

Brain Drain in Ohio; Observations and Summaries with Particular Reference to Northwest Ohio



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Executive Summary

Analyzing the records of 1.1 million college alumni from 26 Ohio institutions since 1980, including all the major public universities, we identify several findings regarding “brain drain”—the exit of college graduates from Ohio and especially Northwest Ohio.

- Brain drain is not as common in this state and area as is generally believed. Only about 20% of 2000-2003 graduates left the state—a relatively low percentage.
- Many who do leave relocate to adjacent states, not to “cool cities” or the sunbelt.
- Graduate retention seems to have increased since 2000, compared to previous periods, especially the late 1990s.
- Most graduates who stay in Ohio for more than 3 years after graduating, remain for two decades. Roughly 60% of the graduates of the state-wide and of the northwest Ohio 1980 cohort are still located in Ohio, and roughly 70% of all 1980-2003 graduates are located in Ohio.
- In-state retention rate of graduates from 8 northwest Ohio universities is similar to our state-wide sample both since 2000, and for the entire 1980-2003 period.
- Science and technology graduates from northwest Ohio universities since 2000 exit the state in numbers that are slightly higher than their peers.
- The Toledo MSA does have a major out-migration of alumni, but this is in part due to the fact that local universities produce so many graduates, many of whom never actually lived in the MSA. Thus, while strongly contributing to the Ohio economy, only about 20% of northwest Ohio college grads stay in the region. However, given the small percentage of state-wide grads who locate in NW Ohio, most alumni located appear to have been educated in the region.
- There is a significant “brain drain” indicated where alumni with advanced degrees (Masters, Doctorates, etc.) from both our state-wide and northwest Ohio samples disproportionately exit the state. This trend is especially pronounced in northwest Ohio, despite the fact that these are relatively small number of people.
- Locational decisions do not appear to be effected by the gender of the graduate.

On a state-wide level, our data suggests that brain drain is not a significant problem. Having an under-educated workforce and insufficient demand by the business community for well-educated workers are problems. When taxpayers support Ohio higher education, they are investing in the quality of the future workers and taxpayers of the State of Ohio—who will subsequently be investing in the social services and programs used by the current taxpayers and their children.

Northwest Ohio is a significant producer of college-educated individuals to the state. Our ability to retain the many graduates of area universities, especially those who have advanced degrees, is relatively weak. Local firms need to recognize that hiring college graduates is an investment in the intellectual capital and competitiveness of their firm. They need to create more elaborate relationships with universities to secure graduates and to support university research activities that may benefit them.

Introduction

For decades there have been numerous reports on “brain drain” or migration of college educated youth from second and third world nations to US universities,¹ corporations, and citizenship. Well-educated immigrants have been recognized as a dynamic element driving the US economy. Articles in academic and mainstream media have increasingly focused on this topic. The international context shows us that “drain” can be bidirectional, uneven, varying over time, reversible, and influenced by government policy and business environment.

In the last decade, “brain drain” has been applied to explain the movement of college educated US youth to a few “cool cities.” This shift has catalyzed the concern of legislators, university officials, policy-makers, and economic development professionals. Two beliefs unite this body of work: that having a sizable pool of talented college graduates is central to the economic vitality of a region,² and that graduates from throughout the nation are moving to relatively few urban centers mostly on the coasts. The implication of this trend is that a vast area is left behind, unable to participate in the “new economy” because it lacks sufficient entrepreneurial and technical talent.

The above noted concerns suggest the questions:

- 1. What is the extent and form of Brain Drain in Ohio, Northwest Ohio, and Toledo?**
- 2. Has this pattern changed over time?**
- 3. And, does this pattern apply to Northwest Ohio?**

To answer these questions we employed a two part approach. First, we reviewed historical and secondary data from studies that examined and posited explanations for brain drain from multiple points of view, methods, and levels of analysis. Second, we gathered and analyzed primary data on Ohio university alumni to shed light both on recent graduates, and the historical migration of Ohio university graduates.

¹ The British Royal Society first coined the expression “brain drain” to describe the outflow of scientists and technologists to the United States and Canada in the 1950s and early 1960s. *OECD Observer*. 5/7/02.

² The Southern Technology Council (1998) quoted a study by Bank Boston measuring the relationship between university science grads and entrepreneurship. They noted that Massachusetts Institute of Technology graduates had founded 4,000 firms, employed over 1.1 million people, and generated \$232 Billion of world sales by 1994—taken together constituting the 24th largest economy in the world.

Context & Background – US Mobility Since 1985

National Mobility

Americans have always been a highly mobile people. Our net national immigration has always exceeded out-migration, and there has been a continuous shifting of the US population from the northeast to the southern and western geographic areas of the US since the first US Census. In the last 30 years the pace of these trends has increased significantly.

Currently about 17% of the US population annually changes residence.³ Racial minorities and the young move more often, especially within their county of residence.⁴ Looking at the 1995-2000 data when 120,347,674 people over age 5 moved, we see that over half (54.4%) of all movers stayed in the same county, 21% moved to another county in the same state, 18.4% moved to another state, and 6% of movers came from abroad.

Almost two-thirds of all people age 25-39 moved during the 1995-2000 period, half of them outside their county, and almost 20% of those movers exited their original state of residence. In fact, 33.8% of all movers were 25 to 39 year olds. Thus, recent college graduate-aged persons, regardless of education are the most mobile age cohort. The most active sub-category is young, single, college-educated (YSC) people⁵—three-fourths of whom moved; 18% changed counties within the state, and 22.6% moved out of state (vs. 12.4% of non-YSC 25 to 39 year olds).⁶ YSC's disproportionately moved to the Sunbelt, far western states, and to larger urban areas.⁷ Marital status was not a significant factor effecting mobility rates among YSC, since over 75% of young, college educated individuals moved regardless of marital status.

Ohio's Mobility

Due to out-migration, Ohio lost 163,876 people between 1986 and 1997—most before 1990. There are estimates that Ohio will be one of only two states with a projected flat population from 2000 through 2030. This is arguably due to the decline of established industries, especially manufacturing-based firms. But given that these jobs are disproportionately held by non-college graduates, these figures do not in and of themselves indicate a brain drain problem.

³ http://www.vipvanlines.com/tax_saving.htm

⁴ In the 1990's only 14.5% of non-Hispanic whites moved, compared to 18.9% of African Americans, 18.9% of Asians, and 21% of Hispanics.

⁵ Among people age 25 and old (as of 1997), 36.1 million (83%) whites, 3 million blacks, 2.7 million Asians, and 1.7 million Hispanics had bachelor's degrees. *Educational Attainment in the United States, Special Report*, US Census 1999. The rate also differs by race; 29.4% of whites, 17.2% of blacks and 11.1% of Hispanics had at least a bachelor's degree in 2002. <http://www.infoplease.com/ipa/A0774057.html>

⁶ US Census 2000, *Migration of the Young, Single, and College Educated: 1995-2000. Special Report*, U.S. Dept. of Commerce, 11/ 2003.

⁷ All 20 largest metropolitan areas had a net increase in young, single, and college educated people during this period suggesting that such folks were heading to or remaining in all the large urban areas generally, and not just “cool cities.”

Ohio has significant movement within its borders. Non-urban counties in the North Central, Western Border, and South East areas of Ohio are losing populations due to out-migration to metropolitan areas. In fact, all regions except the metropolitan counties had a net out-migration during the 1990's. Counties gaining population are contiguous to major urban areas.⁸ Ohioans are moving to a few suburban and exurban areas from traditional urban core and rural locales, away from areas of limited economic opportunity and social resources to places with more urban amenities such as educational institutions, access to parks, cultural diversity, and higher employment. Individuals age 25-39 were most active in changing locations within the state and within regions.

In sum, movement from previously established locations to metropolitan areas, especially by 25-39 year olds, is a general trend, suggesting that brain drain movement is a particular variant of the larger social mobility patterns affecting Ohio and the entire US.

Studies of Brain Drain in the US, Ohio, Northwest Ohio, and Toledo

To understand the dimensions of this issue, we will review and discuss the findings of several studies. This will help us frame specific queries for our analysis, create a basis for comparison with our findings, and show the impacts of different methods, populations, data sources, and definitional criteria upon our understandings. We will also present our findings and compare them to those found in other previous studies.

The press' and government's concern about brain drain are focused on economic development issues associated with loss of high skilled "knowledge workers"--workers whose training they perceive as a lure to outside investment, and whose innovation might help to spur local development. Among these analysts, there are two methodologies to studying "Brain Drain;" 1) losses of college educated people generally, and 2) studies looking at in-out migration of only science and engineering college graduates whose work is associated with "high tech" or the "new economy."

Most studies are outcomes-based deductive statistical analyses derived from the US Census and other government data. Such studies offer greater detail about the size, components, and dynamics of migration. There also are surveys of college attendees and alumni exploring why college graduates decide to leave an area,⁹ but these have been small, of limited focus, and had weak response rates.¹⁰ Most have focused on recent college graduates leaving the locations where they received their degree.

⁸ Major (+4,000) population increases occurred in 5 counties around Cincinnati, 5 around Columbus, 1 between Cleveland and Akron. Only 4 counties in NW Ohio had any increased population (Williams, Fulton, Wood, and Ottawa)—all are around Toledo. Ohio Trends, www.osuedc.org/current/oh Trends/vIn3.html There also was a slight increase in counties south of Columbus beyond the suburban areas.

⁹ The State of Indiana and Georgia have instituted a series of annual surveys of employers, alumni, students, industries, human resource professionals, etc., while New Hampshire, North Carolina, and Pennsylvania did one time surveys pre 1999. Another was done for a small area of Northeast Ohio in 2002-- Stark Education Partnership. 2003. "*Graduate Retention*. Akron. Others are in the information gathering stage, were not publicly released, and/or were not yet available as public reports perhaps due to changing state priorities or budget constraints—a problem previously noted in *Indiana Human Capital*. 2000.

High School to College Transition

Analysts have identified 3 life-cycle-based events as periods when “brain drain” from a state or region occurs: the transition to college (in-region or –state, or out); transition from college to post-college activities (first employment or graduate school), and about 1-2 years after college graduation. Most studies have focused on the post-collegiate and initial work experience period and this study will take a similar focus.

National Studies of the College-Employment Transition and Migration

During the 1970’s and 1980’s southern or sun-belt states offered low taxes and significant tax abatements and subsidies to lure firms and create local employment, only to have firms recruit workers from northern states, and/or move back to northern states to gain access to an educated workforce. Corporate criticisms about the poorly educated local students forced southern states to systematically examine workforce preparation. Many states made substantial investments in higher education and especially university training. By the late 1990’s, states wanted to know the affects of these investments on economic development.

In 1998 the Southern Technology Council (STC) executed a groundbreaking study which showed that, while most college graduates stayed in their state and region, there was a substantial brain drain to urbanized coastal areas, especially in the far west. Examining data on 20,000 students from the NSF’s National Survey of Recent College graduates, they determined that while most college graduates stayed in a state and region,¹¹ scientists and engineers were especially migratory, lured by higher wages,¹² and by defense spending. They disproportionately moved to a few cities in the south- and far-west¹³ seeking a challenging, high tech work environment. These “brains” drained to a few “cool” cities. A 2003 Brookings¹⁴ study of the 100 largest cities notes that the 25 US cities entering the 1990’s with the largest share of college graduates had by 2000 acquired graduates at twice the rate of the other 75 cities and had become distinct from the rest of the nation in their ability to attract and retain an educated workforce.

Cities where 25 to 39 year old graduates migrated were rarely among the most rapidly growing US cities.¹⁵ These receiving locales often suffered a loss of non-college educated residents and even reductions in total population. Attracting “brains” did not benefit most existing business, nor create jobs. Attracting “brains” is not the same as having aggregated intellectual capital, either in terms of

¹⁰ A study using both approaches would seem to offer the greatest opportunity to identify and measure what is happening and why. Unfortunately only one study seems to have used this approach. “Maine’s College Graduates; Where They go and Why” Center for Education Policy, Applied Research and Evaluation. University of South Maine, Portland, Me. & Finance Authority of Maine February 2003.

¹¹ This was especially common among people who had both graduated high school and college in the same state.

¹² The study drew on information from the arguably anomalous 1991-3 period—the initial period of high (info- and bio-) tech expansion in the US.

¹³ While strong, this study focuses on a period with the most dynamic economic activity of the last 30 years, especially in the high tech, information tech, and bio-tech industries.

¹⁴ Brookings Institution in *Washington Post* 11/10/03

¹⁵ Only 1 of the 25 growing “brain” attracting locales, were among the 10 fastest growing US cities.

numbers of graduates or of people with advanced degrees in a region. While a healthy number 25-39 year old graduates are migrating to Southern and Western cities, the highest proportions of baccalaureate-possessing young workers are located in the Northeast (27.5%), followed by the Midwest (26.2%), and then the South and West (22.9% each).¹⁶ However, when looking at workers holding advanced degrees, the Midwest actually ranks last among the four areas.¹⁷ Thus, examining migration alone may distort our understanding of the net intellectual capacity of a region's workforce.

Being a "cool city," or having a large population of bright talented college students, and vibrant high tech and knowledge-based industries, doesn't prevent brain drain nor assure graduate attraction and retention. A Boston study¹⁸ shows substantial out-migration due to colleges creating more graduates than the economy can absorb. Almost half of recent graduates leave each year,¹⁹ and the principal reason for exit was the lack of jobs and low salaries *in their field of expertise*—not lack of employment per se. Those with skills sought by local, high tech industry remained in the area. One quarter of graduates who stayed after graduation left within two years, and subsequent exit of graduates from the same cohort over the next decade was minimal.

¹⁶ Paul Gottlieb. 2004. *Labor Supply Pressures and the "Brain Drain"*. Washington: Brookings Institution.

¹⁷ US Census 2003. *Educational Attainment: 2000*. Graduate degree attainment NE-11% highest, Midwest -8% lowest. Pg. 6.

¹⁸ Boston Chamber of Commerce and the Boston Foundation. 2003. *Preventing a Brain Drain*.

¹⁹ 40% of them to their hometowns, 46% to other cool cities.

Ohio's Brain Drain

While 24.4% of working age Americans had at least a bachelor's level education in 2000, only 21.1% of Ohio's, and 21.6% of the Toledo MSA's workforce had such degrees. The total number of graduates has grown slowly, despite annual increases in immigration of college graduates and the number of new college graduates. Ohio had 32,053 in-migrants and 50,462 out-migrants among college educated single people between 25 and 39 years of age during 2000.²⁰ The 2003 US Census American Community Survey ranks Ohio 40th among the 50 states in percentage of citizens over age 25 who have completed a bachelor's degree, with only 2 of the 8 Ohio MSAs having rates greater than the US Average. In fact, all Ohio MSAs ranked poorly compared to other US urban counties.²¹ A key factor explaining this condition may be Ohio's average tuition which in 2004 was \$6,690, 5th highest among 50 states and 144% of the national average. Only 9 states have a lower appropriation for higher education per \$1,000 of personal income. Relative to the state average income, tuition at Ohio's public 4 year colleges is the second highest in the nation.²²

There have been several studies of brain drain examining the state-wide pattern, each with different population/samples, and using different methods and goals. A 2003 study by the *Cleveland Plain Dealer* looked at 490,000 alumni of 23 public and private schools in Ohio and found that over 70% of baccalaureate graduates who earned degrees in Ohio, stayed to work or returned for further college in Ohio. People with master degrees are 30% more likely to leave Ohio than BA grads, and those with earned doctoral degrees were twice as likely to leave the state as BA grads.²³ They also found that graduates of more selective private colleges were twice as likely to leave Ohio as public university graduates. Thus, more highly educated people, and those who attended private universities,²⁴ are more likely to leave the state.²⁵

²⁰ US Census. 2003 *Migration of Young, Single, and College Educated; 1995-2000*. This was a net migration rate of -88.25, similar to other rust-belt states such as New York, Pennsylvania, Michigan, and West Virginia.

²¹ http://factfinder.census.gov/servlet/GRTTable?_bm=y&-geo_id=D&-box_head_nbr=R02&-ds_name=ACS_2003_EST_G00_&-lang=en

²² All data from http://measuringup.highereducation.org/state_reports.cfm

²³ *SSTI Weekly* 3/28/03. Such rates help explain why the Midwest has the fewest number of people with advanced degrees of the four major US areas.

²⁴ A similar finding was indicated by the Stark Kent State study (2003) using a regional survey of public and private college alumni.

²⁵ This is important, since the State student aid formula may provide a student with more money to attend a private than a public university, helping to reduce the tuition difference between the two types of institutions. On the other hand, the net award to a student including state subsidy to the public university results in a net greater public investment per student when they attend the public colleges.

Using Census data from 1995 and 2000, Mortenson (2004 in Sheehan 2004:2)²⁶ showed that Ohio had the lowest percentage (22%) of YSC's of all US states who lived in the state in 1995 and left by 2000. This suggests that either the Plain Dealer data is flawed, or that many of those people who left, were only here as students and never actually lived in Ohio.

Examining all of Ohio's public and private university graduates from 1998 to 2001 during the first 6 months after graduation, the Ohio Board of Regents (OBOR) found roughly similar results; 76% of baccalaureate,²⁷ 64% of Masters, and 55% of Doctorate graduates of public universities had in-state employment or continued schooling in Ohio.²⁸ Inconsistent with the *Plain Dealer*, they found that public college baccalaureate graduates were slightly less likely than private school grads to obtain in-state employment or continue schooling in-state (75% vs. 77%).²⁹ More importantly, OBOR found that engineering and natural science graduates at all levels, were much less likely to stay in-state than graduates in general (see Table 1 below)—findings are consistent with the STC study.

Table 1 Ohio's public university science and technology graduates 6 months after graduation, 1998 - 2001

Degree	Discipline Area	number	% instate employment &/or continued schooling
Bachelors	Engineering	6,215	68%
Masters	Engineering	1,415	44%
Doctorate	Engineering	255	28%
Bachelors	Natural Science	6,697	75%
Masters	Natural Science	1,272	56%
Doctorate	Natural Science	383	28%

Paul Gottlieb conducted a tightly focused study of scientific and technical graduates in the Cleveland area using NSF data on first employment experiences in the 35 occupations in information technology and biomedical industries.³⁰ It indicates that out-migration of Ohio's scientific and engineering graduates occurs at twice the rate of immigration, and that the percentage of scientific and engineering graduates employed in Ohio but trained outside the state (immigrants) is low—ranked 39th among the US states. Ohio

²⁶ Robert Sheehan. 2004 "Commentary on "Buying Ohioans Loyalty?" Conference on Financial Aid and Brain Drain, Case Western University 4/24/04. Re. T. Mortenson. "Mobility and Interstate Migration for the Young, Single, and College Educated 1995-2000." *Postsecondary Education OPPORTUNITY*. # 125. July 2004.

²⁷ And 75.4% of students completing degrees at the Main Campus universities—historically more selective institutions.

²⁸ <http://regents.state.oh.us/perfrpt/woo3-i.html>

²⁹ OBOR 2002 General Report, chapter 15, pgs. 6-11.

³⁰ Paul Gottlieb. 2001. *The Brain Drain Problem in Ohio and Northeastern Ohio*. This study was funded by OBOR, Greater Cleveland Growth Association, and Case Western University Center for Regional Economic Issues,

ranks 22nd in terms of retaining their own scientists and engineers. Thus, despite being a largely urban, industrial state with a large population, and home to many Fortune 500 firms—factors that should advantage the state—Ohio has serious problems retaining and attracting such people.

Next, Gottlieb moved beyond measuring migration, and examined demand and supply conditions such as wages, availability, college degree production, entrepreneurial activity. He found them to be insufficient in Ohio relative to the net population. After controlling for population, supply, and demand, he found that not only ***are insufficient numbers of trained scientific and technical graduates accepting jobs in Ohio firms, especially high tech firms, but also there are insufficient numbers of high tech firms and jobs in Ohio.***³¹ He also calculated that attempts to attract science and technology graduates in Ohio and elsewhere through the use of amenities, marketing and other policies attempting to influence or redress migration of scientific and engineering graduates explain no more than 17% of variance—these people are motivated by employment and wage level.

Gottlieb compared Cleveland-Akron to 30 other MSAs including Columbus, and Cincinnati.³² The study shows Cleveland, like Ohio generally, is low on both demand for such workers by industry and supply of high tech workers.³³ Finally, he noted that simple out-migration of brains is not a problem in itself, as evidenced by the Boston example noted earlier. High turnover may be a good thing, bringing new people and innovative ideas to firms and helping to drive a dynamic economy. Several other scholars have argued that the real problem in Ohio is not only insufficient demand by business coupled with a failure of the state to retain many out-of-state students who obtain their degrees here, but also an inability to retain many of the 10,000+ residents who each year leave Ohio to obtain their degrees in other states.³⁴

Further verification of the weak status of a demand economy in Ohio is indicated in their rankings in the State New Economy Index, a group of 21 indicators or benchmarks against which a state's economic development are measured relative to other states. Ohio ranks in the bottom half of almost all the categories,³⁵ suggesting that the entrepreneurial dynamics and investment in new technologies by existing companies are lagging behind the national average. (See Appendix 1) A 2004 Milken Institute study, "Tech's Cream of the Crop", ranks Ohio 24th among the 50 states, an improvement from 27th in their 2002 rankings. At the same time, the *Precis State Index* indicates that employment growth in Ohio between 2002 and 2004 ranks 52nd out of 54 US states and territories. The *Index* also indicates that Ohio may improve to a rank of 50th in employment growth of the 54 states and territories by 2007.

³¹ See also "Designing a Brain Drain Plug" – *Federal Gazette* 1/2003 Federal Reserve Bank Minneapolis, Minnesota.

³² In an e-mail exchange he explained that he could not extend his analysis to an MSA as small as Toledo's because of the attributes of his dataset, response rates, and statistical techniques.

³³ See also Stark Education Partnership, Inc. 2003. *College Graduate Retention Initiative Research Report*. KSU-Stark: Canton, Ohio.

³⁴ Paul Gottlieb. 2003. "Brain Drain Policies in the U.S. States; Treating the Symptom Instead of the Disease?" Working paper, Dept. of Agriculture, Food and Resource Economics, Cook College, Rutgers University, New Brunswick, N.J. (2003) Sheehan (2004), Sommers (2003), and Mortensen (2002).

³⁵ *New Economy Index* 2002.

UT-UAC Analysis of Ohio grads

Sample

Data on graduates were requested from the Alumni offices of 62 public and private colleges and universities across Ohio. Twenty-six responded identifying a total of 1,113,959 alumni (bachelors, advanced degrees, and some associate and other degrees) who graduated from their institutions between 1980 and 2003 and have maintained membership in the alumni association (See Table 2). Variables used in this study were degree level (Associate, Bachelors, and Graduate), graduation year, gender, marital status, and degree focus.

Table 2 Institutional Sources of UAC data 1980-2003

INSTITUTION	FREQUENCY	PCT
Ashland University	20,010	1.8
Bowling Green State University	67,498	6.0
Cedarville College	9,152	0.8
Cincinnati State Technical	6,548	0.6
Cleveland State University	65,831	5.8
Defiance College	4,280	0.4
Hiram College	5,509	0.5
John Carroll University	17,186	1.5
Kent State University	83,976	7.4
Lourdes College	2,534	0.2
Malone College	7,330	0.6
Medical College of Ohio	4,376	0.4
Miami University	79,108	7.0
Mount Union College	6,715	0.6
Mount Vernon Nazarene Col	9,900	0.9
NE Ohio University College	1,959	0.2
Notre Dame College Of Ohio	2,184	0.2
Ohio State University	224,985	19.8
Ohio University	90,118	7.9
Tiffin University	3,421	0.3
University of Akron	77,233	6.8
University of Cincinnati	139,376	12.3
University of Dayton	54,280	4.8
University of Toledo	63,361	5.6
Wright State University	45,207	4.0
Youngstown State University	41,882	3.7
<i>Total</i>	<i>1,133,959</i>	<i>100.0</i>

Limits to this study include (1) the data is self reported by alumni and may not be current; (2) characteristics of those graduates who join alumni organizations may differ significantly from those graduates who do not maintain contact; (3) there is no data on the history of individual movement, such as, how many alumni who now reside in Ohio located outside of Ohio at one time or another; and (4), because there is not a link between the student information system (SIS) and alumni databases, data concerning alumni's place of origin is not available. Further, because there were so few responses from private universities, within the state as a whole we can not comment on issues related to public/private differences. This also means that if graduates of private universities more often leave the state, our data will under-report the rate of "brain drain." Graduates of private universities in NW Ohio did respond and we can engage in comparisons among institutional types in that region.

These limits reduce the accuracy of the findings, rendering a set of informed insights, not statistically valid findings. It also renders moot attempts to engage in complex statistical analysis, since the basic data has such empirical limitations.

Data Analysis

Data was analyzed through use of descriptive measures, cross tabulations, and ChiTests. Details of the process and the ChiTest results can be obtained from the UAC.

Where do Graduates of Ohio's Universities Live and Work?

The most recent graduates of Ohio universities have disproportionately remained in Ohio for employment or additional education. **A total of 80.2% of our 2000-2003 sample report that they are located in Ohio.** This probably is due in large part to the nation-wide economic recession and the resulting increase in the lag between graduation and securing initial employment.

Of the roughly 20% who left Ohio, most stayed in the traditional “rust-belt” area, especially states adjacent to Ohio--Michigan, Pennsylvania, Indiana, and Kentucky. Others moved to California, Florida, and New York (See Table 3). Thus, there is no mass exodus to sunbelt locations. They remained close to home and part of the Midwest economy.

When we examined what groups among the 2000-2003 sample disproportionately left the state, we find that contrary to traditional stereotypes, women moved outside the state more often than men. Women constituted 53% of migrating grads, while men constituted 47%. This is in part due to woman constituting 56.8% of our 2000-2003 sample (and 51.4% of all Ohio residents). Finally, alumni in our sample who had advanced graduate degrees disproportionately left the state. While constituting 24% of the sample, they were 30% of all migrants.

<i>Table 3- Destinations for 2000-2003 Ohio University graduates</i>		
State	Frequency	Percent
Ohio	172812	80.2
Illinois	4355	2.0
Pennsylvania	3663	1.7
Michigan	3623	1.7
California	2963	1.4
New York	2524	1.2
Kentucky	2251	1.0
Florida	2230	1.0
Indiana	2182	1.0
Other	18860	8.6
Total	215463	100.0

Comparing our findings to the previously noted studies (relying on data from before the tech bubble burst and before 9-11), we found that **the percentage of alumni leaving the state was markedly LOWER than reported in previous studies.** However, graduate students left the state at rates 50% higher than those with only a baccalaureate degree—a ratio generally consistent with previous studies. Finally, our analysis provides an important insight into where those migrating alumni moved, and learning that they generally did not leave the region is important. It suggests that most Ohio college graduates became the heart of the Ohio economy and resident taxpayers. **When taxpayers underwrite part of the cost of college, they are making an investment in the skills and quality of the Ohio workforce and tax base in the immediate future.**

Our study differs relative to previous studies on another important factor. We sought to identify the longitudinal impacts of alumni location. We wanted to know whether graduates of Ohio universities generally remained in Ohio and to get a sense of the rate of “decay” or relocation outside the state for employment. Only the Boston study had sought to examine this factor and it found that there was minimal but continual exit of alumni-residents after the first three years of post-collegiate experience through the end of a ten year period. By collecting data on Ohio alumni from 1980 to 2003, we are able to make some observations and address this important issue.

Nearly seventy percent (69.9%) of 1980 to 2003 graduates from Ohio colleges and universities in the sample data currently reside in Ohio. The top five states outside of Ohio where Ohio graduates reside, in descending order, are California, Michigan, Illinois, Florida and Pennsylvania. (See Table 4)

California: The largest numbers of graduates who live in California locate in the San Francisco area, followed by San Diego, then Los Angeles.

Michigan: In Michigan the largest number have settled in the Ann Arbor area, followed by Detroit then Jackson

Illinois: More than 50% of Ohio graduates who settle in Illinois are found in the Chicago area followed by 31% in the Des Plaines area.

Florida: Ohio graduates who now reside in Florida are scattered, with approximately 9% in Plant City, while 5.5% have settled in the Orlando, and Tampa-St. Petersburg-Fort Meyers, areas.

Pennsylvania: In Pennsylvania, Ohio graduates have settled in fairly equal numbers in three areas: Pittsburg, Butler-New Castle, and Philadelphia.

The remainder of the alumni are widely dispersed across the US, as shown in Figure 1.

Examining these data we also learn that college and university graduates who currently reside in Ohio are heavily focused in the MSAs of the three Cs': Cleveland-Lorain-Elyria (31%), Columbus (19%), Cincinnati-Hamilton-Middleton (18%), with 10% located in the Toledo MSA. This pattern is consistent with the migration patterns noted within Ohio in general. (See Figure 2).

<i>Table 4- Top states in which Ohio Alumni 1980-2003 reside in 2004</i>		
	Frequency	Percent
Ohio	792,543	69.9
California	26,637	2.3
Michigan	25,363	2.2
Illinois	25,318	2.2
Florida	24,702	2.2
Pennsylvania	24,010	2.1
Other	215,386	19.0
<i>Total</i>	<i>1,133,959</i>	<i>100.0</i>

Distribution of Alumni of Ohio Colleges & Universities 1980 - 2003

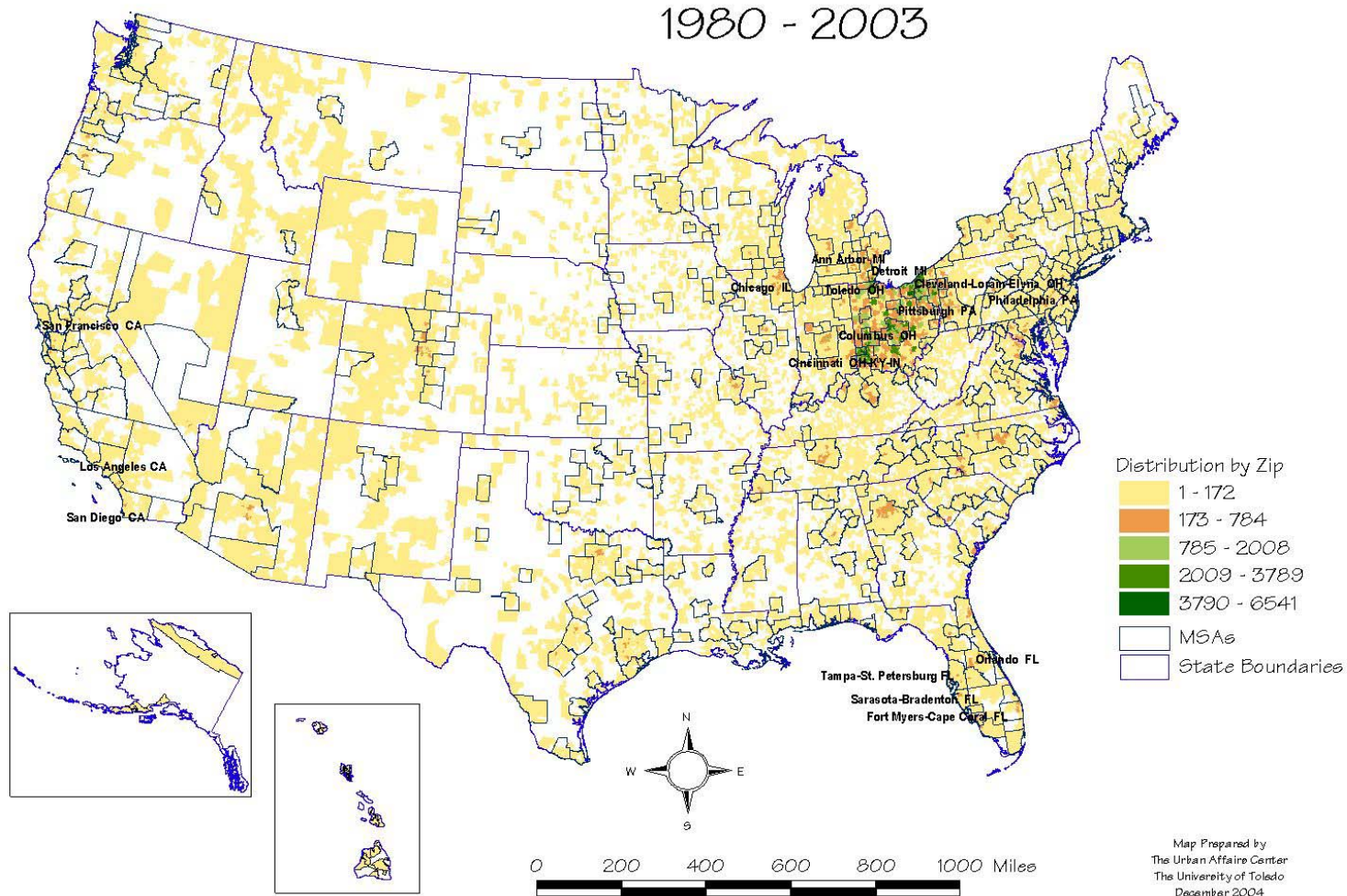
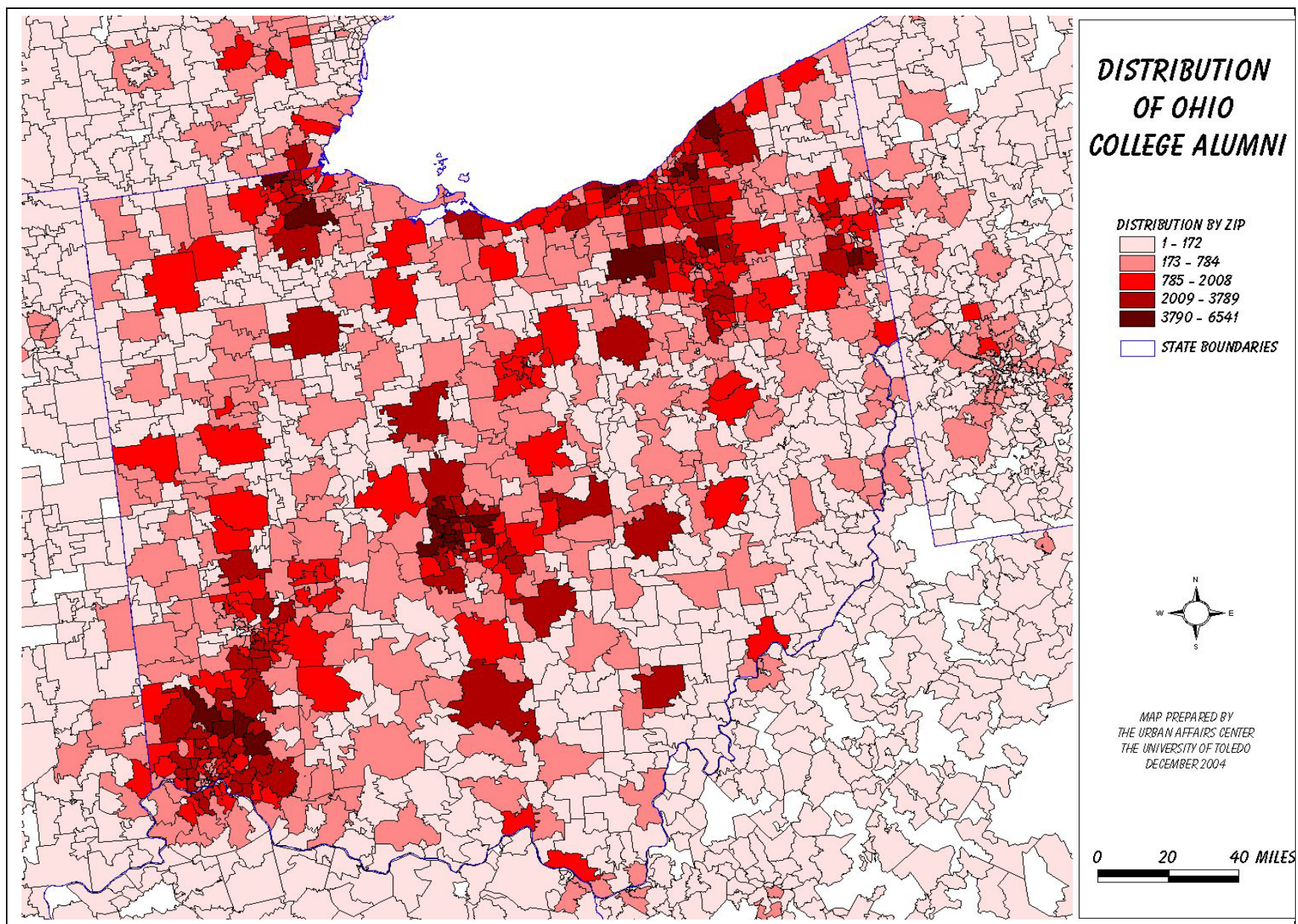


Figure 1 Distribution of Alumni of Ohio Colleges and Universities in the US, 1980 - 2003

Figure 2 Distribution of Alumni of Ohio Colleges and Universities in Ohio, 1980 - 2003



Have state-wide distribution or mobility patterns changed over two decades?

In-state location decisions have changed significantly over the last 23 years. There is a difference of almost 18% in the number of alumni who graduated throughout the 1980s who are now living in Ohio and those alumni graduating since 2000 residing in Ohio. At the absolute, there is a 21% decrease between 1980 and 2003. There has clearly been “decay” in the rate of in-state retention, as is shown in Figure 3. Mortensen (2003 in Sheehan 2004) suggested that significant and disproportionate migration occurred during the late 1980s. We can not definitively challenge his assertion, but the average rate of decay per decade for the 1980’s, 1990’s and 2000’s are proportionate.³⁶ And when we examine the rate for each year cohort statewide (See Figure 3), **the rate of decay seems “constant” (less than 1% /yr.) after the first 3 years—a very low rate showing that once established in their jobs, communities, and families, alumni stay in Ohio as workers and taxpayers.**

The NW Ohio cohorts from the late 1990s do appear to have been more active in exiting the state, than the state-wide average. However, the other NW Ohio cohorts are similar to their state-wide peers.

What is most significant is that the pattern (significant exodus during the first three years following graduation, and then slow constant exit thereafter) is consistent with the only longitudinal study of retention degradation from Boston. **People who are in the area more than 3 years after graduation, tend to stay in the area for decades.**

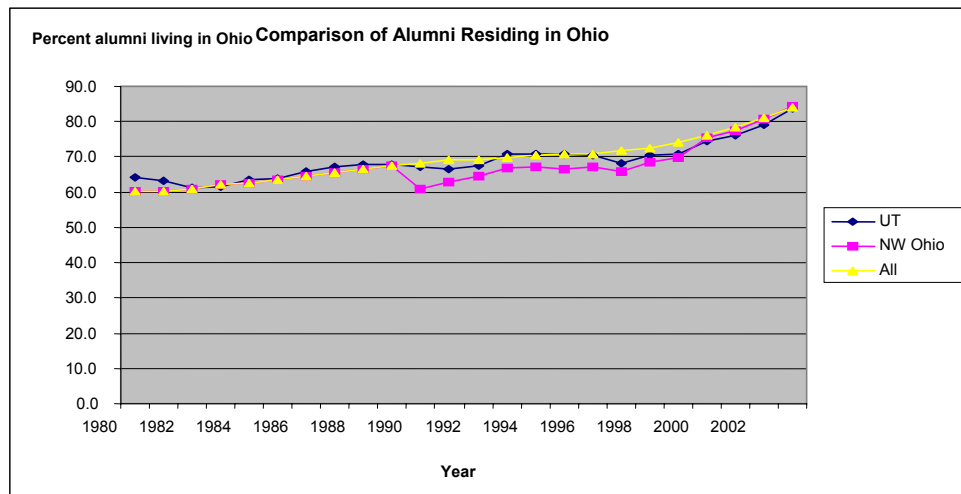


Figure 3 Percent of alumni living in Ohio as of 2004 by year of graduation

³⁶ When all three time periods (1980s, 1990s and 2000s) were tested for independence, the calculated X^2 (3.88) when compared to the absolute value of X^2 (4.61) critical was significant at $\alpha = 0.10$.

Migration of Young College Educated Individuals in Northwest Ohio and Toledo MSA

2000-2003 NW Ohio

The collegiate institutions of northwest Ohio included in this sample are University of Toledo, Bowling Green State University, Medical College of Ohio, Lourdes College, Northern Ohio University, Defiance College, and Tiffin University. The alumni of this group are disproportionately baccalaureate graduates (70% of the sample, vs. 60% of the state-wide sample), and 26% are grads of advanced degree programs (Masters or more) compared to 24% in the state-wide sample. While the percentage of all graduates who have left the state is at the state-wide average, the graduate students from NW Ohio universities are much more likely to leave Ohio. As a percentage of all alumni exiting, they are 49% more likely to leave than the advanced students from the state in general. Regionally, we produce fewer advanced students, and a higher percentage of them leave the state. Women are equally (50%-50%) as likely to leave the state as men.

As is evident in Table 5, **NW Ohio alumni who left the state disproportionately moved to adjacent Michigan—5 times more often than any other state and comprising a quarter of all migrants.** This is not surprising since UT, MCO, and Lourdes College are all within 5 miles of the border, and UT has a tuition reciprocity agreement with two southern Michigan counties. Further, many “Toledoans” live in the rapidly growing northern suburbs of the city—which are in Michigan. When they go home after receiving a degree, they appear to be leaving the state and the MSA, but in fact they may still be engaged in the local economy and even employed in Toledo, but don’t appear as residing in or studying in Ohio or the Toledo MSA—the key factors of the Census and OBOR when looking at brain drain.

<i>Table 5- Top states in which NW Ohio University Alumni 2000-2003 reside in 2004</i>		
	Frequency	Percent
Ohio	23,891	79.7%
Michigan	1,546	5.2%
Illinois	334	1.1%
California	310	1.0%
Indiana	284	0.9%
Florida	283	0.9%
Pennsylvania	264	0.8%
Other	3,082	10.3%
Total	29,994	100.0

Is there degradation of in-state locational patterns of NW Ohio University alumni since 1980?

Sixty-five percent (65%) of graduates of NW Ohio colleges since 1980 reside in Ohio in 2004, a slightly lower rate than Ohio alumni overall. The top states outside of Ohio in which NW Ohio graduates currently reside, in descending order, are: Michigan, Florida, California, Illinois, and Indiana..(See Table 6). Again, we see wide dispersal of graduates to all corners of the nation. We learned earlier (Figure 3) that the Ohio grads disproportionately left the state during the boom economy of the nation. Again the influence of gender was examined and as with the 2000-2003 data on NW Ohio institutions, they generally reflected the state-wide trends. And, degree attainment was similar to the state pattern, except that significantly advanced (graduate) students disproportionately left the state. As is obvious in Figure 5, most of the graduates of NW Ohio universities since 1980 who reside in Ohio, are located in the northwest corner of the state.

<i>Table 6 Top states in which NW Ohio University Alumni 1980-2003 resided in 2004</i>		
State	Frequency	Percent
Ohio	103,172	65.3
Michigan	9,367	5.9
Florida	2,981	1.9
California	2,641	1.7
Illinois	2,433	1.4
Indiana	2,144	1.4
Other	35,229	22.3
Total	157,967	100.0

Deductively, given that only 10% of all Ohio grads are located in NW Ohio (see page 11*), this suggests that **most graduates residing in the NW Ohio region, received their baccalaureate degree from regional colleges**. This suggests that the inflow of graduates from other places is low. Dynamic economies and innovative businesses are fed by the interactions of different cultures, experiences, and modes of operation, while cultural and intellectual incest is generally associated with economic stagnation

Figure 4 - Distribution of Alumni from Northwest Ohio Colleges and Universities throughout the US, 1980 – 2003

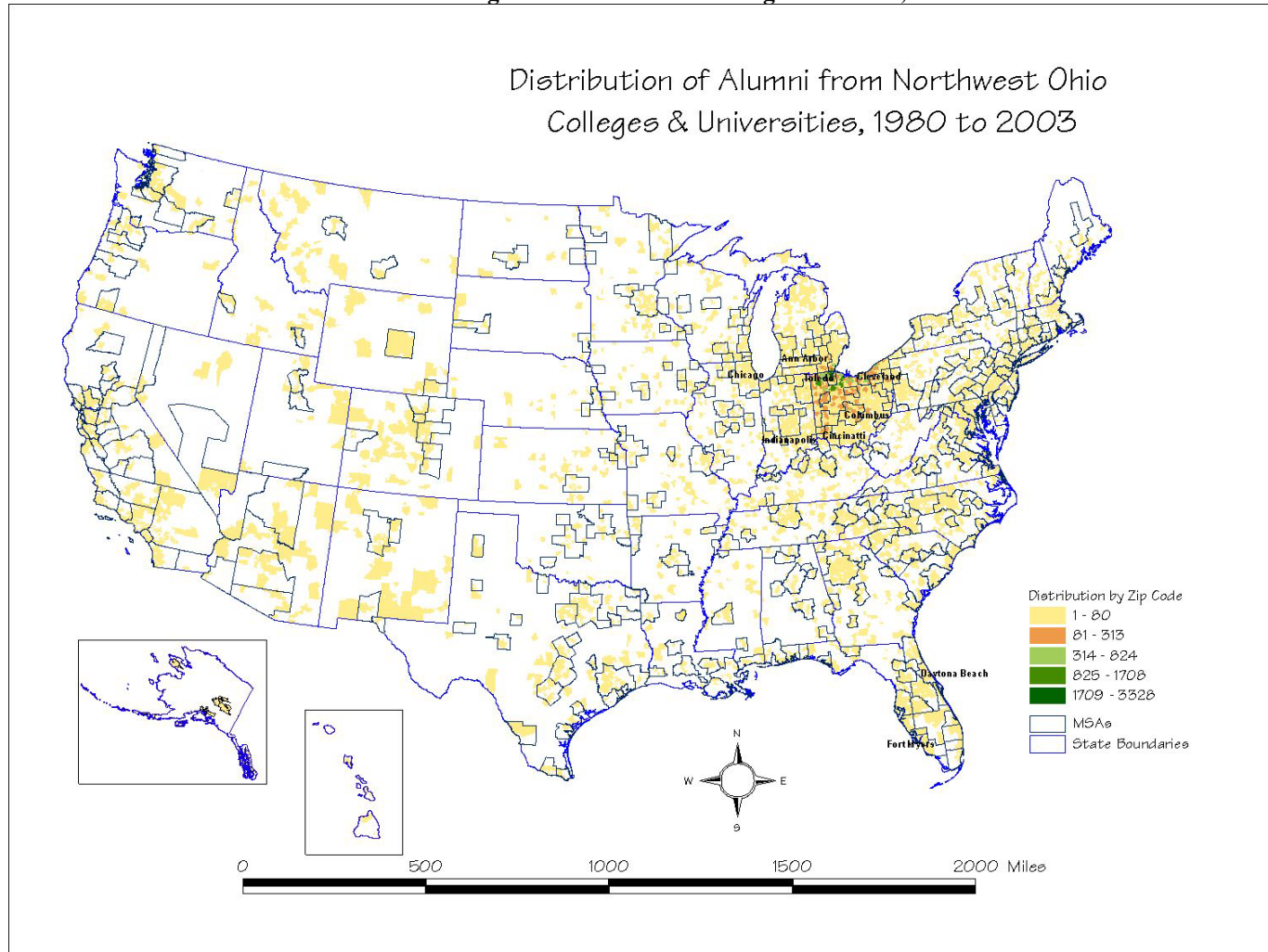
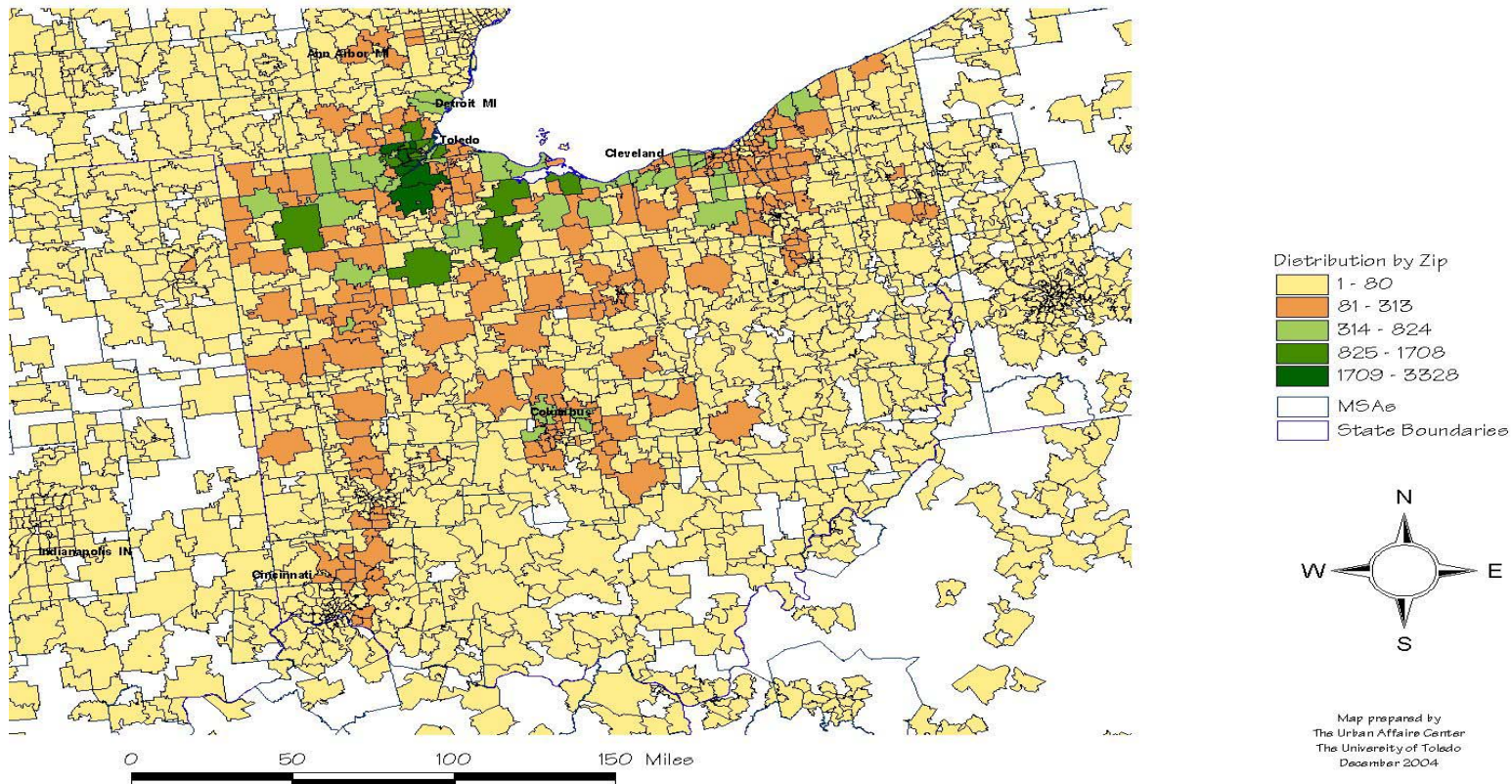


Figure 5 - Distribution of Alumni from Northwest Ohio Colleges and Universities throughout the US, 1980 – 2003

Distribution of Alumni of Northwest Ohio
Colleges & Universities, 1980 - 2003



To more fully explore these trends in NW Ohio, we need to examine the literature and our alumni data on the Toledo MSA. An MSA is an urban area defined by the US Census, and the Toledo MSA includes Lucas, Wood, Fulton, and part of Ottawa Counties.³⁷

While 26% of working age Americans had at least bachelor's level education, only 21.1% of Ohio's workforce had the degree, and 21.6% of workers in the Toledo MSA had completed such by the time of the 2000 Census. While Toledo looks good relative to the State average, it ranked 5th among the 7 Ohio MSAs with at least 400,000 people in 2000. In terms of graduates with advanced degrees, Toledo again barely outpaces the state average and ranks 5th among the state urban MSAs. (See Table 7)

<i>Table 7 College graduates by jurisdiction, 2000 for individuals age 25+³⁸</i>			
	Baccalaureate	Advanced Degrees	Baccalaureate & more
USA	15.5%	8.9	26% ³⁹
Ohio	13.7%	7.4%	21.1%
Toledo MSA	13.9%	7.7%	21.6%
Canton	11.5%	5.9%	17.4%
Cincinnati	17.1%	9.3%	26.4%
Cleveland/Akron	15.2%	8.4%	23.6%
Columbus	19.5%	9.6%	29.1%
Dayton	13.7%	8.5%	22.2%
Youngstown	10.3%	4.8%	15.1%

The full implications of this are evident in the US Census' 2003 American Community Survey which lists the 233 major metropolitan counties in the US. Lucas County ranks 175th in the Survey in the number of baccalaureate graduates. It is estimated that in 2003, 26.5% of all workforce age US citizens in metropolitan counties had a bachelor's degree or higher, but only 24.1% of the Lucas County citizens had such degrees.⁴⁰

³⁷ Before the 2000 Census, it also included parts of Lenawee and Monroe Counties in Michigan.

³⁸ All data except national, from <http://uac.utoledo.edu/Links/census-demog/census-demogs.htm>

³⁹ <http://www.census.gov/prod/2002pubs/p23-210.pdf>

⁴⁰ http://factfinder.census.gov/servlet/GRTSelectServlet?_lang=en&_ts=123694154731

A recent study by Paul Gottlieb⁴¹ examined the migration rates for 25 to 34 year olds for the 100 largest US cities between 1990 and 2000. Counting in-migration, out-migration, local deaths, and people who did not move in age cohort 25-34, Toledo's net migration rate ranks 98th out of 100 cities. More important than rank was the magnitude of loss—Toledo's loss was twice as high as Akron—the next highest Ohio City, which ranked 92nd of 100 cities. Toledo lost almost 21% of its 25-34 year old cohort. Further, the net migration rate of youth from Toledo MSA is twice the rate of exit of people age 35-64 years old, thus transforming our workforce into an aging population. In addition, 25-34 year olds with a BA for example, constitute only 6.7% of Toledo's workforce, which ranks 70th among the 100 largest cities.

A “massive out-migration” of college graduates from Toledo MSA?

We need to recognize the context and particular attributes of the universities of NW Ohio. The Toledo MSA's Domestic Migration ranking from the Census⁴² places it among a group of mid-sized cities whose economies and local social life are dominated by large universities.⁴³ People don't think of Toledo as a University-dominated region, but the University of Toledo, Bowling Green State University, and Medical University/College of Ohio collectively serve a net “student” population of 42,000 baccalaureate and graduate students—a combined population typical of a large research university.

A major study by the US Census argued that Toledo, among all Ohio and total 276 US cities, appears to rank poorly in attracting and retaining young, single, college-educated people (See Table 8). This problem is statewide, and Ohio is ranked 39th in attracting new graduates. However the situation in Toledo is the extreme case among Ohio cities.

Table 8 MSA ranked by numeric gain of people who were young, single, and college educated, 1995-2000.

Rank	City	Immigrants	Outmigrants	Net Migration
104	Columbus	15,343	15,465	-122
142	Canton	1,506	1,784	-278
168	Steubenville	287	693	-406
195	Cleveland-Akron	14,948	15,911	-963
213	Youngstown	1,150	2,688	-1,554
224	Cincinnati	11,493	13,319	-1,838
244	Dayton	4,783	7,386	-2,603
251	Toledo	3,027	6,084	-3,130

⁴¹ Paul Gottlieb. 2004. *Labor supply pressures and the “brain drain.”* Washington: Brookings Institution.

⁴² US Census. <http://www.ssti.org/digest/tales/110703t3.html>

⁴³ Other cities ranked near Toledo included: Columbia Missouri (U. Missouri), Charlottesville Virginia (U. Virginia), Tuscaloosa Alabama (U. Alabama), Lincoln Nebraska (U. Nebraska), Tucson Arizona (U. Arizona), Lawrence Kansas (U. Kansas), Iowa City Iowa (U. Iowa), La Fayette Indiana (Purdue U.), Auburn Alabama (Auburn U.), Athens Georgia (U. Georgia), Madison Wisconsin (U. Wisconsin), Bloomington Indiana (U. Indiana), & State College Pennsylvania (Penn. State U.)—all homes to major universities.

That Census study only looks at immigration and out-migration rates from MSAs, without considering the rate of locally-produced graduates. UT and BGSU educate over 11,000 students, 7,000 from outside the MSA. Almost 58% of freshmen entering UT (Table 9) and 80% entering BGSU (Table 10) listed a permanent address with a zip code outside of the Toledo MSA. Further, as the UT data shows, 45% of UT 2003-2004 students at all levels were from outside the MSA at the time they were admitted.

<i>Table 9 Fall '03 & Spring '04 Toledo MSA residency at time of admission to UT</i>			
Count of Student Key	Toledo MSA		
<u>Degree Level</u>	<u>Yes</u>	<u>No</u>	<u>Grand Total</u>
Graduate	2,508	759	3,267
Professional	367	163	530
All Undergraduates	10,035	9,547	19,582
(Freshman Entry only)	2,887	3,924	6,811
Grand Total	12,910	10,469	23,379

<i>Table 10 Fall 2002 First-time, full-time BGSU Freshmen</i>		
Toledo MSA	Non-Toledo MSA	TOTAL
713	2,875	3,588

More importantly, in 2003 OBOR reported that UT graduated 2,067, BGSU 2,972, and Lourdes College 206 bachelor's level students, for a total of 5,245 baccalaureate college graduates.⁴⁴ Thus, while the 2003 Census study showed the Toledo MSA with a net out-migration of 3,130, it fails to note that each year we generate over 5,000 new baccalaureate graduates.⁴⁵ Thus, the MSA arguably has a net increase of about 2,115 bachelor's level college graduates per year.^{46 47} Net out-migration of graduates from such locales is

⁴⁴ OBOR 2003 Performance Report, Graduate Outcomes, Degree production. This report shows MCO not graduating any bachelor-level students, but the alumni data they provided to us suggests that they graduated students with combined bachelor/masters degrees.

⁴⁵ In addition, as we will see below, about 1800 students receive graduate degrees from UT and BG. For UT, about ¾ of these were originally from the Toledo MSA (previous chart) and these people disproportionately leave the area. Thus some baccalaureate exit may also be occurring at the graduate level, since they never left Toledo after the initial baccalaureate. Our understanding of the graduate students is not as well defined as undergraduates.

⁴⁶ This analysis assumes that all UT, BG, MCO, and Lourdes students live in the Toledo MSA. This may not be factually accurate, although there is no ability to accurately determine how many do. Students often give universities the address of their parents as their permanent address, so we are unable to be precise as to the exact number of new college graduates from an MSA. Thus we probably are overstating the growth of college graduates somewhat, as well as the rate of exit from the MSA—limitations that would also affect the Census data and studies dependent upon it.

⁴⁷ The Census data only includes DOMESTIC migration. UT, BGSU, and MCO have significant numbers of foreign students enter, complete their degrees, and some number relocate to their nations of origin. This may also contribute to the difference between the Census figures and our derived numbers.

common, and focusing only on such data misrepresents the actual changes in the local workforce, because so many people are “transformed” into a person with a BA⁴⁸ by local universities. It is for this reason that the Toledo MSA ranks 113th in the US out of 276⁴⁹ metro areas in the percentage of the 25-39 year old population with college degrees. This is in the top half of all MSAs and slightly below the levels of other Ohio cities.⁵⁰

It should be noted that as an urban university, UT has a disproportionate number of non-traditional and part-time students, and thus a disproportionate number of graduates who are non-single and/or over 35. As such, they are both outside the 25-35 age cohort and, since they often have family, they may remain in their homes and commute to college. Thus, the US Census indicators and those used by Gottlieb focusing on growth of degreed individuals may distort as much as inform the situation in NW Ohio.

Thus the massive outflow of graduates found by the Census may in part be due to having so many individuals attending college in the MSA while still living in their homes outside the MSA. On the day they graduate and go home, the MSA loses a college graduate.—a finding consistent with other large universities, and with the out-of-MSA address of entering UT and BGSU students.

With all this explanation of why the out-migration rates reported by the Census are overstated, we do need to recognize that the other half of the equation—insufficient immigration of new graduates—is a significant factor. While local politicians may want to create jobs to retain local students, the real deficiency is that there are too few graduates from elsewhere being lured to the area with new ideas and experiences

OBOR examined the employment and schooling outcomes for baccalaureate graduates, 1998-2001, 6 months after graduation. A total of 81% of UT and 77% of BGSU baccalaureate grads were employed or continuing schooling in Ohio—rates higher than the state average of 76%. Graduates of private universities in NW Ohio were even more heavily oriented toward in-state employment and education than regional public universities, and much more than the “typical” Ohio private university graduate. Defiance College, Heidelberg College, Lourdes College, Ohio Northern University, and Tiffin University, all had 79% to 83% of graduates and Findlay University 87% of graduates remain in-state after graduation.⁵¹ Thus, **general in-state retention of NW Ohio public and private**

⁴⁸ *The Toledo Blade* 11/5/03.

⁴⁹ US Census. <http://www.ssti.org/digest/tales/110703t3.html>

⁵⁰ Using Census 2000 figures, 13.9% of people over age 25 have bachelors degrees and 7.7% have graduate degrees in the Toledo MSA; summing to 21.6% of the population. Columbus is 29.1% (19.5% and 9.6%), Cincinnati is 26.4% (17.1% and 9.3%), Cleveland Akron is 23.6% (15.2% and 8.4%), Dayton is 22.2% (13.7% and 8.5%), and Youngstown is 15.1% (10.3% and 4.8%) respectively. Major sites for scientific and engineer migration (San Jose, Raleigh, Austin, Denver, Irvine) generally sum to 25%-35% of their adult populations. Milken Institute; *Knowledge-Value Cities in the Digital Age. 2001.*

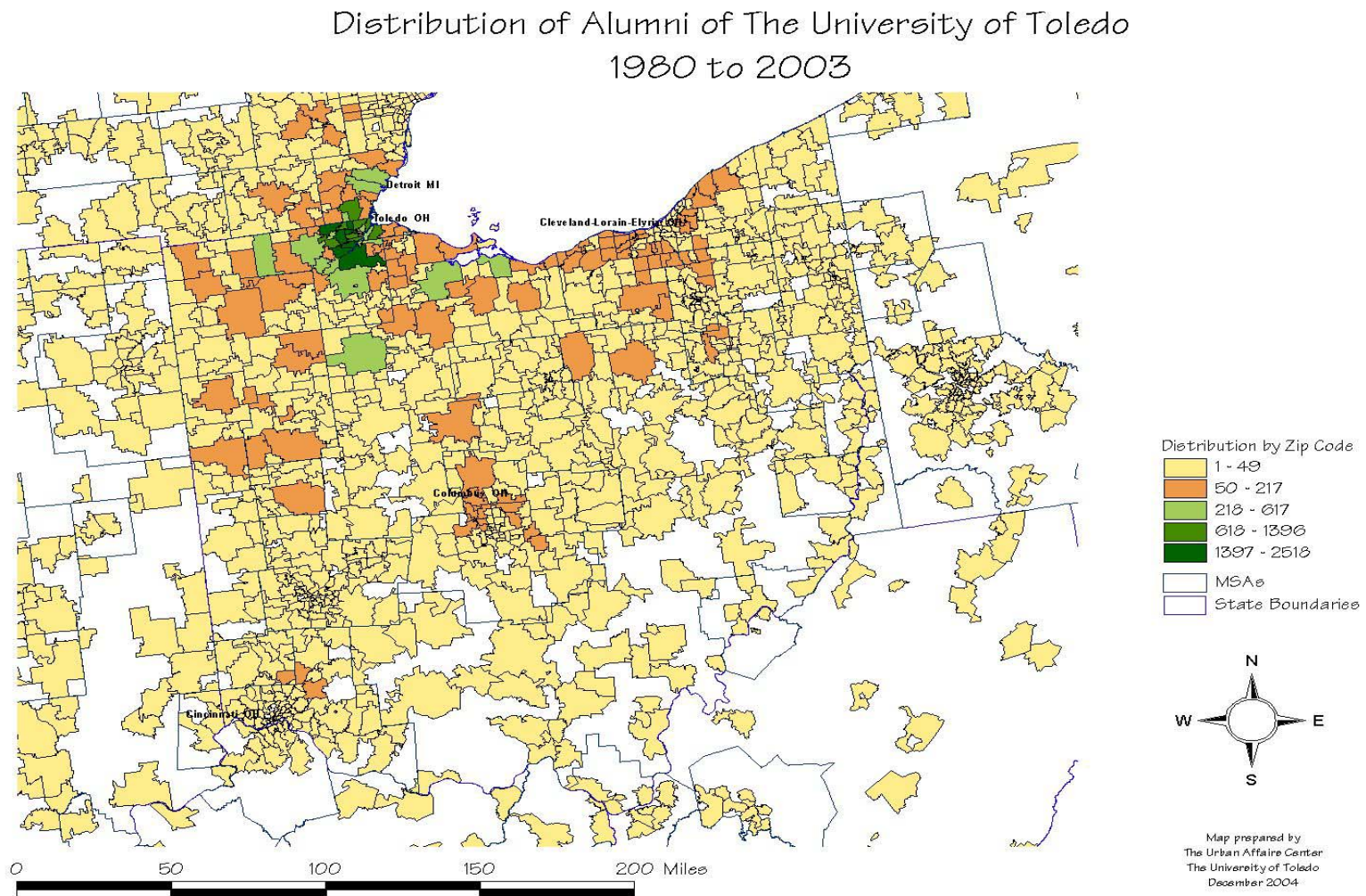
⁵¹ OBOR 2003. Performance Report for Ohio’s Colleges and Universities 2002; Summary. Chapter 15, pgs. 15-13-14. OBOR <http://regents.state.oh.us/perfrpt/2003-i.html>

college graduates are high, even though the retention rate within the MSA—focus of the major 2003 Census report on Migration—indicates significant out-migration.⁵²

Regional retention is understated because the two adjacent Michigan counties are no longer within the MSA, although they are rapidly growing Toledo suburbs. Examining UT as a case shows the impact of state boundaries on perceived impact. Roughly 10% of all UT graduates 1980-2003 reside in Michigan, and most of them reside within 50 miles of Toledo. This same case study shows that even though concentration within the MSA is not high for all institutions, for some, such as UT, the historical pattern for UT alumni shows their location being highly concentrated in NW Ohio. Three-quarters of UT alumni residing in Ohio live within 50 miles of UT, with 13% in Northeast Ohio, 9% in Central Ohio, and 3% in Southwest Ohio. See Figure 6.

⁵² A potentially significant factor in this analysis of immigration would be people who grew up in the area, attended college outside of the region, and moved back to the area. Politicians seem particularly interested in this group. We are unable to determine the size of this group as it leaves the MSA and region, and as some part of the group returns to the area. This group returning to the area, if they then leave after being with their parents briefly following graduation, would also be contributing to the outmigration as well as immigration. Perhaps equally as important, it is not clear how many never return and why, although low local salaries may be an important factor.

Figure 6 UT graduates 1980-2003 in Ohio and adjacent areas.



Examining post-graduate in-state retention of advanced students from universities in the MSA is discouraging. Following the trends of the state and the region, the migration of advanced students is quite pronounced. While rates at specific state institutions vary widely, UT, BG, and MCO graduates have a much lower rate of remaining in the state than the average Ohio post-graduate. (See

Table 11) In fact, they are among the lowest of any Ohio institutions.⁵⁴ This is an extremely important finding for Northwest Ohio. It means that **the most educated new graduates**—masters, professional, and doctoral graduates--**are leaving the region and the state at rates higher than comparable graduates of other Ohio state universities.**

Further, as we can see in Table 9, unlike entering freshmen, **most (75.7%) of UT graduates seeking advanced training came from the Toledo MSA area. Thus it is at this level that the “best and brightest” of the area are leaving in substantial numbers.**

<i>Table 11 Post-graduate retention rate, instate employment or further schooling⁵³</i>			
	Masters	Doctoral	Professional
UT	56%	44%	57%
BGSU	53%	36%	
MCO		28%	40%
Ohio Public Universities	75.4%	56.7%	54.3%

These findings suggest a highly problematic nature of employment demand for the most highly-skilled professionals and/or a lack of appropriate compensation to keep them in the area.

What about the Science/Technology “Brains” Graduating in NW Ohio?

The federal NSF data TSC, Gottlieb, and others have used to examine science and technology graduates, is not aggregated in ways that make analysis of such data applicable for the Toledo MSA area. Using our data to analyze **NW Ohio alumni with science and technology degrees received between 2000 and 2003 indicates that they had a slightly lower rate (76.5%) of retention than NW Ohio retention average, about same as the retention rates as statewide graduates.**

Federal data on full or part time graduate students in a science or engineering curriculum in NW Ohio indicates that 571 such students attended BG and 972 attended UT in 2001.⁵⁵ The actual number reported by those institutions as graduating from 1999 to 2003 (given drop-outs, years of attendance to degree, etc.) seems relatively consistent with those NSF statistics.

⁵³ OBOR, 2003. Profile of student outcomes, experiences, and campus measures. <http://www.regents.state.oh.us/perfrpt/2003-VI.html>

⁵⁴ OBOR, 2003. Performance Report for Ohio’s Colleges and Universities 2002; Summary Chapter 15 pg. 15-15.

⁵⁵ Calculations from NSF CASPAR website calculations. BG’s 5 year average is 582, and UT’s was 990 graduate students in these disciplines.

<i>Table 12 UT bachelor degrees awarded⁵⁶</i>					
	98/99	99/00	00/01	01/02	02/03
Natural Sci	106	73	88	65	72
Engineering	285	332	279	418	480
NS & En	391	405	367	483	552
Other Major	1930	1714	1670	1631	1769
TOTAL	2244	2119	2037	2114	2321

<i>Table 13 BGSU bachelor degrees awarded</i>					
	98/99	99/00	00/01	01/02	02/03
Natural Sci	246	223	213	222	220
Engineering	124	154	156	182	211
NS & En	370	377	369	404	431
Other Major	2,239	2,117	2,194	2,363	2,451
TOTAL	2,609	2,494	2,563	2,767	2,882

<i>Table 14 UT graduate degrees awarded</i>					
	98/99	99/00	00/01	01/02	02/03
Natural Sci	38	27	25	28	30
Engineering	282	203	200	232	112
NS & En	320	230	225	260	142
Other Major	609	706	655	690	731
TOTAL	929	936	860	950	873

<i>Table 15 BGSU graduate degrees awarded</i>					
	98/99	99/00	00/01	01/02	02/03
Natural Sci	75	64	61	65	84
Engineering	22	15	18	12	18
NS & En	97	79	79	77	102
Other Major	736	852	810	747	915
TOTAL	833	931	889	824	1,017

⁵⁶ UT also awarded “other degrees;” a category that seems to include Associates degrees. They awarded 534 of them in 1999, 412 in 2000, 395 in 2001, 368 in 2002, and 335 in 2003. Most of the reductions over 5 years were due to UT phasing out most of their Associate degree programs.

UT and BG constitute the majority of the undergraduate and graduate science and technology students, but we need to learn the locational decisions of the entire NW Ohio science and technology cohort. About 28.5% of all baccalaureates, 45.4% of all science

Table 16 Rate of out-of-state migration for science and technology alumni of NW Ohio Universities 2000-2003

	Expected Values	Observed Values
NW Ohio residing outside of Ohio	29.7%	31.7%
UT residing outside of Ohio	29.7%	35.2%

and technology advanced grads between 1998 and 2001 remained in Ohio (extrapolated from Table 1); 71% of all baccalaureate alumni and a combined rate of 63% retention of science and technology graduates statewide in Ohio (See Table 16). **A total of 68.3% of all NW Ohio science and technology grads remained in Ohio.** Given the baccalaureate vs. advanced grad distributional contribution difference in the two groups, the distributions are not significantly different. Evidence of this influence is found in the fact that 64.8% of the UT science and technology alumni which includes a larger graduate cohort, remained in the state. This shows that science and technology alumni

from both NW Ohio and from UT specifically, are more likely than their classmates to leave the state.

Examining UT and BGSU graduates, it is clear that there has been growth in the number of baccalaureate engineering students and a slight reduction in the number of natural science graduates at both institutions. The graduate programs in engineering and natural sciences at BG and natural sciences at UT are very small and UT's large engineering program has significantly declined in size.⁵⁷ This indicates a potential problem bringing enough highly-qualified technically-oriented employees to the firms of the area. The fact that there is such significant out-migration (relative to other cities) of such advanced degreed individuals from this relatively small pool of graduates with advanced degrees, suggests a very serious demand-based problem in the local economy.

Demand for scientific and technical, and advanced graduate alumni in the Toledo Region

Highly sophisticated demand analysis for this MSA is not easily available in either primary or secondary datasets. We can not reproduce the complex NSF information Gottlieb had for northeast Ohio, or the Metropolitan New Economy Index and Census records relying on the long-form interviews as each includes only the 50 largest US cities.⁵⁸ However, we can look at studies on the information technology industry that Gottlieb examined to provide insight into the demand side of high tech in the Toledo region. As part of a study of the State of Ohio's information technology industry, Dr. James LeSage examined the IT industry in the Toledo Region from 1989-2000 for the UAC.⁵⁹ Using 21 SIC codes for occupations and examining a 20 county area, he found that IT

⁵⁷ That decline is largely due to a reduction in state-mandated funding for foreign-born graduate students

⁵⁸ Perhaps with adequate funding, we can undertake a more coherent and systematic analysis of this topic in the NW Ohio area.

⁵⁹ <http://uac.utoledo.edu/Publications/ohitfinal.pdf> The Information Technology Industry in the State of Ohio and its Regions, Dayton: IT Alliance. pgs. 83-92.

establishments grew 86% and industry employment 24% during that decade. In particular, growth was noted in radio and telephone communications, computer and software stores, and computer programming and other related services. Aside from Calculating and Accounting Equipment, the region is not highly concentrated in IT firms, ranking below the national average and the state average. Much of the employment in this sector was related to computer sales, computer maintenance and repair, cable and telephone installation—not the high end computer professional activities. Further, payroll in this industry (especially relative to inflation and to the national average in these sectors) was weak, and in many cases decreasing while the national trends were rising significantly. Nationally, 28 of 30 IT industry segments exhibited positive growth from 1989 to 2000 while only 11 of the 21 segments that existed in this region had positive growth. While the Toledo region had 13% of the state's total employment, they had only 5% of the IT employment in the State.

Dwyer and Boden⁶⁰ surveyed business leaders and human resource professionals regarding the emerging job opportunities in the region and augmented it with information from the Current Population Survey of the US Census. They found the prospect for employment bleak, and that most of the jobs expected to be created were in low-paying non-technical sectors. They also found that most new jobs being created in the area require interpersonal and conceptual skills rather than technical requirements. And they found disproportionately high unemployment among people under age 35. Employers identifying technical skills frequently identified machine-related production tasks, rather than intellectually-oriented services and professional skills. They also found an interest by employers to hire people who they described as self-trained on having only certification and with only high school or community college, rather than people with bachelors degrees. Thus, even when hiring is occurring in areas that elsewhere would be filled by University graduates and build the intellectual capital of the firm, local practices are discouraging such practice and contributing to brain drain and/or the lack of “brain gain.”

These findings are consistent with a 2000 Workforce Needs Survey⁶¹ which ranked IT, robotics, and other high tech skills as increasingly significant for employees and very important for firms. However, when focusing on the desired level of training for workers with IT, robotics and other high tech skills, respondents sought expertise in these areas disproportionately among people with high school and not four year degrees. Four year graduates were sought primarily for management and communication abilities, not technical or scientific skills.

Another UAC study⁶² issued this year examined demand for IT support and training of IT professionals in a cross-section of the Toledo regional business community, indicated that a vast majority of small and medium firms (<70 employees) seek only IT people with a high school degree and minimal training. Thus, local firms' demand for tech savvy people with bachelor's degrees is weak.

⁶⁰ Dale Dwyer & Richard Boden. 2002. “Where will the Next Jobs Be?” The Urban Affairs Center, the University of Toledo.

⁶¹ Toledo Area Chamber of Commerce and Regional Growth Partnership. 2000. Workforce Needs Assessment. October

⁶² Paul Fritz and Patrick McGuire. 2005. “A Descriptive Study of Information Technology Needs in Toledo Area Businesses and Professions.” The Urban Affairs Center, the University of Toledo.

In an overview of the economic environment side, a Milken Institute study,⁶³ using outcome based measures suggests that Toledo does not have a positive economic environment for growth in general and in high tech in particular. Toledo ranked 120th among 200 cities in economic growth in 1997-2001, but fell to 195th in both 2003 and 2004. This weak performance is similar to many nearby Midwest urban areas.⁶⁴ This may be due to many factors, such as expenses, quality of life, costs of doing business, entrepreneurship, and cultural tolerance and diversity. To succeed, cities need a number of fast growing entrepreneurial firms and venture capital, as well as an entrepreneurial climate. The data in their summary table (see Appendix 1 & 2) suggests that it is the economic drivers that are a problem, not the availability of college graduates per se in Toledo.

The good news in this study is that there is significant high tech activity in the region, especially relative to its size and density of business activity, and this condition has improved in the last two years compared to the last five years. Thus, there have recently been some positive changes and hope for improvement in Toledo.

Conclusions

Summary of Findings

- ✚ Brain Drain is a concern reflective of several conditions and means different things to different audiences
- ✚ The principle pattern of alumni distribution for UT, Northwest Ohio, and the State of Ohio is that their graduates overwhelmingly remain in the state.
 - Alumni are opting to remain in the mid-west region. Further, most of these migrating alumni settle in major urban areas—Columbus, Cleveland, and Cincinnati MSAs in Ohio, and Detroit, Pittsburgh, Chicago, and Indianapolis in nearby states.
 - When taxpayers underwrite part of the cost of college, they are making an investment in the skills and quality of the Ohio workforce
- ✚ The pattern of high in-state retention and the limited relocation mainly to adjacent states found in the 2000-2004 for both the state-wide and NW Ohio samples are similar to the pattern for 1980-2000 periods.
- ✚ The migration of alumni primarily occurs in the first 3 years after graduation. Once embedded in the Ohio economy (and Midwest's more generally) alumni tend to remain in the state economy for extended periods.
- ✚ The state-wide and NW Ohio rate of “brain drain” has declined since 2000, relative to previous periods.

⁶³ Milken Institute. Best Performing Cities. 2003., and Milken Institute. Best Performing Cities 2004. (See Appendix #2)

⁶⁴ Detroit was ranked last among the 10 largest cities in the survey. Almost all the lowest 20 MSAs among the 200 largest MSAs are located along a strip from western Pennsylvania through Ohio, Michigan, Indiana and Illinois.

- ✚ Northwest Ohio and the Toledo MSA are experiencing a major out-migration of college graduates. However, Northwest Ohio universities have one of the highest rates of retaining graduates in-state.
- ✚ Northwest Ohio is experiencing a disproportionate loss of individuals with advanced or post-baccalaureate degrees, despite the fact that the graduate programs are not very large.
- ✚ Science and technology graduates of Northwest Ohio universities since 2000 are not exiting the state at rates significantly greater than their classmates. This differs from results of state-wide studies focused on the pre-2001 period. If there was a substantial brain drain of this group from area universities pre-2000, it has receded.
- ✚ There is ample secondary evidence that the lack of robust demand in Ohio and Toledo MSA is a significant factor in the migration of alumni, especially those with scientific and technical training, and/or post-baccalaureate degrees. Demand for scientific and technically trained graduates is notably weak. Absent a plan or policy to retain such individuals, including support to businesses, individuals, and universities, there is no reason to expect that these trends will reverse.

Policy proposals

This report was an initial attempt to identify changing dynamics since 2001, consider the long-term trends of brain drain, and to ascertain the impacts of NW Ohio universities. If the region is serious about addressing “brain drain” or building the intellectual and innovative entrepreneurial capacity of NW Ohio, there is a need for much more dedicated programs to: promote the area to potential employers and alumni, encourage hiring of well-educated workers, benchmark the economy and workforce, build stronger links between university research and outreach, improve cultural amenities, and better support local universities to promote research and outreach. Some of these efforts could be initiated locally, but most require state support and state funding.

Many attempts to “plug the brain drain” have been undertaken by various foundations, MSAs, states, and regions as they seek to retain and attract graduates. Evidence of their effectiveness is lacking, but a consensus position is emerging. The STC, Minneapolis Federal Reserve Bank, and Paul Gottlieb all agree that only substantial infusions of investment in higher education by a state may increase the numbers of college attendees, innovative graduates, and firms that are attracted to or remain in a locale. Opinions on whether these efforts should be focused on all graduates, the most academically accomplished, or only those involved in high technology specialties, varies among the states, regions, and institutions promoting such efforts.

It is outside the scope of this study to review or analyze such efforts, but they can generally be broken down into five types of projects:

1. Several states have created additional student loan and grant policies to convince students to attend college in their state, and loan forgiveness programs for people who stay in the host state after college graduation. Fiscal contraction and legislative priorities have blocked several of these efforts.⁶⁵ In some venues, locally-based foundations have offered funding in support of such efforts.
2. About a dozen states have created merit scholarships and specialized Honors Colleges to try to attract or retain the best and brightest high school students entering college, especially in the US southern states.⁶⁶
3. Increase collaboration between universities and corporations through internships, sponsored job fairs, social events, electronic job boards, active promotion of students to local firms, etc.⁶⁷
4. Promote high technology research parks and projects to lure the most talented faculty, most innovative firms, and most promising alumni to an area.
5. Build and/or promote the amenities of the region to match the preference of high tech grads. Provide tours, sponsor events and promotions to lure nearby students/graduates to those areas where sophistication, cultural events, ethnic diversity, and environmental attributes can be showcased.

⁶⁵ http://convention.allacademic.com/aera2004/AERA_papers/AERA_3048_15513a.PDF

⁶⁶ http://convention.allacademic.com/aera2004/AERA_papers/AERA_3048_15513a.PDF

⁶⁷ Georgia alone is spending \$3 million/year on this effort.

Appendix 1

New Economy Index 2002, Ohio

Indicator	Rank	Score
Overall*	30	56.47
Aggregated Knowledge Jobs	29	9.47
Information Technology Jobs <i>Employment in IT occupations in non-IT industries as a share of total jobs.</i>	29	1.3%
Managerial, Professional & Tech Jobs <i>Managers, professionals, and technicians as a share of the total workforce.</i>	26	25.3%
Workforce Education <i>A weighted measure of the educational attainment (advanced degrees, bachelor's degrees, associate degrees, or some college course work) of the workforce.</i>	27	48.2
Education Level of the Manufacturing Workforce <i>A weighted measure of the educational attainment of the manufacturing workforce.</i>	30	0.98
Aggregated Globalization Score	27	9.89
Export Focus Of Manufacturing <i>Manufacturing export sales per manufacturing worker.</i>	27	\$29,524
Foreign Direct Investment <i>The percentage of each state's workforce employed by foreign companies.</i>	19	4.7%
Aggregated Economic Dynamism Scores	44	7.47
"Gazelle" Jobs <i>Jobs in gazelle companies (companies with annual sales revenue that has grown 20 percent or more for four straight years) as a share of total employment.</i>	27	13.3%
Job Churning <i>The number of new start-ups and business failures, combined, as a share of all establishments in each state.</i>	46	16.9%
Initial Public Offerings	33	3.67

<i>A weighted measure of the value and number of initial public stock offerings of companies as a share of gross state product.</i>		
Aggregated Digital Economy Scores	16	11.30
Online Population <i>The percentage of adults with Internet access in each state.</i>	29	55.0%
Commercial Internet Domain Names <i>The number of commercial Internet domain names (".com") per firm.</i>	28	0.62
Technology in Schools <i>A weighted measure of five factors measuring computer and internet use in schools.</i>	4	3.47
Digital Government <i>A measure of the utilization of digital technologies in state governments.</i>	5	3.85
Online Agriculture <i>A measure of the percentage of farmers with Internet access and who use computers for business.</i>	29	2.80
Online Manufacturers <i>The percentage of manufacturing establishments with Internet access.</i>	16	87.5%
Broadband Telecommunications <i>A measure of the use and deployment of broadband telecommunications infrastructure over telephone lines.</i>	22	3.22
Aggregated Innovation Capacity	26	8.68
High-Tech Jobs <i>Jobs in electronics manufacturing, software and computer-related services, telecommunications, and biomedical as a share of total employment.</i>	30	3.5%
Scientists and Engineers <i>Civilian scientists and engineers as a percentage of the workforce.</i>	26	0.41%
Patents <i>The number of patents issued to companies or individuals per 1,000 workers.</i>	24	0.57
Industry Investment in R&D <i>Industry investment in research and development as a percentage of Gross State Product (GSP).</i>	22	1.44%
Venture Capital <i>Venture capital invested as a percentage of GSP.</i>	31	0.18%

Appendix # 2

Toledo, OH Milken Institute Best Performing Cities; Where America's Jobs are Created 2003

Overall Rank: 195 of 200 largest US Cities by Population

Job growth (Index = 1997; 2002)	Rank: 176
Job growth (Index = 2001; 2002)	Rank: 155
Wages & salaries growth (Index = 1996; 2001)	Rank: 178
Wages & salaries growth (Index = 2000; 2001)	Rank: 160
Short-term job growth	Rank: 199
Relative High Tech GDP (Index = 1997; 2002)	Rank: 120
Relative High Tech GDP (Index = 2001; 2002)	Rank: 55
High-Tech GDP LQ - 2001	Rank: 160
# of High Tech GDP LQs Over 1 - 2001	Rank: 82