The Value of
University System of Georgia Education

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This report reflects the conclusions of the authors, and not of the Georgia Institute of Technology or the sponsor.

Executive Summary

What is the value of higher education? The University System of Georgia's (USG) Intellectual Capital Partnership Program (ICAPP) has asked Georgia Tech to examine this question in studies conducted over the past six years. Through these studies, a rich base of knowledge has been developed in three areas:

- Demand and shortfall analysis, which addresses the question, Are there enough USG graduates in high-demand occupations?
- Migration analysis, which addresses the question, What impacts do USG institutions have on the flow of students across the state?
- Wage analysis, which addresses the questions, To what extent does higher education yield greater earnings, and, What is the impact on state and county economies?

Demand and Shortfall Analysis

New 2010 projections from the Georgia Department of Labor indicated that **higher education-related occupations will compose 25 percent of all jobs in 2010**, an increase over 2000 levels. Georgia's top three higher education-related occupations based on numeric employment increases are forecast to be registered nurses, computer support specialists, and accountants and auditors; and based on percentage increases, survey researchers, computer support specialists, and physician's assistants.

These projections were compared to the number of graduates from all postsecondary institutions in the state in 2000 by major area of specialization. **USG was the single largest supplier of higher education graduates, producing nearly half of all of Georgia's graduates.** The shortfall analysis also accounted for the number of workers moving into the state (minus the number leaving) based on new data from the 2000 census.

Only 12 higher education-related occupations were found to have shortfalls of more than 100. The largest shortfall was in elementary and kindergarten teaching occupations. Four health care occupations also had significant shortfalls: registered nurses, pharmacists, medical records and health information technicians, and medical and clinical laboratory technicians. **Shortfalls in the information technology area were significantly reduced**, although scarcities continued in certain computer software engineering and systems occupations. The shortfalls in these 12 occupations exceed 3,000 unfilled positions annually.

Migration Analysis

The top 12 occupations with shortfalls of more than 100 a year would have had nearly double the deficits without in-migration. **Forecasts through 2025 suggest that Georgia will have fewer in-migrants than in the past**. Because in-migrants tend to have higher education levels than those staying in the state, the decline in in-migration may have a detrimental affect on the state's ability to fill higher education-related occupations.

Workers migrate within the state as well as between states. Based on a gravity model, researchers found that the location of USG institutions significantly affects the internal flow of graduates in the state. **Graduates are more likely to work in the local area after graduation,** especially graduates of research universities. Also, the size of the pool of graduates has a significant effect on intrastate migration.

Wage Analysis

An economic impact analysis of the value of higher education in Georgia drew on a methodology developed by the U.S. Census Bureau in its 2002 landmark study "The Big Payoff." A comparison of the earnings of high school graduates to USG graduates showed that **graduating from a USG institution paid off**. Not only did it pay off to the average graduate in the 1993 to 1997 timeframe, to the tune of about $14,000 in 1998, but more significantly, it paid off to the state as a whole, by nearly $1.25 billion. And it paid off to 93 counties, which benefited by more than $1 million from USG graduate earnings. These impacts reflect only a single year of

benefits in the careers of a five-year graduate cohort. The total benefits could be as much as 40 times higher over this cohort's full work-life.

Future Directions

Based on these findings, USG should continue to monitor the relationship between supply and demand at the state and sub-state levels, given projected changes in in-migration. USG should also initiate another round of matching of its graduates with Georgia Department of Labor employment security data for multiple years beyond 1998. It is further recommended that

the wage-based economic impact analysis be extended to a more complete benefit-cost analysis to better demonstrate the value of higher education in Georgia.

Section 1

Introduction

Introduction

For the past six years, the Board of Regents of the University System of Georgia (USG) through the Intellectual Capital Partnership Program (ICAPP) has asked Georgia Tech to examine the relationship between the demand for workers in various occupations and the supply of postsecondary institutional program graduates. The most recent study (referred to here as the 2001 study) showed that three factors were important in understanding the economic development impact of higher educational institutions from a human capital perspective—migration, shortfall, and wages. It reported that while most university-related occupations were well supplied by workers from the USG, other postsecondary institutions, and people moving into the state, there was a significant shortfall of information technology (IT) workers. (Drummond and Youtie, 2001)

In the intervening period, the information technology sector shrank along with the rest of the economy. Public-sector cutbacks have become necessary to balance many state and local budgets. In this climate, policy-makers pay increased attention to value of state services, including highly regarded services such as higher education. Traditionally, the value of higher education has been portrayed based on institutional and student spending. Such methodologies compute capital expenditures on buildings and equipment, salary and operating expenses, and purchases made by students and apply multipliers to estimate the extent to which these expenditures generated subsequent rounds of additional spending. (Humphries, et al., 1999; Duhart, 2002.) This is a very useful methodology that has been applied to a broad range of public programs—from education to prisons to road construction.

Although spending by higher educational institutions is important, the core mission of universities and colleges is to educate students. Students undertake higher education for many reasons, but the chief one is that they expect it to lead to future economic success. It would be particularly beneficial to identify methodologies that can capture the economic value of this education mission on the future economic success of students.

Scope of Work

This study aims to demonstrate the value of higher education from three perspectives. First, it will examine the benefits of higher education in addressing the employment needs of high-demand occupations. Section 2 will present recently released employment projections for 2000 to 2010 and show the fastest-growing occupations requiring higher education in Georgia and the nation. Section 3 will relate these projections to the existing supply of USG graduates and graduates of other postsecondary institutions in the state, as well as the supply of in-migrants based on information from the 2000 U.S. Census released in June 2003. This analysis will highlight which higher education-related occupations are unlikely to have enough graduates and in-migrants to fill employers' needs through 2010.

Second, Section 4 of this study will investigate the relationship between USG institutions and migration. Migration has two components: external migration and internal migration. The former looks at the extent to which the state can continue to expect educated workers from other state to fill high-demand occupations in Georgia. Projections from the U.S. Census Bureau through 2025 by educational attainment will be the primary source of data for the external migration analysis. Internal migration focuses on the impact of USG institution location on the flow of students into the economy. Specifically, it examines the extent to which USG institutions affect where a student chooses to work (relative to other factors such as level of wages offered and home county influences).

An economic impact analysis of the value of higher education is presented in Section 5. In its recent landmark study, "The Big Payoff," the U.S. Census Bureau developed an approach for using wages and educational attainment to demonstrate the economic value of education. (Day and Newburger, 2002). Annual earnings of higher education graduates were compared to annual earnings of high school graduates, and the difference was deemed to be the value of higher education. "The Big Payoff" estimated that college graduates earn 1.8 times more than high school graduates. Section 5 presents a variation of the methodology in "The Big Payoff" to show the overall impact of USG institutions and programs on state and county economies.

Section 2

Future Demand for College Education

What is the demand for employees with college education? One way to answer this question is by investigating occupations that require higher education. The U.S. Bureau of Labor Statistics has found in national surveys that certain occupations are linked to certain levels of education and work experience. (Wash, 1996). For example, physicians and lawyers typically have a professional degree; school teachers typically have a bachelor's degree; medical technicians typically have an associate's degree; general managers typically have work experience plus a bachelor's degree; cashiers typically have short-term on-the-job training; and upholsterers typically have long-term on-the-job training. By knowing the demand for employees in these occupations, one can address the demand for higher education.

How Occupational Demand Is Forecast

Occupational employment demand is based on long-range projections that use sophisticated econometric models. These models account for the size and demographic composition of the labor force, the growth of the aggregate economy, final demand or gross domestic product (GDP), and interindustry relationships (input-output). Surveys of employers conducted every three years by the Georgia Department of Labor furnish information for the in-state estimation process. Projections are first made for industries, then a staffing pattern matrix is used to produce projections by occupation.

This set of projections marks the first time that standard occupational classifications (SOCs) were used. Projections were made for nearly 650 SOCs nationally and more than 750 occupations in Georgia. Unfortunately, no sub-state occupational employment projections were available for SOCs 2010, so researchers did not conduct a regional supply-demand analysis

Georgia's Fastest-Growing Higher Education-Related Occupations Are Similar to the Nation's

Which occupations are projected to add the most jobs? There are two approaches to determining the fastest-growing jobs: numerical growth and percentage growth. Numerical growth shows the raw numbers of job openings over the next 10 years. Table 2.2 compares numerical growth projections for Georgia and the nation, focusing only on occupations that generally require a university degree. The top two occupations with the most projected new jobs

are the same in Georgia as in the nation—registered nurses and computer support specialists. Accountants and auditors are on both lists, but rank higher in Georgia than in the nation.

A second way to examine the fastest-growing occupations is percentage growth. Percentage growth indicates how fast employment changes will occur. Table 2.3 compares the percentage growth in jobs projected for higher education-related occupations in Georgia and the nation. Survey researchers are the occupation with the biggest percentage growth rate in Georgia whereas computer software applications engineers top the national list. Computer support specialists rank second on both lists, but physician's assistants rank third on the Georgia list compared to eighth on the national list.

Table 2.2. Top 10 Occupations by Numerical Growth in Job Openings, 2000-2010: Georgia vs. United States*

U.S. Openings, 2000-2010 (000s)			Georgia Openings, (2000-2010)		
1.	Registered Nurses	2,762	1.	Registered Nurses	18,130
2.	Computer Support Specialists	2,376	2.	Computer Support Specialists	15,130
3.	Computer Software Engineers, Applications	1,867	3.	Accountants and Auditors	10,060
4.	Computer Software Engineers, Systems Software	1,410	4.	Computer Software Engineers, Applications	6,320
5.	Computer Systems Analysts	1,208	5.	Network and Computer Systems Administrators	5,940
6.	Network and Computer Systems Administrators	912	6.	Preschool Teachers, Except Special Education	5,550
7.	Accountants and Auditors	866	7.	Elementary School Teachers, Except Special Education	5,450
8.	Elementary School Teachers, Except Special Education	816	8.	Computer Software Engineers, Systems Software	4,480
9.	Secondary School Teachers, Except Special and Vocational Education	748	9.	Computer Systems Analysts	4,180
10.	Lawyers	529	10.	Secondary School Teachers, Except Special and Vocational Education	3,600

*List of occupations excludes occupational categories with titles that begin with "All other…".
Source: U.S. Bureau of Labor Statistics and the Georgia Department of Labor, data accessed April 2003.

Table 2.3. Top 10 Occupations by Percentage Growth in Job Openings, 2000-2010: Georgia vs. United States*

U.S. Percent Growth, 2000-2010 (000s)			Georgia Percent Growth (2000-2010)		
1.	Computer Software Engineers, Applications	101%	1.	Survey Researchers	100%
2.	Computer Support Specialists	98%	2.	Computer Support Specialists	80%
3.	Computer Software Engineers, Systems Software	89%	3.	Physician's Assistants	75%
4.	Network and Computer Systems Administrators	83%	4.	Environmental Engineering Technicians	72%
5.	Network Systems and Data Communications Analysts	79%	5.	Medical Records and Health Information Technicians	69%
6.	Database Administrators	65%	6.	Network and Computer Systems Administrators	66%
7.	Computer Systems Analysts	60%	7.	Network Systems and Data Communications Analysts	63%
8.	Physician's Assistants	54%	8.	Public Relations Specialists	59%
9.	Medical Records and Health Information Technicians	50%	9.	Environmental Engineers	58%
10.	Physical Therapist Aides	46%	10.	Computer Software Engineers, Systems Software	57%
10.	Audiologists	46%			

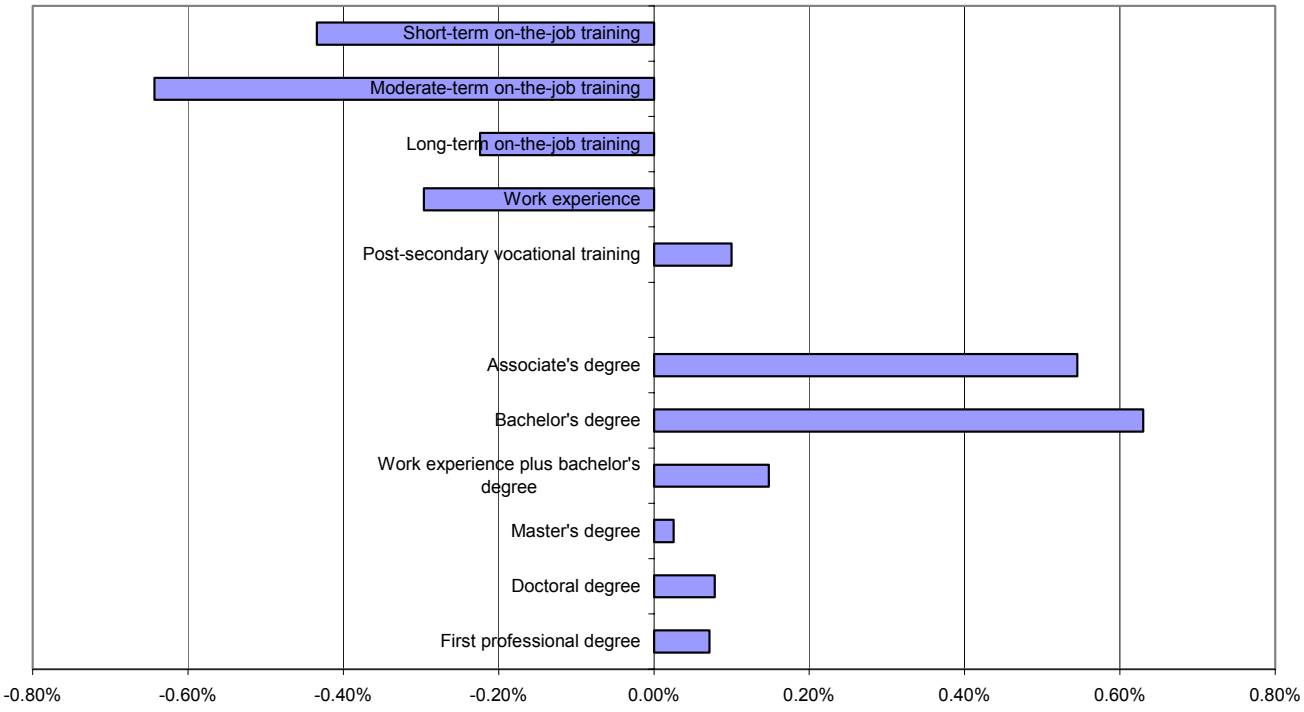
*List of occupations excludes occupational categories with titles that begin with "All other…".
Source: U.S. Bureau of Labor Statistics and the Georgia Department of Labor, data accessed April 2003.

College Education Will Be More Important to Georgia in 2010

Georgia will add 805,570 new jobs through 2010 or nearly 20 percent more new jobs than in 2000. Occupations that typically require higher education will account for a larger share of jobs in 2010 than in 2000. By 2010, a higher education degree will be required for occupations employing nearly 25 percent of workers compared to 23 percent in 2000. Occupations linked to all types of college degrees—from associate's to doctoral and professional

degrees—will compose a greater share of the workforce in 2010 than in 2000, whereas those requiring on-the-job training or work experience will represent a declining share of new jobs in 2010. (See Figure 2.1 and Table 2.4.)

Figure 2.1. College Degrees Will Account for a Larger Share of the Jobs in 2010 than in 2000*



*This chart represents the percentage of jobs in 2010 requiring certain degrees or non-college training minus the percentage of jobs in these same categories in 2000.
Source: Georgia Department of Labor, 2003.

Conclusions

Georgia's 2010 workforce will present new challenges. There will be more than 800,000 new jobs than in 2010. While three-quarters of these jobs still require no formal college degree, the latest projections show that these jobs are on a declining path. College degree-related jobs will account for 1.5 percent more of the jobs in 2010 than in 2000. This may not seem like much, but it represents more than 262,000 new jobs. More important, it shows that college education will be even more valuable to Georgia's citizens and ultimately to the Georgia economy than it is today.

Table 2.4. Every Category of College Degree-Related Occupations Is Increasing in Percentage of Total Jobs in 2010, While Non-Degree Occupations Are Decreasing

Education level	2000 Employment	2010 Employment	2000 Percent Employment	2010 Percent Employment	Percent Change Employment Share
First professional degree	41,100	52,650	1.0%	1.1%	0.1%
Doctoral degree	24,950	33,670	0.6%	0.7%	0.1%
Master's degree	21,690	27,170	0.5%	0.6%	0.0%
Work experience plus bachelor's	275,750	336,790	6.7%	6.8%	0.1%
Bachelor's degree	468,500	590,920	11.3%	12.0%	0.6%
Associate's degree	135,120	188,380	3.3%	3.8%	0.5%
College degree	**967,110**	**1,229,580**	**23.4%**	**24.9%**	**1.5%**
Post-secondary vocational training	117,220	145,000	2.8%	2.9%	0.1%
Work experience	287,880	329,340	7.0%	6.7%	-0.3%
Long-term on-the-job training	405,820	473,840	9.8%	9.6%	-0.2%
Moderate-term on-the-job training	640,300	733,310	15.5%	14.8%	-0.6%
Short-term on-the-job training	1,715,300	2,028,130	41.5%	41.1%	-0.4%
Less than college degree	**3,166,520**	**3,709,620**	**76.6%**	**75.1%**	**-1.5%**
Total	**4,133,630**	**4,939,200**	**100.0%**	**100.0%**	**100.0%**

Source: Georgia Department of Labor, 2003.

Section 3

Shortfall Analysis

Shortfall analysis estimates the long-term need that Georgia companies will have for employees in particular occupations. This estimate is over and above employment needs filled by postsecondary institution graduates available for hire and employees moving into the state (minus the number leaving the state). All estimates are based on 10-year projections made in 2000.

Four elements compose shortfall analysis. These are summarized in Table 3.1 and described in the sections that follow.

Table 3.1. Shortfall Analysis – University System

Annual job openings in occupations typically requiring a university degree, projected from 2000-2010

MINUS **Supply of graduates in majors** for 1999-2000 in all public and private postsecondary institutions in Georgia

MINUS **Supply of net migrants** or employees (in occupations typically requiring a university degree) coming into Georgia from other states (and out from Georgia to other states) from the 2000 census

EQUALS Occupations with **annual shortfalls** through 2010

Annual Job Openings

Annual Openings

For this analysis, researchers used annual openings, rather than the 10-year growth rates discussed in Section 2. Annual openings enable comparisons to be made with other annual data such as the supply of university graduates in a given year. Annual openings are based on annualized 10-year growth rates; however, they also include net replacements. Net replacements consist of workers who transfer from other occupations or who leave the workforce, but do not include persons leaving the state, and persons changing occupations.

Occupational Supply

This study defines occupational supply as the number of graduates by major from all Georgia's postsecondary educational institutions. The significance of the supply component in the shortfall analysis is as follows. If postsecondary institutions continue to graduate the same number of students with the same majors, what impact will that have on filling the demand for workers in occupations critical to the state's economy?

To estimate supply, researchers gathered data on number of graduates by major in

Georgia's postsecondary institutions. These institutions include USG colleges and universities, private colleges and universities, Georgia Department of Technical and Adult Education (DTAE) colleges, and nonprofit and proprietary technical institutions. The Integrated Postsecondary Education Data System (IPEDS) serves as the primary data source for occupational supply analysis. Administered by the National Center for Educational Statistics (NCES) of the U.S. Department of Education, IPEDS includes national, state, and institution-level information (such as enrollment program completion, faculty, staff, finances, and academic libraries) from some 12,000 postsecondary institutions. The most recent data available on completions (graduates) from these institutions is as of 2000. More recent data about graduates is directly available from the USG and DTAE. However to maintain comparability with private institutions, researchers relied on the 2000 IPEDS data.

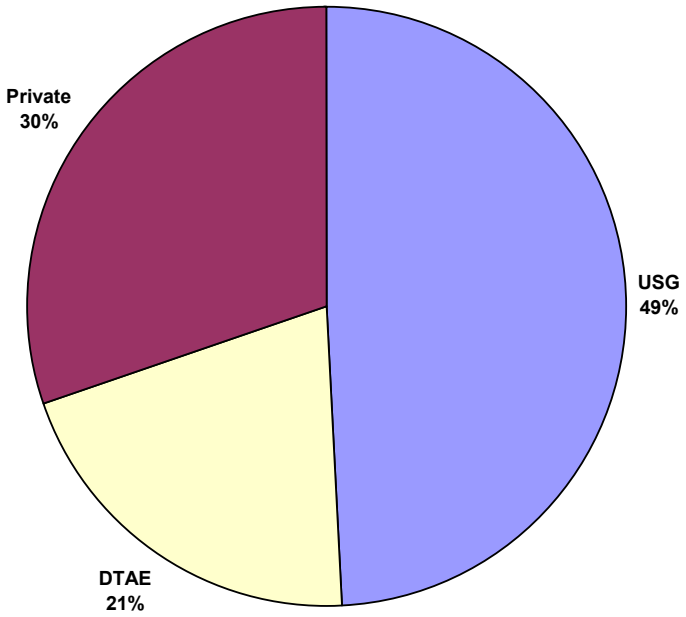
The USG is the major source of postsecondary graduates in the state. About half of all postsecondary institution graduates in Georgia were educated by a USG institution. (See Figure 3.1.) The USG also supplies roughly 60 percent of all graduates with associate's degrees. USG is even more important for bachelor's level and higher education. Two-thirds of all graduates with bachelor's, master's, doctoratal, and professional degrees came from a USG institution.

Figure 3.1. Nearly Half of All Higher Education Graduates Are from the University System of Georgia

Table 3.2. Number of Degree Graduates by Level and Type of Georgia Institution, Academic Year 2000.

	Number of Graduates				Percent of Graduates			
Degree Level	**USG**	**DTAE**	**Private**	**Total**	**USG**	**DTAE**	**Private**	**Total**
Awards of less than 1 academic year	47	6,370	2,970	9,387	0.5%	67.9%	31.6%	100%
Awards between 1 and 2 acad. yrs.	629	4,817	1,498	6,944	9.1%	69.4%	21.6%	100%
Associate's degrees	4,568	1,180	2,056	7,804	58.5%	15.1%	26.3%	100%
Awards between 2 and 4 acad. yrs.	-	2,190	257	2,447	0.0%	89.5%	10.5%	100%
Bachelor's degrees	20,271	-	8,950	29,221	69.4%		30.6%	100%
Postbaccalaureate certificates	8	-	34	42	19.0%		81.0%	100%
Master's degrees	7,083	-	3,327	10,410	68.0%		32.0%	100%
Post-Master's certificates	515	-	91	606	85.0%		15.0%	100%
Doctoral degrees	721	-	311	1,032	69.9%		30.1%	100%
First-professional degrees	767	-	1,781	2,548	30.1%		69.9%	100%
Total	**34,609**	**14,557**	**21,275**	**70,441**	**49.1%**	**20.7%**	**30.2%**	**100%**

Source: Georgia Tech's City Planning Program and Economic Development Institute, calculated from U.S. Department of Education IPEDS 2000 data.



The occupational supply analysis focuses on the data relating to the classification of instructional programs (CIP). The CIP represents all primary fields of study leading to degrees or certificates. There are nearly 900 such classifications.

Net Migration

As part of the shortfall forecasts, Georgia Tech researchers estimated the effects of net migration of talent into the state. Net migration, or the number of people moving into the state minus the number leaving the state, is an important factor in Georgia. During the April 1, 2000 to July 1, 2001 time period, Georgia ranked third among all 50 states in domestic net migration and eighth in international net migration.

The 2001 study showed that there are two types of migration. The first type consists of graduates of Georgia institutions who leave the state immediately after graduation. International or out-of-state students may go back to their home regions. Some students may remain in the state but leave the Georgia workforce for personal reasons. As a result, the first year sees a rather big loss. To estimate the size of this out-migration, researchers used an earlier data set that combines USG student data with Georgia Department of Labor workforce data. Seventy percent of the graduates from 1993-1997 were found in the 1998 workforce data. From this comparison, researchers calculated graduate loss rates by institution.

The second type of migration is slower and steadier. Smaller numbers of people drift in or out of the state over time or leave the Georgia workforce for personal reasons. The best source of state-to-state occupational migration data has been the U.S. Decennial Census and its resulting Public Use Microdata Sample (PUMS) data sets. These data sets were just released in the second quarter of 2003. To track Georgia's out-migrants, researchers analyzed data for each of the 50 states (plus Washington, D.C.) to find out who previously lived in Georgia. To track Georgia in-migrants, researchers simply processed the Georgia data. Based on this data, a net migration rate was calculated for each SOC in Georgia and applied to the employees in that SOC, resulting in the number of net migrants for each occupation.

The state has gained more workers than it has lost in nearly all occupational categories. The top five higher education-related occupations based on net migration are registered nurses, accountants and auditors, business operations specialists, elementary school teachers, and

computer support specialists. More than 800 employees in these five occupations combined are estimated to move to Georgia each year.

Crosswalk and Shortfalls

To link the major occupational and instructional classification information, a crosswalk translation database from the National Crosswalk Service Center (NCSC) was used. NCSC employs survey-based relationships to determine the links between graduates and their majors and occupations.

Georgia Tech researchers used the crosswalk to allocate graduates, net migrants, and occupational employees. Researchers applied the crosswalk across the entire spectrum of occupations, not just the university-educated subset. Thus, not all the graduates in the university CIPs map into the university occupations.

With graduates, net migrants, and occupational employees linked, a simple subtraction furnishes projected shortfalls.

Findings

Only 12 Higher Education-Related Occupations Have Sizable Annual Shortfalls

Table 3.3 shows that there are 12 higher education-related occupations with annual shortfalls of more than 100. The vast majority of occupations do not have significant shortfalls because their needs are filled either by USG or other postsecondary graduates or by in-migration. Most companies' needs for new employees will likely be met through 2010. Nevertheless, the shortfalls in these 12 occupations come to more than 3,000 unfilled positions annually.

Elementary school teachers represent the largest shortfall. Nearly 1,000 elementary school teacher jobs a year are projected to go unfilled. Even with more than 800 teachers coming into the state and nearly 800 graduating from postsecondary institutions, the shortage of elementary school teachers is projected to continue through 2010.

Four higher education health care occupations have significant shortfalls. Three are at the associate's degree level—registered nurses, medical records and health information technicians,

and medical and clinical laboratory technicians. There is also a shortage of pharmacists, who typically must have bachelor's degrees.

The biggest change from the 2001 study is that shortfalls in IT-related occupations are much smaller. The only IT-related occupations with a shortfall of more than 100 are computer software engineers for applications and systems software and computer systems analysts. This shortfall is still significant, but not as large as previously determined.

Education Occupations

Elementary school teachers were the only educational occupation with significant shortfalls. Because Georgia does not offer separate educational programs for kindergarten and elementary school, this analysis has grouped them together. The shortfall finding should be viewed as a joint kindergarten-elementary teacher annual shortfall.

Health Care Occupations

Shortfalls in health care occupations are a national, if not global, problem. Such is the case in Georgia. About 32 percent of health care jobs with university degree connections are projected to go unfilled. This represents an annual shortfall of more than 2,000 a year. (See Table 3.4.) Most significant is the shortfall of registered nurses, followed by pharmacists. There are also shortfalls in various physician specialties—particularly family and general practitioners, surgeons, dentists, and internists. Physician shortfalls may not cause serious problems because other states produce significant oversupplies that spill over into Georgia. Nevertheless, monitoring of the supply and demand of physicians should be continued to maintain the quality of health care in the state.

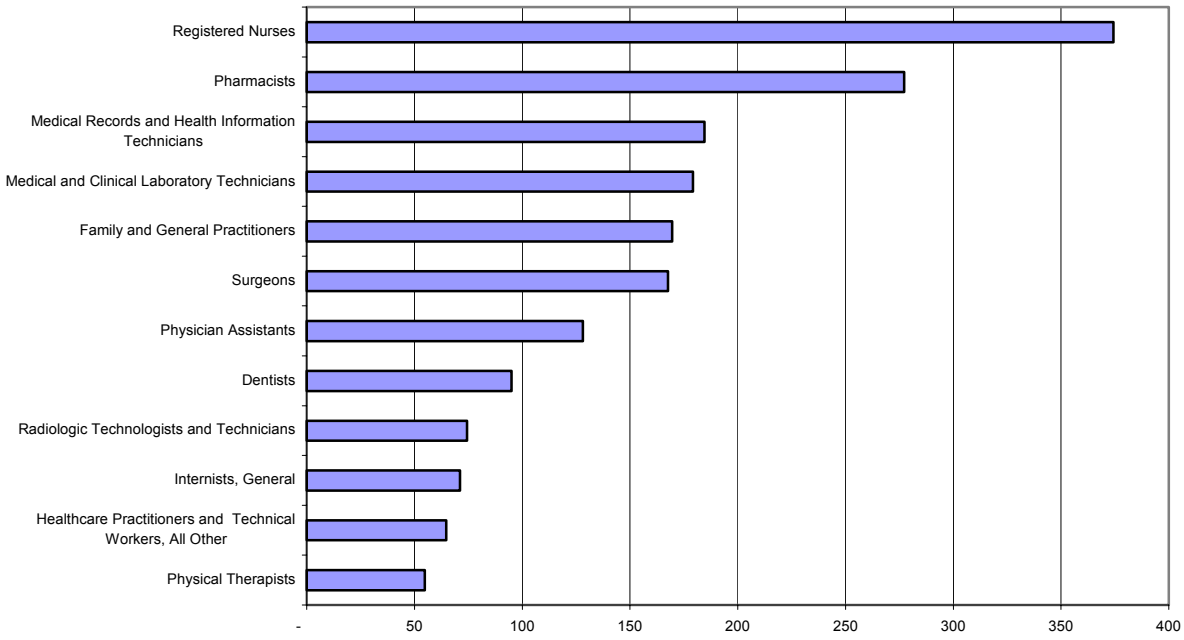
Table 3.3. Occupations With Statewide Shortfalls of More than 100 Annually Through 2010

Description	Openings	Graduates	Migration	Shortfall	Education Level
Elementary School Teachers, Except Special Education	2,590	783	836	971	Bachelor's degree
Computer Software Engineers,	710	32	281	397	Bachelor's degree

Applications					
Registered Nurses	2,920	1,528	1,018	374	Associate's degree
Business Operations Specialists, All Other	1,370	18	1,014	338	Bachelor's degree
Pharmacists	370	152	(59)	277	First professional degree
Property, Real Estate, and Community Association Managers	240	28	14	198	Bachelor's degree
Medical Records and Health Information Technicians	310	90	35	185	Associate's degree
Medical and Clinical Laboratory Technicians	260	41	40	179	Associate's degree
Computer Software Engineers, Systems Software	500	132	191	178	Bachelor's degree
Family and General Practitioners	430	170	90	170	First professional degree
Engineers, All Other	100	8	(57)	149	Bachelor's degree
Computer Systems Analysts	520	198	200	122	Bachelor's degree
Detectives and Criminal Investigators	120	5	10	105	Bachelor's degree

Source: Georgia Tech's City Planning Program and Economic Development Institute, calculated from U.S. Department of Education, Georgia Department of Labor, and U.S. Census Bureau data.

Figure 3.2. Health-Care Related Occupations with Annual Shortfalls of 50 or More



Bioscience Occupations

Georgia Tech researchers conducted a companion study of supply and demand in bioscience occupations. (Drummond and Youtie, 2003) State and national occupational employment forecasts call for long-term shortfalls in medical and clinical laboratory technician and technologist positions. However, current demand measures do not show a great shortage of medical and clinical laboratory technicians and technologists, and executive interviews even suggest that there are plenty of technicians for the number of available bioscience positions in Georgia today. Not all medical and clinical laboratory technicians will work in a bioscience company; most will work in health care services settings. Still, Georgia institutions do not offer programs that produce significant numbers of graduates for these positions. As a result, many of these technician-level positions in Georgia are probably being filled by workers receiving on-the-job training or moving from related occupations. Educators should track the relationship between demand for medical and clinical laboratory technicians and the supply of graduates through 2010 to assess when shortfalls dictate the need for increasing technician training resource allocation.

Also significant were concerns about the lack of experience of the state's bioscience graduates. Nine of 10 bioscience openings require industry-relevant experience. This is particularly true of research and management positions, which can require up to five or more years of experience. And although executives interviewed for this study mentioned having needs to fill positions in a diverse range of occupations (e.g., biostatistician, regulatory affairs, quality assurance), the common thread was the need for professionals with specialized experience in these positions. It was recommended that relevant corporate or government experience be incorporated into the existing curriculum in partnership with local industry, and that certificate programs be considered for executives.

Information Technology Occupations

Shortfalls in the information technology occupations have been significantly reduced since the 2001 study. There are still some shortfalls in certain information technology occupations, especially computer software engineers. Nevertheless, taking all information technology occupations together, the demand for these workers is nearly balanced with the supply. Almost half of all the information technology-related jobs come from in-migration of

out-of-state specialists, so it is important for the state to continue to monitor the relationship between supply and demand for these workers given their important role in economic development.

Limitations

These shortfall results should be interpreted in the context of limitations of the analysis. Demand projections are long-term forecasts, which cannot reflect short-term fluctuations in certain sectors (e.g., layoffs in the high-tech sector) or business changes that may make an occupation seem less attractive (e.g., managed care practices, which may have discouraged workers from taking health care positions). At the same time, these long-term forecasts can be influenced by the economic, demographic, technological, and policy circumstances that exist during the base year, which for this analysis was 2000.

The relationship between supply and demand is constrained by the way that postsecondary educational institutions categorize their major programs. For example, shortfalls may appear in a given occupation when in fact Georgia institutions are graduating students that could take jobs in this occupation, but their major area is coded in a category not typically linked to the occupation. Finally, students have the freedom to pursue certain jobs or majors because of reasons unrelated to the education-occupation link—wanting to live in a certain city, desire jobs with certain working conditions (e.g., those that offer telecommuting, casual clothes). For these reasons, common sense and industry review must be used in interpreting the shortfall findings.

Section 4

External and Internal Migration

The Importance of Migration

Migration of educated workers to Georgia is vital to the state's economy. The top 12 occupations with shortfalls of more than 100 a year would have had nearly double the shortfalls without in-migration. In many cases, the number of net migrants is a larger source of workers than are the graduates of all Georgia's higher educational institutions combined.

This section will examine two types of migration: (1) external migration from other states into Georgia, and (2) internal migration within Georgia.

External Migration

Approach

Will Georgia be able to continue its reliance on educated workers from other state's to fill jobs in critical occupations? The external migration analysis addresses this question by examining migration projections published by the U.S. Census Bureau through 2025. The Census Bureau has two population projection series. Series A bases its forecasts on historic migration. This series has traditionally been the most accurate predictor of state-to-state migration. Series B uses employment projections from the U.S. Bureau of Labor Statistics to drive its migration projections. Both series use the same method to account for births and deaths in the natural population. They differ only in the way they account for migration.

Findings

Georgia May Not Be Able to Rely on Migration to Fill Employment Needs

Even though Georgia is projected to retain its position among the top 10 states with the most in-migration, the state can expect fewer in-migrants in the future. (See Table 4.1.) According to Series A projections, Georgia's 2025 net migration will only be 30 percent of 2000 net migration levels. Series B projections indicate that the state's 2025 net migration will be only 76 percent of 2000 net migration levels. (See Figure 4.1.) In either case, Georgia will have fewer annual net migrants than it has in the past.

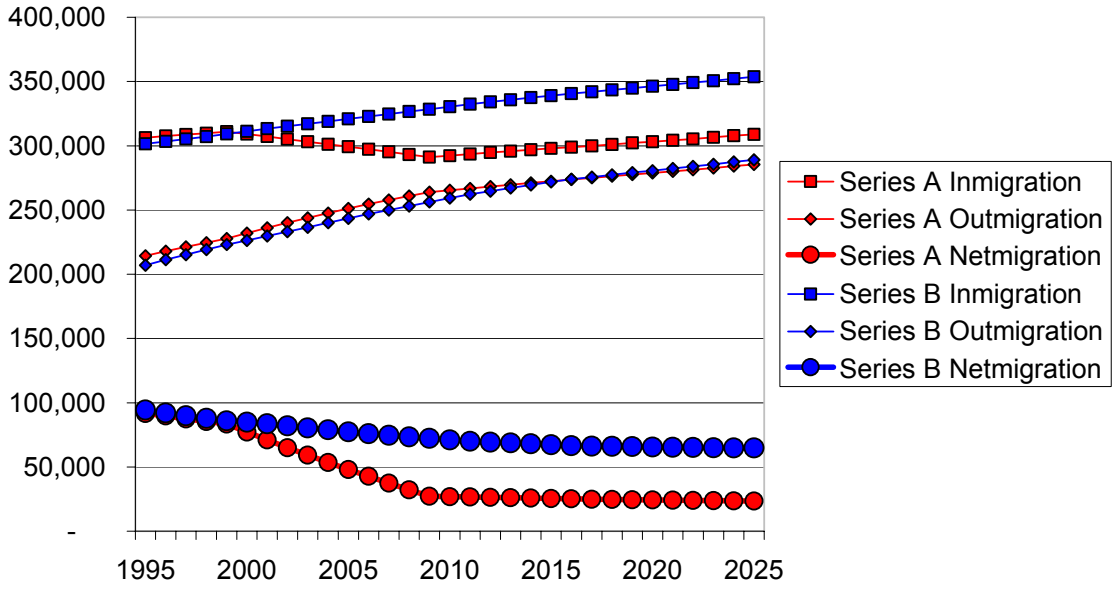
Table 4.1 Interstate Migration Projections, 1995 and 2025: Top 10 States Ranked by Migration Population

1995 Series A&B			2025 Series A (Historic Migration)			2025 Series B (Emp. Migration)		
Rank	State	Pop	Rank	State	Pop	Rank	State	Pop
1	California	31.6	1	California	49.3	1	California	41.5
2	Texas	18.7	2	Texas	27.2	2	Texas	28.2
3	New York	18.1	3	Florida	20.7	3	Florida	20.1
4	Florida	14.2	4	New York	19.8	4	New York	19.4
5	Pennsylvania	12.1	5	Illinois	13.4	5	Illinois	13.7
6	Illinois	11.8	6	Pennsylvania	12.7	6	Pennsylvania	12.9
7	Ohio	11.2	7	Ohio	11.7	7	Ohio	12.3
8	Michigan	9.5	8	Michigan	10.1	**8**	**Georgia**	**11.0**
9	New Jersey	7.9	**9**	**Georgia**	**9.9**	9	Michigan	10.4
10	**Georgia**	**7.2**	10	New Jersey	9.6	10	North Carolina	9.9

Population in millions and projections are for July 1. Series A and B reflect different interstate migration assumptions.

Source: U.S. Bureau of the Census, Population Division, PPL-47, table 1.

Figure 4.1. In-migration and Out-migration From 1995 to 2025: Series A and Series B Projections



In-migrants and Out-migrants – More Educated Than Continuous Residents

This potential migration problem is even more serious because in-migrants and out-migrants have higher education levels than do continuous residents of Georgia. Table 4.2 and Figure 4.2 present data from the 2000 census showing education levels for adults over 25 who enter Georgia, leave Georgia, and stay in the state. Fifteen percent of continuous residents have bachelor's degree or higher. But 25 percent of in-migrants and 29 percent of out-migrants hold bachelor's degrees.

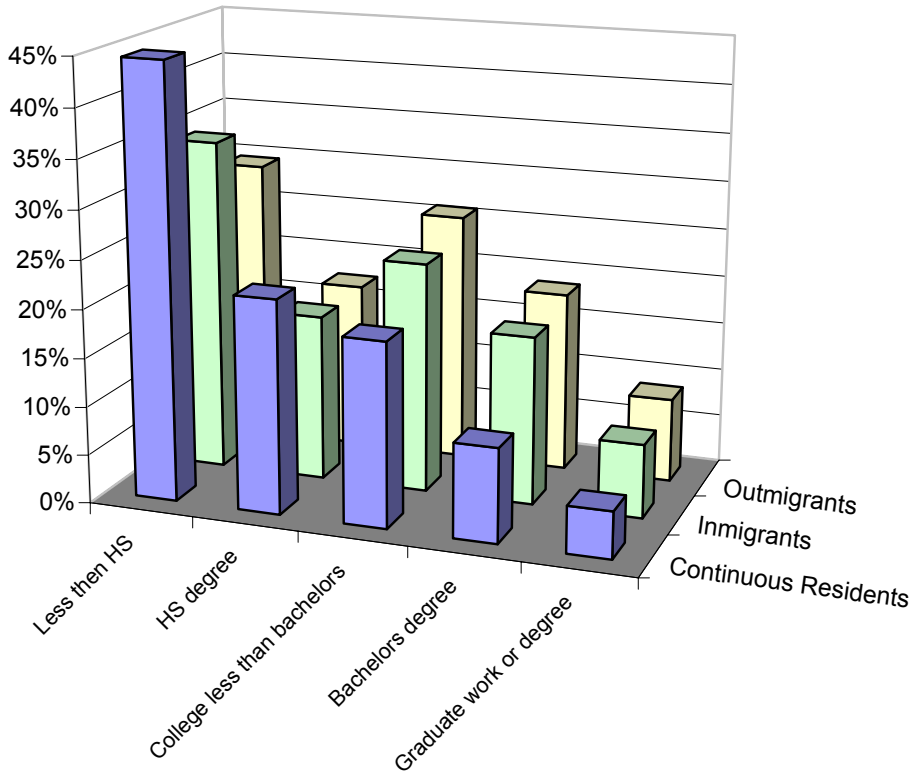
Both series show out-migration will increase, meaning that Georgia may lose a greater number of workers with higher education. Series A shows in-migration decreasing, so Georgia will have fewer of these highly educated in-migrants. Series B shows in-migration increasing, but not as rapidly as out-migration does. In either case, the net migration decline will have a particularly detrimental effect on the state's ability to fill higher education-related occupations.

Table 4.2. Levels of Education of Georgia Residents, In-migrants, and Out-migrants

Level of Education	Continuous Residents	In-migrants	Out-migrants	Continuous Residents	In-migrants	Out-migrants
Less then High School	3,110,905	413,406	188,767	45%	34%	29%
High School degree	1,535,412	206,422	111,156	22%	17%	17%
College less than bachelor's	1,323,601	285,503	165,222	19%	24%	26%
Bachelor's degree	674,882	208,775	119,325	10%	17%	19%
Graduate work or degree	335,416	91,704	55,560	5%	8%	9%
Total	6,980,216	1,205,810	640,030	100%	100%	100%

Population figures reflect all adults over 25 years old.
Source: Public Use Microdata Sample, 2000 Census.

Figure 4.2. Percentage of Georgia's Adult Population by Level of Education of Continuous Residents, In-migrants, and Out-migrants



Internal Migration

In addition to migration between states, the USG and its institutions are affected by intrastate migration. Intrastate migration raises questions such as:

- Are students more likely to go to school in a location near their home county?
- Are students more likely to work in a location near their home counties?
- Are students more likely to work in a location near their educational institution?
- How local is the draw area for different types of USG institutions?
- By adding a new institution to a new location, or by changing the type of an existing institution, how would the systemwide distribution of students change?
- By adding a new institution to a new location, how many more graduates would be likely to stay to work in the area?

Method

One of the best ways to address internal migration is by following graduates of USG institutions into their first jobs. By matching the USG's student database to the Georgia Department of Labor's (DOL) employment database, it is possible to track each individual student from home county, to institution, to work county. The first matching effort involved linking USG graduates during the 1993-1997 academic years to the DOL 1998 employment security database.[1] Some 80,000 individual students were located in the employment database, which provides a rich foundation to build models of intra-state migration.

The basic statistical-geographical model utilized for this analysis is the gravity model. A gravity model is much like Newton's discovery that gravitation attraction between two bodies is a function of the size of the bodies and distance between them.[2]

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[1]For the last two years, this research team has worked with the Board of Regents staff to procure an updated version of this dataset that would include employment information for 1998 to 2002. The updated dataset could not be secured in time for inclusion in this study. Thus, the models presented in this section are based upon the original 1998 dataset. Although these models make sense and show much promise, before any policy decisions can be based on them it will be necessary to develop a more robust, multi-year dataset.

[2] In a typical social science application of the gravity model, the number of employees working in one location and living in a second location is equal to

$$C * emp^{\alpha} * pop^{\beta} / d^{\gamma}$$

where C is a constant, emp is the number of employees in the first location, pop is the population at the second location, and d is the distance between the locations. The parameters α, β, and γ can be understood as weights, with

To understand the student migration model, assume a high school student lived in Columbus, attended college at Statesboro, then after graduation worked in Savannah. Figure 4.3 shows the "flow" path of that student. The magnitude of this flow will be larger when the number of students in the home county is larger, the size of the institution is larger, and the size of the workforce in the work county is larger. The flow will decrease the longer the home county-school county distance, and the longer the school county-work county distance.

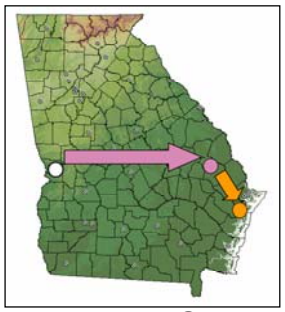

Figure 4.3. Student Flow Path: Home, School, Work

There is a third factor. We would expect that the distance between the student's home county and work county would also be important. Because of familiarity and contacts generated through family and friends, a student might be more likely to work in a county near to his or her home county. (See Figure 4.4.)

Wages are an important fourth factor. Locations with higher wages are likely to offer an additional attraction to graduates seeking work in certain locations across the state. The model also accounts for instances where home and work counties are identical or adjacent.[3]

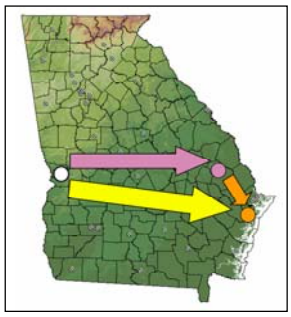

Figure 4.4. Flow Path of Student Working Near Home County

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larger parameter values giving more weight to that factor, and smaller (nearer to 0) weights giving less weight.

[3] The model can be written as

Flow = $C * hgrads^{\alpha} * sgrads^{\beta} * wgrads^{\gamma} * hstime^{\delta} * hwtime^{\varepsilon} * swtime^{\zeta}$

Instead of dividing by the distances, researchers rewrite the model in multiplicative terms, and expect that the final three parameters will be negative.

For each home county-school county-work county flow, researchers know the hgrads (the number of USG students from a county), the sgrads (the number of students at the school), the wgrads (the number of workers found in the work county), the hstime (home-school travel time in hours), the hwtime (home-work travel time in hours), and the swtime (school-work travel time in hours). By taking the natural log of both sides of the flow equation above, the equation is transformed into

$lflow = lC + \alpha*lhgrads + \beta*lsgrads + \gamma*lwgrads + \delta*lhstime + \varepsilon*lhwtime + \zeta*lswtime$

The six parameters (and constant) of this equation can then be estimated by multiple regression.

There are seven other control variables added to the equation, including

lewage: natural log of the expected wage in the work county

hwsame: 1 if the home county and work county are the same, 0 otherwise

hwadj2: 1 if the home county and work county are adjacent, 0 otherwise

Findings

Detailed regression results for this model can be found in Appendix 1. Figure 4.5 shows the model parameters (for the systemwide model) superimposed over the Columbus-Statesboro-Savannah example. The red parameters show that the size of the institution and the size of a county's workforce are equal, with less importance for the number of students coming from the home county. The blue numbers show the distance effects. If any of these were zero, it would mean that distance has no effect on the flow of graduates. The home-work distance is the most important distance factor (-.46), with the home-school the next most important (-.33), and the school-work the least important of the three (-.18). Yet it should be noted that the location of the school does have some influence on USG graduates' work location decisions. The school-work factor is statistically significant and not zero. The county from which a student comes still has more influence on where a student works, however.

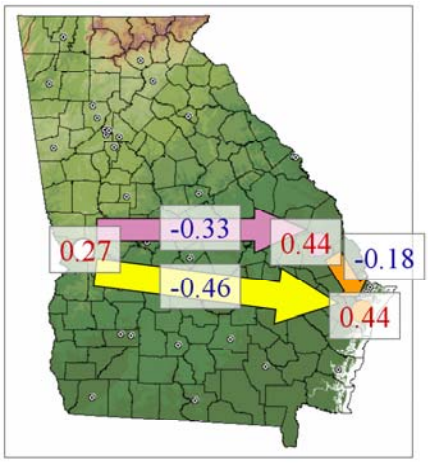

Figure 4.5. Model Results: Home, School, Work Flow Path Weights

Overall, we found that the location of a USG institution significantly affects the locational behavior of USG graduates.

- A 10 percent increase in the size of the home county student population (whose parameter is 0.27) produces a 2.7 percent increase in the flow of students from that county to that institution.
- A 10 percent increase in institution size produces a 4.4 percent increase in the flow of students to that institution.
- A 10 percent increase in a county's college graduate workforce generates a 4.4 percent increase in the flow of students to that county.
- A 10 percent increase in the distance between home and school decreases the flow of students by 3.3 percent.

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hssame: 1 if the home county and school county are the same, 0 otherwise
hsadj2: 1 if the home county and school county are adjacent, 0 otherwise
swsame: 1 if the school county and work county are the same, 0 otherwise

- A 10 percent increase in the distance between school and work decreases the flow of students by 1.8 percent.

The model also found that a 10 percent increase in wages in a county means that 10.5 percent more graduates would flow to that area. There is an extra likelihood that students will attend an institution in their home (or adjacent) county, return to their home (or adjacent to home) county to work, or work in the same county where they attended college.

In addition to the overall model, researchers conducted special analyses of four types of USG institutions: research institutions, other four-year institutions, two-year institutions, and historically black institutions. First, the model indicates that graduates of the research institutions are less sensitive to changes in wages than graduates of the other types of institutions. For research institution graduates, a 10 percent increase in wages produces only a 2.5 percent increase in graduates taking positions. Second, more two-year students come from the school's county and adjacent counties relative to other types of institutions. Third, graduates of historically black institutions have a greater tendency than other types of institutions to stay in the local area after graduation.

Finally, an examination of the distance parameters yields several interesting findings. The home-school distance is especially important for the historically black institutions (parameter of -0.81). These students are very sensitive to distance and tend not to travel far from their home counties to attend school. It is not surprising that students at research universities are least sensitive (-0.24) to home-school distance. The home-work distance factor is reversed: it has little effect on students at historically black institutions (-0.01), and the most effect (-0.55) on students at research institutions. The latter may be due to the tendency of research universities to be located in large urban areas, where many students come from and where many jobs exist

swadj2: 1 if the school county and work county are adjacent, 0 otherwise

Conclusions

Georgia may not be able to rely on an ever-increasing stream of educated in-migrants to fill important occupational categories in the future. USG should track net migration, especially by education and occupation, to assess if and when decreasing in-migration into the state impacts critical university-related occupations.

At the same time, attention must also be paid to intrastate migration. A gravity model found that the location of USG institutions has a significant effect on the internal flow of graduates in the state. The distance between home and school is important, particularly to graduates of two-year and historically black institutions. Graduates are more likely to work in the local area after graduation, especially graduates of research universities. Also the size of the pool of graduates has a significant effect on intrastate migration. The USG should pay attention to the effect of its institutions on the distribution of graduates and potential workers in various regions across the state.

Section 5

Economic Value of USG Students: A Wage-Based Analysis

There are many ways to portray the economic impact of higher education. While educational institutions generate significant value from expenditures and capital projects, higher education's most compelling impact on the state's economy may be its influence on the earnings of its students.

This analysis will answer the question: "In economic terms, what is the value of our graduates to the state of Georgia?" There are many personal and social benefits to higher education, but this analysis will be restricted to estimating the economic benefits of USG graduates to the state of Georgia.

Method

The most accurate way to determine the economic worth of higher education would be to estimate what a person's earnings would have been without higher education. Ideally the analysis would include statistical controls for personal characteristics such as intelligence, energy, and creativity, then estimate the increment of earnings due to additional education, holding the control variables constant. Yet such variables are difficult to measure and extraordinarily expensive to obtain.

Instead, this report presents a modification of the U.S. Census Bureau's study "The Big Payoff" (Day and Newburger, 2002). It assumes that the economic value of higher education can be estimated by comparing the earnings of high school graduates to the earnings of those completing, two-year, four-year, and graduate degrees. The (presumably) positive increment of earnings is assumed to be the value of higher education.

The basic data source for this analysis is the matched database of 1993-97 USG graduates and 1998 Georgia Department of Labor worker records referenced in the previous section. To estimate wages for full-time workers more accurately, the analysis is restricted to those earning $10,000 or more in 1998, producing a dataset of 83,329 individual graduates.

There is one significant difficulty with this approach. The matched graduate-worker dataset only contains information on those completing degrees; there is no information on persons graduating from high school and not completing a USG degree. Fortunately, we can overcome this difficulty by using the recently released PUMS dataset from the U.S. Census

Bureau. The PUMS data contains a 1 percent sample of the Georgia population, and includes a weight factor that allows data aggregations to reflect the population as a whole. Because it is microdata (individual records without any identifying information), researchers can create any type of cross-tabulation and are not restricted to the tables published by the Census Bureau.

Table 5.1 was produced from the PUMS dataset (excluding those earning more than $10,000 per year), and shows the relationship between education and earnings for those aged 21-30 (the approximate age range of those included in the graduate-worker matched dataset). Table 5.2 contains similar estimates for the graduate-worker dataset. In Table 5.2, an estimated earnings value of $22,000 for high school graduates produces similar ratios of higher education values, and matches exactly the earnings ratio for bachelor's degrees to high school graduates.

Table 5.1: Earnings by Education Level from Census PUMS Data

Level of Education	1999 Earnings	Percent of Earnings Due to Higher Education
No schooling completed	$ 19,960	
Nursery school to 4th grade	22,941	
5th grade or 6th grade	18,161	
7th grade or 8th grade	19,280	
9th grade	21,977	
10th grade	21,445	
11th grade	21,522	
12th grade, no diploma	20,758	
High school graduate	24,012	0%
Some college, but less than 1 year	25,354	5%
One or more years of college, no degree	25,619	6%
Associate's degree	28,593	16%
Bachelor's degree	36,429	34%
Master's degree	39,772	40%
Professional degree	48,869	51%
Doctoral degree	44,412	46%

Source: U.S. Census Bureau, Public Use Microdata Sample, 2003.

Table 5.2 Earnings Due to Higher Education by Education Level

Level of Education	1998 Earnings	Percent of Earnings due to Higher Education
High School Graduate (estimated)	$22,000	0%
Certificate	29,585	26%
Bachelor's	33,261	34%
Master's	43,567	50%
Professional	54,796	60%
Doctoral	53,883	59%

Source: USG-Georgia Department of Labor matched dataset, 1998.

The wage analysis estimates incremental earnings due to higher education by applying the percentages in the second table to the earnings reported in the graduate-worker matched dataset. These estimates calculate the economic value of recent graduates (1993-1997) for the 1998 Georgia economy. In general, the incremental percentage of earnings due to higher education increases as educational levels increase. Higher education accounts for only 16 percent of the earnings of an associate's degree graduate, but up to 60 percent of the earnings of a graduate with a professional degree such as law or medicine.

Findings: Total Economic Impact of USG in 1998 – Nearly $1.25 Billion

The USG's total economic impact on the Georgia economy in 1998 was nearly $1.25 billion. The average value of a USG education to its roughly 90,000 graduates was just under $14,000 per graduate. Table 5.3 presents the economic impact of higher education on recent graduates of USG institutions. Based on total impact, the top two institutions are Georgia State University and University of Georgia, each representing a total economic impact from higher education of more than $200 million apiece, followed by the Georgia Institute of Technology with a total economic impact of more than $100 million. On a per graduate basis, Medical College of Georgia, Georgia Institute of Technology, and Georgia State University had the highest economic impacts of more than $18,000 per graduate.

Institutional rankings depend on the types of instructional programs offered. Appendix 2

presents the 1998 economic impact of higher education on recent graduates for the top 10 most lucrative instructional programs based on total and average values. The top program in terms of total impact is business administration, followed by nursing and teaching. This ranking reflects the large numbers of students who graduate with these majors. The three top programs with the greatest average values are the professional degrees—dentistry, medicine, and law.

Table 5.3: 1998 Economic Impact of Higher Education by Institution

Institution	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
Georgia State University	11767	$ 499,691,357	$ 217,838,198	$ 42,465	$ 18,513
University of Georgia	14383	518,041,561	211,175,465	36,018	14,682
Georgia Institute of Technology	5472	254,639,260	101,895,959	46,535	18,621
State University of West Georgia	5250	189,640,420	83,267,303	36,122	15,860
Georgia Southern Univ.	6550	211,194,146	83,101,150	32,243	12,687
Kennesaw State University	4198	164,604,740	62,562,811	39,210	14,903
Valdosta State University	4287	132,613,463	53,597,070	30,934	12,502
Georgia College & State Univ.	3139	100,252,797	39,595,895	31,938	12,614
Southern Polytechnic State Universit	1912	86,888,370	32,569,378	45,444	17,034
Medical College of Georgia	1517	66,002,953	29,372,187	43,509	19,362
Columbus State University	2254	74,191,454	26,964,491	32,915	11,963
North Georgia College & State Univ.	2076	66,779,215	25,254,200	32,167	12,165
Georgia Southwestern Univ.	1724	55,394,110	21,903,950	32,131	12,705
Augusta State University	1603	52,722,323	20,357,182	32,890	12,699
Georgia Perimeter College	2155	70,770,481	18,400,325	32,840	8,538
Clayton College & State Univ.	1829	60,485,718	17,500,668	33,070	9,568
Armstrong Atlantic State Univ.	1668	50,959,709	16,533,367	30,551	9,912
Albany State University	1034	32,890,689	13,285,723	31,809	12,849
Fort Valley State Univ.	918	26,845,393	10,957,098	29,243	11,936
Macon State College	1078	32,080,474	8,340,923	29,759	7,737
Abraham Baldwin Agricultural College	980	27,023,427	7,026,091	27,575	7,169
Gainesville College	937	25,882,630	6,729,484	27,623	7,182
Darton College	908	25,852,419	6,721,629	28,472	7,403
Floyd College	795	23,230,795	6,040,007	29,221	7,597
Dalton State College	828	22,987,175	5,976,666	27,762	7,218
Gordon College	759	21,037,987	5,469,877	27,718	7,207
Savannah State University	543	14,559,252	4,999,921	26,813	9,208
Coastal Georgia Community College	596	17,239,011	4,482,143	28,925	7,520
South Georgia College	565	16,155,240	4,200,362	28,593	7,434
Middle Georgia College	587	16,100,461	4,186,120	27,428	7,131
Atlanta Metropolitan College	320	8,510,189	2,212,649	26,594	6,915
Bainbridge College	324	7,948,270	2,066,550	24,532	6,378
Waycross College	201	5,025,167	1,306,543	25,001	6,500
East Georgia College	172	3,774,976	981,494	21,948	5,706
Statewide	89,652	$ 3,234,142,486	$ 1,249,963,035	$ 36,074	$ 13,942

Table 5.4 Top 10 Programs with the Greatest Total Economic Impact in 1998 Based on Educational Value

Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
Business Administration & Mgmt., Gen.	4,609	$ 205,509,260	$ 83,642,480	$ 44,589	$ 18,148
Nursing (R.N. Training)	6,764	227,611,427	68,304,553	33,650	10,098
Pre-Elem/Erly Childhd/KG. Teach Educ	4,518	134,137,737	55,144,047	29,690	12,205
Jr High/Intermed/Middle Sch Teach Educ	3,435	113,259,285	49,656,280	32,972	14,456
Liberal Arts & Sciences/Liberal Studies	6,684	186,231,485	48,469,272	27,862	7,252
Accounting	2,892	104,386,812	37,112,341	36,095	12,833
Computer and Information Sciences, Gen.	1,865	92,872,771	36,214,314	49,798	19,418
Education Admin. & Supervision, Gen.	1,300	70,044,392	35,699,158	53,880	27,461
Law (LL.B., J.D.)	1,000	52,503,545	31,492,540	52,504	31,493
Business, General	1,432	69,576,826	31,020,608	48,587	21,662

Table 5.5 Top 10 Programs with the Greatest Average Economic Impact in 1998 Based on Educational Value

Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
Dentistry (D.D.S., D.M.D.)	77	$ 5,953,818	$ 3,572,291	$ 77,322	$ 46,393
Medicine (M.D.)	321	20,050,938	12,030,563	62,464	37,478
Law (LL.B., J.D.)	1,000	52,503,545	31,492,540	52,504	31,493
Education Admin. & Supervision, Gen.	1,300	70,044,392	35,699,158	53,880	27,461
Health System/Health Services Admin.	80	4,180,731	2,090,365	52,259	26,130
Taxation	132	6,892,631	3,446,316	52,217	26,108
Veterinary Medicine (D.V.M.)	140	6,006,569	3,603,941	42,904	25,742
Enterprise Management & Operation, Gen.	168	8,929,459	4,252,463	53,152	25,312
Adult and Continuing Teacher Education	172	8,221,165	4,297,671	47,797	24,986
Nursing, Other	100	4,831,923	2,473,403	48,319	24,734

Figure 5.1 maps the total economic impact in millions of dollars, and Figure 5.2 maps the average impact per USG graduate. **In 93 counties across the state, the USG had a per-county economic impact of more than $1 million in 1998.** USG's impact was more than $10 million in 17 counties, mostly in Atlanta and Georgia's mid-sized cities. (See Appendix 3 for a listing of impacts by county.)

It is important to remember that this impact is only for one year's worth of benefits (1998) to a single graduate cohort (1993 to 1997 graduates). A more complete cost-benefit analysis would extend these benefits over a full 40-year career. Benefits thus could be as large as 40 times the total impact indicated in this report.

Figure 5.1: Economic Impact by County (in Millions of Dollars)

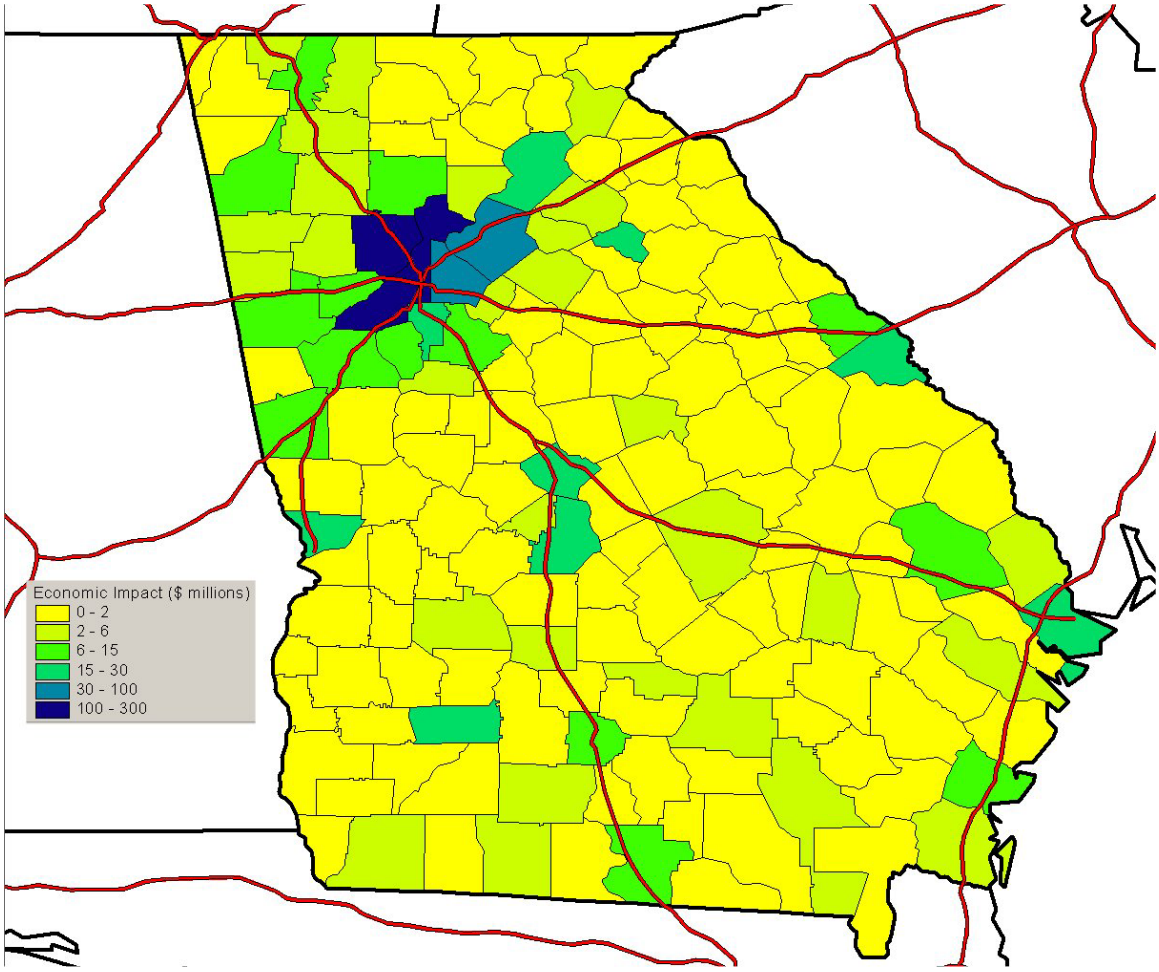
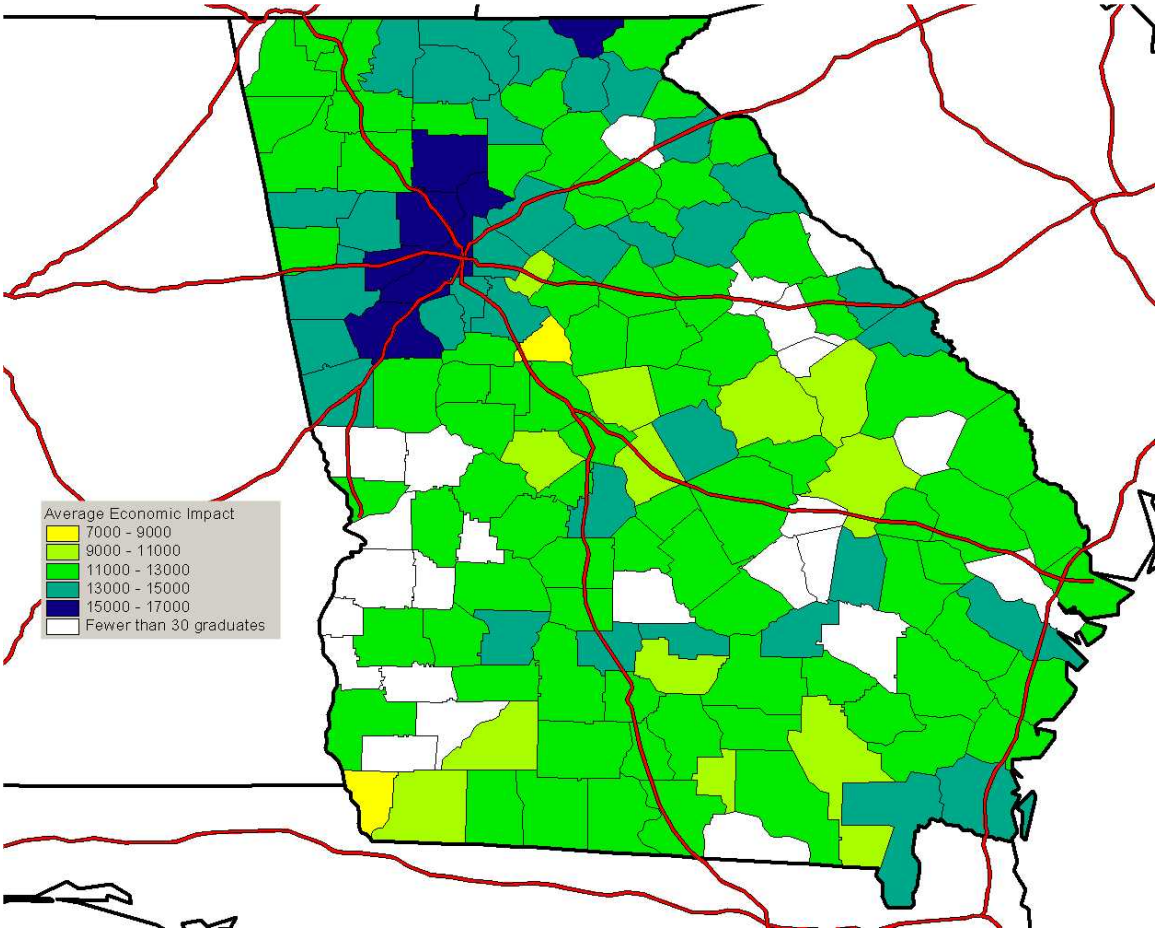


Figure 5.2: Average Economic Impact per Graduate (in Dollars)



Conclusion

Drawing on the methodology developed by the U.S. Census Bureau in its study, "The Big Payoff," this analysis has shown that graduating from a USG institution pays off. Not only did it pay off to the average graduate in the 1993 to 1997 time period, to the tune of about $14,000 in 1998, but more significantly it paid off to the state as a whole, by nearly $1.25 billion. It also paid off to 93 counties, each of which benefited by more than $1 million from USG graduates. These impacts reflect only a single year (1998) in the careers of a five-year (1993-1997)

graduate cohort. The total benefits could be as much as 40 times higher over this cohort's full work-life.

Section 6

Future Directions

This report has examined the value of a USG education from three perspectives: (1) filling jobs in high demand occupations, (2) impacting the migration of graduates within the state, and (3) demonstrating the economic impact of USG education on the state's 1998 economy. The demand-based shortfall analysis continues USG's tradition of monitoring needs for talent in high-demand occupations requiring university education. It shows that the state faces significant health care shortfalls, along with shortages of elementary school teaching and selected IT positions, a situation which calls for a central role for the USG. The migration study introduced new techniques for examining critical issues. The migration analysis presented projections of declining in-migration of educated workers from other states into Georgia through 2025. This finding suggests that close attention should be paid to the needs of high-demand occupations and the extent to which the state must step up to fill employment gaps caused by reduced numbers of in-migrants. This report also introduced new techniques for showing the vital role that USG plays in the state's economy based on educational attainment and wages.

These analyses should be continued in several future directions. First, the regional shortfall analysis should be updated as new projections become available from the Georgia Department of Labor. Sub-state regional projections are due to be updated in the coming year.

Second, the USG should initiate another round of matching of its graduates with Georgia Department of Labor employment security data for multiple years beyond 1998. This larger database would enable an updated tracking of USG graduates and facilitate a more complete understanding of the impact of particular USG institutions on intrastate migration.

Third, the wage-based economic analysis presented in this report should be extended to a full wage benefit-cost analysis. This benefit-cost analysis should incorporate resident instruction expenditures and be applied to all graduates (not just the most recent ones). Such an analysis would show the extent to which the full benefits of higher education compare to the costs of providing this education. In tight economic times, such information can be particularly worthwhile in demonstrating the value of higher education.

Section 7

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Appendix 1

Intrastate Migration Model

The following table shows the models estimated for all students at all institutions, then four additional models that separately estimate parameters for four-year institutions, historically black institutions, research institutions, and two-year institutions. The dependent variable is the home county-school county-work county flow of students (with all flows below 5 omitted), weighted by the size of the flow.

	Variable	All USG Institutions	Four Year Inst.	Hist. Black Inst.	Research Inst.	Two Year Inst.
	(Constant)	-6.10 ***	-5.02 ***	-10.10 ***	-14.45 ***	-5.39 ***
1	LHGRADS	0.27 ***	0.14 ***	0.22 ***	0.55 ***	0.05 ***
	LSGRADS	0.44 ***	0.41 ***	0.91 ***	0.90 ***	0.51 ***
	LWGRADS	0.44 ***	0.43 ***	0.49 ***	0.55 ***	0.42 ***
2	LEWAGE	1.05 ***	0.79 ***	1.02 ***	0.25 ***	0.80 ***
3	LHWTIME	-0.33 ***	-0.16 ***	-0.01 ***	-0.55 ***	-0.26 ***
	LHSTIME	-0.46 ***	-0.33 ***	-0.81 ***	-0.24 ***	0.51 ***
	LSWTIME	-0.18 ***	-0.39 ***	0.29 ***	-0.23 ***	-0.22 ***
4	HWSAME	1.59 ***	1.99 ***	1.54 ***	1.04 ***	1.41 ***
	HWADJ2	0.58 ***	0.58 ***	0.21 ***	0.39 ***	0.29 ***
5	HSSAME	0.49 ***	0.85 ***	-0.03	0.28 ***	2.16 ***
	HSADJ2	0.10 ***	0.02	-0.71	0.19 ***	1.14 ***
6	SWSAME	0.27 ***	0.01	1.84 ***	0.14 ***	0.51 ***
	SWADJ2	-0.15 ***	-0.10 ***	1.33 ***	-0.23 ***	0.19 ***
	Adj R Square	0.77	0.79	0.91	0.86	0.80
	N	80,440	36,661	2,089	31,376	10,321

*** Parameter is significant at the .001 level of significance.

LFLOW	natural log of the flow of students from home county to school county to work county	(number of students flowing over this home-school-work path)
LHGRADS	natural log of the number of USG graduates from the home county	(size of sending population from home county)
LSGRADS	natural log of the number of students at the institution	(size of institution)
LWGRADS	natural log of the number of USG graduates found working in the county	(size of employment in work county)
LEWAGE	natural log of USG graduate wages in the working county	(wages)
LHWTIME	natural log of home county-work county travel time	(home-work distance)
LHSTIME	natural log of home county-school county travel time	(home-school distance)
LSWTIME	natural log of school county-work county travel time	(school-work distance)
HWSAME	home county and work county are the same	(home-work local effect)
HWADJ2	home county and work county are adjacent	(home-work regional effect)
HSSAME	home county and school county are the same	(home-school local effect)
HSADJ2	home county and school county are adjacent	(home-school regional effect)
SWSAME	school county and work county are the same	(school-work local effect)
SWADJ2	school county and work county are adjacent	(school-work regional effect)

Due to the multiplicative nature of the gravity model, the regression parameters involving natural logarithms can be interpreted as elasticities. An elasticity of 1.0 means that a 10 percent increase in the value of an independent variable produces a 10 percent increase (or decrease, if the parameter sign is negative) in the value of the dependent variable.

Appendix 2

Economic Impact of Higher Education by CIP

Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
Agricultural Business/Agribusiness Oper.	32	$ 1,144,736	$ 380,444	$ 35,773	$ 11,889
Agricultural Economics	102	3,195,829	1,116,054	31,332	10,942
Horticulture Svcs. Ops. and Mgmt., Gen.	144	3,732,228	1,117,734	25,918	7,762
Animal Sciences, General	75	2,310,407	812,549	30,805	10,834
Poultry Science	45	1,433,299	545,653	31,851	12,126
Food Sciences and Tech.	36	1,122,934	493,008	31,193	13,695
Agronomy and Crop Science	29	926,021	373,571	31,932	12,882
Forest Harvesting and Production Tech.	60	1,672,422	434,830	27,874	7,247
Forestry, General	183	5,870,401	2,239,956	32,079	12,240
Wildlife and Wildlands Management	69	1,667,671	449,517	24,169	6,515
Architecture	331	11,774,151	4,776,348	35,571	14,430
City/Urban, Community & Reg. Planning	60	2,338,792	1,169,396	38,980	19,490
Landscape Architecture	155	4,779,397	1,746,304	30,835	11,266
Fashion Merchandising	56	1,555,020	528,707	27,768	9,441
Gen. Retail & Whlsale Opns. & Skills,Oth	268	10,128,172	3,443,578	37,792	12,849
Marketing Opns/Market. & Distrib.,Oth	42	1,192,645	405,499	28,396	9,655
Communications, General	504	16,047,691	5,590,646	31,841	11,093
Advertising	180	5,640,928	1,917,915	31,338	10,655
Journalism	476	14,211,295	4,919,586	29,856	10,335
Broadcast Journalism	42	1,364,348	455,499	32,484	10,845
Mass Communications	44	1,338,011	680,604	30,409	15,468
Public Relations & Organizational Comm.	170	5,066,615	1,722,649	29,804	10,133
Radio and Television Broadcasting Tech.	146	4,605,523	1,565,878	31,545	10,725
Computer and Information Sciences, Gen.	1,865	92,872,771	36,214,314	49,798	19,418
Information Sciences and Systems	346	15,826,961	5,446,664	45,743	15,742
Education Admin. & Supervision, Gen.	1,300	70,044,392	35,699,158	53,880	27,461
Educational Supervision	352	16,863,348	8,482,213	47,907	24,097
Educational/Instructional Media Design	433	17,512,253	8,804,345	40,444	20,333
Educ. Assessment, Testing & Measurement	100	3,759,265	1,879,633	37,593	18,796
Educational Psychology	158	5,216,441	2,389,460	33,015	15,123
Special Education, General	1,119	34,305,509	14,635,394	30,657	13,079
Education of the Deaf & Hearing Impaired	61	1,976,960	749,431	32,409	12,286
Education of the Emotionally Handicapped	228	8,433,552	4,231,309	36,989	18,558
Education of the Mentally Handicapped	414	13,687,896	5,860,177	33,063	14,155
Education of the Multiple Handicapped	57	2,077,498	1,038,749	36,447	18,224
Education of the Physically Handicapped	211	7,747,488	3,873,744	36,718	18,359
Educ. of the Specific Learning Disabled	205	7,804,915	3,902,457	38,073	19,036
Education of the Speech Impaired	65	1,735,740	764,128	26,704	11,756
Counselor Educ. Counseling & Guid. Svc.	1,226	43,860,696	22,010,070	35,775	17,953
Adult and Continuing Teacher Education	172	8,221,165	4,297,671	47,797	24,986
Elementary Teacher Education	1,894	61,276,872	26,300,006	32,353	13,886

CIP	Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
13.1203	Jr High/Intermed/Middle Sch Teach Educ	3,435	113,259,285	49,656,280	32,972	14,456
13.1204	Pre-Elem/Erly Childhd/KG. Teach Educ	4,518	134,137,737	55,144,047	29,690	12,205
13.1205	Secondary Teacher Education	299	9,447,384	4,001,975	31,597	13,385
13.1301	Agricultural Teacher Educ (Vocational)	67	2,527,598	1,101,440	37,725	16,439
13.1302	Art Teacher Education	227	6,824,167	2,797,164	30,062	12,322
13.1303	Business Teacher Education (Vocational)	324	11,302,748	5,026,755	34,885	15,515
13.1305	English Teacher Education	474	16,085,303	7,253,074	33,935	15,302
13.1306	Foreign Languages Teacher Education	118	3,871,376	1,680,655	32,808	14,243
13.1307	Health Teacher Education	160	4,873,588	1,884,212	30,460	11,776
13.1308	Home Economics Teacher Educ (Vocational)	86	2,877,947	1,266,123	33,465	14,722
13.1309	Technology/Industrial Arts Teacher Educ.	187	7,061,956	2,830,419	37,764	15,136
13.131	Mkt. Op./Mkt. & Distrib. Teacher Educ.	27	1,206,617	465,641	44,690	17,246
13.1311	Mathematics Teacher Education	577	21,143,382	9,912,378	36,644	17,179
13.1312	Music Teacher Education	270	8,243,489	3,369,426	30,531	12,479
13.1314	Physical Education Teaching and Coaching	1,141	36,450,262	14,752,130	31,946	12,929
13.1315	Reading Teacher Education	155	6,018,182	3,036,194	38,827	19,588
13.1316	Science Teacher Education, General	332	12,427,992	5,987,285	37,434	18,034
13.1317	Social Science Teacher Education	380	11,933,392	4,909,756	31,404	12,920
13.1318	Social Studies Teacher Education	151	5,599,220	2,516,581	37,081	16,666
13.1319	Technical Teacher Education (Vocational)	103	4,719,949	2,476,143	45,825	24,040
13.132	Trade & Industrial Teacher Educ. (Voc)	98	5,237,002	2,416,346	53,439	24,657
13.133	Spanish Language Teacher Education	35	1,007,320	443,950	28,781	12,684
13.1401	Teaching ESL/Foreign Language	37	1,292,462	646,231	34,931	17,466
13.9999	Education, Other	117	4,290,560	2,163,080	36,671	18,488
14.0201	Aerospace, Aeronautical and Astronautic	105	5,199,631	2,307,421	49,520	21,975
14.0301	Agricultural Engineering	60	2,364,553	825,416	39,409	13,757
14.0701	Chemical Engineering	182	7,704,471	2,791,399	42,332	15,337
14.0801	Civil Engineering, General	507	21,031,503	8,562,128	41,482	16,888
14.0901	Computer Engineering	80	4,301,743	1,462,593	53,772	18,282
14.1001	Electrical, Electronics & Communication	810	42,491,892	17,313,852	52,459	21,375
14.1401	Environmental/Environmental Health Engin	33	1,586,508	793,254	48,076	24,038
14.1701	Industrial/Manufacturing Engineering	715	34,596,614	12,817,671	48,387	17,927
14.1801	Material Engineering	27	1,126,517	383,016	41,723	14,186
14.1901	Mechanical Engineering	615	28,914,625	11,199,098	47,016	18,210
14.2801	Textile Sciences and Engineering	77	3,359,819	1,369,130	43,634	17,781
15.0101	Architectural Engineering Techno/Tech	62	2,569,395	873,594	41,442	14,090
15.0201	Civil Engineering/Civil Tech./Technician	282	10,562,128	3,591,123	37,454	12,734
15.0301	Computer Engineering Tech./Technician	72	2,881,587	979,740	40,022	13,607
15.0303	Elec., Electronic & Comm. Engin. Tech.	441	20,381,034	6,765,493	46,216	15,341
15.0603	Industrial/Manufacturing Tech/Technician	32	1,203,453	398,961	37,608	12,468
15.0699	Industrial Product. Technol./Techn, Oth.	69	2,589,875	880,557	37,534	12,762

CIP	Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
15.0805	Mechanical Engineering/Mechanical Tech.	273	11,459,492	3,890,630	41,976	14,251
15.1001	Construction/Building Tech./Technician	245	10,217,067	3,544,352	41,702	14,467
15.1101	Engineering-Related Tech/Technician, Gen	279	12,642,996	4,709,904	45,315	16,881
16.0501	German Language and Literature	35	998,831	358,940	28,538	10,255
16.0901	French Language and Literature	75	2,053,917	717,998	27,386	9,573
16.0905	Spanish Language and Literature	157	4,397,702	1,516,808	28,011	9,661
19.0402	Consumer Economics and Science	77	2,426,053	824,858	31,507	10,712
19.0501	Foods and Nutrition Studies, General	75	2,163,339	807,342	28,845	10,765
19.0503	Dietetics/Human Nutritional Services	65	1,751,732	595,589	26,950	9,163
19.0601	Housing Studies, General	72	2,144,227	753,162	29,781	10,461
19.0701	Individual/Family Devel. Studies, Gen.	205	4,996,078	1,853,036	24,371	9,039
19.0901	Clothing/Apparel and Textile Studies	31	937,113	334,373	30,229	10,786
22.0101	Law (LL.B., J.D.)	1,000	52,503,545	31,492,540	52,504	31,493
22.0103	Paralegal/Legal Assistant	47	1,263,932	371,528	26,892	7,905
23.0101	English Language and Literature, General	1,037	29,750,722	10,827,428	28,689	10,441
23.1001	Speech and Rhetorical Studies	390	14,297,884	4,916,434	36,661	12,606
23.1101	English Technical and Business Writing	64	2,589,063	1,268,426	40,454	19,819
24.0101	Liberal Arts & Sciences/Liberal Studies	6,684	186,231,485	48,469,272	27,862	7,252
24.0199	Lib. Art&Sci., Gen. Studies&Human., Oth	301	9,311,265	3,399,056	30,934	11,293
26.0101	Biology, General	1,095	31,112,194	11,050,004	28,413	10,091
26.0202	Biochemistry	45	1,328,777	580,895	29,528	12,909
26.0501	Microbiology/Bacteriology	69	2,257,425	830,974	32,716	12,043
26.0701	Zoology, General	76	2,331,868	816,904	30,682	10,749
27.0101	Mathematics	436	14,426,171	5,157,473	33,088	11,829
27.0302	Operations Research	155	8,167,442	3,495,532	52,693	22,552
27.0501	Mathematical Statistics	66	3,189,217	1,474,445	48,321	22,340
30.0101	Biological and Physical Sciences	38	1,473,728	501,068	38,782	13,186
30.9999	Multi/Interdisciplinary Studies, Other	97	3,076,208	1,114,406	31,713	11,489
31.0101	Parks, Recreation and Leisure Studies	124	3,254,407	1,106,498	26,245	8,923
31.0301	Parks, Rec. & Leisure Facilities Mgmt.	113	2,930,288	1,027,492	25,932	9,093
31.0501	Health and Physical Education, General	44	1,394,620	474,171	31,696	10,777
31.0504	Sport and Fitness Administration/Mgmt.	123	3,996,741	1,680,166	32,494	13,660
31.0505	Exercise Sciences/Physiology & Movement	37	1,072,728	460,131	28,993	12,436
38.0101	Philosophy	77	2,099,265	754,572	27,263	9,800
40.0501	Chemistry, General	385	13,189,917	4,995,746	34,260	12,976
40.0601	Geology	102	3,177,692	1,259,935	31,154	12,352
40.0699	Geological and Related Sciences, Other	38	1,374,878	688,351	36,181	18,114
40.0801	Physics, General	177	7,425,007	2,994,509	41,949	16,918
42.0101	Psychology, General	1,894	52,670,640	19,497,813	27,809	10,295
42.0901	Industrial and Organizational Psychology	50	2,330,760	1,089,261	46,615	21,785
42.1701	School Psychology	95	3,597,538	1,821,610	37,869	19,175

CIP	Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
43.0103	Criminal Justice/Law Enforcement Admin.	102	2,973,496	992,794	29,152	9,733
43.0104	Criminal Justice Studies	1,343	37,733,176	12,650,821	28,096	9,420
43.0107	Law Enforcement/Police Science	114	3,038,069	935,357	26,650	8,205
43.0199	Criminal Justice and Corrections, Other	71	1,737,270	590,672	24,469	8,319
43.0201	Fire Protection and Safety Tech./Technic	80	3,490,772	907,601	43,635	11,345
44.0401	Public Administration	536	18,453,896	8,653,454	34,429	16,145
44.0701	Social Work	649	17,036,415	7,229,601	26,250	11,140
45.0201	Anthropology	106	2,724,316	1,018,815	25,701	9,611
45.0601	Economics, General	247	9,416,494	3,357,356	38,123	13,593
45.0701	Geography	108	3,231,414	1,198,072	29,921	11,093
45.0801	History, General	701	20,961,390	7,585,428	29,902	10,821
45.0901	International Relations and Affairs	67	2,311,275	785,834	34,497	11,729
45.1001	Political Science, General	799	25,789,515	8,942,002	32,277	11,191
45.1101	Sociology	674	17,882,550	6,435,774	26,532	9,549
45.1201	Urban Affairs/Studies	202	7,521,668	2,828,031	37,236	14,000
45.9999	Social Sciences and History, Other	148	5,102,668	2,393,146	34,477	16,170
47.0101	Electrical and Electronics Equipment Ins	58	2,088,163	542,922	36,003	9,361
47.0104	Computer Installer and Repairer	26	1,006,082	261,581	38,695	10,061
47.0303	Industrial Machinery Main. and Repairer	41	1,497,399	389,324	36,522	9,496
47.0604	Auto/Automotive Mechanic/Technician	31	967,208	251,474	31,200	8,112
47.0608	Aircraft Mechanic/Technician, Powerplant	58	2,098,649	545,649	36,184	9,408
48.0102	Architectural Drafting	29	897,578	233,370	30,951	8,047
48.0201	Graphic & Printing Equip. Operator, Gen.	68	2,273,872	773,117	33,439	11,369
48.9999	Precision Production Trades, Other	163	5,927,990	1,541,277	36,368	9,456
50.0101	Visual and Performing Arts	188	5,676,952	1,930,164	30,197	10,267
50.0404	Industrial Design	51	1,645,070	559,324	32,256	10,967
50.0408	Interior Design	28	771,643	262,359	27,559	9,370
50.0501	Drama/Theater Arts, General	61	1,628,760	620,096	26,701	10,166
50.0601	Film/Cinema Studies	68	2,094,615	712,169	30,803	10,473
50.0701	Art, General	353	9,570,609	3,331,379	27,112	9,437
50.0703	Art History, Criticism and Conservation	37	1,117,509	387,428	30,203	10,471
50.0705	Drawing	177	5,465,502	1,974,465	30,879	11,155
50.0901	Music, General	37	1,044,347	425,733	28,226	11,506
50.0903	Music - General Performance	94	2,874,073	1,164,009	30,575	12,383
51.0201	Communication Disorders, General	158	4,659,186	1,949,575	29,489	12,339
51.0203	Speech-Language Pathology	281	8,155,197	3,478,009	29,022	12,377
51.0301	Community Health Liaison	39	759,788	197,545	19,482	5,065
51.0401	Dentistry (D.D.S., D.M.D.)	77	5,953,818	3,572,291	77,322	46,393
51.0602	Dental Hygienist	383	12,540,968	3,346,090	32,744	8,737
51.0701	Health System/Health Services Admin.	80	4,180,731	2,090,365	52,259	26,130

CIP	Description	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
51.0706	Medical Records Administration	40	1,390,709	472,841	34,768	11,821
51.0801	Medical Assistant	81	1,599,433	415,853	19,746	5,134
51.0803	Occupational Therapy Assistant	32	990,652	257,569	30,958	8,049
51.0806	Physical Therapy Assistant	50	1,645,048	427,713	32,901	8,554
51.0807	Physician Assistant	60	3,164,931	1,076,077	52,749	17,935
51.0904	Emergency Medical Tech./Technician	68	1,832,693	476,500	26,951	7,007
51.0907	Medical Radiologic Tech./Technician	106	3,034,803	815,225	28,630	7,691
51.0908	Respiratory Therapy Technician	182	5,466,676	1,648,176	30,037	9,056
51.091	Diagnostic Medical Sonography	28	1,063,699	320,816	37,989	11,458
51.1004	Medical Laboratory Technician	63	1,556,203	404,613	24,702	6,422
51.1005	Medical Technology	117	3,736,378	1,284,984	31,935	10,983
51.1201	Medicine (M.D.)	321	20,050,938	12,030,563	62,464	37,478
51.1399	Basic Medical Sciences, Other	61	1,537,303	520,660	25,202	8,535
51.1502	Psychiatric/Mental Health Services Tech.	26	677,185	230,243	26,046	8,856
51.1599	Mental Health Services, Other	32	918,791	459,395	28,712	14,356
51.1601	Nursing (R.N. Training)	6,764	227,611,427	68,304,553	33,650	10,098
51.1602	Nursing Administration (Post-R.N.)	126	5,153,897	1,752,325	40,904	13,907
51.1613	Practical Nurse (L.P.N. Training)	76	1,604,108	417,068	21,107	5,488
51.1699	Nursing, Other	100	4,831,923	2,473,403	48,319	24,734
51.2001	Pharmacy (B. Pharm., Pharm.D.)	420	22,254,873	8,895,704	52,988	21,180
51.2202	Environmental Health	137	4,053,098	1,398,488	29,585	10,208
51.2306	Occupational Therapy	87	3,076,837	1,046,125	35,366	12,024
51.2308	Physical Therapy	224	9,722,245	3,400,735	43,403	15,182
51.231	Vocational Rehabilitation Counseling	111	3,554,427	1,777,213	32,022	16,011
51.2401	Veterinary Medicine (D.V.M.)	140	6,006,569	3,603,941	42,904	25,742
51.9999	Health Professions & Rel. Sciences, Oth.	323	9,851,041	3,547,225	30,499	10,982
52.0101	Business, General	1,432	69,576,826	31,020,608	48,587	21,662
52.0201	Business Administration & Mgmt., Gen.	4,609	205,509,260	83,642,480	44,589	18,148
52.0202	Purchasing, Procurement & Contracts Mgmt	60	1,939,947	659,582	32,332	10,993
52.0203	Logistics and Materials Management	62	2,080,041	816,589	33,549	13,171
52.0204	Office Supervision and Management	59	1,581,552	534,141	26,806	9,053
52.0205	Operations Management and Supervision	39	1,514,645	525,881	38,837	13,484
52.0299	Business Administration & Mgmt., Oth.	42	2,271,985	913,088	54,095	21,740
52.0301	Accounting	2,892	104,386,812	37,112,341	36,095	12,833
52.0302	Accounting Technician	63	1,503,357	390,873	23,863	6,204
52.0401	Administrative Assistant/Secretarial Sci	184	3,886,452	1,079,958	21,122	5,869
52.0408	General Office/Clerical & Typing Serv.	106	2,395,071	622,718	22,595	5,875
52.0499	Administrative & Secretarial Serv., Oth.	37	758,390	197,181	20,497	5,329
52.0601	Business/Managerial Economics	211	7,968,208	2,911,250	37,764	13,797
52.0701	Enterprise Management & Operation, Gen.	168	8,929,459	4,252,463	53,152	25,312
52.0801	Finance, General	1,794	73,921,879	28,245,246	41,205	15,744
52.0802	Actuarial Science	71	3,530,735	1,609,430	49,729	22,668
52.0805	Insurance and Risk Management	543	21,355,916	7,846,564	39,330	14,450
52.0902	Hotel/Motel and Restaurant Management	168	5,277,682	1,794,412	31,415	10,681
52.1002	Labor/Personnel Relations and Studies	78	3,215,103	1,416,719	41,219	18,163
52.1101	International Business	352	16,158,678	6,631,424	45,905	18,839
52.1201	Mgmt. Info. Systems & Bus. Data Process	694	29,166,370	10,023,574	42,026	14,443
52.1202	Business Computer Programming/Programmer	37	1,512,787	393,325	40,886	10,630
52.1301	Management Science	52	2,073,271	704,912	39,871	13,556
52.1399	Bus. Quantitative Methods & Mgmt.,Oth.	85	2,900,015	986,005	34,118	11,600
52.1401	Business Marketing/Marketing Management	1,774	66,129,808	23,550,602	37,277	13,275
52.1501	Real Estate	191	9,671,210	3,959,684	50,635	20,731
52.1601	Taxation	132	6,892,631	3,446,316	52,217	26,108
52.9999	Business Management & Admin. Serv., Oth.	226	6,202,650	1,612,689	27,445	7,136

Appendix 3

Economic Impact of Higher Education by County

County	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
	6,323	$ 252,126,854	$ 93,090,156	$ 39,875	$ 14,722
Appling	20	647,115	238,374	32,356	11,919
Atkinson	68	1,984,167	776,500	29,179	11,419
Bacon	113	3,355,694	1,284,435	29,696	11,367
Baker	29	696,443	259,584	24,015	8,951
Baldwin	423	12,769,301	5,039,343	30,187	11,913
Banks	26	782,136	335,704	30,082	12,912
Barrow	244	7,353,093	2,970,083	30,136	12,172
Bartow	336	10,683,938	4,305,093	31,797	12,813
Ben Hill	188	6,198,741	2,471,622	32,972	13,147
Berrien	103	2,956,536	1,175,268	28,704	11,410
Bibb	2,208	73,386,458	26,278,534	33,237	11,902
Bleckley	90	2,536,207	1,006,591	28,180	11,184
Brantley	129	3,700,262	1,498,976	28,684	11,620
Brooks	82	2,292,702	968,924	27,960	11,816
Bryan	16	659,767	287,247	41,235	17,953
Bulloch	767	22,369,354	9,167,471	29,165	11,952
Burke	152	4,435,973	1,770,339	29,184	11,647
Butts	32	769,086	234,796	24,034	7,337
Calhoun	28	882,907	348,993	31,532	12,464
Camden	266	8,530,298	3,479,026	32,069	13,079
Candler	75	2,244,472	865,301	29,926	11,537
Carroll	848	28,908,212	11,674,158	34,090	13,767
Catoosa	178	5,526,088	2,121,752	31,045	11,920
Charlton	66	2,111,881	901,278	31,998	13,656
Chatham	2,226	75,409,034	28,478,833	33,876	12,794
Chattahoochee	12	347,721	138,735	28,977	11,561
Chattooga	42	1,257,090	495,758	29,931	11,804
Cherokee	570	21,083,296	8,708,116	36,988	15,277
Clarke	1,650	48,783,847	20,415,827	29,566	12,373
Clayton	1,631	61,247,266	23,600,963	37,552	14,470
Clinch	52	1,683,659	653,214	32,378	12,562
Cobb	6,703	259,787,054	102,654,575	38,757	15,315
Coffee	381	11,963,754	4,425,816	31,401	11,616
Colquitt	342	10,681,106	4,059,096	31,231	11,869
Columbia	486	16,697,633	6,876,684	34,357	14,150
Cook	106	3,191,332	1,215,990	30,107	11,472
Coweta	450	16,881,569	7,006,210	37,515	15,569
Crawford	47	1,179,976	458,295	25,106	9,751
Crisp	237	6,871,356	2,714,003	28,993	11,451
Dade	20	859,282	395,060	42,964	19,753
Dawson	88	2,906,901	1,199,778	33,033	13,634

County	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
De Kalb	6,393	245,300,673	95,670,495	38,370	14,965
Decatur	242	6,601,579	2,303,329	27,279	9,518
Dodge	135	4,251,311	1,727,298	31,491	12,795
Dooly	74	2,244,803	884,615	30,335	11,954
Dougherty	1,386	46,846,323	17,300,579	33,800	12,482
Douglas	550	19,979,001	8,384,105	36,325	15,244
Early	65	2,206,700	796,581	33,949	12,255
Echols	27	743,936	307,133	27,553	11,375
Effingham	229	6,908,027	2,894,361	30,166	12,639
Elbert	73	2,362,628	998,398	32,365	13,677
Emanuel	94	2,716,871	986,523	28,903	10,495
Evans	84	2,671,545	1,054,738	31,804	12,556
Fannin	94	3,094,734	1,329,920	32,923	14,148
Fayette	684	24,172,648	9,932,441	35,340	14,521
Floyd	595	18,828,864	6,764,739	31,645	11,369
Forsyth	460	14,730,552	5,845,374	32,023	12,707
Franklin	69	2,226,662	947,610	32,270	13,733
Fulton	18,234	702,502,314	276,148,872	38,527	15,145
Gilmer	108	3,705,472	1,518,817	34,310	14,063
Glascock	18	544,479	244,188	30,249	13,566
Glynn	775	25,731,675	9,318,123	33,202	12,023
Gordon	280	8,913,748	3,128,488	31,835	11,173
Grady	100	3,154,675	1,214,543	31,547	12,145
Greene	81	2,543,312	972,494	31,399	12,006
Gwinnett	5,600	212,613,029	82,625,120	37,967	14,754
Habersham	166	5,481,667	2,308,984	33,022	13,910
Hall	1,212	40,056,574	15,105,490	33,050	12,463
Hancock	31	849,545	345,172	27,405	11,135
Haralson	173	5,244,720	2,151,757	30,316	12,438
Harris	13	341,928	126,644	26,302	9,742
Hart	48	1,448,130	593,895	30,169	12,373
Heard	52	1,734,942	774,755	33,364	14,899
Henry	556	19,133,619	7,494,903	34,413	13,480
Houston	1,153	42,361,611	16,702,765	36,740	14,486
Irwin	37	1,220,189	371,819	32,978	10,049
Jackson	291	9,027,148	3,444,585	31,021	11,837
Jasper	49	1,497,616	606,573	30,564	12,379
Jeff Davis	83	2,921,820	1,232,414	35,203	14,848
Jefferson	39	1,192,286	398,165	30,571	10,209
Jenkins	12	494,993	159,173	41,249	13,264

County	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
Johnson	40	1,125,179	446,018	28,129	11,150
Jones	87	2,407,480	948,268	27,672	10,900
Lamar	62	1,730,467	718,932	27,911	11,596
Lanier	54	1,535,307	550,422	28,432	10,193
Laurens	445	13,905,645	5,485,058	31,249	12,326
Lee	129	3,972,889	1,708,242	30,798	13,242
Liberty	289	9,409,630	3,821,479	32,559	13,223
Lincoln	25	737,374	312,320	29,495	12,493
Long	63	1,877,664	795,361	29,804	12,625
Lowndes	1,015	30,031,011	11,466,241	29,587	11,297
Lumpkin	150	4,437,344	1,895,304	29,582	12,635
Macon	67	2,097,584	805,538	31,307	12,023
Madison	96	2,901,125	1,227,926	30,220	12,791
Marion	41	1,239,963	488,909	30,243	11,925
McDuffie	155	4,862,864	1,946,284	31,373	12,557
McIntosh	71	2,054,642	781,506	28,939	11,007
Meriwether	95	2,654,877	1,094,518	27,946	11,521
Miller	23	591,569	228,706	25,720	9,944
Mitchell	163	4,563,284	1,764,454	27,996	10,825
Monroe	78	2,308,952	960,466	29,602	12,314
Montgomery	19	553,749	266,145	29,145	14,008
Morgan	136	4,185,370	1,698,863	30,775	12,492
Murray	165	5,283,008	2,149,220	32,018	13,026
Muscogee	2,062	70,530,863	25,782,348	34,205	12,504
Newton	138	4,585,871	1,583,680	33,231	11,476
Oconee	108	3,269,398	1,424,567	30,272	13,190
Oglethorpe	46	1,406,267	656,510	30,571	14,272
Paulding	305	9,841,231	4,190,020	32,266	13,738
Peach	217	6,742,114	2,788,518	31,070	12,850
Pickens	126	4,182,539	1,634,410	33,195	12,972
Pierce	112	3,371,277	1,390,208	30,101	12,413
Pike	45	1,303,644	527,136	28,970	11,714
Polk	189	6,519,632	2,601,007	34,495	13,762
Pulaski	141	4,462,684	1,611,459	31,650	11,429
Putnam	98	3,018,545	1,148,442	30,801	11,719
Quitman	1	12,288	4,178	12,288	4,178
Rabun	65	1,978,038	833,915	30,431	12,829
Randolph	61	1,678,301	673,020	27,513	11,033
Richmond	1,754	59,812,734	23,421,417	34,101	13,353
Rockdale	206	6,412,917	2,184,650	31,131	10,605
Schley	22	707,987	291,411	32,181	13,246

County	Count	Total Wages	Educational Value	Average Wage	Average Educational Value
Screven	107	3,059,997	1,268,134	28,598	11,852
Seminole	38	925,607	288,135	24,358	7,582
Spalding	393	13,285,582	5,058,620	33,806	12,872
Stephens	96	3,148,554	1,169,903	32,797	12,186
Stewart	18	600,355	221,165	33,353	12,287
Sumter	434	13,234,120	4,949,844	30,493	11,405
Talbot	19	382,919	145,869	20,154	7,677
Taliaferro	2	83,512	34,177	41,756	17,089
Tattnall	107	3,267,483	1,359,147	30,537	12,702
Taylor	37	1,110,108	412,376	30,003	11,145
Telfair	51	1,443,696	563,913	28,308	11,057
Terrell	58	1,735,315	730,926	29,919	12,602
Thomas	361	11,293,119	4,155,252	31,283	11,510
Tift	549	17,094,334	6,067,632	31,137	11,052
Toombs	151	5,626,910	2,207,436	37,264	14,619
Towns	40	1,542,988	652,462	38,575	16,312
Treutlen	18	488,984	208,908	27,166	11,606
Troup	443	15,645,923	6,260,998	35,318	14,133
Turner	66	2,035,911	865,883	30,847	13,119
Twiggs	76	2,082,256	773,956	27,398	10,184
Union	74	2,418,087	985,311	32,677	13,315
Upson	173	5,303,474	1,940,990	30,656	11,220
Walker	165	5,138,852	1,999,248	31,145	12,117
Walton	320	11,081,391	4,465,065	34,629	13,953
Ware	412	12,665,740	4,425,345	30,742	10,741
Warren	24	639,860	253,952	26,661	10,581
Washington	182	5,110,251	1,984,460	28,078	10,904
Wayne	173	5,171,036	2,027,884	29,890	11,722
Webster	11	308,785	120,352	28,071	10,941
Wheeler	26	776,422	327,891	29,862	12,611
White	87	2,834,472	1,280,829	32,580	14,722
Whitfield	925	30,725,744	10,189,454	33,217	11,016
Wilcox	27	904,864	418,440	33,513	15,498
Wilkes	62	1,956,101	769,296	31,550	12,408
Wilkinson	82	2,942,909	1,098,861	35,889	13,401
Worth	140	4,304,758	1,721,211	30,748	12,294
Unknown	6,323	252,126,854	93,090,156	39,875	14,722
Statewide	89,652	3,234,142,486	1,249,963,035	36,074	13,942