted the unemployment rates for each college town, mid-sized city, and University City for 2007, 2010, 2012, 2014, and 2017.[xxii] Similar to the graphs we created for alumni retention, we have plotted the median and middle quartiles for each year within each of the three cohorts. The first trend we noticed is that Uni-



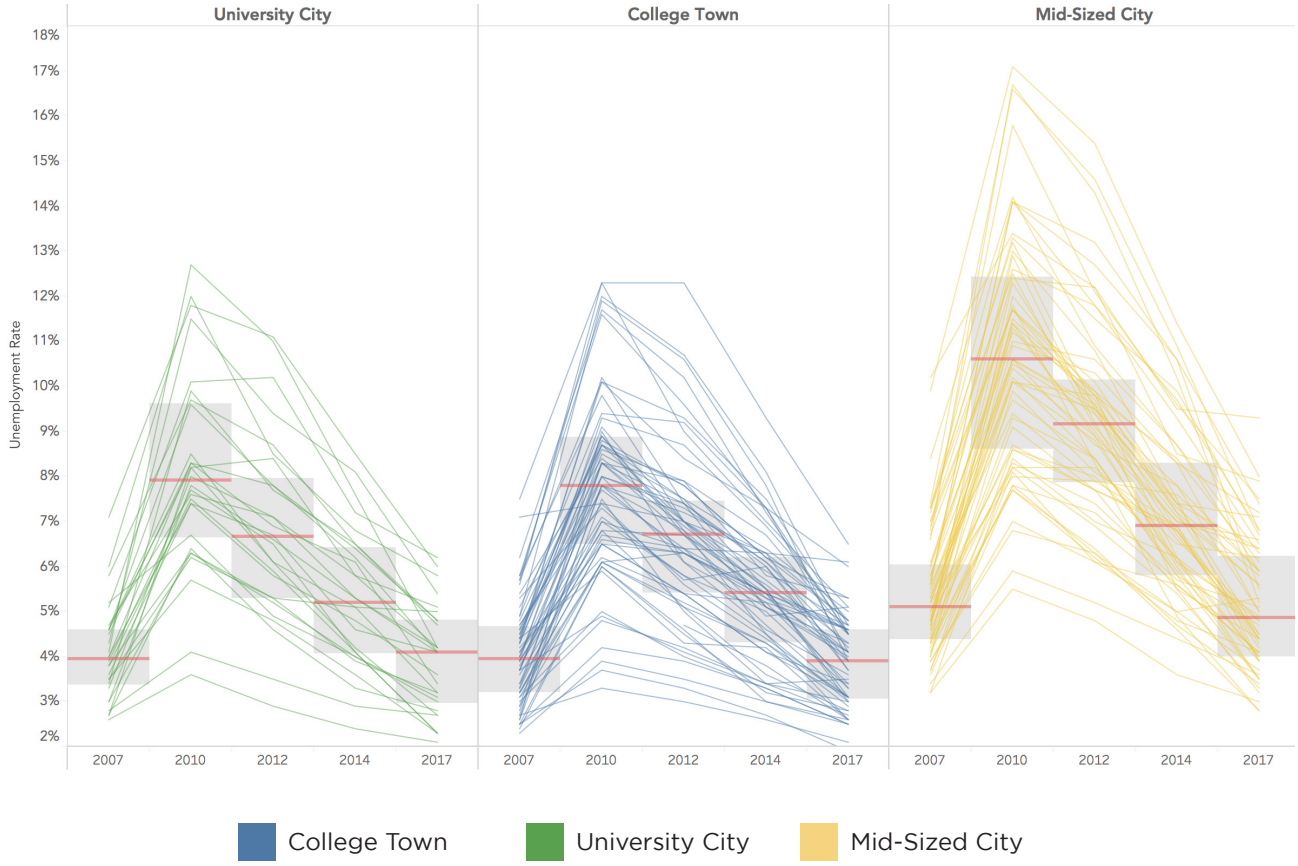
Annual Job Change and Job Requiring a Bachelors Degree

versity Cities and college towns have had almost identical unemployment distributions every year and their respective medians are never more than .2% from one another. Compared to mid-sized cities, University Cities (and college towns) were far more resilient in weathering the economic downturn. *(See Unemployment Rates below).*

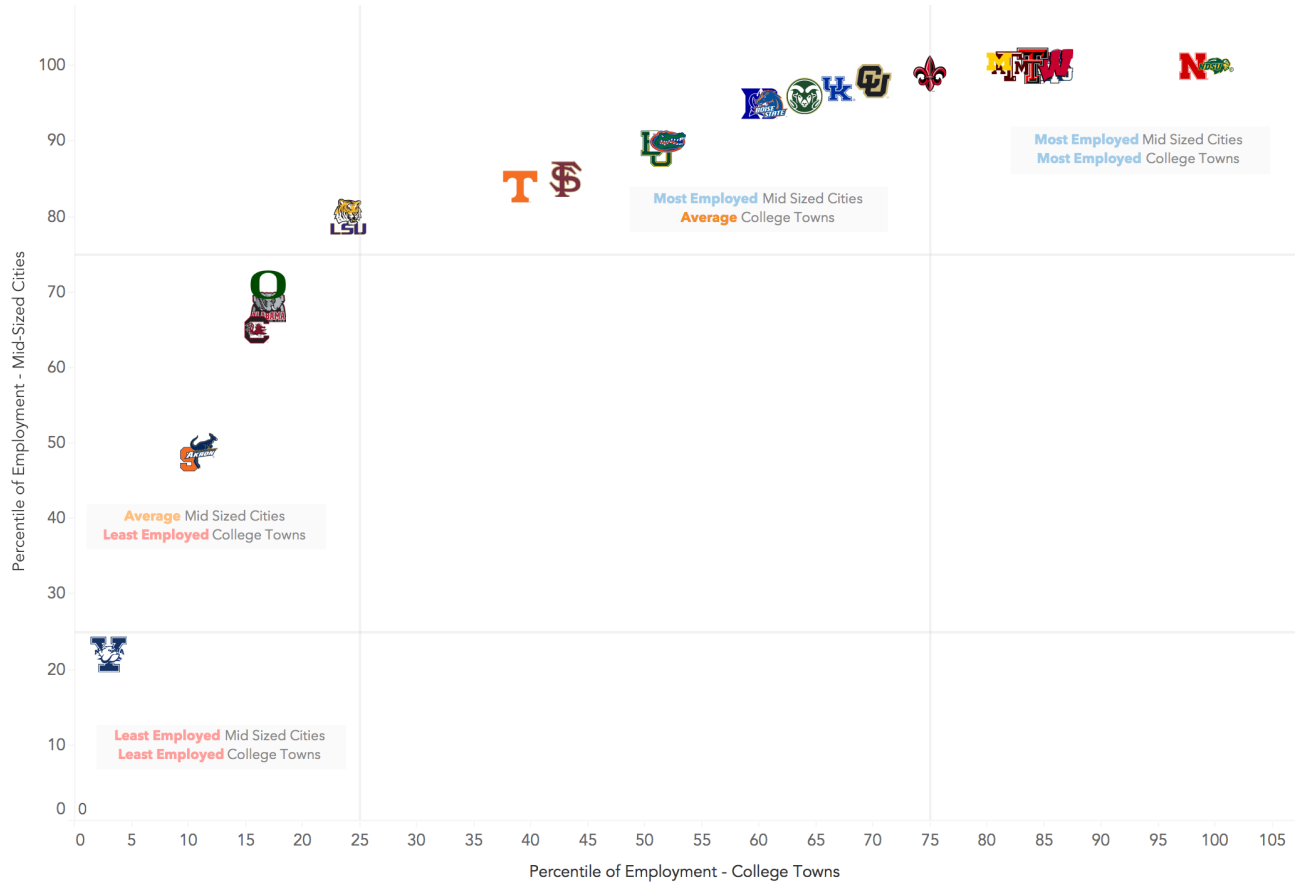
The similarity between how University Cities and college towns fared during the recession (as well as the degree to which they differ from mid-sized cities) is not surprising and likely has a lot to do with educational attainment. There is a statistically significant correlation between each city's unemployment rates during the heart of the recession and the % of their population that has a bachelors degree or higher (P <= .00001; R2 = .467). Interestingly, we could not find any statistically significant correlation between the rate of change in unemployment and the growth rate of educated jobs[11]. This is likely because employment losses during the recession were greater for non-educated jobs than educated jobs[xxiii] , leaving segments of the population who did not have bachelors degrees at a disadvantage.

Plotting University Cities along the comparative matrix for unemployment reinforces the degree to which University Cities weathered the recession better than other mid-sized cities. *(see Employment Grid above).* There are only a few University Cities whose unemployment rates track outside of the expected range for college

11 We tried several variables for this correlation including: % of unemployment; % unemployed in 2017 compared to 2010; % change in unemployment; absolute change in unemployment. No regression returned a P value higher than .12



Unemployment Rates. Compared to mid-sized cities, University Cities (and college towns) were far more resilient in weathering the economic downturn

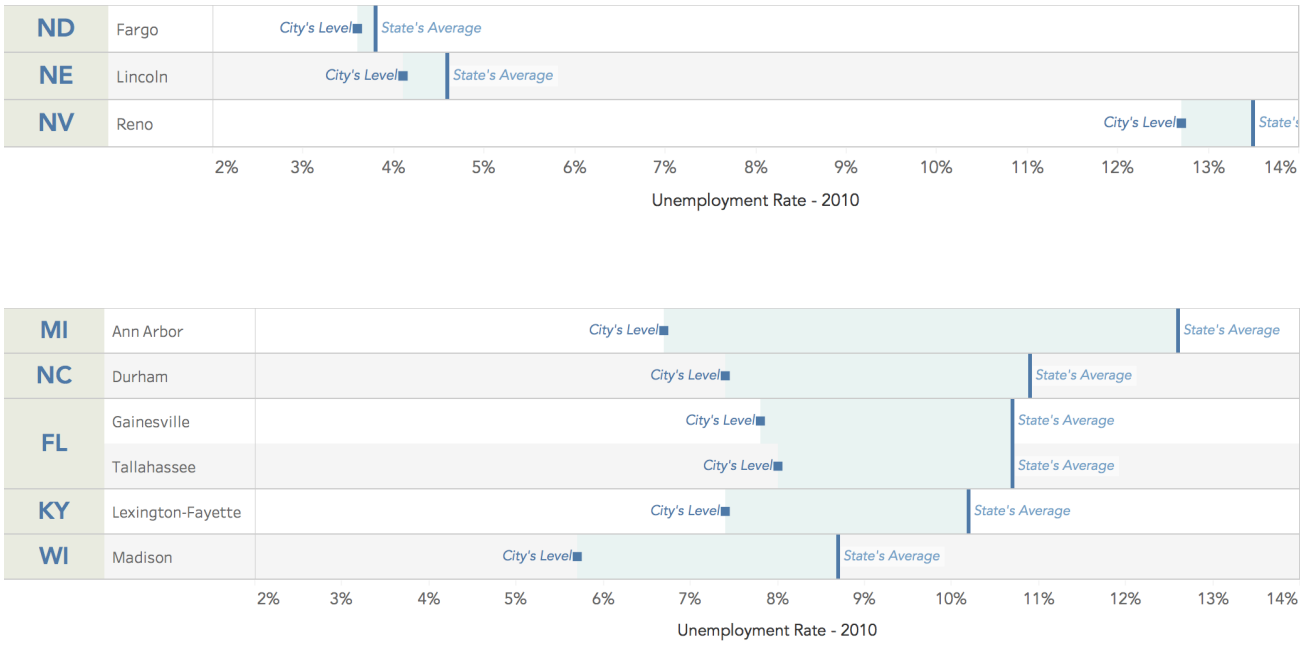


Percent of Employment, Mid-Sized Cities and College Towns.

towns (Baton Rouge, Eugene, Columbia). Cities that performed the worst relative to both college towns and mid-sized cities also performed poorly across metrics related to educational attainment and the creation of educated jobs. These are the same cities that experienced the most severe population decline since 1950, further reinforcing the degree to which the history of these cities makes them a unique subset of University Cities.

A question arose as we examined economic resiliency that we will continue to explore throughout this research, especially as a potential qualifier of some of the variation we will encounter: to what degree does the broader geographical context of where a city is located explain why it performs the way that it does? To show what we mean, we created two charts that plot the unemployment rates in 2010 for a sample of University Cities against the rates of their respective states. *(see Geography charts on following page).*

The first chart shows Fargo, ND, Lincoln, NE, and Reno, NV. Not wishing to minimize the accomplishments of economic policy makers in Lincoln and Fargo, but a chart like this makes the case that the low unemployment rates in these cities during the nadir of the last ten years may have more to do with the fact that Nebraska and North Dakota largely sat out the worst of the recession. This trend is apparent from the other side as well, where you can forgive a city like Reno for such a high unemployment rate in 2010 when you consider Reno was actually outperforming its own state (unemployment in Reno has since fallen to 4%)



(Top) Fargo, Lincoln, and Reno each have an uneployment roughly the same as their rerspective state. (Bottom) These six cities, on the other hand, greatly outperform their state in terms of unemployment.

The second chart shows how we can also use geographic context to highlight those University Cities that deserve additional praise for how well they overcame a geographic disadvantage. Ann Arbor, Durham, Gainesville, Tallahassee, Lexington and Madison each had unemployment rates that were well below the average in their state during the worst year of the recession. Nowhere is this more apparent than in Ann Arbor, where the unemployment rate was almost half as low as the state average.

There is another significant factor that separates some University Cities above others in terms of their economic resiliency – the presence of a university-affiliated hospital. If we control for the geographical and historical outliers (Reno, Lincoln, Fargo, New Haven, Akron, Syracuse) we can plot a clear difference in the unemployment rates for those cities that have a university-affiliated hospital and those cities that do not *(see Hospital Impact, next page).*

We imagine this could be true for a few reasons. For one, job opportunities at hospitals are more evenly distributed across wage brackets than universities (measured as Wage GINI coefficients of .429 and .493 , respectively). In addition, the connection of the university-affiliated hospitals to the educational systems might imbue them with a greater degree of long-term stability, at least compared to private or government run hospitals experiencing downturns.

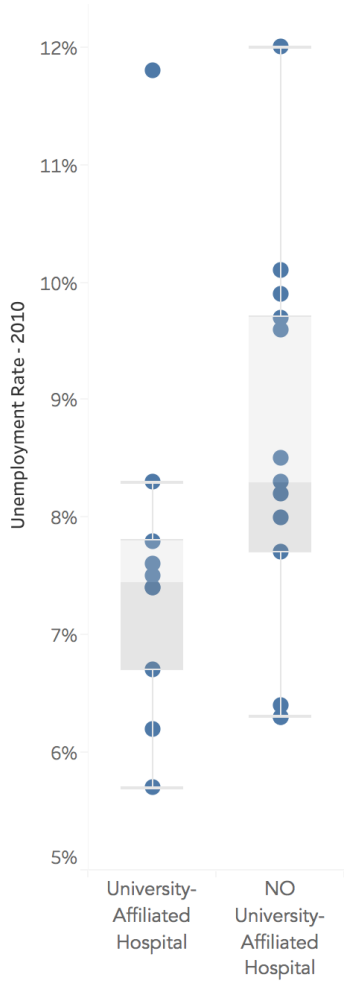
We imagine this could be true for a few reasons. For one, job opportunities at hospitals are more evenly distributed across wage brackets than universities (measured as Wage GINI coefficients of .429 and .493 , respectively).[xxiv] In addition, the connection of the university-affiliated hospitals to the educational systems might imbue them with a greater degree of long-term stability, at least compared to private or government run hospitals experiencing downturns.

Local Entrepreneurial Output

We chose to model the entrepreneurial output of each university and its encompassing city

by using data from CrunchBase[xxv] , one of the most comprehensive records of start-ups and other innovative companies that is populated by over 560,000 active contributors. For each University City and a broad sample of college towns for comparison,[12] we downloaded the total number of companies within the CrunchBase database that were created by alumni of each institution AND the total number of those companies that are headquartered within the city of each respective school, since 2007. We chose to download companies create by alumni because it provides a clear picture of the role each university can play in brokering entrepreneurial output locally.

12 This is the only variable for which were not able to access information on the entire sample of college towns. Instead we chose 25 of the largest from our sample, all of whom who had at least 20 companies created by alumni, to ensure a sizeable denominator against which to measure local impact.

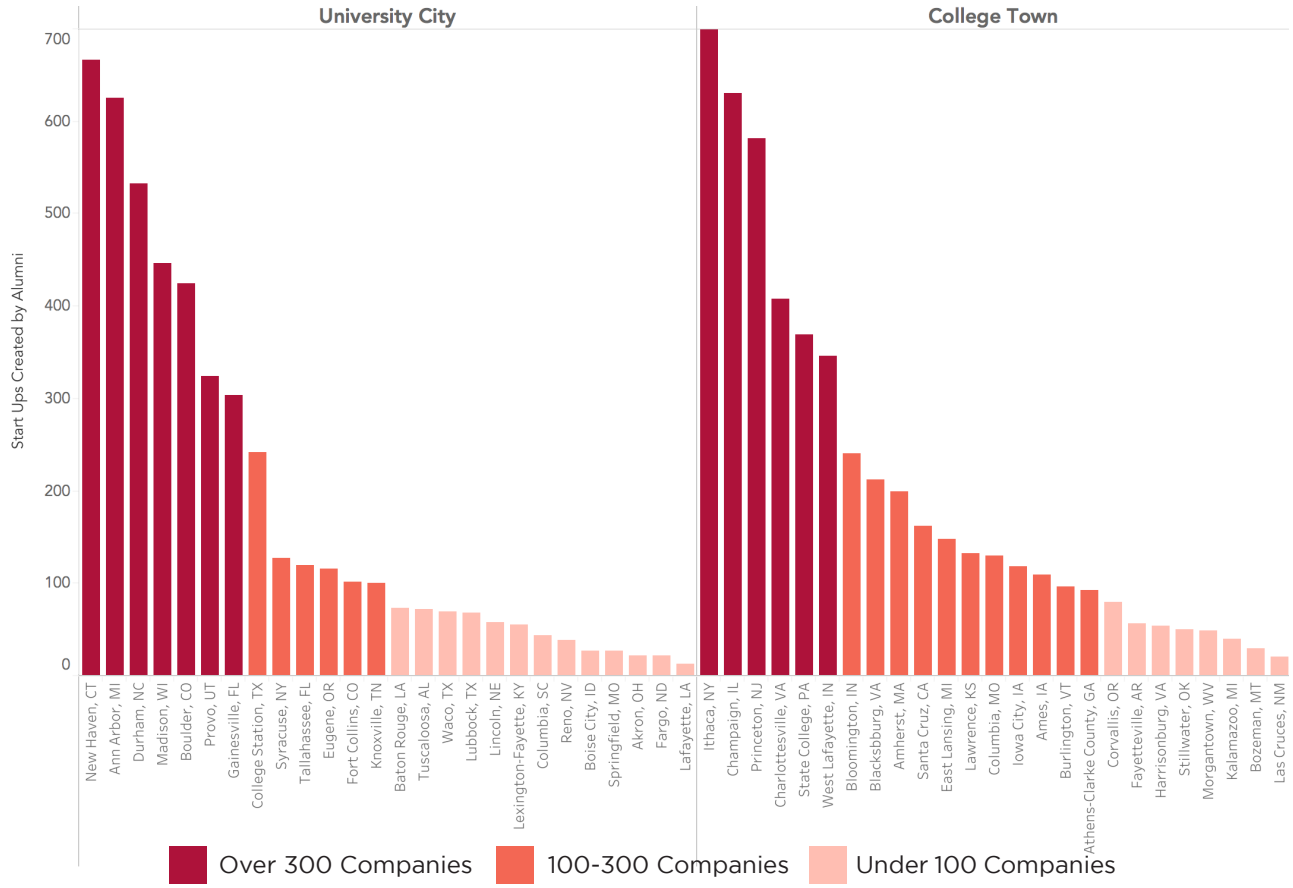


Unemployment & Hospital Affiliation. The presence of a university-affiliated hospital generally decreases unemployment rates.

The first chart *(see Total Companies, following page)* plots the overall number of companies that have been founded by alumni, according to CrunchBase. We have colored the graph by the range of total companies per institution: dark red = 300+ ; medium red = 100 to 300; light red = <100. The first graph makes clear that the entrepreneurial capacity of alumni has no bearing on the size of the encompassing city. Nor should it. There is no reason to believe that students from Cornell should create only a third as many companies as alumni of Yale just because their city is a third of the size. A good variable to predict entrepreneurial capacity is the total research spending per student of each university. This produces strong correlations for both University Cities (P <= .00001; R2 = .612) and college towns (P <= .00001; R2 = .431)

However, this calculus changes significantly when we modify the chart to show the percentage of alumni-founded companies that remained headquartered in the city that educated their founder *(see Companies Retained, following page)* Modeling the data by the percentage of companies retained locally makes a few trends immediately apparent:

- This is another area where we can clearly see the argument that University Cities have the potential to become something different from the college towns that birthed them. The median retention for college towns was 4.1%, with an interquartile range of 2.1% to 5.9% (only a fourth of college towns retained over 6% of their alumni-founded companies). University Cities have a median of 9.5%, and retention is equally dispersed across all universities,

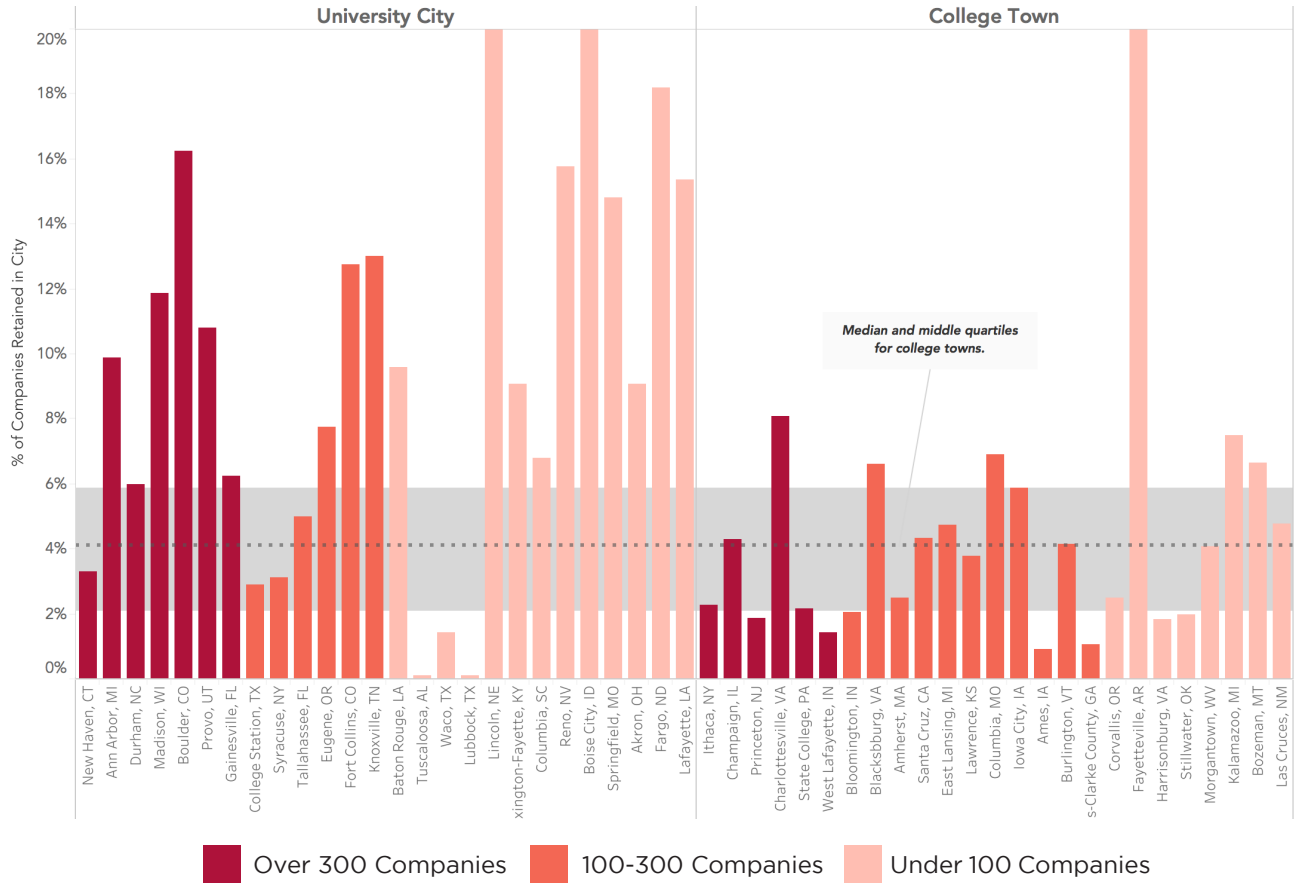


Number of companies that have been founded by alumni, according to CrunchBase.

regardless of how many companies alumni create (compared to college towns where most of the proportional retention is from universities whose alumni create fewer overall companies.)

- University Cities do have a fairly broad interquartile range, making it easy to identify University Cities that do not align with their peers. College Station, Tallahassee, Tuscaloosa, Lubbock, Waco, Gainesville and Columbia/Eugene (to lesser degrees) are all exhibiting retention rates more in line with college towns. This same trend impacts Syracuse, New Haven, and Durham as well, though this may have to do with economic stresses felt by Syracuse and New Haven.

The low levels of company retention from the alumni of Duke and Yale are also interesting because those are two of the schools that have the highest overall research spending by their institutions. If we correlate research funding and retained companies, there is no longer a statistically significant correlation as there was when we correlated research funding with overall company creation. This seems to suggest that while a university can influence the overall level of entrepreneurship that emanates from its student body, research funding alone is not a predictor or guarantee that the company will remain local. There are other factors likely that are likely needed to keep those companies within the city, which will become more evident as we proceed with this analysis.



Company Retainment. Percentage of alumni-founded companies that remained headquartered in the city that educated their founder.

Economics: Key Findings and Conclusions

Our review of educational attainment, job creation, and economic resiliency affirms many of the findings from New Species of City, especially the strong performance of the original six cities. However, our research also uncovered a few novel insights across the full cohort of University Cities:

- Three University Cities have markedly different outcomes across all economic metrics than their peers. Each of these cities has experienced population decline of over 21%, which is likely the biggest explanation of their poor performance against other University Cities.
- The most entrepreneurial universities are not always the best at retaining companies locally.
- The most educated cities are not always those that create the highest proportion of educated jobs. This can lead to a challenge of underemployment
- Geography plays an important role in contextualizing a city's economic resiliency
- Universities with affiliated hospitals are more resilient than those who do not have an affiliated health system

AFFORDABILITY

New Species of City highlighted the low cost of living within the six University Cities as one of the most important elements that helps these cities attract and retain residents[xxvi] . Interestingly, there are a few competing perspectives as to the role that affordability plays in mobility and permanence in American cities. The Current Population Survey from the United State's Census routinely identifies housing as one of the driving issues in why people move [xxvii] and these conclusions are substantiated by other studies that argue how the housing crisis in America is also a crisis of mobility.[xxviii] However there are some studies that arrive at competing conclusions, notably a recent analysis out of CityLab that used survey data to argue how people are willing to tolerate less affordable cities as long as those cities are safe and rich in amenities[xxix] .

Our views align with the results from the Current Population Survey, and we feel that affordability is a critical factor in assessing the growth of University Cities. In New Species of City, the preferred variable to analyze this trend was adjusted median income, a normalized income figure across all cities that factors in the cost of living. We will employ a variation of this metric in benchmarking the full cohort; however we also feel that we must also assess affordability in absolute terms, especially as it relates to housing. There are segments of the population for which a cost-of-living adjusted income would not fully account, such as individuals earning significantly below the median income and, most importantly for this research, students. Some students might work and others might draw a stipend from their university, but there will be numerous others who have no income outside of their savings, loans, or what they are able to wrestle away from their legal guardians.

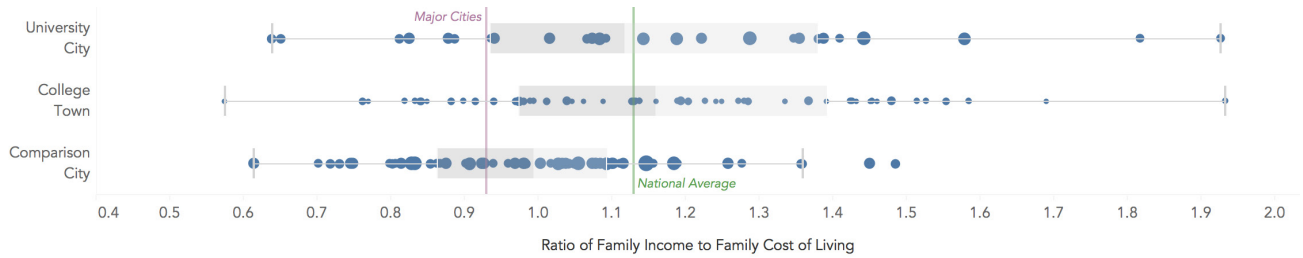
By examining affordability in a manner that is agnostic of income, we can assess the full degree to which University Cities are affordable to all or to certain subsets of their populations.

Income and Cost of Living

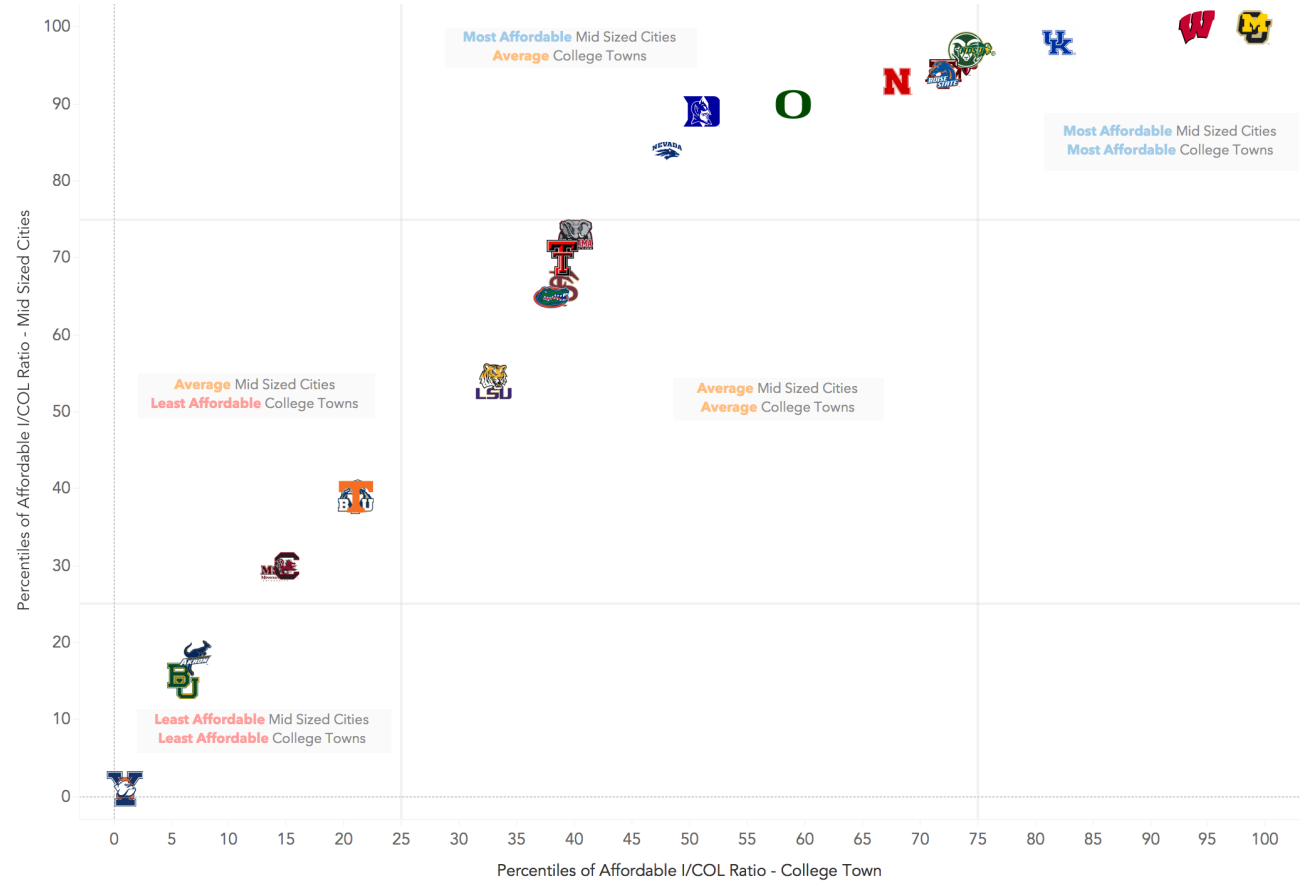
To calculate the relative cost of living within each University City, we opted to use a ratio of median family income to the median cost of living for a family (we will hereby refer to this as the "I/COL ratio. [xxx] ") We chose to focus on family income instead of household income due to the tendency of college students to push down the overall rate of household incomes in college towns.[xxxi] Non family-households and students will be considered later in this section when examining absolute measures of rental affordability.

The I/COL ratio below should be interpreted such that a score of 1 would indicate that the median family income and the median cost of living for a family within that city are identical; anything above or below would indicate that incomes or cost of living outweighs the other, respectively. *(see I/COL Ratio, next page)*

College towns track well above major American cities and even the national average on a measure of I/COL ratio. The average for this cohort is 1.17, though there is significant variation (standard deviation of .27.) Still, over two-thirds of college towns have median incomes that exceed the median costs of living. Examining absolute cost of living and absolute income shows that college towns are more uniformly clustered in terms of their shared low costs of living than they are in terms of shared median incomes levels (though this is not true for more "boutique college towns" such as Burlington, Ithaca, and Chapel Hill)



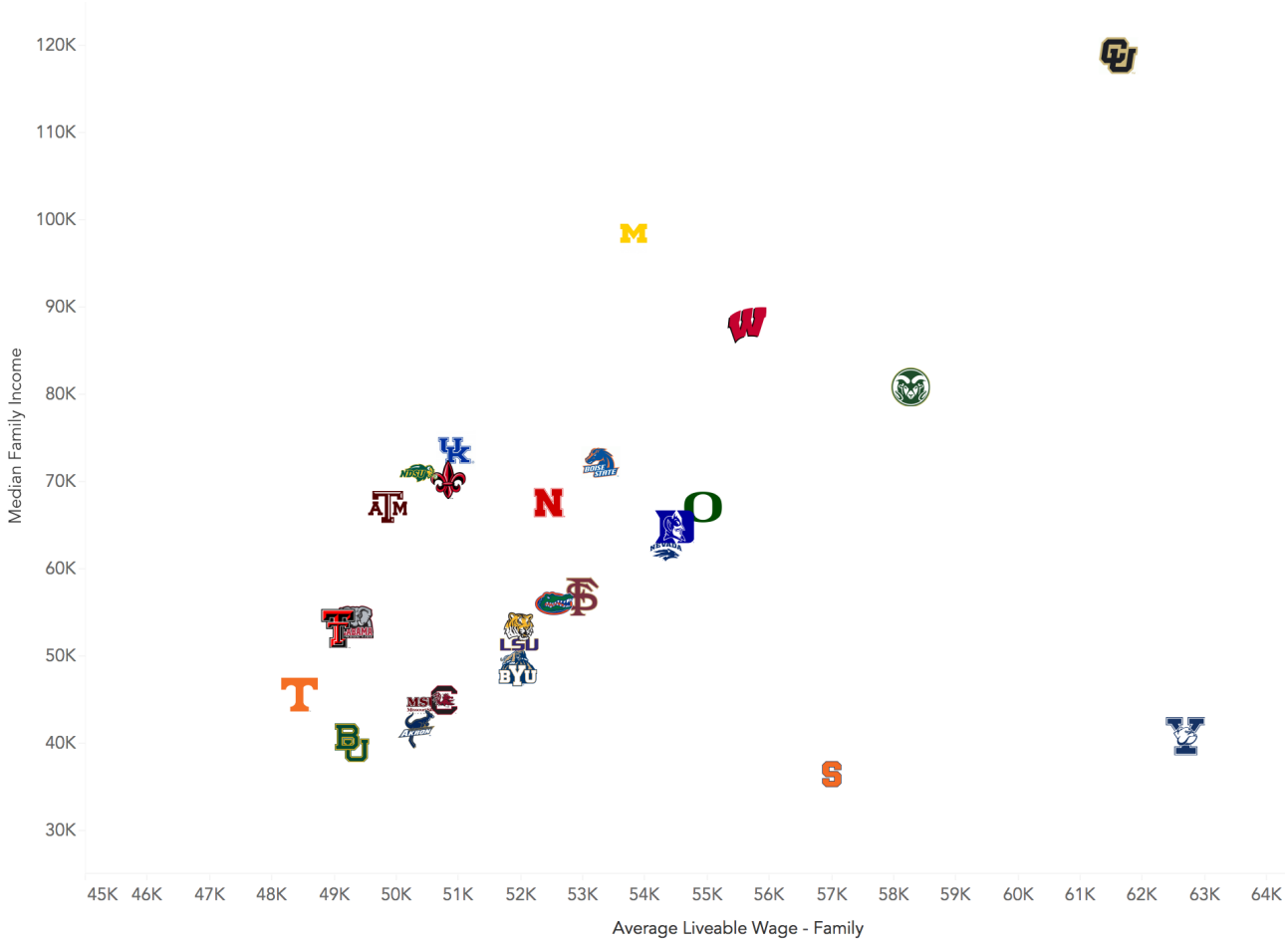
I/COL Ratio: ratio of median family income to the median cost of living for a family.



Affordability of various University Cities and College Towns.

Mid-sized cities have a median I/COL ratio of .993, indicating that a narrow majority of these mid-sized cities have median incomes that fall below the respective costs of living. Unlike college towns, it seems that the I/COL in mid-sized cities are impacted both by higher absolute costs of living and by lower absolute median incomes.

As a group University Cities are distributed similar to college towns *(see Affordability Grid, above)*. Using the comparative matrix for the I/COL ratio shows that 13 out of the 28 University Cities would fall within the highest percentiles (read, "most affordable") against both college towns and mid-sized cities. Another seven University Cities would within the expected ranges for cities this size, though they begin to track



Income of various University Cities and College Towns.

toward the least affordable college towns. At the bottom of the grid are some of the usual suspects, such as Waco, Syracuse, and New Haven.

We can further visualize the degree to which the rates of affordability in University Cities are impacted by incomes versus costs of living by graphing the 26 university cities along these two axes *(see Income, above)*. This view makes it easier to see how cities like Syracuse and Yale are getting hit at both ends, with high costs of living and relatively low incomes. This contrasts with cities like Knoxville, Akron, Columbia, Baton Rouge, and Provo that benefit from low costs of living, but whose residents may struggle to fully appreciate the benefits because the median income levels are so low. On the other end of the spectrum, Boulder, Fort Collins and to a lesser degree Madison and Ann Arbor earn their impressive income/COL ratios more because of the high incomes within those cities.[13]

The I/COL ratio is a good starting point for assessing affordability. However, it cannot account fully for those without an income. In addition, since the cost of living estimates are calculated for an MSA, it is possible that these estimates may not fully incorporate market-rate housing spikes that impact the central cities. Therefore,

13 An explanation that is by no means uniform, but can offer some context to this differentiation is local and state minimum wage laws. Some of the cities with the highest income levels (Michigan, Colorado, Oregon) have all passed progressive minimum wage laws at the state level. Other cities, like Lexington, have passed these laws at the local level. While the laws themselves may not be driving the growth, they could reflect cultures within these cities that value fair income practices

we feel that we must balance an assessment of each city's relative affordability by also examining the absolute cost of housing for both rental and owner-occupied units.

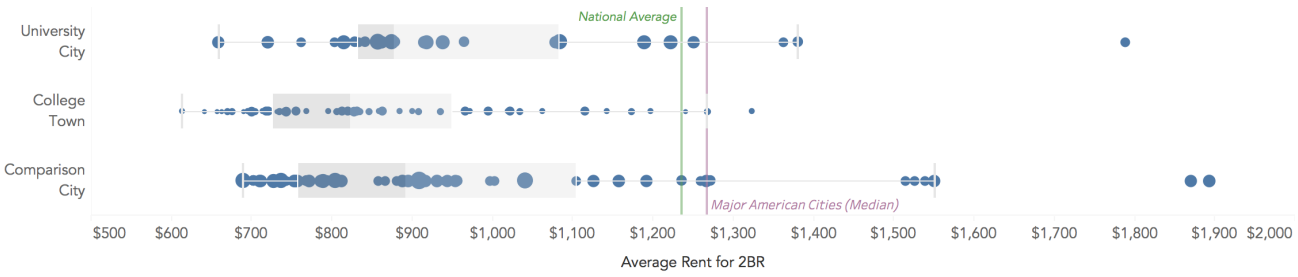
Rental Affordability in University Cities

Data on rental prices can vary significantly depending on the source of the information. Census data on gross rent may be inclusive of a broader sample of housing typologies, but it tends to ignore recent trends in market-rate housing. On the other hand, resources like Apartments.Com and Zillow achieve the opposite effect. To balance these liabilities, we calculated an average 2BR price from all three sources, and plotted the average monthly 2BR price for all three cohorts[xxxii] .

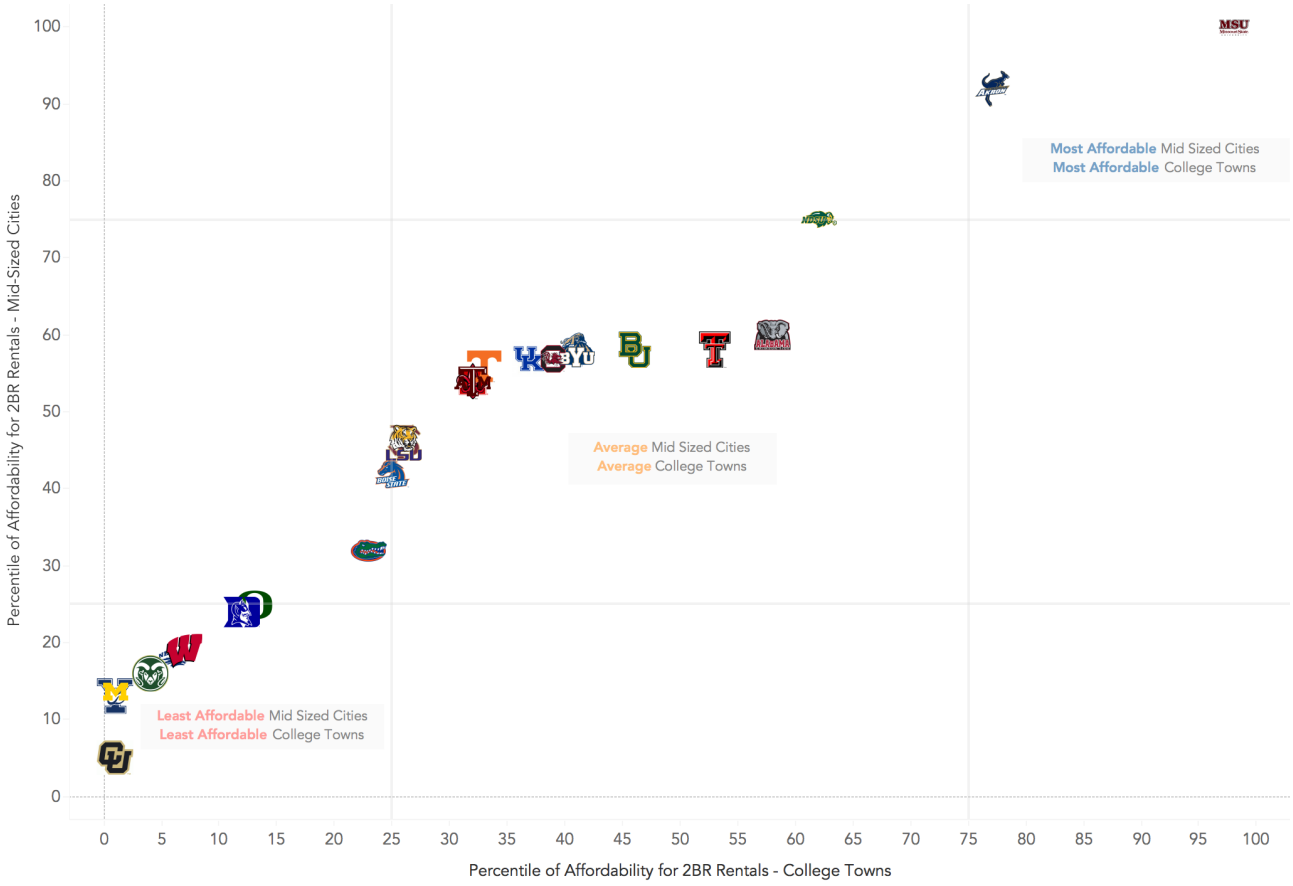
Absolute rental price is one of two variables in this study where college towns really earn their positive stereotypes (*see Rent Distribution)*. While the recurring, boutique outliers are still present (Ithaca, Charlottesville, Burlington, Chapel Hill), most college towns cluster around a median rent of $823 per month. The median 2BR price in mid-sized cities is somewhat higher at $891 per month, though this deserves a bit of clarification. Due to California's objectively high housing prices, there are several California cities in this sample that sit at 1.5 times or greater than the interquartile range. This may skew the sample somewhat, but even with these cities factored out mid-sized cities would cluster around rents of about $875 a month.

Though the median rental value for University Cities is between college towns and mid-sized cities ($877), there is a sizeable gap between Gainesville ($965) and the next most expensive city, Eugene ($1,080.) Eugene, Durham, Boulder, Fort Collins, Albany, New Haven, Ann Arbor, Reno and Madison all track alongside the most boutique of American college towns and the most expensive mid-sized American cities. Absolute rental price is also one of the few variables for which the comparative matrix reveals a different orientation for those cities that usually frequent the right/top (positive) vs the left/bottom (negative) sides of the grid. *(see Rental Grid, next page)*

While some of those cities (Ann Arbor, Boulder, Fort Collins, Madison) have sufficiently high incomes to moderate these higher rents, this qualifier would not necessarily help students mitigate the high rents. Together these four institutions account for approximately 153,000 total students, of whom they only collectively house about 23% (~35,000)[xxxiii] . This leaves 120,000 students across those four institutions that would be looking for some form of housing each year, preferably in the neighborhoods proximate to campus that may even track more expensive than the cities' averages.



Rent Distributions across various University Cities, College Towns, and Comparison Cities.



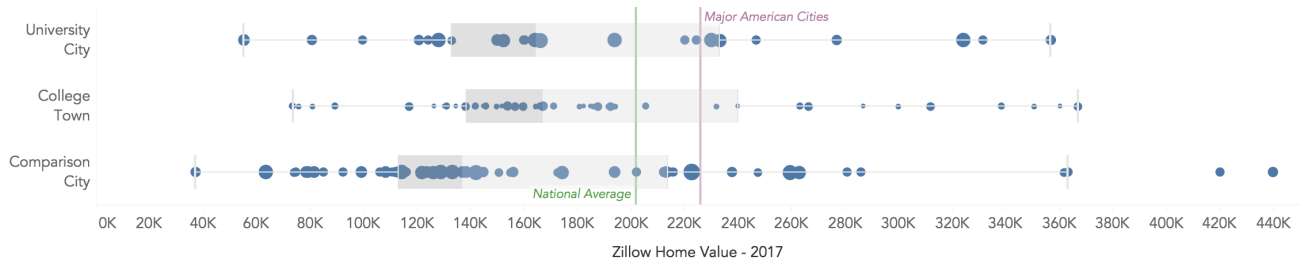
Percentile of Affordability for 2 Bedroom Rental, across various University Cities and College Towns.

Owning a Home

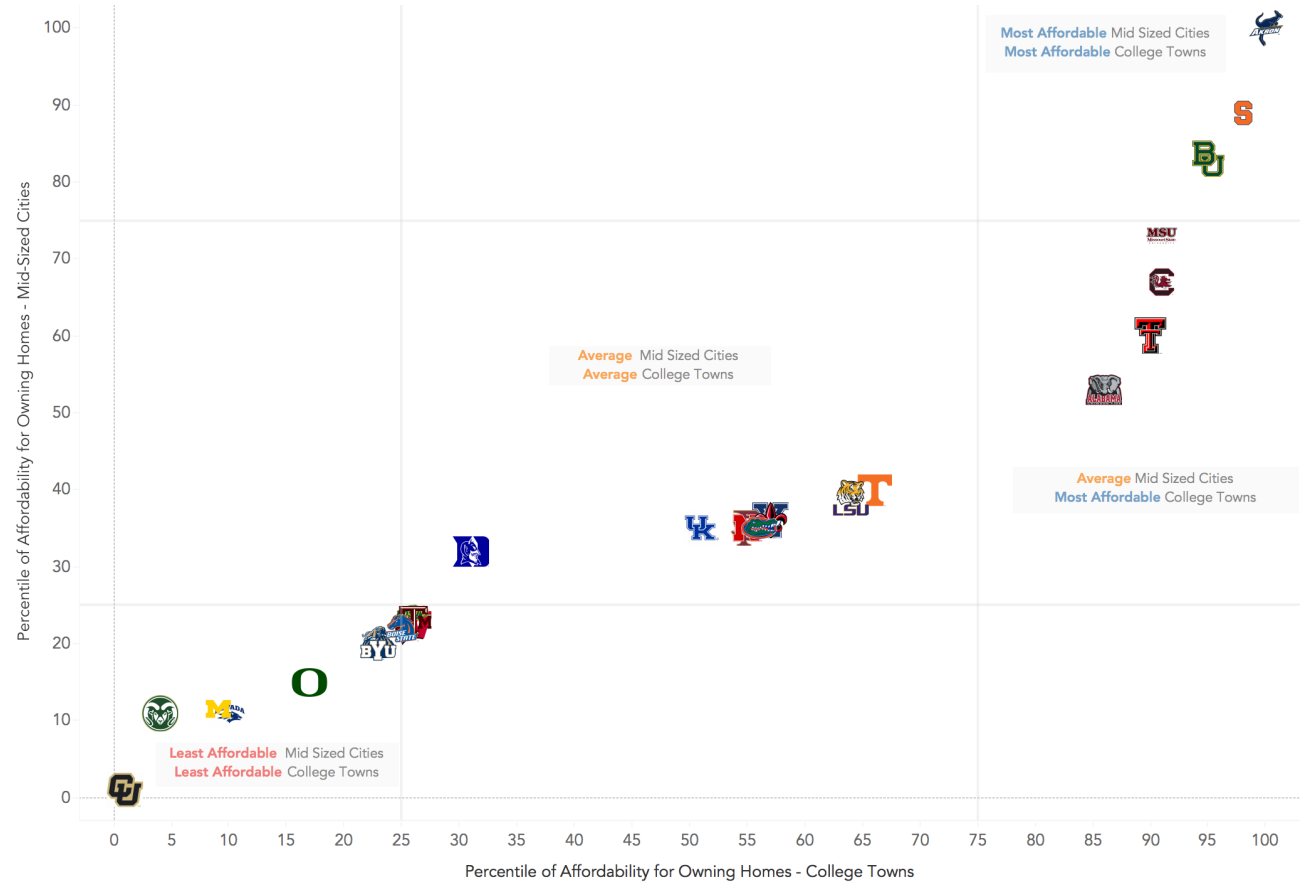
The high absolute costs of rental housing in cities like Ann Arbor, Madison and Fort Collins suggests that even the strongest University Cities are not entirely shielded from issues of affordable housing that to afflict the most popular American cities. We can further explore these themes by examining the other side of the affordable housing coin – what does it cost to own a home in a University City? To do this we downloaded Zillow Home Value Index as a standard proxy for home sale price[xxxiv] .

On average, college towns track below the national average in terms of home values, with a median value of $166,000 *(see Home Values Distribution)*. There is some variation; with roughly 20% of the sample having housing values at or above the median price one would pay in a major American city. Median home values track below the national average for mid-sized cities with a sample median of $133,000. Similar to rental values, cities in California are major outliers but their overall skew of the data is minimal.

University Cities are distributed almost identically to college towns. The overall median for University Cities is just below that for college towns ($164,000), though approximately 25-30% of University Cities have median home values that track closer to the most boutique college towns and, in some cases, above home values in major American cities. The most expensive University Cities in which to purchase a home are Provo, Eugene, Reno, Fort Collins, Boulder, and Ann Arbor. Most of these cities are reflecting the high costs of housing within their states



Home Value Distributions across various University Cities, College Towns, and Comparison Cities.



Percentile of Affordability for Owning Homes, across various University Cities and College Towns.

(Oregon, Utah, and Colorado are 3 of 10 most expensive states in which to buy a home in the US). Ann Arbor is a true outlier, where the median home value is around 250% more than that the state average. *(see Home Affordability, above)*

A Premium for Innovation?

One potential hypothesis that bears review is whether real estate values are responding to degree of entrepreneurship and innovation emanating from some universities. If we correlate research funding per student OR the total companies founded by alumni with housing prices the results suggest a statistically significant relationship, even if the degree of fit is not perfect.[14] This is most evidenced in cities like New Haven, Durham, Madison, Ann Arbor and Boulder – all of whom have the highest research and entrepreneurial output and the highest real estate values of all University Cities. An argu-

14 Alumni founded companies and Rents (P < .00001; R2 =.449); Research Spend and Rents (P < .00001; R2 = .275)

ment could be made that the "quality of life" is driving these values up; however, as the next section will show, this argument cannot fully explain why Durham and New Haven have such high real estate prices. The Connecticut real estate market may explain some of the spike in New Haven, but we would also argue that the high quality and output of research at these institutions may have an impact on the local real estate market.

Affordability Conclusions

Our review of affordability metrics contradicts some of the findings from New Species of City, especially the degree to which the original research concluded that the six university cities were blessed with "incredibly low costs of living." The actual story of affordability in University Cities is a bit more nuanced:

- Cities that have the highest income to cost of living ratio (I/COL) -- such as Ann Arbor, Madison, Boulder, Durham, and Fort Collins – likely meet this milestone due to the high income levels within these cities, especially to other University Cities or mid-sized cities of the same size.
- These same cities actually have some of the highest absolute rents and home values, indicating that from a measure of absolute dollars, housing can be expensive in these cities. While this may be mitigated for around half of the workforce, the high rental prices would still create a problem for the cities low-income residents and for the students. This likely creates (or will soon create) the same crises of affordability and equity that those residents within America's largest cities experience, indicating that University Cities are not excused from this reality by rule.
- There is some evidence to suggest that the entrepreneurial output and/or research capacity of these cities may be contributing to some of the high rental prices.
- On the other end of the spectrum, low median incomes affects affordability in University Cities in two main ways. Cities like Knoxville, Waco and Columbia are blessed with low costs of living – but residents may struggle to capitalize on this fact since the incomes are so low. Cities like Syracuse and New Haven must struggle with both low incomes and high costs of living.
- There is also a cohort of cities that seem to strike the perfect balance between relatively stable/high wages, and relatively low/moderate housing costs. These cities include Lexington, Lafayette, Lincoln, Boise, Fargo, and College Station

QUALITY OF LIFE

Quality of Life can be a loaded term. The definition is naturally subjective and may result in competing value judgments on the same measure (you may think that the high concentration of young people in your neighborhood is positive; your grandparents may not). However, we do feel that there are some metrics for assessing quality of life that are as close to objective as possible, such as low crime and access to amenities (it is highly unlikely you would ever meet someone passionately defending the value of living in an unsafe city). Qualitative survey data also supports the importance of these two variables in determining housing choice[xxxv] .

Violent Crime and Safety

Violent crime rate is the other of the two variables in this study where you can really see how college towns live up to their stereotypes. By and large college towns are among the safest places in country. To show this we plotted all cohorts based on the number of violent crimes per 1,000 residents, using an average of 2013 and 2014 data from the FBI Uniform Crime Statistics.

College towns have a median of 3.08 crimes per 1,000 residents and cluster quite closely around this median (*see Crime Distribution below)*. Mid-sized cities have more variable rates of violent crime, though they track more towards high crime levels in the aggregate. Over half of all mid-sized cities have violent crime rates greater than 5 incidences per 1,000, and only around four or five are as safe a typical college town.

University Cities, on the other hand, look as if they belong in two different datasets. Though the overall median is 4.76, a little over half of all University Cities cluster around a violent crime rate of 3, about as safe as an average college town. There is then a significant jump in the data with all remaining University Cities exceeding the crime rates of major American cities and tracking among the lowest percentiles for public safety among mid-sized cities. This distribution produces one of the most unique and interesting Comparative Matrices of this entire research project *(see Crime Grid, next page).*

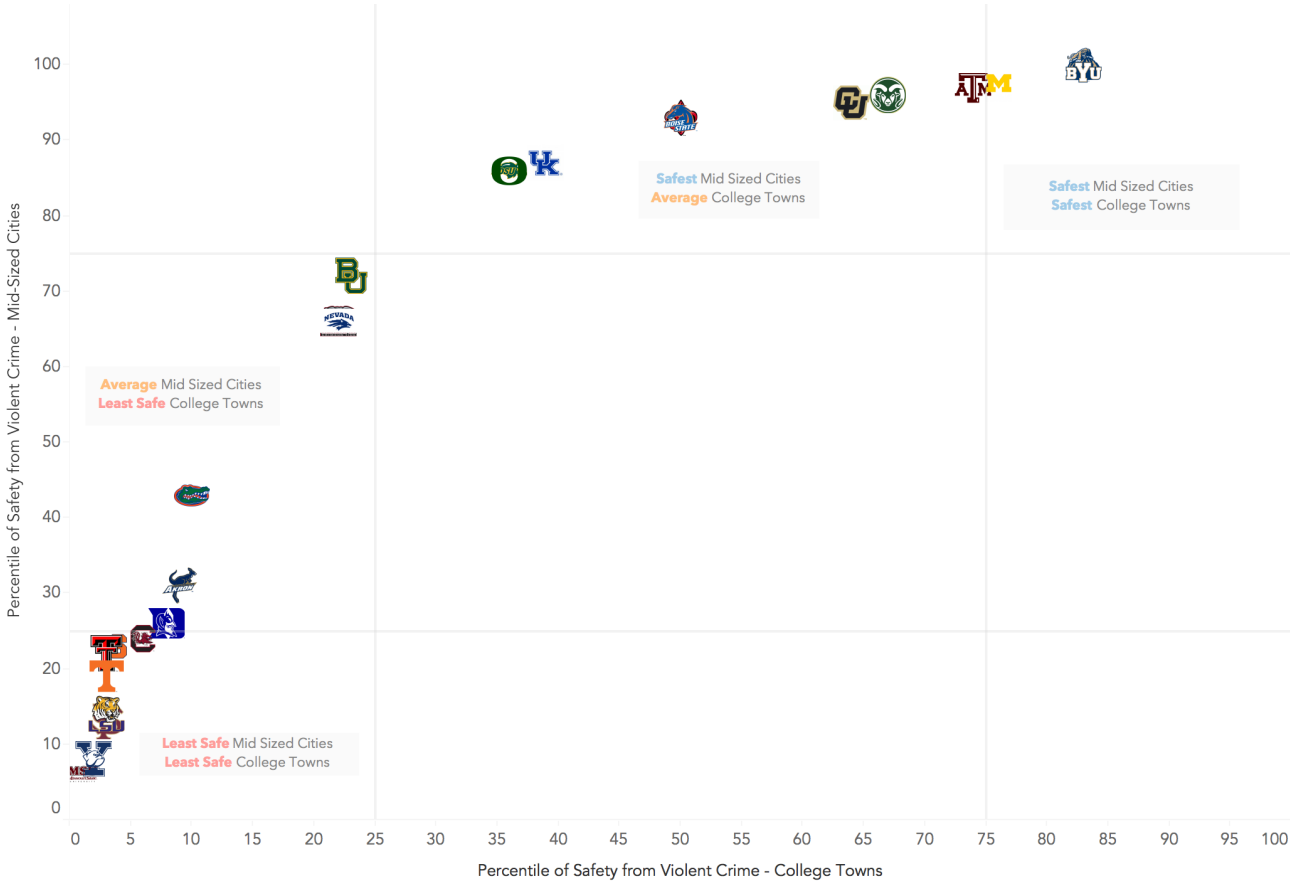
Returning to a hypothesis introduced in the last section, perhaps this bizarre variation has a spatial explanation? If we plot map of University Cities (Os) and college towns (Xs) on a map and color the shapes by their rate of violent crime (low = green; high = red, with a break at 5 incidences per 1,000) it reveals some fascinating insights.*(see Crime Map, next page)* With almost no exceptions, every University City that suffers from high rates of violent crime in the South or the Northeast (only Tuscaloosa and Lafayette don't adhere to this trend). This is not the case with college towns in either geography. Southern University Cities (especially) appear to behave more like proximate mid-sized cities in their geographies than they do proximate

Crime Distribution across various University Cities, College Towns, and Comparison Cities.

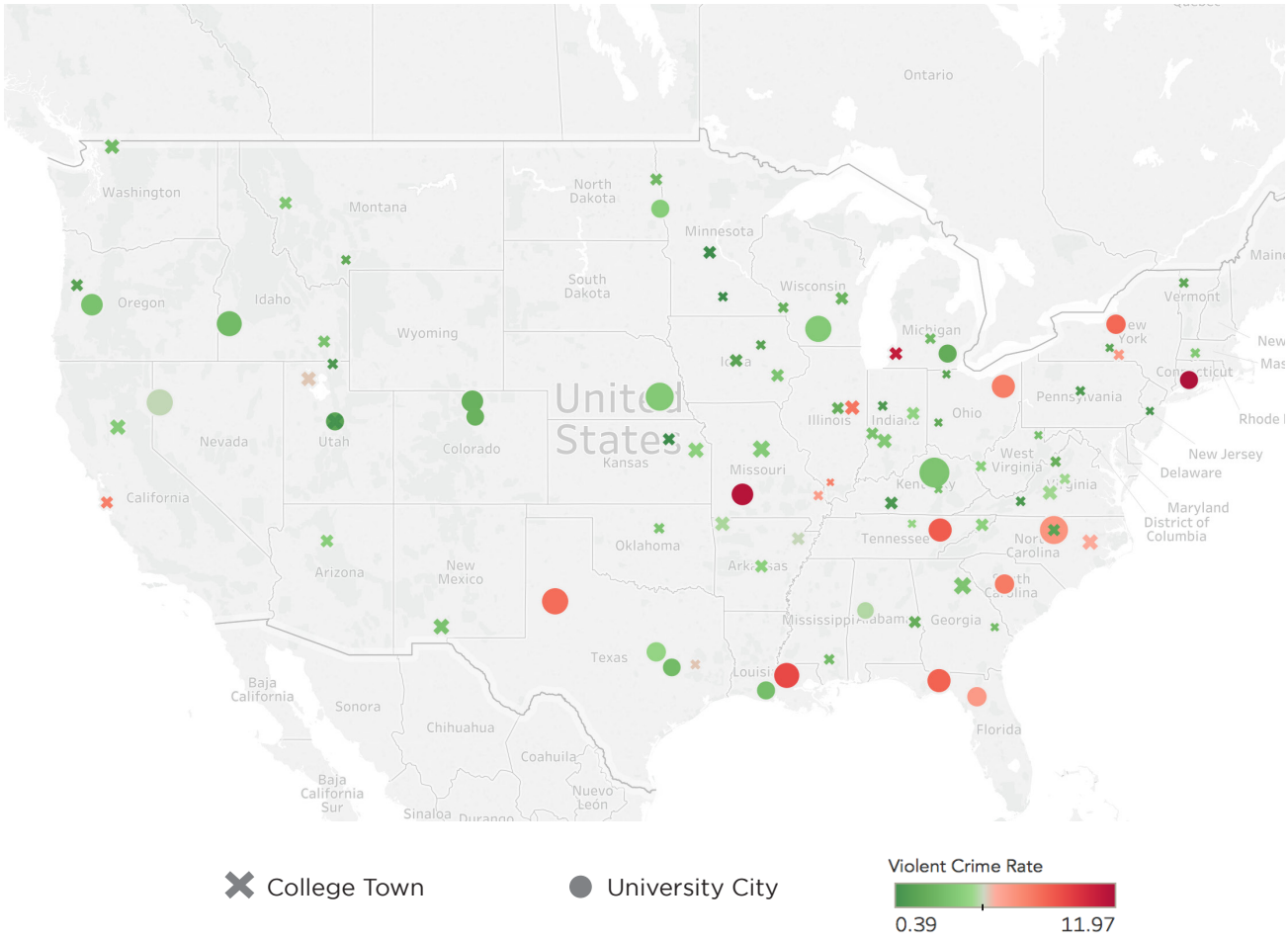
college town (this is the opposite of the Great Lakes region, where University Cities, excepting Akron, behave more like proximate college towns than they do proximate mid-sized cities in terms of violent crime).

So what is going on here? At the time of this writing we could not find any conclusive research that proves why southern cities exhibit greater levels of violence – though there are some interesting theories that include a legacy of violence, heat and humidity, and, most plausibly, concentrations of poverty[xxxvi] . To test this, we ran a regression between poverty rates and violent crime rates. The results demonstrate strong significance (P <= .00001 and an R2 of .5916) – but only if the sample includes only University Cities. If we run the same regression on the college towns, and there is no statistically significant correlation.

Perhaps the variation is also a product of history. The eleven University Cities with the highest levels of violent crime are also eleven of the fourteen oldest University Cities (the other three oldest cities that do not suffer the same rates of violent crime are Lexington, Madison, and Lincoln). Cities like Knoxville, Baton Rouge, and even Tallahassee came of age during the tumult of the middle decades of the 20th century. They lived through deindustrialization, the Civil Rights movement, unfair housing practices, and urban renewal policies that resulted in deep issues with segregation and poverty in many cities in the Americans South and Northeast. Even though most of these cities are grow-



Percentile of Safety from Violent Crimes, across various University Cities and College Towns.



Crimes rates across various University Cities and College Towns.

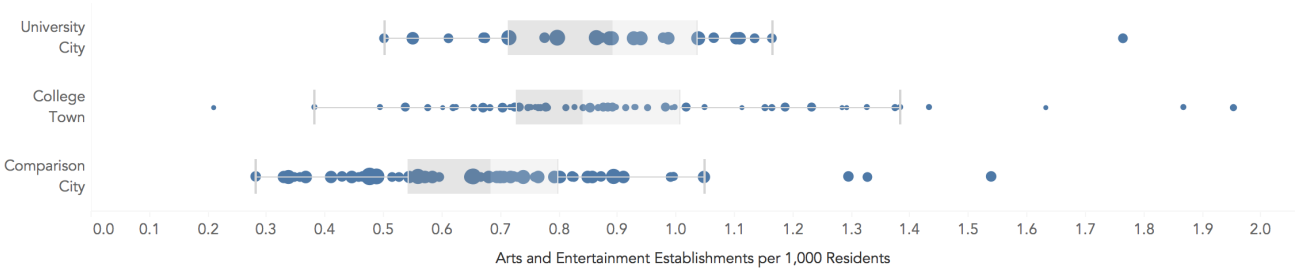
ing at a steady rate annually and have demonstrated greater economic resiliency than other mid-sized cities in the south, the legacies of poverty and segregation would remain in some neighborhoods.

There is one more analysis that could shed some light on this area that, unfortunately, this study does not have the bandwidth to complete. The FBI's Uniform Crime Statistics are released only at a city level, so it is difficult to see intra-city spatial trends. A final test to determine the true danger of these "high crime cities" would be to plot violent crime trends across the city and see where they cluster. If they are dispersed evenly, then it is fair to argue that the city has a crime problem. If they are clustered in specific neighborhoods, especially those with deep-rooted issues of segregation or poverty, than it may be the case that only a small number of each city's communities (albeit those with some of its most intractable problems) are causing the spike in crimes.

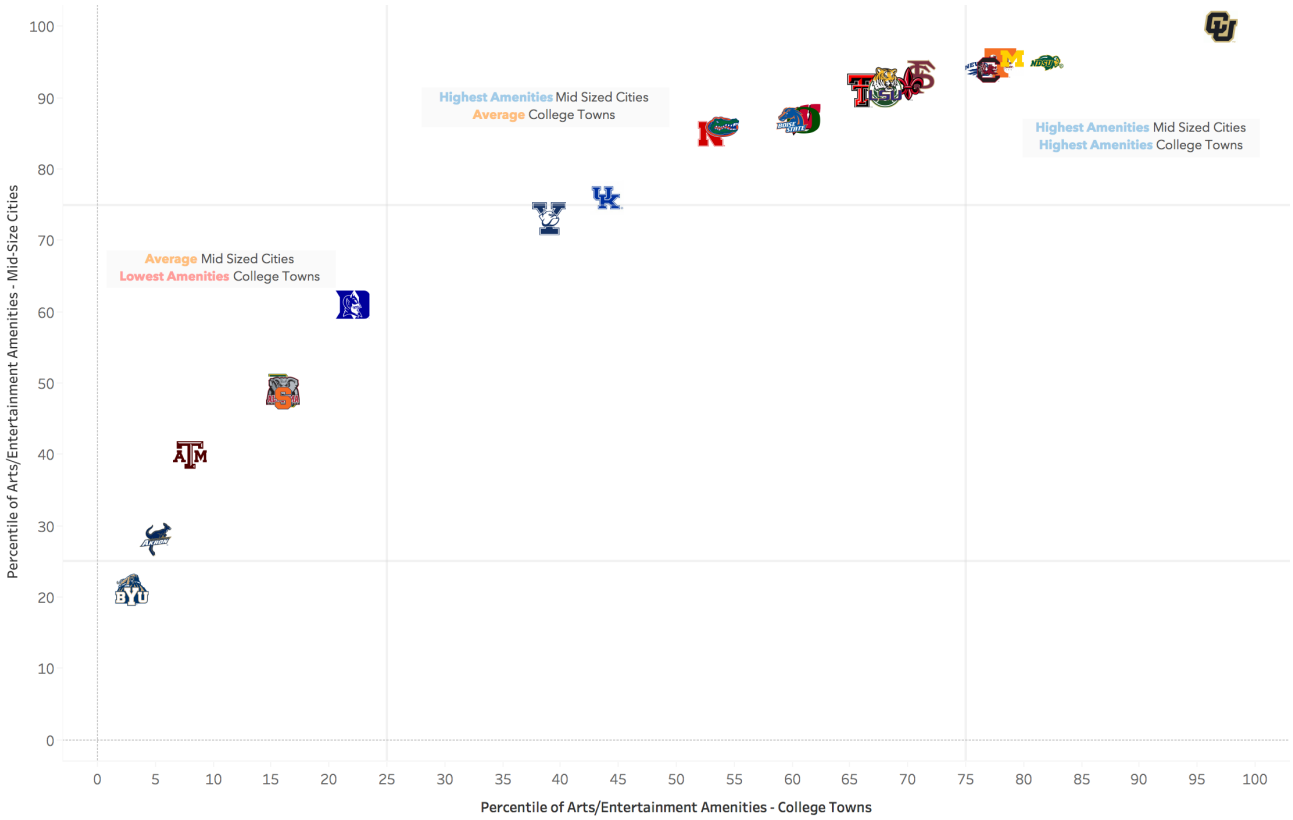
Access to Amenities

For consistency of analysis, we have selected arts, culture and entertainment establishments (defined as NAICS codes 71xxxx) as our primary amenities to analyze[xxxvii] . We also pulled information on the composition of food and dining establishments, though we chose to include this as a note in the appendix rather than the main body of research.

Though there is some variation, college towns on the whole tend to have a relatively high num-



Amenities Distribution across various University Cities, College Towns, and Comparison Cities.



Percentile of Amenities, across various University Cities and College Towns.

ber of cultural and entertainment establishments proportionate to their size (*see AAmenities Distribution)*. Absent a few outliers, almost all college towns have at least .5 establishments per 1,000 residents. Several of the more boutique college towns have numbers that exceed the average by a factor of 2 ore more, which is impressive given the smaller size of these cities in absolute terms (Ithaca, Charlottesville Burlington). Mid-sized cities skew lower in this category, with a median of .65 and a middle quartile range from .53 to .8.

(Arts and Entertainment Grid) University Cities look like a blend of the other two cohorts. Like college towns they track higher; like mid-sized cities they cluster relatively closely around the median (.9 per 1,000, in this case). Unlike other metrics reviewed in this research, there is only one significant outlier – Boulder. Using a comparative matrix it is easy to visualize how the majority of University Cities rank among the highest percentile for cities of this size, and fall mostly within the upper 70th percentile of college towns. Provo's low rate of cultural and

entertainment amenities may have something to do with the more reserved Mormon culture of the city. Lexington likely has more proportional amenities than this grid suggests (population for Lexington is reported at the consolidated city/county level; it is likely that most of the amenities are clustered within the growth boundary, so the number is likely higher considering density)

Interestingly, there is no universal correlation (positive or negative) between levels of violent crime and concentration of amenities. Some of the cities with the most dangerous levels of violent crime (Knoxville, Columbia, Tallahassee, Baton Rouge) have some of the highest proportional levels of cultural and entertainment amenities. Some of the cities that are objectively the safest has some of the lowest proportional levels of cultural and entertainment amenities (Provo, College Station). Only cities such as Akron, Syracuse and, surprisingly, Durham seem to track low across both metrics.

Quality of Life Conclusions

Our review of the quality of life metrics affirms most of the findings from New Species of City, with a few discrepancies. The most important of which is that Durham seems to perform much differently than the other five original University Cities across measures of both violent crime and cultural amenities. Our research suggests that while violent crime is an important factor in a city's overall livability, it may not be as strong a deterrent on its face as previously thought. Some other notable revelations include:

- There is no correlation (negative or positive) between violent crimes and lack of amenities. This suggests that high crime levels in many southern University Cities have not inhibited these cities from remaining "liveable" in terms of their access to amenities.
- An argument can be made that College Station and Tuscaloosa may be "falsely" underperforming in terms of their access to cultural amenities. However, this would not fully explain why Fargo, another city of the same size, tracks completely in the opposite direction.

Conclusions

The primary goal of this research was to build a framework for assessing and comparing college towns that had outgrown this definition. To accomplish this we compared all University City candidates to a sample of college towns, mid-sized cities, and to one another. Five key observations emerged from our research that we feel are the most valuable in advancing future study of University Cities.

What It Means to be a College Town – The very notion of defining a University City depends on an agreement of what defines a college town. Our research shows that while there is sometimes variation among college towns (i.e Ithaca to a Lawrence), as a unit they largely track in the same direction across key metrics, especially when compared to other cohorts (i.e mid sized cities, national average, etc). While University Cities largely tracked alongside college towns, there were four variables that allowed us to see the clearest difference between the cohorts, and thus help define why University Cities could be classified differently: violent crime, cost of living (absolute and relative), retention of alumni, and retention of alumni-created companies. These metrics help paint a clear picture of those University Cities that fulfilled the promise of something new, as well as those who have not yet fully emerged beyond the constraints of being a college town.

Affordability is not a Guarantee of University Cities – We found significant variability in affordability measures, especially in housing costs. This is most noticeable in five cities: Durham, Ann Arbor, Fort Collins, Boulder, and Madison. Overall economic strength (as measured through a combination of entrepreneurial output, low unemployment, and high educated populations/workfares) is highest in these five cities and four out of five are among the safest and most amenity-rich of all University Cities. The accelerated growth and attractive nature of these cities has come at the expense of increased housing prices, a trend that separates them from college towns and makes them far more similar to America's most competitive cities While these cities also have some of the highest income levels of all University Cities, this alone would not mitigate affordability challenges for low-income residents or students.

The Economics of University Cities – University Cities seem to differentiate themselves more in terms of their entrepreneurial output or the educational composition of their workforces than they do in terms of economic resiliency. Though some University Cities performed objectively better than others in minimizing unemployment, these differences are often measured in degrees (for example, in 2010 the unemployment rates of Ann Arbor and Baton Rouge were only separated by 1.6%). Entrepreneurial output and the educational composition of a city's population and workforce are the variables across which the clearest variation between University Cities occurs.

The Limits of University Cities -- Three cities are so uniquely different in their economic output that they cannot be plotted in the same way economically: Akron, New Haven, and Syracuse. The label of University City is entirely fresh for these three cities, as none of them were ever thought of as college towns. They are all post-industrial cities that have experienced high levels of deindustrialization and population loss, leaving lasting challenges that are more vexing than those faced by other University Cities.

Questioning the Importance of Crime in Some Cities – Violent crime is one of the metrics that would preclude southern cities such as Gainesville, Tallahassee, and Knoxville from

eventual inclusion as University Cities. However, our research suggests that these high levels of crime are a phenomenon of southern cities, tied especially to the history of poverty and segregation in those cities. Our research suggests that high crime in these southern cities does not seem to impact economic growth or amenity-creation. A good next step for this research would be to evaluate these crime trends more granularly to understand if crime is affecting these cities uniformly, or if there are several high crime neighborhoods that are driving the increases.

These observations lead us to agree with some of the central conclusions reached in New Species of City, namely around the unique economic strengths and growth patterns of University Cities. However, our key findings do not always align and in some instances contradict the initial grouping of six cities (especially in terms of affordability). Given our findings, we feel that there is room to expand the original classification of University Cities into a few sub-cohorts. We will conclude this research by delineating five potential cohorts that we feel can organize research of University Cities moving forward.[15]

COLLEGE TOWNS EVOLVED: HIGHEST VALUE/HIGHEST PRICE

(Ann Arbor, Durham, Madison, Boulder, Fort Collins)

Though there is some small differentiation in terms of Durham, these University Cities as a whole are the closest to achieving the promise that University Cities are something unique beyond college towns. The economies in these cities are highly innovative. Their populations are highly educated. They are creating job and weathering economic downturns at levels significantly above their states. However, this growth seems to have come at the cost of affordability that defines the majority of college towns. As these cities have already established sustainable economies, focus will need to shift more toward the creation of more affordable housing.

COLLEGE TOWNS MATURED: BALANCED VALUE

(Lexington, Lafayette, Fargo, Lincoln, Boise)

These cities demonstrate what might happen if a College Town grew to sustain enhanced population growth, but retained almost everything that made it attractive when it was smaller. These cities may not have the highest entrepreneurial output per capita, but they manage to retain a good portion of companies that are created by founders. They have high levels of alumni retention over long periods of time and their economies are growing at around 3% annually for both educated and non-educated jobs. These cities have also retained proportionally low levels of crime and low costs of living, in both in relative and absolute terms.

COLLEGE TOWNS STUNTED: NOT FULLY UNIVERSITY CITIES

(Gainesville, Tallahassee, Columbia, Eugene, Tuscaloosa, Provo, College Station)

Each of these cities is experiencing one ore more conditions that has kept them stuck in somewhat of a "college town loop." For cities like Eugene, Tallahassee, Gainesville, and Columbia (to a degree) the retention of alumni and companies created by alumni more closely resemble levels associated with college towns. One factor that may explain this is the under-creation of educated-jobs compared to overall economic growth. This is likely creating

15 Not all cities cluster perfectly. Reno and Waco, for example for different reasons. Reno has a wide assortment, where as Baylor performed like Akron or Syracuse across almost all metrics, but did have some stability of job and population growth making it difficult to fully classify

a climate of under-employment that cannot sustain educated residents over time. Time is a factor in mitigating these conditions; however these universities and cities could also benefit from programs that target enhanced alumni business creation locally.

MORE MID-SIZED CITIES WITH COLLEGE TOWN ELEMENTS

(Knoxville, Baton Rouge, Springfield, Lubbock)

These cities are harder to identify, but they do share some key trends. Amenity creation is high within these cities and they seem to retain a relatively high proportion of employees and employee-founded companies, even if the absolute entrepreneurial output is lower than other cities. However, each of these four seems to be far more similar to mid-sized cities than college towns across two key metrics: educational attainment and incomes. These populations in these cities are less educated than other University City peers and have some of the lowest overall income levels, a fact that is only somewhat mitigated by the very low cost of living in these cities.

UNIVERSITY CITIES BY DEFAULT

(Akron, Syracuse, New Haven)

These cities are University Cities by default and not design. The proportional influence of the University within these cities has risen in the last fifty years as their populations have declined at rates between 20% and 35%. As such these cities will have some of the most severe instances of inter-generational poverty and low high school education that would make it difficult to fully integrate the benefits of a university at a city level. Cities like these may benefit most from strategies that are employed by universities in weak markets in larger cities, such as the University of Pennsylvania or the University of Chicago, that concentrate reinvestment heavily within the most proximate neighborhoods first.

Endnotes

i Population Data 2016: All Population Data for cities, MSAs, and national averages from 2016 is sourced from the following dataset: U.S Census Bureau, 2012-2016 American Community Survey 1 Year Estimates; B01003 – Total Population, generated using American Fact Finder. Hereafter abbreviated as ACS [#] Year Estimates.

ii National Center for Education Statistics: IPEDS: Integrated Postsecondary Education Dataset: All Institutions: 2017 Provisional Release Data – All Students. Unless otherwise noted, all subsequent data about each university will come from this source, with the specific attribute noted.

iii Career Insights, LinkedIn All subsequent LinkedIn citations (called LinkedIn) searched each universities alumni page and analyzed the Total US Graduates and Total in Respective MSA for a given year.

iv Federal Bureau of Investigation. 2014. Crime in the United States 2012 [Uniform Crime Reports]. Knoxville & Lexington-Fayette. Accessed June 2018. From this point all crime data is sourced from this dataset, relative to each city.

v Cost of Living: Cost of Living is calculated using the "Living Wage Calculator," created in 2004 by Dr Amy K Glassmeir at Massachusetts Institute of Technology. Information accessed here: http://livingwage.mit.edu/pages/about. All cost of living data is calculated at an MSA level, unless otherwise noted.

vi Family Median Income data retrieved from U.S Census Bureau, 2012-2016 American Community Survey 5 Year Estimates; S1903 – Median Income Last 12 Months (Family Income)

vii New Species of City Discovered: University Cities, Scott Shapiro. Accessed online, http://universitycities.org/wp-content/uploads/2018/07/New-species-of-city.pdf

viii New Species of City, 1.

ix New Species of City, 1.

x College Ranker, "The 50 Best College Towns to Live in Forever." Accessed online at (http://www.collegeranker.com/features/best-college-towns/)

xi Census Bureau, ACS 1 Year Estimates, B01003 – Total Population

xii WalletHub, "2018's Best College Towns & Cities in America," Richie Bernardo, Dec 12th, 2017. Accessed online at https://wallethub.com/edu/best-worst-college-cities-and-towns-in-america/8974/#citysize-rankings. The Chronicle of Higher Education, "What Makes a College Town, and Which Are the Best?", Scott Carlson, August 28th, 2012. Accessed online at https://www.chronicle.com/blogs/buildings/what-makes-a-college-town-and-which-are-the-best/31762

xiii National Center for Education Statistics: IPEDS

xiv CityLab.com, "What Makes Us the Happiest About the Places We Live," Richard Florida, September 19th, 2014. Accessed online at https://www.citylab.com/equity/2014/09/what-makes-us-the-happiest-about-the-places-we-live/380469/

xv All historical population data accessed through U.S Census Bureau, Decennial Census for appropriate year.

xvi Moretti, Enrico. "Where the Good Jobs Are – And Why." The Wall Street Journal. Sept 17th, 2013; Moretti, Enrico. "Education, Spillovers and Productivity." American Economic Review. June, 2004. Pp 656-690 – cited from New Species of City, 1.

xvii Henceforth all national averages and averages/medians for major cities are calculated using the same data source that assess the other three cohorts. Major cities include the top 30 cities by population as of 2017 and include: New York, Los Angeles, Chicago, Houston, Phoenix, Philadelphia, San Antonio, San Diego, Dallas, San Jose, Austin, Jacksonville, San Francisco, Columbus, Fort Worth, Indianapolis, Charlotte, Seattle, Denver, Washington, Boston, El Paso, Detroit, Nashville, Memphis, Portland, Oklahoma City, Las Vegas, Louisville, Baltimore.

xviii US Census Bureau, ACS 5 Year Estimates, B1503 – Educational Attainment of Population 25 and Older

xix Population size has no bearing on this (P-.304; R2-.016), though the size of the student body does produce a small correlation (P-.004; R2 - .17).

xx Bureau of Labor Statistics, U.S Department of Labor, Occupational Employment Statistics 2017. Accessed online at https://www.bls.gov/oes/

xxi Bureau of Labor Statistics, U.S Department of Labor, Occupational Employment Statistics 2017. Accessed online at https://www.bls.gov/oes/

xxii Bureau of Labor Statistics, U.S Department of Labor, Local Area Unemployment Statistics. Metropolitan Area Employment and Unemployment 2007-2017. Accessed online at https://www.bls.gov/lau/

xxiii This trend can be seen in a few ways. First, according to Census Data, Education and health services was one of the only industries

that saw job growth during the hardest years of the recessions (https://www.census.gov/history/pdf/greatrecession-bls.pdf); also, Richard Florida has shown in his research that what he defines as "Creative Class Jobs" (a good proxy for jobs requiring higher education) experienced lower absolute levels of unemployment during the recession (Florida, Richard. Rise of the Creative Class Revisited, 2012)

xxiv Census Bureau, American Community Survey PUMS 1-year Estimate, Wage GINI 2016. Accessed from https://datausa.io/profile/naics/622/

xxv All subsequent CrunchBase data accessed through CrunchBase Pro Account. To download the data we set up the following query: Companies where the founder was an alumni of the respective institution AND Companies where the founder was an alumni of the respective institution filtered by those companies that are headquartered within the city that houses the university.

xxvi New Species of City, 3.

xxvii United States Census Bureau, Report: Reasons for Moving: 2012 to 2013. David Ihrke, Issued June 2014. Accessed online at https://www.census.gov/prod/2014pubs/p20-574.pdf

xxviii Curbed, "The Housing Crisis Isn't Just About Affordability – It's about Economic Mobility Too." Patrick Sisson, April 24, 2018. Accessed online at https://www.curbed.com/2018/4/24/17275068/jobs-mobility-high-rent-housing-costs

xxix CityLab, "What Makes us Happiest…"

xxx Unless otherwise noted, all calculations regarding Cost of Living reference Glassmeir, "Cost of Living Calculator"; all calculations regarding family income reference ACS 5 Year Estimate, S1903

xxxi Casselman, Ben. "Inequality in College Towns." FiveThirtyEight. http://fivethirtyeight.com/features/inequality-in-college-towns/. Cited via New Species of City, 3

xxxii ACS 5 Year Estimates, B25031 – Median Gross Rent by Bedrooms; Zillow Rental List Price ($) – 2BR, average 2017. Accessed online at https://www.zillow.com/research/data/ ; Apartments.Com, accessed "Local Guide" for each city, data reported as 2BR average price as of August 2018. Accessed online at: https://www.apartments.com

xxxiii IPEDS, Final Release Data 2016-2017, Total Dormitory Capacity

xxxiv Zillow Home Value Index – All Homes Time Series Average – Average 2017. Accessed online at https://www.zillow.com/research/data/

xxxv CityLab, "What Makes us Happiest…"

xxxvi Business Insider, ""Why the South is More Violent Than the Rest of America." Erin Fuchs, Sept 18th, 2013. Accessed online at: https://www.businessinsider.com/south-has-more-violent-crime-fbi-statistics-show-2013-9

xxxvii Infogroup, Inc, 2018. Business Summary, total businesses pulled for NAICS Category Group "Arts, Entertainment & Recreation." Accessed through Business Analyst Online, an ESRI product

APPENDICES

Appendix A

TABLE OF UNIVERSITY CITIES

	CITY	POP	MSA	UNIVERSITY	Stud : Emps
	Akron, OH	197,634	702,221	University of Akron	21,100 : 2,993
	Ann Arbor, MI	120,777	364,709	University of Michigan	44,718: 23,045
	Baton Rouge, LA	227.707	835,175	Louisiana State University	31,409: 6,313
	Boise, ID	223,152	690,214	Boise State University	23,854: 3,004
	Boulder, CO	108.108	322,226	University of Colorado	33,977: 8,902
	College Station, TX	112,142	254,716	Texas A&M University	65,632: 10,544
	Columbia, SC	133,972	816,450	University of South Carolina	34,099: 8,258
	Durham, N/c	262,989	559,535	Duke University	15,735: 18,029
	Eugene, OR	166,581	369,519	University of Oregon	23,546: 5,192
	Fargo, ND	120,235	238,124	North Dakota State Univ	14,432: 2,704
	Fort Collins, CO	164,196	339,993	Colorado State University	31,856: 7,653
	Gainesville, FL	131,593	281,796	University of Florida	52,367: 14,706
	Knoxville, TN	186,238	869,076	University of Tennessee	28,052: 10,088

	Lafayette, LA	127,625	491,528	University of Louisiana	17,519: 2,054
	Lexington, KY	318,449	506,751	University of Kentucky	29,781: 11,720
	Lincoln, NE	280,369	326,591	University of Nebraska	25,897: 6,212
	Lubbock, TX	252,514	313,910	Texas Tech University	36,551: 5,223
	Madison, WI	252,557	648,929	University of Wisconsin	42,582: 16,538
	New Haven, CT	129,939	856,875	Yale University	12,458: 15,319
	Provo, UT	116,874	602,543	Brigham Young University	34,240: 5,199
	Reno, NV	254,251	457,387	University of Nevada	21,353: 4,410
	Springfield, MO	167,313	456,434	Missouri State University	23,538: 2,900
	Syracuse, NY	143,378	656,510	Syracuse University	21,970: 5,281
	Tallahassee, FL	190,895	380,110	Florida State University	41,173: 6,938
	Tuscaloosa, AL	99,556	239,593	University of Alabama	37,663: 6,665
	Waco, TX	134,422	264,869	Baylor University	16,959: 3,047

Appendix B

TABLE OF COMPARISON COLLEGE TOWNS & MID SIZED CITIES

Mid Sized Cities

The following cities met the base criteria for inclusion for our sample of mid-sized cities that did not have a proportionally large university (it is important to note that some of these cities, such as Chattanooga and Dayton, do have doctoral institution. It is simply that the total number of students and employees would not meet the 10% criteria). We opted to excluded a few cities that technically met the baseline criteria, but had population sizes within the central city that made them too large to compare in our opinion (El Paso, Albuquerque, Fresno, Colorado Springs, Tulsa)

- Albany, NY
- Allentown, PA
- Amarillo, TX
- August-Richmond, GA
- Bakersfield, CA
- Beaumont, TX
- Bridgeport, CT
- Brownsville, TX
- Cape Coral, FL
- Cedar Rapids, IA
- Charleston, SC
- Chattanooga, TN
- Clarksville, TN
- Columbus, GA
- Corpus Christi, TX
- Davenport, IA
- Dayton, OH
- Des Moines, IA
- Erie, PA
- Evansville, IN
- Fairfield, CA
- Fayetteville, NC
- Fort Wayne, IN
- Greeley, CO
- Green Bay, WI
- Greensboro, NC
- Huntsville, AL
- Jackson, MS
- Killeen, TX
- Lakeland, FL
- Lansing, MI
- Laredo, TX
- Little Rock, AR
- Manchester, NJ
- McAllen, TX
- Mobile, AL
- Modesto, CA
- Montgomery, AL
- North Charleston, SC
- Oxnard, CA
- Palm Bay, FL
- Peoria, IL
- Port St Lucie, FL
- Rockford, IL
- Salem, OR
- Salinas, CA
- Santa Maria, CA
- Santa Rosa, CA
- Savannah, GA
- Shreveport, LA
- South Bend, IN
- Spokane, WA
- Springfield, MA
- Stamford, CT
- Stockton, CA
- Toledo, OH
- Vallejo, CA
- Visalia, CA
- Waterbury, CT
- Wichita, KS
- Wilmington, NC
- Winston-Salem, NC
- Worcester, MA

College Towns

The following cities met the base criteria for inclusion for our sample of college towns.

- Ames, IA
- Amherst, MA
- Athens, GA
- Auburn, AL
- Bellingham, WA
- Binghamton, NY
- Blacksburg, VA
- Bloomington, IN
- Bowling Green, KY
- Bowling Green, OH
- Bozeman, MT
- Burlington, VT
- Cape Girardeau, MO
- Carbondale, IL
- Cedar Falls, IA
- Champaign/Urbana, IL
- Chapel Hill, NC
- Charlottesville, VA
- Chico, CA
- Columbia, MO
- Conway, AR
- Cookeville, TN
- Corvallis, OR
- East Lansing, MI
- Fairborn, OH
- Fayetteville, AR
- Flagstaff, AZ
- Grand Forks, ND
- Greenville, NC
- Harrisonburg, VA
- Hattiesburg, MS
- Huntington, WV
- Huntsville, TX
- Iowa City, IA
- Ithaca, NY
- Johnson City, TN
- Jonesboro, AR
- Kalamazoo, MI
- Kent, OH
- La Cross, WI
- Las Cruces, NM
- Lawrence, KS
- Logan, UT
- Lynchburg, VA
- Manhattan, KS
- Mankato, MN
- Missoula, MT
- Morgantown, WV
- Muncie, IN
- Normal, IL
- Ogden, UT
- Orem, UT
- Oshkosh, WI
- Princeton, NJ
- Pocatello, ID
- Richmond, KY
- Santa Cruz, CA
- St Cloud, MN
- State College, PA
- Statesboro, GA
- Stillwater, OK
- Terre Haute, IN
- West Lafayette, IN

Appendix C

SOURCES & METHODOLOGY

Sources

We pulled a variety of socio-economic and institutional variables to complete this analysis. Below is a recording of the principal variables used this analysis, with notes on geography, origin, and year.

Methodology

This section of the appendix will walk through the methodology of our research. This discussion of methodology is broken into two sub-sections. First, we will detail those techniques, parameters, or assumptions that were universally applied throughout the research paper (such as the comparative matrices). Second, we discuss specific methodological approaches, organized by headings of the paper (this will make it easier for readers to connect back to actual body of research.) We will only reference those headings where we felt additional clarification or nuance is required beyond what we could describe in the body of the paper.

General Methodology

OVERALL GRAPHIC & ANALYTIC CREATION

All graphics and charts exported for this presentation were created using Tableau Desktop 10.5 on a base Excel file that organized all University Cities, college towns, and comparison cities into a single sample.

OVERALL DISTRIBUTION GRAPHS

We chose to visualize a majority of the variables using linear box plots generated in Tableau. We plotted each individual city within its appropriate cohort across the available values for each metric. We generated a Box Plot for each cohort. The Box Plot shows the median, interquartile range (25th to 75th percentile), and has whiskers that extend out to 1.5x the IQR. All calculations on averages, standard deviations, medians, and percentiles were calculated using Tableau.

OVERALL COMPARATIVE MATRICES

We created the Comparative Matrices as a "visual-analytic tool" that could quickly convey how University Cities stacked up against college towns, mid-sized cities, and each other. The x-axis of the grid is the percentile of each respective metric for college towns; the y-axis of the grid is the percentile of each respective metric for mid-sized cities. Percentiles are to be read from 0-100 where 100 will always mean the most positive output. For example, in the comparative matrix for violent crime the 1st or 2nd percentile would mean the LEAST SAFE (most violent crime) against either cohort; a percentile of 99 or 100 would mean the MOST SAFE (least violent crime) against either cohort.

CORRELATIONS AND REGRESSIONS

While this paper is not a traditional statistical analysis, we did rely on several regressions to elaborate into some of the trend were seeing. We ran all regressions and k-means clustering algorithms using Tableau's built in statistical functions. For each regression we set up a scatter plot with the respective dependent and independent variables and tried to match linear, logarithmic, and exponential trend lines, and reported the corresponding p and r2 values of each.

Methodology by Section Heading

DEFINING COHORTS FOR COMPARISON

In order to determine the cohort of sample college towns, we pulled data from IPEDS using the final release 2016-2017 vintage. We joined each of these universities to the most appropriate Census Designated Place, so that we could review the total number of students and employees against the population of the city and its encompassing MSA.

THE GROWTH OF UNIVERSITY CITIES AND COLLEGE TOWNS

We downloaded population data for each University City and college town for all years between 1930 and 2016. For 1930-2010 the data is from the decennial census; for 2016 it is from the ACS 1 Year Estimates. As noted, we normalized Lexington, KY and Athens, GA by the total population of their counties historically, to avoid spikes when those cities consolidated their governments.

HOW ALUMNI RETENTION CAN FURTHER EXPLAIN GROWTH

In order to complete this analysis, we manually pulled data from LinkedIn by searching all universities' LinkedIn pages. We copied over the total number of US alumni the total number of alumni living in the respective metropolitan area, for each institution. We chose to collect US alumni over total alumni to control for schools like Cornell or Ann Arbor that have large international populations, many of whom never intended to stay behind.

We excluded any college town or University City that did not have a specific MSA. A good example of this is Ann Arbor, where LinkedIn would only report people living in "Greater Detroit." Since we cannot use this to approximate Ann Arbor's retention rates, Ann Arbor was not included in these charts.

One limitation of the LinkedIn data is that it can only show a point in time. There is no way to understand, for example, how many graduates in 2008 still lived in a city in 2009, 2010, 2011, etc. We can only see how many remain now, crating an effective but imperfect method of assessing retention

EDUCATED POPULATIONS VS EDUCATED WORKFORCES

In order to obtain an approximate understanding of the educational criteria for jobs being created, we had to merge data from two different datasets from the Bureau of Labor Statistics: Occupational Employment Statistics and Education and Training Assignments by Detailed Occupations. We used the Detailed Occupation ID to join the educational requirements data. We used the attribute "typical degree needed for entry" as our proxy for education. Therefore a city increased by 100 computer programmers between 2012 and 2017, and the typical degree for entry for that position is a "bachelors degree," then we would report that city as growing by "100 jobs that require bachelors degrees or higher."

ECONOMIC RESILIENCY

We accessed non-seasonally adjusted unemployment data from the Local Unemployment Statistics through the Bureau of Labor Statistics. We chose the years 2007, 2010, 2012, 2014, and 2017 because they allowed us to view the strength of the economy before the recession, the strength of the economy within the heart of the recession, the strength of the economy on the other end of the recession, and the progression each city took across the ten-year period.

LOCAL ENTREPRENEURIAL OUTPUT

Data from CrunchBase is only one method of assessing entrepreneurial output, but we felt it was the most workable for our analysis, given the constraints of finding uniform data for a

large number of cities.

In order to access information on companies created by alumni, we established a specific search hierarchy on CrunchBase Pro. We set up the following query:

- Schools – Organization Name includes [EACH UNIVERSITY]
- Number of Founded Organizations >=1 (indicates an alumni founded a company)
- Founded Organizations – Headquarters Location Includes [RESPECTIVE CITY]
- Founded Organization is ACTIVE

Taken together this would read as: "return all companies founded by an alumni of the respective institution that are still operational and located within the city that housed the alumni's university." To understand the TOTAL number of companies (as reported by CrunchBase) that are created by alumni of each institution, we removed the third criteria from the above query (Headquarters location in respective city) .

To compare the local entrepreneurial output against research funding internally, we accessed data from IPEDS on Research Expenses from the 2016-2017 final release data. We divided this spending by the total number of students to get a standardized metric of "research spend per student"

INCOME AND COST OF LIVING

In order to create the "cost of living ratio" we opted to use family income and family cost of living. We chose to do this to obviate the tendency of college students to lower the overall median income rates within cities. We that a focus on family incomes for the ratios would give us the best chance of factoring out most college students from this section of the analysis (we were comfortable with this as they would be addressed when focusing on absolute rents)

We opted to use the Living Wage Calculator designed by Dr. Amy K Glassmeir at Massachusetts Institute of Technology. We could only pull this data at the MSA level for each respective city. We used the expense category "2 Adults 1 Child" as our best approximation of a cost of living to compare against family incomes.

RENTAL AFFORDABILITY IN UNIVERSITY CITIES

We opted to pull data from three different sources and analyze the average. We pulled data on 2BR rental prices from the Census Bureau, Apartments.Com, and Zillow. To calculate the student impact, we pulled data from IPEDS (2016-2017 Final Release) on the total number of students and the total dorm capacity of each institution.

OWNING A HOME

Home value data was taken from Zillow as the best current reflection of market prices. At any point where we reference housing price growth over time, we normalized all figures using the Consumer Price Index for Housing to 2017 dollars.

VIOLENT CRIME AND SAFETY

We opted to average all recent violent crime rates for 2013 and 2014, the two years most currently available on the FBI's Uniform Crime Statistics reporting page. We opted to use an average to control for any spike or dip that may have occurred in one year or the other. This gave us a smoother representation of "current crimes."

VARIABLE	VARIABLE CATEGORY	GEOGRAPHY	SOURCE	YEAR
City Population	Demographic	City; MSA; State	US Census Bureau; Deccenial Census; American Community Survey 1 Year Estimate (2016 only)	1930 to 2016
% Alumni retained in respective metro	Demographic	MSA	LinkedIn - Alumni page for each institution	2002 to 2017
% of Population Over 24 with Bachelors Degrees	Economic	City	US Census Bureau; American Community Survey 5 Year Estimates 2012-2016	2016
Unemployment Rate (non seasonally adjusted)	Economic	City; State	Bureau of Labor Statistics; Local Unemployment Statistics (annual averages)	2007 to 2017
Occupational Employment Statistics by MSA	Economic	MSA	Bureau of Labor Statistics; Occupational Employment Statistics	2012 to 2017
Education and Training Assignments by Detailed Occupations	Economic	N/A	Bureau of Labor Statistics; Occupational Employment Statistics	2016
Companies created by alumni	Economic	City	CrunchBase Pro - custom querry	2007 to 2018
Companies created by alumni that remained local	Economic	City	CrunchBase Pro - custom querry	2007 to 2018
Typical expenses for 2 Adults 1 Child (Cost of Living)	Economic	MSA; State	Living Wage Calculator - MIT - Dr Amy K Glasmeir	2018
% of Families living in Poverty	Economic	City	US Census Bureau; American Community Survey 5 Year Estimates 2012-2016	2016
Median Gross Rent for 2BR	Economic	City; State	US Census Bureau; American Community Survey 5 Year Estimates 2012-2016	2016
Average Rent for 2BR (current)	Economic	City; State	Apartments.com	2017
Average Rent for 2BR (2017 average)	Economic	City; State	Zillow Data	2017
Zillow Home Value Index (annual averages)	Economic	City; State	Zillow Data	2007 to 2017
Total Institutional Expenses	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
Total Institutioanl Research Expenses	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
Total All Students	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
Total All Employees (including medical)	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
Carnegie Classification (Basic)	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
Dormitory Capacity	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
% of First Year Students by State	Institutional	Institution	National Center for Educational Statistics; IPEDS	2016/2017
Violent Crime (per 1,000 residents)	Place-based	City; State	Federal Bureau of Investigation; Uniform Crime Reporting Statistics	2013/2014
Total Arts and Entertainment Establishments (NAICS 71xxxx)	Place-based	City	Infogroup pulled through ESRI Business Analyst	2018