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Are Universities Sticky? Evidence from LinkedIn Users in the U.S.

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Are Universities Sticky?

Evidence from LinkedIn Users in the U.S.

A thesis submitted in partial satisfaction

of the requirements for the degree Master of Arts

In Urban and Regional Planning

by

Jing Deng

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ABSTRACT OF THE THESIS

Are Universities Sticky?

Evidence from LinkedIn Users in the U.S.

By

Jing Deng

Master of Arts in Urban Planning

University of California, Los Angeles, 2014

Professor Michael Storper, Chair

This study examines college-to-work migration of graduates in the United States using big data from the professional networking website LinkedIn, with a special focus on how the ratio of graduates staying at the areas of study changes over time and how universities affect the stay rate. A multivariate least squares regression model is adopted for analysis. The research finds over 40 percent of graduates graduated 2003-2012 have stayed in the areas of study, with the most recent graduates having the highest stay rate. Graduates from the more prestigious universities are more likely to migrate after graduation. Metropolitan size still dominates variations in stay rates. Strengths and limitations of big data are also explored in this study.

The thesis of Jing Deng is approved.

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2014

Table of Contents

List of Figures

List of Tables

List of Supplementary Materials

Chapter 1: Purpose and Significance of the Study

Human capital is, if not the most important, a very significant contributor to economic growth (Arrow, 1962; Romer, 1986 &1990; Lucas, 1988; Storper & Scott, 2009). As the institutions that generate high quality human capital, universities play an important role in facilitating growth (Gyimah-Brempong, Paddison, & Mitiku, 2005; Horri et al., 2008; Curs, Bhandari, & Steiger, 2011). For regional economists, of particular interest is how higher education fosters local development (Bradley & Taylor, 1996; Faggian & McCann, 2006). While at the national level all regions benefit from human-capital growth, the regional rates of return to higher education depend largely on the migration behavior of students prior to and after higher education (Bennett et al., 1995; Faggian & McCann, 2006).

Although the migration pattern of university graduates in the U.S. has been studied by many scholars (Yousefi & Rives, 1987; Kodrzycki, 2001; Hansen, Ban & Huggins. 2003; Gottlieb & Joseph, 2006; Whisler, Waldorf, Mulligan, & Plane, 2008), little attention has been paid to how universities affect graduates' migration. Most of the existing studies focus on individual characteristics and region-specific factors, including economic opportunities and amenities (Yousefi & Rives, 1987; Kodrzycki, 2001; Hansen, Ban & Huggins, 2003; Gottlieb & Joseph, 2006). Whether universities play a role in determining where graduates go is left largely unanswered.

In this study, I investigate the effect of universities on graduates' migration using big data generated from user profiles on LinkedIn.com. I investigate more than 4 million graduates who graduated between 2003 and 2012 from 217 universities nationwide. Of particular interest is how many of the graduates are staying in the metropolitan areas of their universities, and how that percentage varies for cohorts graduated in different years. The research will explore how university characteristics including academic ranking, type, campus setting, ratio of graduates,

and price affect stay rate. Metropolitan size and income level are also examined to provide more comprehensive understanding.

This study will join the growing list of literature on college-to-work migration in the U.S. Its contribution, if any, might be in two ways. First, it provides new evidence on how universities contribute to local human capital stock. Secondly, it serves as an example using big data generated by social media for academic study. Some of the strengths and limitations of big data are revealed in this study.

The rest of the paper is organized as follows. The next chapter discusses the literature on college-to-work migration by scholars in and outside of the U.S. Chapter 3 describes the methods I use, followed by a description of data in chapter 4. Chapter 5 introduces the main findings, which is further discussed in chapter 6. The chapter also covers discussions on the advantages and limitations of big data. Conclusions are reported in chapter 7.

Chapter 2: Literature Review

College-to-work migration has drawn wide interest from scholars in and outside of the U.S.

In Europe and Canada, existing studies explore how personal and place factors affect migration (Faggian, McCann, & Sheppard, 2007; Delisle and Shearmur, 2010; Venhorst, Van Dijk, & Van Wissen, 2011), how migration happen over time (Haapanen & Tervo, 2012), and how universities affect students' loyalty to university towns (Øyvind, Erik, & Øivind, 2013). Faggian et al (2007) track 76,000 Scottish and Welsh students from their domicile to higher education to work location and analyze their migration pattern with a logit model. Results show higher human capital individuals have higher geographical mobility (Faggian et al., 2007). Delisle and Shearmur (2010) compare the migration patterns of graduates and non-graduates in

Canada using census data of 10,000 individuals. With a gravity model, the study finds that at the interregional level, graduates and non-graduates follow the same pattern of migrating from low-income to high-income regions, whereas at the intraregional level, graduates are more likely to migrate to more educated places than non-graduates (Delisle and Shearmur, 2010). Venhorst at al. (2011) investigate how individual and regional characteristics affect migration using a micro dataset on Dutch college and university students, and found that a large labor market is the most important determinant for regions to retain graduates. Haapanen and Tervo (2012) study Finnish university graduates spanning 1991-2003 and observe whether graduates stay and for how long using micro-data. They find that most of the Finnish graduates do not move from their region of study within 10 years after graduation (Haapanen and Tervo, 2012). They also find graduates' propensity to migrate is particularly high in the first two years after graduation (Haapanen and Tervo, 2012). Norwegian scholars study students' loyalty to their student town using a partial least square path model, and find social activities is the most important loyalty driver, while the university's reputation also influences student loyalty (Øyvind et al., 2013).

For the United States, existing literature largely focuses on how individual and regional characteristics affect migration (Yousefi and Rives, 1987; Kodrzycki, 2001; Hansen et al., 2003; Gottlieb and Joseph, 2006; Whisler et al., 2008). Kodrzycki (2001) use the National Longitudinal Survey of Youth (NLSY) to map the migration pattern of about 6,000 individuals and figured out the major destination regions. The study find adults who have a college degree are more likely to live in a state different from their places of education than adults who do not have a college degree (Kodrzycki, 2001). Hansen et al. (2003) survey 2,131 graduates from the Pittsburgh-area universities on their migration decisions prior to and after attending university. They find economic opportunities, low housing costs, and opportunities for continuing education are the main reasons (Hansen et al., 2003). Gottlieb and Joseph (2006) apply a logit model to the

college-to-work migration of technology graduates and doctorate degree holders in the U.S, focusing on the effect of personal characteristics and place characteristics. They find that technology graduates migrate to better educated places and PhD graduates pay greater attention to amenities, although amenities play a relatively weak role overall (Gottlieb & Joseph, 2006). Whisler *et al* (2008) study how old and young college-educated adults value quality of life, and find that while the elder college-educated cohort value climate and safety more, the younger college-educated cohort prefer cultural and recreational amenities.

One major drawback of the existing literature on graduate-to-work migration in the United States is a lack of variations in issues explored. Unlike the European counterpart which concerns a variety of issues related to graduate migration, the U.S. literature narrowly focuses on the correlation between people/place factors and migration.

Another limitation is data size. The existing literature relies heavily on micro-data. Some studies use opinion surveys (Yousefi & Rives, 1987; Hansen et al., 2003; Whisler at al., 2008), which risks severe bias as what people think is often different from what they do. Other studies use surveys on facts (Kodrzycki, 2001; Hansen et al., 2003; Gottlieb & Joseph, 2006; Venhorst et al., 2011). Fact surveys are more accurate, yet like opinion surveys, they suffer from limited sample size and coverage. For a small country in Europe, this may not be a big problem, as the population is also small. But for the United States, small sample and limited coverage means the findings are hard to generalize.

Chapter 3: Methodology

This research aims to generate a big picture of college-to-work migration in the United States using big data. Instead of looking at where graduates go, the study focuses on how many

of them stay. The idea is to explore how universities help retain graduates in the area of education.

To begin with, I observe how stay rate changes over time. A simple linear model is used to estimate the relationship between time and the average stay rate of all sampled universities:

$$Y = \beta_0 + \beta_1 T \qquad \text{(model 1)}$$

In the model, Y (stay rate) stands for the percentage of university graduates who currently live in the metropolitan area of study. T is the number of years after graduation, which is 2013 subtracted by the year of graduation.

To examine how university factors as well as metropolitan factors affect stay rate, I use a linear regression model which concerns a set of university characteristics and a set of metropolitan characteristics. Because little is known about how universities affect graduates' migration, the model takes into consideration quite a few possible factors, including campus setting, type of university, price, ratio of graduate students, and academic ranking. For metropolitan characteristics, the model concerns economic characteristics only, because previous studies indicate that economic characteristics are the most important place factors in college-to-work migration (Kodrzycki, 2001; Hansen, Ban and Huggins, 2003; Gottlieb and Joseph, 2006; Venhorst, Van Dijk, & Van Wissen, 2011).

The model can then be expressed as:

$$Y = \beta_0 + l_u + f_m \qquad \text{(model 2)}$$

Here Y (stay rate) is the percentage of university graduates who currently live in the metropolitan area of study. l_u is a set of university variables, including campus setting, type of university, ratio of graduate students, and academic ranking. f_m is a set of metropolitan variables, including population and GDP per capita.

Chapter 4: Data

Drawing on user-reported information, LinkedIn generates interesting statistics on users' current places of living and educational backgrounds. Using the "find alumni" function, users can view the spatial distribution of alumni from any university (see Appendix 1). The "find alumni" function used to allow users to specify the years of graduation in the search. With this function, I recorded the LinkedIn alumni statistics report for 217 universities in early March, 2014. The following paragraph explains how the university sample is selected.

The list of universities is composed of 4-year universities in the United States that match the following conditions: 1) provide a full range of degree programs (bachelor's, master's, doctorate) 2) have over 10,000 undergraduates 3) operate on physical campuses 4) have a recognizable title on LinkedIn. The first condition reduces variances in the human capital quality of the sampled universities, thus increases sample comparability. The second condition reduces sample size and keeps the data manageable. The third condition eliminates online universities. The fourth condition ensures that the university's alumni information is available on LinkedIn. Under those conditions, a total number of 217 universities are selected. The full list of 4-year U.S. universities together with university characteristics information is downloaded from the National Center for Educational Statistics (nces.gov) on Nov. 29, 2013.

To observe time trend, I choose a 10-year period from 2003 to 2012. The reason why 2003 is chosen as the first year is that LinkedIn was officially launched in May, 2003. Since LinkedIn was first recognized on university campuses, cohorts who graduated before 2003 are less likely to have a LinkedIn account.

Using the sampling method above, a sample covering a total number of 4,677,721 graduates who graduated from the 217 universities between 2003 and 2012 is composed[1].

[1] The data was retrieved from LinkedIn in early march, 2014. Because the number of LinkedIn users is changing all the time, the number may be different when accessed at a different time.

University characteristics data come from two sources. Number of students, university type, ratio of graduates, and net price[2] comes with the full list of 4-year universities provided by the National Center for Educational Statistics (nces.ed.gov). Academic ranking draws on the 2014 U.S. News & World Report[3] (www.usnews.com/usnews/edu/college/rankings/) (see ranking method in Appendix 2). Because the original rankings list only includes the top 200 universities, some universities in the sample are not covered. Two dummy variables are constructed: top ranked or not (ranking 1-100) and middle ranked or not (ranking 101-200).

Metropolitan characteristics data come from the U.S. census. Population data is retrieved from 2010 U.S. census. Metropolitan income level (GDP per capita) is from 2012 U.S. census. A major challenge was to decide which "metropolitan area" concept to use, since different definitions correspond to different population and income data. When LinkedIn presents the data, it uses combined statistical area (CSA) for some cases and metropolitan statistical areas (MSA) for other cases (see Appendix 1). The idea seems to be using the maximum metropolitan concept available. To be consistent with LinkedIn's definition, this research uses the same CSAs and MSAs for metropolitan characteristics (97 CSAs and 48 MSAs).

Table 1 List of Variables

Variables	Operations
University Characteristics	

[2] ** Net Price is Average Net Price for 2011-2012 generated for full-time beginning undergraduate students who were awarded grant or scholarship aid from federal, state or local governments, or the institution. For public institutions only students paying the in-state or in-district rate are included. For institutions that charge students by program, net price is generated for the institution's largest program.

[3] We also considered using the Times Higher Education Supplement world university rankings for reference. Only 78 out of the 217 sampled universities are included on the Times rankings list. Because the U.S. News rankings covers more sampled universities (110), we decide to use the U.S. News rankings instead.

Top ranked (dummy)	1= rank 1-100	0= else
Middle ranked (dummy)	1= rank 101-200	0=else
Campus Setting		
Type		
Net Price		
Ratio of graduate students		
Metropolitan Characteristics		
Size (population)		
Income (GDP/capita)		

Chapter 5: Findings

1. Descriptive statistics: Stay rate

Stay rate is the percentage of university graduates who currently live in the metropolitan area where they graduated. The average 10-year stay rate of all 217 universities is 0.42. Some universities have almost 0 stay rate, while some others have stay rates higher than 0.80.

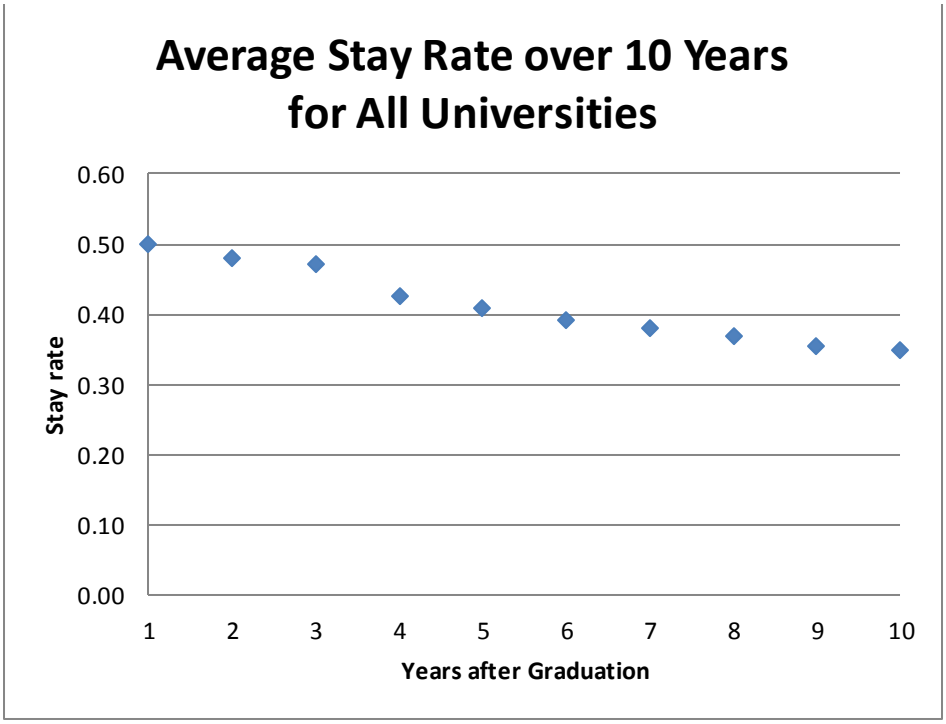
Table 2 Descriptive Statistics: Stay Rate

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Av.10-Year Stay rate	217	.00	.87	.4212	.22467
Av. Annual Change in Stay rate	217	-.077	.025	-.01656	.010489
Valid N	217				

For most universities, stay rate declines as the number of years after graduation increases. Seasoned cohorts tend to have lower stay rates than newer cohorts. The average stay rate of students graduated in 2012 is 0.50, which is 15 percentage points higher than that of students graduated 10 years ago (0.35). Stay rate declines by 1.66 percentage points each year on average. The sharpest declination happens between year 3 and year 4 (-0.04).

Figure 1 Average Stay Rate over 10 Years for All Universities



2. University Characteristics and Stay Rate

Among the university characteristics examined, only university ranking is found to be correlated with stay rate.

As is shown in table 3, stay rate is negatively correlated with top ranked (sig.=.01). Correlational analysis for the middle ranked dummy is meaningless, because if university ranking has a negative effect on stay rate, the stay rates of the middle ranked universities

should be greater than the top ranked universities but smaller than the lower ranked. Thus no correlation can be observed. However, comparing the average stay rates of universities, we can see a clear correlational trend. Universities ranking from 1 to 100 have an average stay rate of 0.34, comparing to that of 0.38 for universities ranking 101 to 200. Universities ranking below 200 have an average stay rate of 0.48 (Table 4).

Table 3 University Ranking and Stay Rate

Correlations

		Stay Rate	Top ranked (dummy)
Stay Rate	Pearson Correlation	1	-.197**
	Sig. (2-tailed)		.004
	N	217	217
Top ranked (dummy)	Pearson Correlation	-.197**	1
	Sig. (2-tailed)	.004	
	N	217	217

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 University Ranking and Stay Rate (continued)

Report

Stay rate

University Ranking	Mean	N	Std. Deviation
Top ranked	.3383	52	.19839
Middle ranked	.3817	54	.20728
Other	.4794	111	.22963
Total	.4212	217	.22467

As is shown in table 5, 6, and 7, there is no obvious correlation between stay rate and university type, ratio of graduate students, and net price.

Table 5 University Type and Stay rate

Type	Mean	N	Std. Deviation
4-year, primarily associate's, Private not-for-profit	.3500	1	.
4-year, Private for-profit	.1600	2	.11314
4-year, Private not-for-profit	.4200	20	.21902
4-year, Public	.4244	194	.22574
Total	.4212	217	.22467

Table 6 Ratio of Graduate Students and Stay rate

Correlations

		Stay rate	Ratio of Grad Students
Stay rate	Pearson Correlation	1	.095
	Sig. (2-tailed)		.161
	N	217	217
Ratio of Grad Students	Pearson Correlation	.095	1
	Sig. (2-tailed)	.161	
	N	217	217

Table 7 Net Price and Stay rate

Correlations

		Stay rate	Net Price
Stay rate	Pearson Correlation	1	-.065
	Sig. (2-tailed)		.341
	N	217	217
Net Price	Pearson Correlation	-.065	1
	Sig. (2-tailed)	.341	
	N	217	217

Different campus settings correspond to very different stay rates (Table 7). Universities in larger cities and large suburbs have the highest stay rates (0.58, 0.52). Universities in Rural areas and midsized suburbs have the lowest stay rates (0.18, 0.18). Because campus setting seems to impact stay rate, location factor is considered in the following section.

Table 8 Campus Setting and Stay rate

Report

Stay rate

Campus setting	Mean	N	Std. Deviation
City: Large	.5766	59	.15258
City: Midsize	.3929	42	.20940
City: Small	.2725	52	.17854
Rural: Fringe	.1775	4	.09946
Suburb: Large	.5581	31	.20425
Suburb: Midsize	.1767	6	.12094
Suburb: Small	.5250	4	.22956
Town: Distant	.2556	9	.20038
Town: Fringe	.3100	3	.10440
Town: Remote	.3314	7	.13171
Total	.4212	217	.22467

3. Metropolitan Characteristics and Stay rate

Initial correlational analysis shows stay rate is positively correlated with both metropolitan size ranking and metropolitan income ranking (Table 8). Nevertheless, further examination shows metropolitan size and income are correlated, indicating that the two factors may overlap with one another in their effect on stay rate.

Table 9 Metropolitan Characteristics and Stay rate

Correlations

		Stay Rate	Metropolitan Size	Metropolitan Income
Stay Rate	Pearson Correlation	1	.594**	.504**
	Sig. (2-tailed)		.000	.000
	N	217	217	217
Metropolitan Size	Pearson Correlation	.594**	1	.573**
	Sig. (2-tailed)	.000		.000
	N	217	217	217
Metropolitan Income	Pearson Correlation	.504**	.573**	1
	Sig. (2-tailed)	.000	.000	
	N	217	217	217

**. Correlation is significant at the 0.01 level (2-tailed).

4. Least Squares Regression Model

So far, the analysis above has suggested three variables to include in the regression model: university ranking, metropolitan size, and metropolitan income. Because metropolitan size and income are correlated, we include a multicollinearity test in the regression analysis.

Regression results show all factors are significant (sig. <.05) and multicollinearity is not a major concern here (VIF<5) (Table 11). The model explains up to 48% of variation in stay rate (R-Square=.477) (Table 10). University ranking is proved to have a negative effect on stay rate: the top ranked universities are likely to have the lowest stay rates (-.164), while both the top ranked and middle ranked universities tend to have lower stay rates than other universities (-.164, -.059). Universities located in big metropolitan areas or high-income metropolitan areas tend to have higher stay rates (Table 11).

Table 10 Model Summary and ANOVA Table

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.691[a]	.477	.467	.16397

a. Predictors: (Constant), Top ranked, Middle Ranked, Metropolitan Size, Metropolitan Income

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.203	4	1.301	48.377	.000[b]
	Residual	5.700	212	.027		
	Total	10.903	216			

a. Dependent Variable: Stay Rate

b. Predictors: (Constant), Top ranked, Middle Ranked, Metropolitan Size, Metropolitan Income

Table 11 Model: Coefficients

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.044	.072		.615	.539		
	Top Ranked	-.164	.028	-.310	-5.858	.000	.880	1.137
	Middle Ranked	-.059	.027	-.115	-2.173	.031	.886	1.129
	Metropolitan Size	1.825E-8	.000	.433	7.097	.000	.664	1.506
	Metropolitan Income	8.608E-6	.000	.294	4.796	.000	.658	1.519

a. Dependent Variable: Stay Rate

The model:

Stay Rate = .044 -.164 * Top Ranked -.059 * Middle Ranked

+ 1.825E-8 * Metropolitan Size + 8.608E-6 * Metropolitan Income

The standardized coefficients (Beta) show the relative effects of university ranking and metropolitan characteristics (Table 10). The Beta table shows that metropolitan size is the most influential factor among all factors (Beta=.433). Next to it is whether the university is top ranked or not (Beta=-.310). Metropolitan Income is also influential

Chapter 6: Discussions

Like what Haapanen & Tervo (2012) find about Finnish graduates, the study finds a very high average stay rate for graduates in the U.S. within 10 years of graduation. Two reasons may explain why stay rate is high. The first reason has to do with the locations of universities. About half of the universities in the sample are located in large cities or large suburbs (90 out of 217), which have the highest stay rates compared with other universities (.58 for universities in large cities, .56 for universities in large suburbs). The reason why large cities and large suburbs have higher stay rates will be explained later in this chapter under metropolitan characteristics.

Another reason that leads to high stay rate is probably the "cumulative inertia" (Molho, 1995). Cumulative inertia refers to the effect that over time, people develop attachments to the area of residence, as they get adapt to the area and their local social network develops (Molho, 1995). Friends and professional connections accumulated during university years lend psychological and physical support to graduates and make life in the same metropolitan area easier. Cumulative inertia may be particularly strong among recent graduates, since their social resources just start to develop and their work experience just started to accumulate.

Over time, graduates' discontent about current living condition accumulates; this "cumulative stress" pressures graduates to relocate (Haapanen & Tervo, 2012). That explains why despite of high average stay rate, stay rate declines over time. Cumulative stress is also

observed in other studies. In a survey on graduates from the Pittsburgh-area universities, researchers find that only 44 out of 985 graduates who currently live in the Pittsburgh area actually prefer to live there (Hansen et al., 2003). The bifurcation in the graduates' present and preferred place of residence explains potential future migration. As the graduates gain more work experience over time, their ability to migrate increases. Different from Haapanen & Tervo (2012), the study finds no particularly sharp declination in stay rate during the 10 year period.

Although university ranking is found to have a negative effect on stay rate, a sampling bias may render this conclusion less robust. Note the sample is composed of relatively large universities (with more than 10,000 undergraduates); only half of the sampled universities have a corresponding ranking on the U.S. News and World Report university rankings top 200 list. The percentage is even smaller for the Times Higher Education Supplement world university rankings (about one-third). Because of the sampling limitation, we could not use both ranking systems to test the robustness of the conclusion.

Yet, if it is the case that the more prestigious universities tend to have lower stay rates, the reason probably lies in the graduates' higher human capital quality and more diversified places of origin. High quality human capitals are more likely to move in general (Kodrzycki, 2001). Graduates who are more spatially mobile usually find better job-matches than those who stay in the region of study (Hensen et al., 2009), and the income gain of leavers is likely to be higher than stayers (Di Cintio and Grassi, 2013). Graduates from the more prestigious universities probably leave the area of study for better economic opportunities. Besides, the more prestigious universities have a larger portion of non-local students. Studies found students who are studying at the home region are less likely to migrate than those studying away from the home region (Faggian et al., 2007; Haapanen & Tervo, 2012).

As for metropolitan characteristics, the findings seem to support the idea that a large labor market is the most important determinant for regions to retain graduates (Venhorst, Dijk,

and Wissen, 2011). The reason why big metropolitan areas are more attractive to graduates is that big metropolitan areas provide more job matching opportunities (Faggian, 2007), and they are often growth centers where income levels are high. In addition, young graduates generally prefer rich cultural and recreational amenities in large metropolitan areas (Whisler et al, 2008). The findings also lend new evidence to Haapanen and Tervo (2012) that students who studied at growth centers are less likely to migrate than graduates studying at peripheral areas.

Big Data: Strengths and Limitations

The big data from LinkedIn show several strengths and limitations. First, the data provides answers to questions that are impossible to answer with conventional data. The LinkedIn data is of previously unimaginable size and coverage. With LinkedIn, this research was able to find alumni information for 217 universities nationwide for a 10-year period. Such coverage is almost impossible using survey data.

More importantly, big data inspires new questions that have never been asked before (Mayer-Schönberger & Cukier, 2013). The study was initially inspired by a random glance at the alumni report on my LinkedIn page. I was surprised by the high percentage of UCLA alumni who currently live in the Los Angeles Metropolitan Area. That was how I started to ask about stay rate. As is mentioned before, few existing studies on U.S. graduate migration has asked this question. The big data inspired the question and provided resource to answer them.

Despite of its strengths, the limitations of big data are also obvious. On top of them is sampling bias. Although many university graduates have LinkedIn accounts, not everyone does. To what extent can LinkedIn users represent the population is hard to tell. It is possible that LinkedIn users networking more, thus their migration pattern might be slightly different. Because big data is not complete data, such built-in sampling bias is hard to avoid.

Accuracy is another issue, albeit less important. Some users do not update their profile page, thus some information are not be accurate. However, this should not be a big concern, since the sample is big and some errors will not affect main findings.

Perhaps a more urgent problem is the ambiguity in the definition of key concepts. For this research, how LinkedIn defines "metropolitan area" determines which census data to choose. By "metropolitan area," does LinkedIn mean combined statistical area (CSA) or metropolitan statistical area (MSA)? LinkedIn provides no direct answer. It was through trial-and-error that I figured out the most possible method LinkedIn used to define the concept. Yet there is still some chance that I was wrong. The ambiguity in key concepts adds to research difficulty and uncertainty which, in the worst case, may overthrow the whole research.

Another limitation is the limited level of details. Comparing to survey data, big data generated by LinkedIn is bigger but rougher. Because of that, this research has limited ability to go into further details. For instance, graduates who continue their education in the area of study will contribute to high stay rates. Because little is known about the level of degrees with the data, I cannot conduct further analysis.

Finally there is the issue of accessibility. When the research started in 2013, the data on LinkedIn was completely accessible. Sometime between April and May, 2014, LinkedIn started blocking access to some of the statistics. Users could no longer retrieve data for alumni of a specific year. Will big data be controlled and manipulated by agencies that generate them? Some researchers have already expressed such concerns (Boyd and Crawford, 2012; Parks, 2014). Particularly, companies that generate the data may choose which data to reveal depending on its commercial interest (Parks, 2014).

Chapter 7: Conclusion

This research examines college-to-work migration of graduates in the United States using big data from professional networking website LinkedIn, with a focus on how the ratio of staying graduates changes over time and how universities affect the stay rate.

We learned that universities are sticky to graduates in general. Cumulative inertia triggered from social network and professional connections developed during schooling years function to retain a large portion of graduates in the metropolitan areas of graduation. The more prestigious universities are less sticky because of their higher human capital quality, which results in higher mobility.

We also learnt that time matters. Over time, cumulative stress together with increasing work competency increases graduates propensity and ability to migrate. The migration trend does not change much within 10 years after graduation.

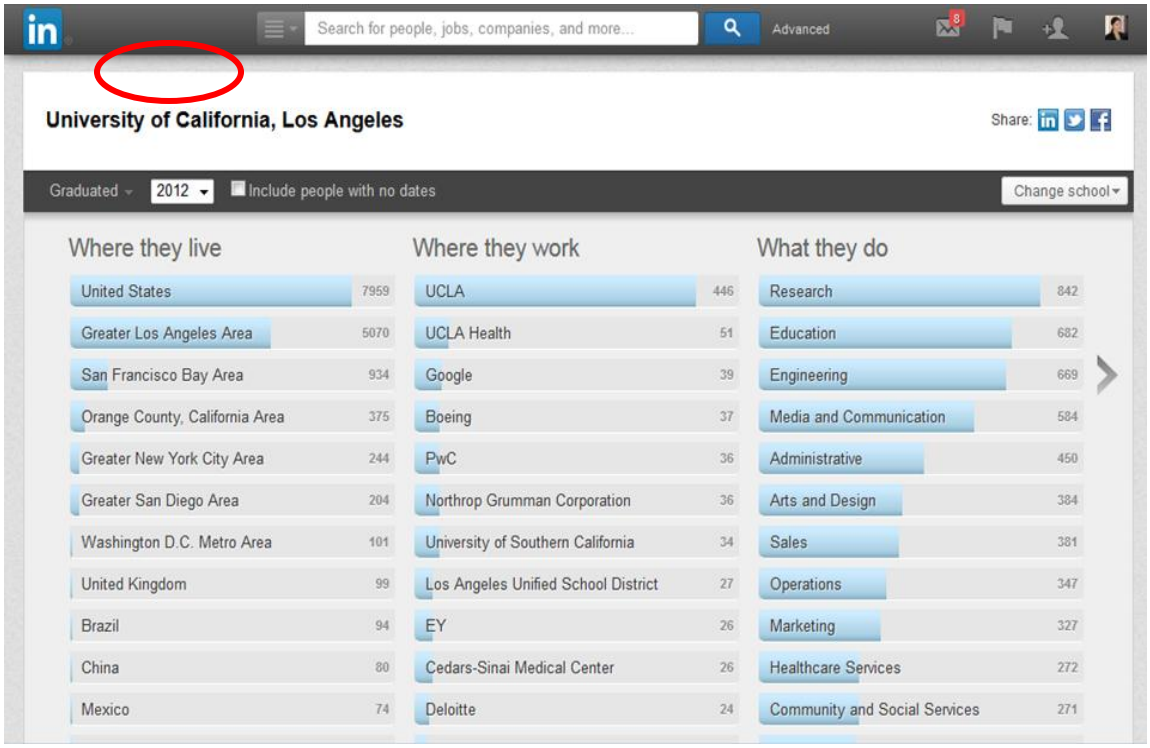
Metropolitan size has a big impact on stay rate. Big metropolitan areas retain larger portions of local graduates because of the abundant job matching opportunities they provide. Like many other studies, we also found that income level positively affects stay rate.

Lastly, as an experiment using big data for academic research, the study revealed several challenges of the method, including sampling bias, ambiguous concepts, limited level of details and potential threats in access. Despite of its limitations, big data advantages in the scale and scope of facts it covers, and the possibilities it provides to study new questions that have never been asked before.

Appendix 1: Obtain LinkedIn data

With the "network—find alumni" function, users could find the spatial distribution of LinkedIn users graduated from a certain university. LinkedIn used to allow users to specify the year of graduation in this search function, as is shown in the red oval below. However, around late April to May, 2014, the function was discontinued.

LinkedIn "find alumni" search screenshot (approached in March, 2014)



As is shown above, LinkedIn told users the metropolitan areas where the alumni live (Greater Los Angeles Area, San Francisco Bay Area, etc.). When a user registers a LinkedIn account, he or she will input his or her zip code, and LinkedIn assign the user a metropolitan area of living tag based on the user's zip code. By trying different zip codes and see how LinkedIn tagged them, I figured out the "metropolitan areas" LinkedIn used were most likely to be a mixture of combined statistical areas (CSA) and metropolitan statistical areas (MSA). Places with corresponding CSAs were likely to be tagged by the CSAs, and places with no

corresponding CSA were likely to be tagged by the MSAs. For instance, San Jose was tagged as the “San Francisco Bay Area,” which is consistent with the CSA definition. Under the MSA definition, however, San Jose and San Francisco are two different metropolitan areas. Although this rule seemed to work for most of the cases, there were some exceptions. For example, Orange County was tagged as “Orange County” rather than “Greater Los Angeles Area,” although under the CSA definition Orange County is part of the Los Angeles—Long Beach---Riverside CSA. The bias originated from the definition problem still exists.

Appendix 2: University Ranking Model Indicators

Source: U.S. News and World Report[4]

The indicators we use to capture academic quality fall into a number of categories: assessment by administrators at peer institutions, retention of students, faculty resources, student selectivity, financial resources, alumni giving, graduation rate performance and, for National Universities and National Liberal Arts Colleges only, high school counselor ratings of colleges.

The indicators include input measures that reflect a school's student body, its faculty and its financial resources, along with outcome measures that signal how well the institution does its job of educating students.

The measures, their weights in the ranking formula and an explanation of each follow.

Undergraduate academic reputation (22.5 percent): The U.S. News ranking formula gives significant weight to the opinions of those in a position to judge a school's undergraduate academic excellence. The academic peer assessment survey allows top academics – presidents, provosts and deans of admissions – to account for intangibles at peer institutions such as faculty dedication to teaching.

For their views on National Universities and National Liberal Arts Colleges, we also surveyed 2,202 counselors at public high schools, each of which is a gold, silver or bronze medal winner in the U.S. News rankings of Best High Schools, published in April 2013, and 400 college counselors at the largest independent schools. The counselors represent nearly every state and the District of Columbia.

[4] http://www.usnews.com/education/best-colleges/articles/2013/09/09/how-us-news-calculated-the-2014-best-colleges-rankings?page=4. Last accessed on May 28, 2014

Each person surveyed was asked to rate schools' academic programs on a scale from 1 (marginal) to 5 (distinguished). Those who didn't know enough about a school to evaluate it fairly were asked to mark "don't know."

The score used in the rankings is the average score of those who rated the school on the 5-point scale; "don't knows" are not counted as part of the average. In the case of National Universities and National Liberal Arts Colleges, the academic peer assessment accounts for 15 percentage points of the weighting, and 7.5 percentage points go to the counselors' ratings. For the second year in row, the two most recent years' survey results, from spring 2012 and spring 2013, were averaged to compute the high school counselor reputation score. This was done to increase the number of ratings each college received from the high school counselors and to reduce the year-to-year volatility in the average counselor score.

The academic peer assessment score continues to be based only on the most recent year's results. Both the Regional Universities and Regional Colleges rankings continue to rely on one assessment score, by the academic peer group.

In order to reduce the impact of strategic voting by respondents, we eliminated the two highest and two lowest scores each school received before calculating the average score. Ipsos Public Affairs collected the data in spring 2013; of the 4,554 academics who were sent questionnaires, 42 percent responded. The counselors' one-year response rate was 11 percent for the spring 2013 surveys.

Retention (22.5 percent): The higher the proportion of freshmen who return to campus for sophomore year and eventually graduate, the better a school is apt to be at offering the classes and services that students need to succeed.

This measure has two components: six-year graduation rate (80 percent of the retention score) and freshman retention rate (20 percent). The graduation rate indicates the average proportion of a graduating class earning a degree in six years or less; we consider freshman

classes that started from fall 2003 through fall 2006. Freshman retention indicates the average proportion of freshmen who entered the school in the fall of 2008 through fall 2011 and returned the following fall.

Faculty resources (20 percent): Research shows that the more satisfied students are about their contact with professors, the more they will learn and the more likely they are to graduate. We use six factors from the 2012-2013 academic year to assess a school's commitment to instruction.

Class size has two components: the proportion of classes with fewer than 20 students (30 percent of the faculty resources score) and the proportion with 50 or more students (10 percent of the score).

Faculty salary (35 percent) is the average faculty pay, plus benefits, during the 2011-2012 and 2012-2013 academic years, adjusted for regional differences in the cost of living using indexes from the consulting firm Runzheimer International. We also weigh the proportion of professors with the highest degree in their fields (15 percent), the student-faculty ratio (5 percent) and the proportion of faculty who are full time (5 percent).

Student selectivity (12.5 percent): A school's academic atmosphere is determined in part by the abilities and ambitions of the students.

We use three components: We factor in the admissions test scores for all enrollees who took the Critical Reading and Math portions of the SAT and the Composite ACT score (65 percent of the selectivity score); the proportion of enrolled freshmen at National Universities and National Liberal Arts Colleges who graduated in the top 10 percent of their high school classes or in the top quarter at Regional Universities and Regional Colleges (25 percent); and the acceptance rate, or the ratio of students admitted to applicants (10 percent).

The data are all for the fall 2012 entering class. While the ranking calculation takes account of both the SAT and ACT scores of all entering students, the table displays the score range for whichever test was taken by most students.

Financial resources (10 percent): Generous per-student spending indicates that a college can offer a wide variety of programs and services. U.S. News measures financial resources by using the average spending per student on instruction, research, student services and related educational expenditures in the 2011 and 2012 fiscal years. Spending on sports, dorms and hospitals doesn't count.

Graduation rate performance (7.5 percent): This indicator of added value shows the effect of the college's programs and policies on the graduation rate of students after controlling for spending and student characteristics such as test scores and the proportion receiving Pell Grants. We measure the difference between a school's six-year graduation rate for the class that entered in 2006 and the rate we predicted for the class.

If the actual graduation rate is higher than the predicted rate, the college is enhancing achievement.

Alumni giving rate (5 percent): This reflects the average percentage of living alumni with bachelor's degrees who gave to their school during 2010-2011 and 2011-2012, an indirect measure of student satisfaction.

To arrive at a school's rank, we first calculated the weighted sum of its scores. The final scores were rescaled so that the top school in each category received a value of 100, and the other schools' weighted scores were calculated as a proportion of that top score. Final scores were rounded to the nearest whole number and ranked in descending order. Schools that are tied appear in alphabetical order.

Appendix 3: List of Universities

University Name	U.S. News Ranking	NO. of LinkedIn Users	Metropolitan Area	Metropolitan Population	Metropolitan Income	Stay Rate (10-year avg.)	Annual Change of Stay Rate	Type	Campus Setting	Grad Student Ratio (cohort year: 2006)	Net Price
Harvard University	2	90389	Greater Boston	7893376	54967	0.31	-0.022	4-year, Private not-for-profit	City: Midsize	0.625	14445
University of Pennsylvania	7	94690	Greater Philadelphia	7067807	49831	0.31	-0.020	4-year, Private not-for-profit	City: Large	0.528	21821
Cornell University	16	125564	Ithaca New York	150900	37481	0.07	-0.014	4-year, Private not-for-profit	City: Small	0.334	23684
University of California-Berkeley	20	212816	San Francisco	8153696	60603	0.56	-0.014	4-year, Public	City: Midsize	0.282	16178
University of Virginia-Main Campus	23	96877	Charlottevill e Virginia	218705	40465	0.12	-0.013	4-year, Public	City: Small	0.338	12672
University of Southern California	23	161461	Greater Los Angeles	1787700 6	43008	0.52	-0.015	4-year, Private not-for-profit	City: Large	0.542	27544
University of California-Los Angeles	23	201006	Greater Los Angeles	1787700 6	43008	0.60	-0.041	4-year, Public	City: Large	0.301	14857
University of Michigan-Ann Arbor	28	188113	Greater Detroit	5318744	41276	0.30	-0.026	4-year, Public	City: Midsize	0.356	14490

University of North Carolina at Chapel Hill	30	111059	Raleigh-Durham North Carolina	1912729	41445	0.35	-0.024	4-year, Public	City: Small	0.368	11092
New York University	32	181827	Greater NYC City	23076664	58119	0.69	-0.017	4-year, Private not-for-profit	City: Large	0.495	37656
Georgia Institute of Technology-Main Campus	36	93022	Greater Atlanta	5910296	40046	0.47	-0.017	4-year, Public	City: Large	0.326	9116
Pennsylvania State University-Main Campus	37	241380	State College Pennsylvania	235632	38772	0.16	-0.034	4-year, Public	City: Small	0.144	22560
San Diego State University	39	110398	Greater San Diego	3095313	49719	0.28	0.013	4-year, Public	City: Large	0.157	9214
University of California-Davis	39	107572	Sacramento California	423895	44641	0.22	-0.018	4-year, Public	Suburb: Small	0.207	14877
University of California-Santa Barbara	41	99922	Santa Barbara	897121	47862	0.15	-0.020	4-year, Public	Suburb: Midsize	0.135	13144
University of Illinois at Urbana-Champaign	41	191078	Urbana-Champaign Illinois	231891	39086	0.13	-0.024	4-year, Public	City: Small	0.275	16495
Boston University	41	137053	Greater Boston	7893376	54967	0.41	-0.012	4-year, Private not-for-profit	City: Large	0.439	33172
University of Miami	47	45514	Miami/Fort Lauderdale	4244501	43958	0.40	-0.015	4-year, Private not-for-profit	Suburb: Large	0.345	28656
University of California-Irvine	49	84944	Orange County	3010232	44498	0.34	-0.002	4-year, Public	City: Midsize	0.192	12856

Northeastern University	49	123284	Greater Boston	7893376	54967	0.60	-0.011	4-year, Private not-for-profit	City: Large	0.399	31821
University of Florida	49	169841	Gainesville Florida	331806	36412	0.14	-0.023	4-year, Public	City: Midsize	0.343	13619
The University of Texas at Austin	52	223645	Austin Texas	28417	42902	0.37	-0.018	4-year, Public	City: Large	0.234	15844
George Washington University	52	100743	Washington DC	5636232	57810	0.47	-0.021	4-year, Private not-for-profit	City: Large	0.592	31443
University of Washington-Seattle Campus	52	177742	Greater Seattle	4274767	51058	0.69	-0.014	4-year, Public	City: Large	0.322	9395
Ohio State University-Main Campus	52	202245	Columbus Ohio	107841	41156	0.44	-0.019	4-year, Public	City: Large	0.236	19998
University of Connecticut	57	82444	Hartford Connecticut	1486436	53389	0.27	-0.011	4-year, Public	Suburb: Large	0.312	16357
University of Georgia	60	108792	Athens Georgia	5910296	40046	0.14	-0.022	4-year, Public	City: Midsize	0.239	12674
University of Maryland-College Park	62	168735	Washington DC	5636232	57810	0.48	-0.017	4-year, Public	Suburb: Large	0.288	14402
University of Pittsburgh-Pittsburgh Campus	62	99505	Greater Pittsburgh	2356285	46458	0.46	-0.021	4-year, Public	City: Large	0.359	21641
Syracuse University	62	97246	Syracuse New York	742603	41285	0.14	-0.015	4-year, Private not-for-profit	City: Midsize	0.296	28419
Brigham Young University-Provo	62	131406	Provo Utah	526810	36745	0.29	-0.028	4-year, Private not-for-profit	City: Midsize	0.097	11565

Clemson University	62	62951	Greenville South Carolina	1362073	34434	0.28	-0.019	4-year, Public	Suburb: Large	0.203	16251
Purdue University-Main Campus	68	173031	Lafayette Indiana	235013	33870	0.13	-0.022	4-year, Public	Suburb: Midsize	0.226	12969
Texas A & M University-College Station	69	178720	Bryan/College Station Texas	228660	31788	0.12	-0.019	4-year, Public	City: Small	0.208	12417
Rutgers University-New Brunswick	69	158414	Greater NYC City	23076664	58119	0.71	-0.012	4-year, Public	City: Small	0.219	15922
University of Minnesota-Twin Cities	69	174621	Greater Minneapolis-St. Paul	3684928	49191	0.65	-0.016	4-year, Public	City: Large	0.335	14516
University of Iowa	73	86585	Iowa City Iowa	152586	44542	0.16	-0.023	4-year, Public	City: Small	0.270	14928
Michigan State University	73	194555	Lansing Michigan	534684	34857	0.18	-0.027	4-year, Public	City: Small	0.234	13836
Baylor University	75	44408	Waco Texas	252772	34657	0.10	-0.012	4-year, Private not-for-profit	City: Midsize	0.159	28055
University of Delaware	75	71550	Greater Philadelphia	7067807	49831	0.39	-0.009	4-year, Public	Suburb: Large	0.167	14748
Miami University-Oxford	75	94765	Cincinnati Area	2114580	43186	0.26	-0.009	4-year, Public	Town: Fringe	0.147	24674
Indiana University-Bloomington	75	153469	Bloomington Indiana	205683	32830	0.12	-0.020	4-year, Public	City: Small	0.232	10899
University of Vermont	82	43403	Burlington Vermont	211261	32929	0.28	-0.016	4-year, Public	City: Small	0.144	15498
The University of Alabama	86	73808	Tuscaloosa Alabama	230162	34870	0.16	-0.019	4-year, Public	City: Small	0.163	18462
University of California-Santa Cruz	86	58679	San Francisco	8153696	60603	0.61	-0.015	4-year, Public	City: Small	0.082	15443

University of Colorado Boulder	86	120503	Greater Denver	3090874	49623	0.50	-0.022	4-year, Public	City: Small	0.188	19991
Florida State University	91	118704	Tallahassee Florida	395255	37038	0.17	-0.020	4-year, Public	City: Midsize	0.209	15031
Auburn University	91	82222	Auburn Alabama	140247	35965	0.13	-0.021	4-year, Public	City: Small	0.197	15092
University of Massachusetts Amherst	91	103130	Springfield Massachusetts	621570	33420	0.14	-0.015	4-year, Public	Suburb: Large	0.223	18156
University of New Hampshire-Main Campus	97	49881	Greater Boston	7893376	54967	0.67	-0.017	4-year, Public	Suburb: Small	0.161	21424
Drexel University	97	67599	Greater Philadelphia	7067807	49831	0.58	-0.001	4-year, Private not-for-profit	City: Large	0.377	35948
University of Missouri-Columbia	97	96966	Columbia Missouri	213585	38049	0.18	-0.022	4-year, Public	City: Midsize	0.223	16505
Iowa State University	101	91542	Des Moines Iowa	722323	45876	0.32	-0.020	4-year, Public	City: Small	0.169	13400
Saint Louis University-Main Campus	101	33912	Greater St. Louis	2892497	44153	0.54	-0.009	4-year, Private not-for-profit	City: Large	0.291	33572
Oklahoma State University-Main Campus	101	77744	Oklahoma City Oklahoma	1322429	42924	0.29	-0.019	4-year, Public	Town: Distant	0.209	13994
University of Nebraska-Lincoln	101	71289	Lincoln Nebraska	302157	41696	0.30	-0.024	4-year, Public	City: Large	0.211	13890
North Carolina State University at Raleigh	101	104883	Raleigh-Durham North Carolina	1912729	41445	0.50	-0.021	4-year, Public	City: Large	0.277	11208
The University of Tennessee	101	122031	Knoxville Tennessee	1077073	36400	0.32	-0.024	4-year, Public	City: Midsize	0.299	15298

University of Oregon	109	71935	Eugene Oregon	351715	35941	0.20	-0.019	4-year, Public	City: Midsize	0.151	15403
University of California-Riverside	112	40602	Greater Los Angeles	17877006	43008	0.57	-0.021	4-year, Public	City: Large	0.115	11484
University of South Carolina-Columbia	112	73336	Columbia South Carolina	767598	36405	0.31	-0.014	4-year, Public	City: Midsize	0.253	16672
University of Kentucky	119	75876	Lexington Kentucky	687173	37391	0.34	-0.020	4-year, Public	City: Large	0.257	14390
University of Arizona	119	111680	Tucson Arizona	1027683	35954	0.25	-0.022	4-year, Public	City: Large	0.215	13485
Colorado State University-Fort Collins	121	107229	Fort Collins Colorado	299630	41311	0.23	-0.026	4-year, Public	City: Midsize	0.242	12230
Temple University	121	98702	Greater Philadelphia	7067807	49831	0.62	-0.018	4-year, Public	City: Large	0.250	21012
DePaul University	121	89106	Greater Chicago	9840929	47831	0.77	-0.009	4-year, Private not-for-profit	City: Large	0.339	27561
University of Utah	121	78544	Greater Salt Lake City	2271696	36745	0.62	-0.020	4-year, Public	City: Midsize	0.233	11246
University of Illinois at Chicago	128	87914	Greater Chicago	9840929	47831	0.75	-0.011	4-year, Public	City: Large	0.402	11932
State university of New York at Albany	128	64522	Albany New York	870716	45757	0.34	-0.026	4-year, Public	City: Small	0.256	13692
University of Arkansas	128	52363	Fayetteville Arkansas	463204	38632	0.40	-0.015	4-year, Public	City: Small	0.171	11496
Washington State University	128	71644	Spokane Washington	527753	36441	0.13	-0.014	4-year, Public	Town: Distant	0.164	16327
Louisiana State University and Agricultural & Mechanical College	135	50356	Baton Rouge	802484	40245	0.32	-0.015	4-year, Public	Rural: Fringe	0.185	11676

Ohio University-Main Campus	135	86040	Athens Ohio	64757	33073	0.00	0.000	4-year, Public	Town: Distant	0.172	18356
Arkansas State University-Main Campus	135	18424	Jonesboro Arkansas	163116	33516	0.34	-0.017	4-year, Public	City: Small	0.267	8708
George Mason University	141	82996	Washington DC	5636232	57810	0.76	-0.012	4-year, Public	Suburb: Large	0.373	14709
Arizona State University	142	188226	Phoenix Arizona	4192887	38006	0.54	-0.016	4-year, Public	City: Midsize	0.191	12369
Mississippi State University	142	37768	Tuscaloosa Alabama	230162	34870	0.16	-0.022	4-year, Public	Rural: Fringe	0.195	14708
Oregon State University	142	67417	Corvallis Oregon	85579	39880	0.14	-0.023	4-year, Public	City: Small	0.173	15950
The University of Texas at Dallas	142	44736	Dallas/Fort Worth	6817483	45568	0.71	-0.012	4-year, Public	City: Midsize	0.390	7111
University of Mississippi	150	32398	Greater Memphis	1353087	40008	0.26	-0.016	4-year, Public	Town: Remote	0.145	12640
University of Rhode Island	152	44326	Providence Rhode Island	2921408	54967	0.40	-0.018	4-year, Public	Suburb: Large	0.187	16297
Illinois State University	152	73528	Bloomington /Normal Illinois	186133	43466	0.16	0.010	4-year, Public	Suburb: Midsize	0.118	16293
University of Hawaii at Manoa	158	37731	Hawaiian Islands	1360301	52017	0.50	-0.029	4-year, Public	City: Large	0.283	11562
University of Maryland-Baltimore County	158	30843	Baltimore Maryland	2710489	57810	0.48	-0.015	4-year, Public	Suburb: Large	0.197	13937
University of Wyoming	161	25659	Cheyenne Wyoming	91738	50755	0.24	-0.023	4-year, Public	Town: Remote	0.210	11203
University of Louisville	161	46304	Louisville Kentucky	1459911	40401	0.63	-0.012	4-year, Public	City: Large	0.260	12990
Texas Tech University	161	86665	Lubbock Texas	313740	36703	0.17	-0.023	4-year, Public	City: Midsize	0.184	12982

Virginia Commonwealth University	167	58936	Richmond Virginia	1208101	32528	0.47	-0.014	4-year, Public	City: Midsize	0.248	15838
University of South Florida-Main Campus	170	94834	Tampa/St. Petersburg Florida	2783243	40862	0.52	-0.018	4-year, Public	City: Large	0.243	13222
West Virginia University	170	67810	Greater Pittsburgh	2356285	46458	0.28	-0.018	4-year, Public	City: Small	0.232	9100
University of Central Florida	170	102551	Orlando Florida	2818120	36007	0.46	-0.020	4-year, Public	Suburb: Large	0.144	13489
Northern Illinois University	177	83041	Greater Chicago	9840929	47831	0.73	-0.013	4-year, Public	Suburb: Small	0.243	18552
Southern Illinois University Carbondale	177	81290	Greater St. Louis	2892497	44153	0.23	-0.020	4-year, Public	City: Small	0.250	13537
Indiana University of Pennsylvania-Main Campus	177	37861	Johnstown Pennsylvania	221421	35148	0.13	-0.018	4-year, Public	Town: Distant	0.149	16344
Ball State University	181	61097	Muncie Indiana	117671	32318	0.12	-0.018	4-year, Public	City: Small	0.209	12622
University of Nevada-Reno	181	29626	Reno Nevada	579668	42955	0.49	-0.021	4-year, Public	City: Midsize	0.173	15033
Bowling Green State University-Main Campus	181	68429	Toledo Ohio	651429	37925	0.24	-0.026	4-year, Public	Town: Fringe	0.143	16618
University of New Mexico-Main Campus	181	44112	Albuquerque New Mexico	1146049	37194	0.51	-0.032	4-year, Public	City: Large	0.216	11001
Western Michigan University	181	74893	Kalamazoo Michigan	524030	35975	0.23	-0.030	4-year, Public	City: Small	0.208	15610
East Carolina University	181	51714	Greenville North Carolina	215907	35449	0.24	-0.002	4-year, Public	City: Small	0.210	11112

Utah State University	190	42640	Logan Utah	125442	29243	0.00	0.000	4-year, Public	City: Small	0.116	11049
University of Houston	190	111422	Houston Texas	6114562	50490	0.76	-0.014	4-year, Public	City: Large	0.196	12262
University of Colorado Denver	190	44272	Greater Denver	3090874	49623	0.72	-0.011	4-year, Public	City: Large	0.415	16003
University of North Carolina at Greensboro	190	34284	Greensboro/ Winston-Salem North Carolina	1589200	36471	0.45	-0.022	4-year, Public	City: Large	0.188	9628
Central Michigan University	190	83604	Saginaw Michigan	391569	36199	0.15	-0.021	4-year, Public	Town: Distant	0.228	12668
New Mexico State University-Main Campus	190	32028	Las Cruces New Mexico	1013356	30325	0.27	-0.033	4-year, Public	Suburb: Midsize	0.191	11107
University of Missouri-Kansas City	201	30397	Kansas City Missouri	2343008	43373	0.67	-0.018	4-year, Public	City: Large	0.336	20509
South Dakota State University	201	17910	Sioux Falls South Dakota	228261	41746	0.44	-0.020	4-year, Public	Town: Remote	0.116	13753
University of North Carolina at Charlotte	201	51453	Charlotte North Carolina	2217012	39965	0.62	-0.017	4-year, Public	City: Large	0.193	11002
Kent State University at Kent	201	192	Cleveland/Akron Ohio	3515646	32727	0.47	-0.012	4-year, Public	Suburb: Large	0.216	18663
California State University-San Bernardino		18624	San Bernardino	4224851	31900	0.00	0.000	4-year, Public	City: Midsize	0.120	7113
Grand Canyon University		26703	Phoenix Arizona	4192887	38006	0.24	0.025	4-year, Private for-profit	City: Large	0.360	17220
University of California-San Diego		100690	Greater San Diego	3095313	49719	0.40	-0.022	4-year, Public	City: Large	0.199	13408

California State University-Fullerton	83913	Orange County	3010232	44498	0.49	-0.012	4-year, Public	Suburb: Large	0.141	7125
The University of Texas at San Antonio	44569	San Antonio Texas	2142508	39019	0.57	-0.010	4-year, Public	City: Large	0.148	11828
Florida Atlantic University	58293	West Palm Beach	1320134	44222	0.29	-0.012	4-year, Public	City: Small	0.163	11838
Florida Gulf Coast University	11015	Fort Myers Florida	940274	43169	0.33	-0.009	4-year, Public	Suburb: Large	0.090	12648
Southeastern Louisiana University	17822	Baton Rouge	802484	40245	0.40	-0.011	4-year, Public	City: Small	0.087	9055
The University of West Florida	20383	Pensacola Florida	448991	37538	0.37	-0.027	4-year, Public	City: Small	0.182	10050
University of Alaska Anchorage	15450	Anchorage Alaska	380821	52360	0.59	-0.034	4-year, Public	City: Large	0.057	8943
Troy University	35413	Montgomery Alabama	374536	37905	0.09	-0.077	4-year, Public	Rural: Fringe	0.206	10193
University of Minnesota-Duluth	27631	Duluth Minnesota	279771	38171	0.19	-0.020	4-year, Public	City: Small	0.100	15718
University of North Carolina Wilmington	26711	Wilmington North Carolina	254884	51519	0.28	-0.018	4-year, Public	City: Midsize	0.098	11502
Liberty University	48003	Lynchburg Virginia	252634	35243	0.12	0.000	4-year, Private not-for-profit	City: Small	0.380	22798
State university of New York at Binghamton	46826	Binghamton New York	251725	38365	0.00	0.000	4-year, Public	Suburb: Midsize	0.193	14776
Virginia Polytechnic Institute and State University	110785	Blacksburg	178237	31460	0.00	0.000	4-year, Public	City: Small	0.233	17375
Indiana State University	28080	Terre Haute Indiana	172425	33473	0.24	0.000	4-year, Public	City: Small	0.168	11183
University of Northern Iowa	34587	Waterloo Iowa	167819	41339	0.23	-0.028	4-year, Public	City: Small	0.132	13778

University of Southern Mississippi	31834	Hattiesburg Mississippi	142842	32567	0.22	-0.023	4-year, Public	City: Small	0.171	11911
Northern Arizona University	46252	Flagstaff Arizona	134421	34820	0.14	-0.014	4-year, Public	City: Small	0.162	15090
University of Kansas	95944	Lawrence Kansas	110826	36331	0.12	-0.019	4-year, Public	City: Small	0.294	16326
The University of Montana	24347	Missoula Montana	109299	36584	0.30	-0.016	4-year, Public	City: Small	0.153	13345
University of North Dakota	27667	Grand Folks	98461	43916	0.19	-0.023	4-year, Public	City: Small	0.216	16333
Idaho State University	18513	Pocatello Idaho	82839	29972	0.47	-0.026	4-year, Public	City: Small	0.141	12328
Texas State University-San Marcos	75024	Austin Texas	28417	42902	0.48	-0.020	4-year, Public	Suburb: Small	0.139	10505
California State University-East Bay	18741	San Francisco	8153696	60603	0.83	-0.012	4-year, Public	City: Midsize	0.165	10606
San Francisco State University	104417	San Francisco	8153696	60603	0.76	-0.014	4-year, Public	City: Large	0.133	11246
Stony Brook University	58572	Greater NYC City	23076664	58119	0.76	-0.011	4-year, Public	Suburb: Large	0.339	12700
City College of New York-Hunter College	42500	Greater NYC City	23076664	58119	0.83	-0.016	4-year, Public	City: Large	0.274	7260
St. John's University-New York	4256	Greater NYC City	23076664	58119	0.76	-0.002	4-year, Private not-for-profit	City: Large	0.249	27874
Montclair State University	43987	Greater NYC City	23076664	58119	0.86	-0.011	4-year, Public	Suburb: Large	0.215	13043
Kean University	26962	Greater NYC City	23076664	58119	0.87	-0.013	4-year, Public	Suburb: Large	0.162	18021
William Paterson University of New Jersey	25619	Greater NYC City	23076664	58119	0.86	-0.014	4-year, Public	Suburb: Large	0.117	12358

University of Maryland-University College	70297	Washington DC	5636232	57810	0.42	-0.011	4-year, Public	Suburb: Large	0.331	10913
Towson University	52926	Baltimore Maryland	2710489	57810	0.57	-0.012	4-year, Public	City: Small	0.181	13566
Southern New Hampshire University	29649	Greater Boston	7893376	54967	0.67	-0.007	4-year, Private not-for-profit	City: Midsize	0.363	24652
University of Massachusetts-Lowell	44008	Greater Boston	7893376	54967	0.79	-0.010	4-year, Public	Suburb: Large	0.246	13211
University of Massachusetts-Boston	37933	Greater Boston	7893376	54967	0.76	-0.015	4-year, Public	City: Large	0.236	10940
Sam Houston State University	38378	Houston Texas	6114562	50490	0.65	-0.009	4-year, Public	Town: Distant	0.154	9516
Rowan University	26191	Greater Philadelphia	7067807	49831	0.58	-0.003	4-year, Public	Suburb: Large	0.120	17131
University of Northern Colorado	33284	Greater Denver	3090874	49623	0.59	-0.009	4-year, Public	City: Small	0.211	12982
Minnesota State University-Mankato	40517	Greater Minneapolis-St. Paul	3684928	49191	0.70	-0.008	4-year, Public	City: Small	0.125	12526
North Dakota State University-Main Campus	27545	Fargo North Dakota	231674	47034	0.33	-0.024	4-year, Public	City: Midsize	0.170	14227
University of Nebraska at Omaha	35776	Greater Omaha	902041	46351	0.69	-0.017	4-year, Public	City: Large	0.179	10755
The University of Texas at Arlington	75614	Dallas/Fort Worth	6817483	45568	0.69	-0.016	4-year, Public	City: Large	0.225	10079
University of North Texas	100706	Dallas/Fort Worth	6817483	45568	0.70	-0.015	4-year, Public	City: Midsize	0.194	10345
Tarleton State University	14671	Dallas/Fort Worth	6817483	45568	0.50	-0.016	4-year, Public	Town: Remote	0.163	15464

Western Illinois University	39706	Peoria Illinois	379186	45401	0.13	0.010	4-year, Public	Town: Remote	0.159	15088
University of Wisconsin-Madison	163639	Madison Wisconsin	827742	45042	0.26	-0.024	4-year, Public	City: Midsize	0.283	15317
University of Wisconsin-Milwaukee	69785	Greater Milwaukee	2025989	45032	0.61	-0.015	4-year, Public	City: Large	0.172	14469
Western Kentucky University	32305	Greater Nashville	1788434	44201	0.39	-0.015	4-year, Public	City: Small	0.143	12128
Middle Tennessee State University	45065	Greater Nashville	1788434	44201	0.66	-0.019	4-year, Public	City: Midsize	0.119	8855
University of Missouri-St Louis	33107	Greater St. Louis	2892497	44153	0.77	-0.012	4-year, Public	Suburb: Large	0.202	14536
Southern Illinois University Edwardsville	29712	Greater St. Louis	2892497	44153	0.66	-0.009	4-year, Public	Suburb: Large	0.193	14294
California State University-Sacramento	72031	Sacramento California	2414783	44099	0.58	-0.015	4-year, Public	City: Large	0.102	8859
Florida International University	73934	Miami/Fort Lauderdale	4244501	43958	0.72	-0.015	4-year, Public	Suburb: Large	0.188	11933
Keiser University-Ft Lauderdale	3735	Miami/Fort Lauderdale	4244501	43958	0.35	0.017	4-year, primarily associate's, Private not-for-profit	City: Midsize	0.052	21682
Old Dominion University	48197	Norfolk Virginia	1779243	43824	0.50	-0.045	4-year, Public	City: Midsize	0.205	11775
Kaplan University-Davenport Campus	5503	Davenport Iowa	471551	43295	0.08	0.017	4-year, Private for-profit	City: Midsize	0.221	13963
Rochester Institute of Technology	71990	Rochester New York	1079671	43133	0.32	-0.020	4-year, Private not-for-profit	Suburb: Large	0.162	26519

California State University-Los Angeles	36282	Greater Los Angeles	17877006	43008	0.79	-0.014	4-year, Public	City: Large	0.168	3713
University of California-Los Angeles	201006	Greater Los Angeles	17877006	43008	0.60	-0.041	4-year, Public	City: Large	0.301	14857
California State University-Long Beach	83706	Greater Los Angeles	17877006	43008	0.52	-0.016	4-year, Public	City: Large	0.144	8466
California State University-Northridge	93659	Greater Los Angeles	17877006	43008	0.80	-0.014	4-year, Public	City: Large	0.131	10458
California State Polytechnic University-Pomona	60697	Greater Los Angeles	17877006	43008	0.65	-0.015	4-year, Public	Suburb: Large	0.073	9707
University of Oklahoma Norman Campus	73925	Oklahoma City Oklahoma	1322429	42924	0.35	-0.020	4-year, Public	Suburb: Midsize	0.233	16280
University at Buffalo	79090	Buffalo/Niagara	1135509	42413	0.38	-0.021	4-year, Public	Suburb: Large	0.326	13109
Kansas State University	69420	Manhattan Kansas	127081	42223	0.00	0.000	4-year, Public	City: Small	0.186	14639
University of Wisconsin-Oshkosh	27579	Oshkosh Wisconsin	392660	41277	0.40	-0.024	4-year, Public	City: Small	0.084	11554
Wayne State University	79958	Greater Detroit	5318744	41276	0.73	-0.025	4-year, Public	City: Large	0.332	11973
Eastern Michigan University	61837	Greater Detroit	5318744	41276	0.67	-0.023	4-year, Public	Suburb: Large	0.195	13240
Oakland University	44982	Greater Detroit	5318744	41276	0.79	-0.020	4-year, Public	Suburb: Large	0.180	13305
Indiana Wesleyan University	30344	Indianapolis Indiana	1887877	41236	0.33	0.015	4-year, Private not-for-profit	Town: Distant	0.287	22928

Indiana University-Purdue University-Indianapolis	41410	Indianapolis Indiana	1887877	41236	0.68	-0.012	4-year, Public	City: Large	0.269	12442
Portland State University	59167	Portland Oregon	2921408	41139	0.72	-0.014	4-year, Public	City: Large	0.195	12335
University of North Florida	26958	Jacksonville Florida	1470473	40955	0.61	-0.018	4-year, Public	City: Large	0.111	11135
Wichita State University	33593	Wichita Kansas	667230	40928	0.58	-0.029	4-year, Public	City: Large	0.180	8645
University of Alabama at Birmingham	34094	Birmingham Alabama	1302283	40537	0.55	-0.018	4-year, Public	City: Midsize	0.373	14296
Georgia State University	79060	Greater Atlanta	5910296	40046	0.77	-0.016	4-year, Public	City: Large	0.232	14290
Georgia Southern University	34468	Greater Atlanta	5910296	40046	0.43	0.004	4-year, Public	Town: Remote	0.125	15866
Kennesaw State University	38062	Greater Atlanta	5910296	40046	0.82	-0.012	4-year, Public	Suburb: Large	0.078	14742
University of Memphis	48152	Greater Memphis	1353087	40008	0.64	-0.023	4-year, Public	City: Large	0.203	11237
University of Arkansas at Little Rock	17355	Little Rock Arkansas	877091	39761	0.65	-0.019	4-year, Public	City: Midsize	0.199	9872
Stephen F Austin State University	32899	Tyler Texas	260559	39281	0.14	-0.015	4-year, Public	Rural: Fringe	0.131	13097
Wright State University-Main Campus	42217	Dayton Ohio	1080044	38796	0.50	-0.031	4-year, Public	Suburb: Large	0.217	17090
University of Wisconsin-Eau Claire	30270	Eau Claire Wisconsin	205008	38366	0.18	-0.025	4-year, Public	City: Small	0.049	12204
University of Toledo	49404	Toledo Ohio	651429	37925	0.38	-0.027	4-year, Public	City: Large	0.215	13298
Eastern Kentucky University	25882	Lexington Kentucky	687173	37391	0.46	-0.015	4-year, Public	Town: Distant	0.127	12073

Valdosta State University	17659	Tallahassee Florida	395255	37038	0.19	-0.012	4-year, Public	City: Small	0.178	14147
Florida Agricultural and Mechanical University	23565	Tallahassee Florida	395255	37038	0.21	-0.036	4-year, Public	City: Midsize	0.166	10683
Eastern Washington University	23365	Spokane Washington	527753	36441	0.43	-0.018	4-year, Public	Town: Fringe	0.097	11499
University of Nevada-Las Vegas	44004	Las Vegas Nevada	2195401	35764	0.58	-0.026	4-year, Public	City: Midsize	0.181	10038
Grand Valley State University	47170	Greater Grand Rapids Michigan	988938	35720	0.53	-0.009	4-year, Public	Suburb: Large	0.135	15390
Ferris State University	36582	Greater Grand Rapids Michigan	988938	35720	0.32	-0.022	4-year, Public	Town: Remote	0.087	13235
Boise State University	36990	Boise Idaho	697535	34874	0.65	-0.013	4-year, Public	City: Midsize	0.128	13790
East Tennessee State University	22437	Johnson City Tennessee	508260	34820	0.45	-0.022	4-year, Public	City: Small	0.189	14688
Youngstown State University	26573	Youngstown Ohio	673614	34736	0.46	-0.037	4-year, Public	City: Small	0.085	11459
James Madison University	53583	Harrisonburg Virginia	243730	34727	0.00	0.000	4-year, Public	City: Small	0.091	14029
University of South Alabama	21483	Mobile Alabama	595257	34594	0.47	-0.026	4-year, Public	City: Midsize	0.227	10108
The University of Tennessee at Chattanooga	19294	Chattanooga Tennessee	923460	34412	0.54	-0.012	4-year, Public	City: Midsize	0.129	12390
University of Louisiana at Lafayette	27436	Lafayette Indiana	235013	33870	0.52	-0.025	4-year, Public	City: Midsize	0.093	5891
California State University-Fresno	34618	Fresno	1081315	33672	0.48	-0.022	4-year, Public	City: Large	0.126	5894

Missouri State University-Springfield	45503	Springfield Missouri	436712	33420	0.33	-0.021	4-year, Public	City: Midsize	0.155	13107
Cleveland State University	49184	Cleveland/Akron Ohio	3515646	32727	0.76	-0.020	4-year, Public	City: Large	0.317	16372
University of Akron Main Campus	60155	Cleveland/Akron Ohio	3515646	32727	0.61	-0.018	4-year, Public	City: Midsize	0.168	15894
Appalachian State University	44983	Hickory/Lenoir North Carolina	410493	31755	0.16	-0.020	4-year, Public	Town: Distant	0.107	8874
The University of Texas at El Paso	24303	El Paso Texas	1013356	30325	0.52	-0.032	4-year, Public	City: Large	0.155	5164
The University of Texas-Pan American	10103	McAllen Texas	835737	22220	0.52	-0.026	4-year, Public	City: Small	0.142	2394

** Net Price is Average Net Price for 2011-2012 generated for full-time beginning undergraduate students who were awarded grant or scholarship aid from federal, state or local governments, or the institution. For public institutions only students paying the in-state or in-district rate are included. For institutions that charge students by program, net price is generated for the institution's largest program.

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