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# **Plugging the Brain Drain**

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A Review of Studies and Issues for  
Attracting and Retaining Talent

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## **Caveats**

This report represents the work of the Center for Economic Development and the authors alone. This report does not represent the conclusions, views, or official positions of Carnegie Mellon University or any of its corporate officers.

## ***Executive Summary***

“Brain drain is a symptom of an economic development problem. It is not the problem itself” Paul Gottlieb, Ph.D., Case Western Reserve University

There are two sides to the Brain Drain/Brain Gain equation. One side is the retention of local youth and the other side is the attraction of youth from other areas. Dynamic and growing regions are characterized by high levels of both out-migration and in-migration.<sup>1</sup> Focusing purely on one side of the equation may not adequately address the problem. According to a report by the Southern Technology Council, students who go to high school and college in-state are the most likely to stay in-state after graduation. However the report notes that states and regions may be able to do little to increase that level of retention with further inducements. STC recommends a focus on attracting out-of-state high school students to attend college in a state or region as these *arrivers* are also highly likely to stay after graduation. Lowering out-of-state tuition was suggested to accomplish that goal.

One of the key issues is whether the *Brain Gain* is an appropriate target for policy action. If the drain of educated young people is merely the symptom of broader economic problems, then policy responses must focus on the root causes of the drain. Furthermore, if a region is able to attract students and workers sufficient to meet the needs of the regional economy, then *exporting* excess talent produced by local universities is not a critical policy problem. In this case, a focus on creating opportunities for employment and entrepreneurship can serve to both attract and retain talent.

### **Summary of Key Points**

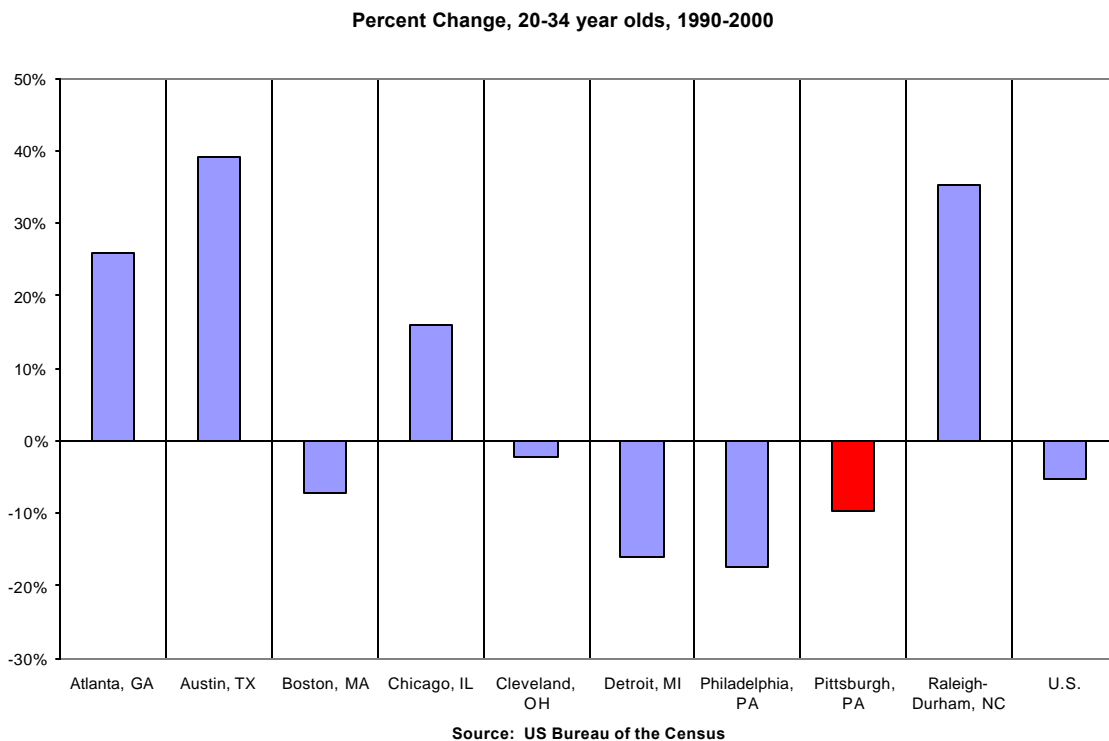
- Growing regions are both importers and exporters of talent, but they tend to import more than they export.
- The Pittsburgh region, like the U.S. as a whole, has fewer people aged 20-34.
- In Pittsburgh and Pennsylvania, retention of students ranges between 40-57% according to recent studies. These figures are comparable to those of competitors.
- Job quality and family considerations drive the location decisions of regional graduates. Amenities were far less a factor.
- The region is most appealing to those valuing family concerns, cost of living, and education.
- Pennsylvania offers competitive incentives for attracting and retaining graduates and workers.

## Demographics

One of the key demographic trends is that the population of 20-34 year olds has declined nationwide. According to the 2000 census, there were more than 3.3 million fewer persons in that age range in the United States compared to 1990. As a proportion of the population, persons in the 20-34 age group accounted for just under 21% of the total population in 2000 compared to 25% in 1990.

With fewer young people to go around, some metropolitan areas are feeling the pinch more than others. Pittsburgh, Philadelphia, Detroit and Boston all lost young people at a faster rate than the nation. Cleveland lost young people at a rate well below the nation, decreasing by only 2% between 1990-2000. Other regions like Atlanta, Austin, Chicago and Raleigh-Durham gained significant amounts of people in this age range. The success of these regions indicates that the national trend can be reversed on the regional level.

Figure 1



## Evidence of the *Brain Drain*

So is there a *Brain Drain* in Pittsburgh? There has been an overwhelming perception, supported by limited empirical evidence that the region and the state are exporters of young talent. There has been particular concern over the loss of 20,000 college-educated young people in the state.<sup>2</sup> A recent study by Case Western Reserve University found that between 1990-1995, Pennsylvania retained less than 41% of its science and technology graduates, ranking 33<sup>rd</sup> out of 50 states while Pittsburgh ranked last (30<sup>th</sup>), retaining only 19%.<sup>3</sup>

Table 1

Region / Study	Finding
Pittsburgh <sup>4</sup>	40-52 %
Pennsylvania <sup>5</sup>	40.7%
Michigan <sup>6</sup>	79 % of graduates <i>employed in technology</i>
Wisconsin <sup>7</sup>	80%
Florida <sup>8</sup>	48%
STC <sup>9</sup>	57% (range: 18%-81%)
Cleveland <sup>10</sup>	30%

There is evidence that our retention of students is improving. A recent survey reported that the region is retaining 40-52% of the students graduating from southwestern Pennsylvania universities.<sup>11</sup> Many other regions have done similar studies, and although these studies are not directly comparable, our performance is average (Table 1). Michigan retained nearly 80% of graduates who worked in high-tech jobs, but this is not the same as retaining 80% of graduates. Other studies reported Michigan's retention rate as closer to 60%.<sup>12</sup> Wisconsin also achieved a high retention rate, but it is not a major technology or job growth region. It is more likely that Wisconsin's universities serve a local market and their graduates are not highly sought outside the state. If we interpret Pittsburgh's performance through this dual lens, retaining about half of our students indicates that our institutions are producing quality graduates demanded by other regions, but we are still retaining a sizable portion of the student base.

The Center for Economic Development has been tracking student enrollment and alumni from regional colleges and universities.<sup>13</sup> Our data roughly confirms the picture provided in the University of Pittsburgh study. On average, 57% of the graduates remain in Pittsburgh for employment (Stayers). The universities have also been important magnets for attracting talent to the region. In total, 41% of the enrollment in Business, Computer and Engineering programs are attracted from outside the region (Arrivers).

Examining Table 2 we can see the roles that different programs and fields of study play. For example, the business schools attract the smallest portion of *arrivers* but have the largest proportion of *stayers*. In part this reflects the emphasis of some business schools

on serving local industries and employers, but it also suggests an opportunity. Marketing our business schools and degrees to students outside the region, to increase the enrollment of *arrivers* could greatly increase the number of *stayers* in the region. Our excellence in computer degrees is attracting a large portion of students from outside the region and these students also tend to stay in the region. Increasing marketing of these programs should also increase retention – especially if we can link programs in computing with the business schools. Our engineering programs also attract a large number of students, but a smaller proportion are staying. This most likely reflects the lack of job opportunities for these graduates. Efforts such as the Digital Greenhouse may increase the job opportunities, but we will need broader efforts to reach other engineering areas.

**Table 2**

	Enrollment, 1990-1999			Alumni, 1990-1999		
	Local	Arrivers		Leavers	Stayers	
Business	15,125	9,118	38%	6,768	11,385	63%
Computer	1,272	1,494	54%	1,411	1,581	53%
Engineering	2,685	2,842	51%	3,485	2,638	43%
Total	19,082	13,454	41%	11,664	15,604	57%

Source: Center for Economic Development analysis of data reported by Carnegie Mellon, Duquesne, Robert Morris and the University of Pittsburgh.

### Location Decisions

Recent graduates from Pittsburgh universities indicated that regional characteristics and amenities were far less important than job quality and family considerations in choosing among available opportunities.

Alumni were motivated to stay by family connections, the relative low cost of living, and the quality of public education.

Low starting salaries was a primary factor in the decision to leave the region.

Source: Hansen and Huggins. 2001. *Career and Location Decisions: Recent Pittsburgh Area University Graduates*.

In terms of the level of education, undergraduate and doctoral students have the highest rates for leaving. Graduates with master’s degrees generally stay at a higher rate, although these rates do vary by school and by program. Undergraduates in Business programs have the highest retention, about 75%, while students pursuing a higher degree in that discipline tend to leave at a higher rate. Students with a Master's degree in Computer or Engineering programs have the highest retention, about 50%, for those in their field, with both undergraduates and doctorates leaving at a higher rate.

The studies that examined the reasons for leaving found one consistent reason:

higher pay or better job opportunities. This reason was cited in the University of Pittsburgh study. Similarly, the studies in Michigan and Florida cited higher pay or better

jobs as factors in leaving those states. The analysis conducted in Wisconsin did not inquire about higher pay but actually analyzed the pay of leavers and stayers and found that those who left the state earned \$12,000 more than their in-state counterparts. Controlling for various wage inflation factors, the leavers still earned \$7,200 more than those who stayed in Wisconsin.

**Table 3**

<b>Program Focus or Tools</b>	<b>Count</b>
Focus: Graduates & Workers	10
Financial Incentives (scholarships, tax breaks, grants)	9
Marketing Programs (ads & job fairs)	6
Focus: College students	5
Focus: High School students	2
Attract Jobs	1
Focus: Faculty	1

Approximately twenty states or regions have programs to encourage talent attraction and retention. Many of these programs began in the late 1990s. The Center has briefly summarized the focus or tools used by these various programs in Table 3. The principal target population of these strategies has been graduates or workers, with significantly fewer programs targeting college or high school students. A mixture of scholarships and tax incentives, as well as marketing efforts are used in these programs. A few innovative programs have focused on creating job opportunities or even attracting faculty members – in hopes of recruiting more students and workers to the region. It is too early to evaluate the success of these programs, but it should be noted that judging by the level of investment alone, Pennsylvania already has significant stake in the Brain Gain (Table 4).

**Table 4: Incentive Programs**

<b>State or Region</b>	<b>Incentives</b>
Michigan	\$300 tax credit for Community College tuition
Delaware	Two years free at Community College for in-state students, requires a 2.7 GPA to qualify
Georgia	HOPE scholarships for tuition, fees and books for in-state students, requires a 3.0 GPA to qualify, subsidy average of \$2,285
Pennsylvania	SciTech provides a maximum subsidy of \$3,000 per year. Technology scholarships provide maximum grants of \$1,000 to current workers seeking two-year degrees
Philadelphia	Coordinated marketing plan to promote “Collegetown” and profile as a technology center

In the summer of 2001, the Pittsburgh Technology Council commissioned the Carnegie Mellon Center for Economic Development (CED) and the Duquesne University Center

for a Competitive Workforce to conduct surveys of manufacturing and information technology firms in the region. According to these surveys, one of the key factors suppressing the ability of southwestern PA to attract workers is the lack of a depth in job opportunities. Workers not only evaluate the company and the job, they also look at what other opportunities exist in the region, as well as the future career path available in the region. Multiple opportunities provide greater alternatives if one job does not work out. In this era of two-career families, many workers are concerned about the options for their spouse as well.

From the perspective of the employers responding to our survey, the nature of work has the greatest impact on the recruitment of workers. Workers will accept outstanding jobs in companies with a good culture and reputation, and will avoid those that do not provide sufficient opportunities.

Company leaders did feel the region was attractive due to its high-quality universities, and the perception of Pittsburgh as a good environment for families. Perhaps because they have had first-hand familiarity with these and other positive qualities of the region, companies reported it was much easier to recruit outsiders with an existing Pittsburgh connection. This finding may indicate negative perceptions of the Pittsburgh region in other parts of the country still exist.

Many of the region's manufacturing and IT firms are small and lack experience and sophistication in their recruiting activities. Most companies rely on employee referrals and personal networks. The companies that reported the least problems in recruiting tended to have national networks built on prior employment or the reputation of the firm or key managers. However, for many small firms, these recruiting techniques limit their ability to target potential employees living outside the region.

Many of the same factors that attract a worker to a job in the first place are what motivate them to stay. The most positive retention factors related to the nature of the work and the reputation of the company. A favorable environment with rewarding and challenging assignments, an emphasis on teamwork, and quality leadership were characteristics of a workplace that is able to successfully retain employees.<sup>14</sup>

Compensation and benefits were the largest negative retention factor identified by local firms, indicating that even high-quality work opportunities still had to be financially competitive. Other barriers to retention include those related to the regional economy (local IT growth, and work opportunities for spouses), and those related to the company and job (advancement opportunities, company image, and human resource practices). Sports, cultural, and recreational amenities were only slightly positive retention factors.



## ***Appendix 1: Resources***

- **Case Western Reserve University / Cleveland**
  - <http://weatherhead.cwru.edu/REI/Publications/braindrain/>
  
- **Southern Technology Council**
  - <http://www.southern.org/pubs/stc/Mic2001.pdf>
  
- **Florida**
  - <http://www.leadershipflorida.org/survey.asp>
  
- **Wisconsin**
  - <http://www.wpri.org/Reports/Volume14/Vol14no5.pdf>
  
- **Michigan**
  - <http://medc.michigan.org/news/reports/economic>

## **Appendix 2: Brain Gain Programs**

**From the State Science and Technology Institute ([www.ssti.org](http://www.ssti.org))**

### **Michigan**

A bill introduced in the Michigan Senate last week would provide a \$300 state tax credit to cover the balance of a student's Michigan community college tuition that is not covered by the federal Hope Scholarship tax credit. The state tax credit would be available to all students from two-parent households with incomes under \$100,000 and single-parent families with less than \$50,000 in annual income. The bill's sponsor estimates 90 percent of Michigan's 120,000 community college students would be eligible to use the credit.

Possible revenue sources to cover the tax credit's \$30 million cost to the state include a portion of the state's share of the national tobacco settlement, new revenues generated from the strength of the Michigan economy, and existing jobs' program monies.

### **Delaware**

In Delaware, the House Education Committee unanimously approved last week a bill that would allow any Delaware student who graduates from a public or private high school with at least a 3.0 grade point average to attend the Delaware Technical and Community College free for two years. Students must be accepted and enrolled as a technology student. Funds would be available on a reimbursement basis, after the student passes each semester with a minimum 2.7 average (3.0 average cumulative).

Students also must apply for all appropriate state financial aid programs and the Federal Pell grant. Pell grant recipients may only receive half-tuition reimbursement from the state program.

State education officials estimate 150 students of the school would be eligible under the tuition incentive program, making the cost to the state approximately \$425,000 annually.

### **Georgia**

A new University of Georgia study <<http://www.terry.uga.edu/hope/hope.enrollments.pdf>> showed the HOPE scholarship program has been influential in keeping the state's brightest high school students in-state for college – a significant goal based on the STC findings regarding the likelihood of students remaining in-state after school. Three-fourths of high school students scoring over 1500 on the SAT now remain in state for higher education; only 23 percent stayed in Georgia prior to the creation of the scholarship program. Additionally, results showed 96 percent of the in-state students at the University of Georgia received HOPE scholarship funds.

### **Georgia's Yamacraw Mission**

One year ago this month, in the midst of a booming economy, Georgia Governor Roy Barnes announced a new \$100 million, five-year initiative to advance the state's position in the research and production of key components of the global economy. The Yamacraw Mission, named after one of the state's first colonial settlements, focuses on research, education, and economic development in microchip design and high-bandwidth communications.

The Mission coordinates the activities of three usually disparate approaches -- a large state center of excellence, an education and training program, and an industrial inducement program -- under a single, unified technology-based economic development strategy and office. On a smaller scale, the Pittsburgh Digital Greenhouse, a \$13.2 million initiative focusing on high definition video and systems-on-a-chip technology, represents another example of this new model for state science and technology policy (see the 7/23/99 issue of the SSTI Weekly Digest: <http://www.ssti.org/Digest/1999/072399.htm>)

### **Research**

Five Georgia institutions currently participate in the research program. Money is used for: establishing new advanced communications research facilities; hiring 85 additional professors to teach high-tech development courses at universities; and, adding more semiconductor designers to implement research results. Already, 21 new faculty have been added to the member schools.

Seven Yamacraw research focus areas have been identified: systems-on-a-chip technology, embedded systems, optical networks, wireless, content processing, digital signal processing, and high speed access devices.

### **Education**

In addition to the technical experience students gain from the research component of Yamacraw, the Georgia Board of Regents has launched the Georgia Tech Regional Engineering Program (GTREP). Designed to increase the number of engineers in Southeast Georgia, GTREP allows students at three smaller state universities to enroll as Georgia Tech students without leaving their home campuses.

### **Economic Development**

Along with the traditional inducement incentives states use to attract industry, semiconductor companies locating in Georgia will be given special access to the research, facilities, and personnel of the Yamacraw Mission schools. Companies also will have influence over the research agenda for the Mission. To participate, businesses must commit \$250,000 annually to Mission research or promise to employ at least 100 more engineers in Georgia by 2003.

Star\*Core, a strategic alliance between Motorola and Lucent Technologies, was the Mission's first member last May, and committed to creating 100 electronic design jobs by the end of 2000. According to an unconfirmed report in the *Atlanta Business Chronicle*, the state is close to signing the second and third business members to join the Yamacraw Mission. National Semiconductor Corporation and Broadcom Corp., two international microchip design companies, currently each employ less than 50 people in Atlanta.

### **Administration**

The budget for the Yamacraw Mission, to range between \$14 -25 million per year, must be approved annually by the Georgia Legislature. According to *Wall Street Journal* reports, Cadence Design Systems, a San Jose California software-design firm, received \$3 million from the state of Georgia for development of the overall Yamacraw Mission. Cadence has a similar relationship with the state of Pennsylvania for the Digital Greenhouse.

More information on the Yamacraw Mission will be forthcoming on its own website: <http://www.yamacraw.org>. Until then, information may be found at: <http://www.gcatt.gatech.edu/yamacraw/index.html>

## **Indiana**

Lilly Endowment Inc. awarded a \$29.9 million grant to the Indiana University Foundation to develop a world-class research initiative in some of the fundamental information technologies of the next century.

The Endowment also announced a \$29.7 million grant to Rose-Hulman Institute of Technology to establish a Center for an Innovation Economy.

This five-year grant will enable IU to establish the Indiana Pervasive Computing Research (IPCRES) Initiative. IPCRES will be devoted to research in one of the most important new areas for information technology in the next century, pervasive computing. Under this initiative, six world-class research laboratories will be established at IU in key areas that underpin the pervasive computing environment of the future. IU will recruit distinguished scientists -- researchers of the highest international standing as well as their research groups including staff and graduate students to lead the IPCRES Laboratories.

Pervasive computing is the increasingly powerful combination of high-speed computers and intelligent devices, ranging from scientific instruments to home appliances to online digital libraries, all completely interconnected by wired and wireless networks and accessible anywhere in the world. This will have increasingly major impacts in education and entertainment, manufacturing and design, health care and home safety. All these areas and more will be transformed as advances in information technology lead to a world in which computing, telecommunication and information are truly pervasive.

"IU is extremely serious about its obligation as a public university to assist the state in economic development. This project will be a launching pad for growth in the Indiana IT industry, and for Indianapolis this means telecommunications and potentially e-business," Brand added.

"This grant will enable IU to build on the formidable IT infrastructure that it has established in recent years, its information technology research programs, and new developments such as its proposed School of Informatics, in a way that will help significantly grow the state's information economy," said IU Vice President for Information Technology and Chief Information Officer Michael McRobbie. "This will in turn lead to the **retention of more highly-trained Indiana graduates** in the state through expanded employment opportunities in information industries."

## Pennsylvania

Pennsylvania has provided \$8.2 million for SciTech and Technology scholarship programs to work in conjunction with the "Brain Gain" initiative to better prepare Pennsylvania's workforce for the 21st century. Eligible students studying in technology-intensive fields can receive scholarships of up to \$3,000 a year under SciTech, in return for committing to stay in the state. The Technology scholarships would provide grants of up to \$1,000 to current workers seeking two-year degrees.

## Philadelphia

### **Campaign to Market Philadelphia as a Technology Center**

**(TL Ventures, University of Pennsylvania, Greater Philadelphia Chamber of Commerce, Greater Philadelphia Venture Group, Eastern Technology Council):**

A \$2-million marketing campaign announced on October 25, 2000, geared toward raising the profile of the region as a technology center. The campaign will target students and technology publications, with the objective of getting Philadelphia mentioned in national rankings and lists of tech "hotspots."

## **Greater Philadelphia Collegetown Project**

**(Temple Issues Forum):**

A proposed umbrella organization aimed to bring people and ideas together around the general theme of "Collegetown Philadelphia." GPCP recently hosted a conference, "Collegetown Philadelphia: Is This an Idea Whose Time has Come," at the WHYY studios where academic and civic officials discussed the connections between the region's colleges and universities and economic development.

## **Onebigcampus.com**

**(Greater Philadelphia Tourism Marketing Corporation, Campus Visit):**

A marketing campaign sponsored by GPTMC and run by Campus Visit, with the overarching goal of extending the overnight stays of visitors to regional campuses. The campaign uses a magazine, website, and toll-free number to help prospective students and parents make travel arrangements in the Philadelphia area for their campus visits.

## **Student Retention Committee**

**(City of Philadelphia, Commerce Department):**

A committee formed by the City of Philadelphia's Commerce Department initially under the Rendell Administration and still in existence under the Street Administration. The Committee has undertaken numerous initiatives to increase graduate retention in the area, including conducting a promotional campaign ("Philly College Town"), hosting a free concert/job fair for area students, and providing a communications venue for the university, civic, and student communities.

## **University City District**

A partnership of institutions (including three universities – University of Pennsylvania, Drexel University, and University of the Science in Philadelphia), businesses, and communities in University City formed to supplement city maintenance and public safety services. UCD also implements hospitality, promotional, and physical improvement programs to enhance the neighborhood.

## Notes

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- <sup>1</sup> See CED policy briefs: <http://www.heinz.cmu.edu/ced/topics/T1Migration/index.html>.
- <sup>2</sup> DeJong, Gordon and Pamela Klein. 1999. *Pennsylvania's Brain Drain Migration in the Mid-1990s*. Pennsylvania State Data Center.
- <sup>3</sup> Gottlieb, Paul. 2001. *The Problem of Brain Drain in Ohio and Northeastern Ohio*. Center for Regional Economic Issues, Case Western Reserve University.
- <sup>4</sup> Hansen, Susan and Leonard Huggins. 2001. *Career and location decisions: Recent Pittsburgh Area university graduates*. Graduate School of Public and International Affairs, University of Pittsburgh.
- <sup>5</sup> Gottlieb, Paul. 2001.
- <sup>6</sup> Partnership for Economic Progress. 2001. *Attracting and Retaining the Best Talent to Michigan*. Michigan Economic Development Corporation.
- <sup>7</sup> Brannon, J. Isaac and M. Kevin McGee. 2001. *Draining Away: Who is leaving the state? Where are they going?* Wisconsin Policy Research Institute Report, Volume 14, Number 5.
- <sup>8</sup> Cherry Communications. 2001. Leadership Florida College Survey. Leadership Florida.
- <sup>9</sup> Tornatzky, et al. 2000.
- <sup>10</sup> Gottlieb, Paul. 2001.
- <sup>11</sup> Hansen and Huggins. 2001.
- <sup>12</sup> Tornatzky et al, 2000. See also, Gottlieb 2001.
- <sup>13</sup> The CED uses zipcodes to track where students are from and where they go. In some cases the alumni records may not be up to date or the current location of a student is not known. The entry-exit lag also causes discrepancies between enrollment and graduates. Undeclared majors can also cause a larger number of graduates than reported enrollment. Finally, the data also lacks common identifiers to link the enrollment to alumni, therefore we cannot determine our retention of local students versus arriving students, for example.
- <sup>14</sup> These findings agree with those of another recent study. See Hansen, Susan, and Huggins, Leonard. *Career and Location Decisions: Recent Pittsburgh Area University Graduates*. Graduate School of Public and International Affairs. University of Pittsburgh. September 19, 2001