Updated Economic Impact of High School Non-Completion in Georgia: 2005 Estimate

Prepared for: University System of Georgia

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

EXECUTIVE SUMMARY

At the request of Dr. Jan Kettlewell, this study updates the estimates of the economic impact of high school non-completion. Since, a revision of the previous studies will not be impossible before the decennial census of 2010, this study employs data from the 2005 American Community Survey to calculate statewide and regional economic impacts of high school non-completion.

This study details the state's progress toward parody with the U.S. rate of high school non-completion for the population age 25 and older. To demonstrate the economic impact of high school non-completion across time, direct and total economic impacts for 1990, 2000 and 2005 are all shown in current 2006 dollars.

As of 2005, Georgia was within 1.46 percentage points of the U.S. rate of high school non-completion for the population age 25 and older. The 1.47% high school rate of non-completion translates into a statewide $1.5 billion annual direct loss in foregone income. In other words, just attaining parody with the U.S. rate of high school non-completion would have resulted in a $1.5 billion boost in the state's economy and would have meant an average per person increase in personal income of $1,873. The enormous benefit to be gained from further reductions in the rate of high school non-completion makes policies directed toward improving educational attainment vital components of the state's economic development agenda.

The direct losses as measured by per capita personal income, as noted in this and previous studies, underestimates the cost of high school non-completion. It misses other costs directly related to high rates of high school non-completion such as: higher rates of unemployment; higher welfare costs; higher crime rates; and, higher cost of health care for the poor.

Additions to personal income circulate through the economy creating multiple additional impacts. To show the total economic impact, i.e. direct, induced and indirect impacts, an input-output analysis was completed. The direct loss of the $17.4 billion in foregone income associated with Georgia's 17.23% rate of high school non-completion in 2005 resulted in a total loss of $24.5 billion in gross state output/income, and deprived the economy of 200,000 jobs.

The final chapter of this study extends the discussion from previous studies to begin to identify why Georgia's rates of high school non-completion have been dropping toward parody with the U.S. This study finds only minor evidence that state efforts to improve educational attainment have been a source of the movement toward equality between the Georgia and U.S. rate of high school non-completion. Georgia has reduced its *event dropout rate* from a high of 9.0% to 6.5%. However, *average freshman high school graduation rates* have not changed since AY2001/02, remaining at approximately 61%. Nationally, the average freshman high school graduation rate has been approximately 74% over the same period.

This study presents evidence that Georgia's movement toward parody with the U.S. rate of high school non-completion for the population age 25 and older is, in part, explained by migration. Data not available previously shows that migrants to Georgia from other U.S. states have much lower rates of high school non-completion than the rate of high school non-completion in the Georgia population. Since the majority of Georgia's high educational attainment jobs are created in urban communities, there is a strong potential for a growing disparity between low rates of high school non-completion in metropolitan and urban counties and the high rates of high school non-completion in rural counties.

This study also presents a look at the future job growth by occupation. The forecast for the Georgia economy shows that the state's economy will continue to lose jobs in low skilled, low education occupations such as textile production, agriculture and agricultural processing. The losses in these low skilled, low education sectors will generally be offset almost one-to-one by low skilled, low educational attainment service sector jobs. However, by a margin of 2 to 1, the Georgia economy is expected to produce more high skilled, high education jobs than low skilled, low educations jobs. The continued shifting structure of the Georgia economy will induce economic migrants to move to the state at an annual rate of between 15,000 and 30,000 per year over 2010 to 2050. Again, the high skilled, high educational attainment jobs will be concentrated in metropolitan and urban areas of the state.

The conclusion from the final chapter of this report suggests that tremendous regional disparities in the rate of high school non-completion will remain well into the future unless there is an intervening policy. Addressing the needs of rural school and building an economic development strategy that encourages the creation of higher quality jobs in rural communities will be essential to the goal for one Georgia.

INTRODUCTION

In August 2003, the Bureau of Business Research and Economic Development (BBRED) at Georgia Southern University completed a study entitled "The Economic Impact of High School Non-Completion in Georgia." That report built on and extended a previous study of the same title completed by BBRED in 1995. Associate Vice Chancellor, Dr. Jan Kettlewell, has requested a new update of the economic impact of high school non-completion.

The present study provides current estimates of the economic impact of high non-completion in Georgia. However, this study is not a pure replication of the previous studies. Both previous studies relied on data available only from the decennial census, so a pure replication cannot be completed until the U.S. Census of 2010. Drawing on data from the Current Population Survey and from the American Community Survey, estimates of the statewide and sub-regional economic impacts of high school non-completion are provided.

The present study is divided into three chapters. Chapter one provides a review of the findings from the two previous studies. Chapter two provides updated, statewide and regional estimates of the economic impact of high school non-completion. Chapter three provides a cautionary discussion of potential pitfalls in policy formulation if one relies only on rates of high school non-completion for ages 25 and older. Forces both within the U.S. economy and within the Georgia economy, if not clearly understood, may lead one to interpret sub-state decreases/increases in the rates of high school non-completion for ages 25 and older as signals of improvement/failure of the education system when in fact failure/improvement may be the case.

REVIEW AND SUMMARY OF PREVIOUS FINDINGS: ECONOMIC IMPACT OF HIGH SCHOOL NON-COMPLETION 1995 AND 2003

Two previous studies, both prepared by the Bureau of Business Research and Economic Development (BBRED), have examined the economic impact of high school non-completion. The first study, prepared under the direction of Dr. Dan S. Rickman, relied on data from the 1990 U.S. Census. The second study, prepared by Mr. Jeremy Hill and Dr. Phyllis W. Isley, relied on data from both the 1990 and 2000 U.S. Census. The findings from these studies will serve as the basis for this 2007 update. To lay a foundation for the updated study, this chapter of the report reviews and summarizes the previous studies.

Human Capital

Human capital is the stock of knowledge, training, skills, experience and other productivity-enhancing traits held by a nation's current and potential labor force.[1] A concept first introduced in 1958 by Jacob Mincer, today human capital theory is central to much of the understanding of the labor market.[2] Human capital theory provides the main explanation for variations in wages, salaries and unemployment by differences in age, occupation and educational attainment.

Measuring Variations in Per Capita Income and Educational Attainment in Georgia

There is a strong analogy between the investment in human capital and investments made in physical capital.[3] Individuals make decisions about spending resources to acquire schooling, training, health and other productivity-enhancing activities based on costs relative to the expected gain in returns. A portion of the gains from the investment in human capital is measured by the expected increase in earnings, but gains may also include intangible benefits such as higher job satisfaction, greater choice in job and/or *greater choice in the location of work*, etc. In fact, the implications of this last benefit, geographic choices about where one works, will be discussed in the final chapter of this report.

The demand for labor is *derived demand*. Firms hire workers because there is a demand for the goods and services produced by that labor. The wage a firm is willing to pay for a unit of labor depends on the amount of additional revenue the unit of labor will bring to the firm. Additional revenue is dependent on the market price of the good or service sold by the firm and the additional quantities of goods or services produced by the additional unit of labor. Hence, the wage a firm is willing to pay for any particular unit of labor is the market price of the good or service, *P*, multiplied by the quantity of additional product produced, the marginal product, *MP*, where $P * MP = VMP$, the value of the marginal product. Investments in human capital increase

[1] Investments in health, family care, and labor market information are also part of the stock of human capital.
[2] See "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy*, 1958.
[3] Human capital differs from physical capital in two respects. First, human capital is not collateral; it cannot be sold. Second, the individual cannot spread risk in the same manner as owners of physical capital.

the productivity of a unit of labor, and, therefore, increase the value of the marginal product of labor, increasing the wage a firm is willing to pay.

The actual wage earned depends on the interaction of both the supply of labor and the demand for labor. The investments made by individuals in human capital result in product differentiation on the supply side of the labor market. Firms search for labor with specific bundles of skills that will result in the highest productivity. Actual earnings are determined by the demand for the various bundles of skills relative to the supply of those bundles of skills most closely matching the demand.

Previous Studies

Both previous studies employed multiple regression to calculate the quantitative relationship between variations in county per capita income and variations in the percent of the population age 25 and older with the status of high school non-completion.[4] The estimating equations varied slightly between the two studies, so the Rickman study period was re-estimated in 2000. The estimating equation included both human capital variables as well as variables to capture the market effects of supply relative to demand.

The Estimating Equation

Per capita personal income is a function both of the decisions made by the suppliers of labor and the firms demanding labor. Individuals make decisions about investment in human capital that affects their productivity, but the return to that investment depends on the supply of a given type of human capital relative to the demand for that type of human capital. Hence, estimating variations in per capita personal income requires that the estimating equation contain controls for both human capital investment and for relative demand.

The general equation that was estimated in both previous studies was:
CPCPY = F (CPNC, CPSC, CPC, CPU18, CPO64, CPM, ATLMETRO, OTHERMETRO, CENTRAL, *or COUNTY & TIME*[5])
where:

1. CPCPY is county per capita personal income;
2. CPNC is county percent of the population age 25 or older with less than a high school education;
3. CPSC is the county percent of population age 25 or older with some college;
4. CPC is the county percent of the population age 25 and older with a college degree;[6]
5. CPU18 is the county percent of population under the age of 18;

[4] High school non-completion is defined as any person within the population, citizen or not, without a high school diploma or an equivalent.
[5] County and time dummies were included only in the pooled cross-section and time series estimates.
[6] To avoid perfect multicollinearity, the percent of county population with a high school education is excluded from the equation. This means that the coefficient on each educational category measures the effect of that level of educational attainment relative to high school graduation.

6. CPO64 is the percent of the county population over age 64;
7. CPM is the percent of the county male population;
8. ATLMETRO and OTHERMETRO are dummy variables for the counties in the metropolitan areas;
9. CENTRAL is a dummy variable for each county in which the principle city of a metropolitan area is located;
10. *COUNTY* is a series of 158 dummy variables representing each county, used only in the pooled cross-section time series;[7] and,
11. *TIME* is a dummy for 1990 or 2000, used only in the pooled cross-section time series.

The data measuring each of the variables was taken from the U.S. Census for 1990 and 2000.[8] The equation was estimated for 1990, for 2000, and then pooled across both years.

CPNC, CPSC and CPC are measures of the investment in human capital. It is expected that the sign on CPNC, the measure of high school non-completion, will be negative in terms of county per capita personal income. Per capita incomes in those counties with high rates of high school non-completion are expected to be lower than county per capita personal incomes where there are lower rates of high school non-completion. Conversely, it is expected that the sign on CPSC and CPC will be positive. Counties with populations that have higher rates of investment in human capital beyond high school are expected to have higher county per capita personal incomes relative to those with lower levels of investment.

Experience also contributes to human capital. A county with a high percent of inexperienced work force population, as well as a high percent of dependent children, will be expected to have a lower per capita personal income than one with a more experienced work force. Hence, it is expected that the sign on CPU18 will be negative.

The sign on CPO64 is not so easily predicted. On the one hand, this age group is more experienced, but their incomes may be lower due to retirement. However, returns for highly educated workers increase dramatically with experience. This results in an incentive for highly educated workers to remain in the work force long after customary retirement age. The high returns for higher educated workers who remain in the work force may outweigh the effect of lower incomes for retirees.

CPM is the percent of the population which is male and again the sign on this variable is difficult to predict. On average, for any given level of education, men earn more than women. However, there remains strong gender bias in choice of occupation so that if there are a large number of men relative to the number of those jobs which are traditionally viewed as men's jobs, the excess supply may reduce earnings and per capita personal incomes might be lower where there is a large male work force.

[7] Worth County is excluded from the equation to avoid perfect multicollinearity. This means that the coefficient on each county measures the effect of the county relative to Worth County.
[8] U.S. Census 1990 and 2000, Summary File 3.

The two dummy variables, ATLMETRO and OTHERMETRO, are controls for the potentially higher per capita personal incomes associated with higher costs of living in urban areas relative to smaller and rural communities. Additionally, these dummy variables will capture the potentially higher per capita personal incomes due to agglomerations effects.

The dummy variable CENTRAL is a control for the possibility that although the cost of living in the core urban center of a metropolitan area may be high, central cities are often places where there are high concentrations of low income populations. In this case, the sign on CENTRAL should be negative. The dummy variables for COUNTY and TIME effects appear only in the pooled cross-section time series regression.

Findings

The study in 2003 re-estimated the exact Rickman formulation from the 1995 study for both 1990 and 2000.[9] The re-estimation using the Rickman formulation with the 1990 data found that for every one percent of county population age 25 and older without a high school education or its equivalent, the county's per capita income was reduced by $108. The Rickman formula estimated for 2000 data found the for every one percent of county population age 25 and older without a high school education or its equivalent, county per capita income was decreased by $153. The conclusion was that over the period the earning power of those with less than a high school education had declined in real terms. For example, inflation over the period was approximately 26%. If labor market conditions had remained the same, real county per capita income should have declined to only $136 per one percent of the population age 25 and older without a high school education or its equivalent.

Pooling time-series and cross-sections is a robust regression estimating technique. The 2003 study employed the technique on a final formulation of the equation. The results of the pooled cross-section time series equation were:

$$CPCPY_{pooled} = \$17{,}552 - 98.2\ CPNC - 82.1\ CPSC + 400\ CPC + 239.0\ CPO64$$
$$(3.11) \quad (2.93) \quad (1.63) \quad (9.30) \quad (2.60)$$
$$- 141.0\ CPU18 - 70.1\ CPM + 86\ ATLMETRO_{2000} + 26\ OTHERMETRO_{2000}$$
$$(1.92) \quad (1.08) \quad (.14) \quad (.06)$$
$$- 953\ ATLMETRO1990 - 337\ OTHERMETRO1990 + 3{,}974\ YEAR$$
$$(1.55) \quad (.67) \quad (11.46)$$
$$+ \text{ or } - (COUNTY\ EFFECTS)$$

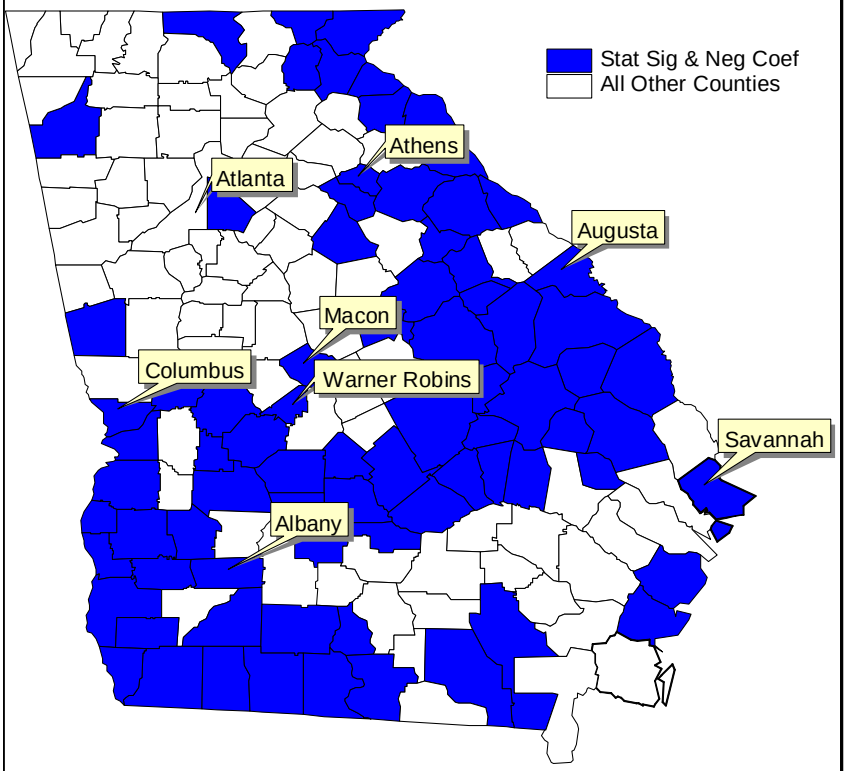
The Adjusted R-Square for the pooled cross-section time series estimation was 96.4.%, the best overall fit of any of the equations estimated. The t-statistics shown under the coefficients are

[9] The Rickman equation differed in its formulation in the way the impact of the sizes of urban labor markets were include in the equation. Between 1990 and 2000, the Census changed some city classifications, so to re-estimate the Rickman equation for both periods city classifications had to be reassigned. His equation was CPCPY = F (CPNC, CPSC, CPC, CPO64, CPU18, CPM, ATLMETRO, OTHERMETRO, CENTRAL).

significant for CPNC, CPC, CPO64, and YEAR. For 86 counties, the dummy for the county effect was statistically significant. Figure 1 shows those counties for which the dummy for the county effect was negative and statistically significant. The pattern shows that central cities like Atlanta, Savannah and Macon have per capita incomes like those of poorer rural counties. Rickman's dummy for CENTRAL is captured by the pooled cross-section time series equation along with the effect of distressed rural counties. This partially explains the better overall performance of the pooled cross-section equation.

The coefficient on CPNC of - 98.2 contains no effect of time or inflation, which is captured in the trend coefficient, YEAR. The interpretation of the coefficient is the same as previously discussed. For every one percent of a county's population age 25 or older without a high school education, the county's per capita personal income is reduced by $98.20. This means that for a county with the 1990 statewide average for high school non-completion of 29.1%, county per capita income would have been reduced by $2,858. If a county had reduced its non-completion rate from the 1990 average of 29.1% to the average rate of non-completion in 2000 of 21.4%, high-school non-completion would have reduced county per capita personal income by $2,101. According to the 2000 U.S. Census, only 28 counties had non-completion rates of 21.4% or less. The other 131 counties had non-completion rates of between 22% and 44%, meaning that the per capita costs of non-completion of high school ranged from $2,160 to $4,321.

FIGURE 1
Counties with a Statistically Significant T Value and a Negative Coefficient



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Conclusions: Previous Studies

All of the previous estimates, whatever the formulation, concluded that the percent of county population age 25 and older without a high school education or its equivalent is significant in explaining variations in county per capital income. The higher the percent of the population age 25 and older without a high school education or its equivalent, the lower the county per capita income. All of the quantitative estimates were on the order of approximately $100 per one percent of the population age 25 and older without a high school education or its equivalent.

The following chapter uses the final equation with a per capita income of $92 to estimate the economic impact of high school non-completion. However, before turning to the updated estimation of the economic impact of high school non-completion, it is important to discuss two cautionary notes regarding the limits of the study approach.

Cautions: Some Constraints Imposed by Data

Using Per Capita Personal Income to Measure the Return to Human Capital

Per capita personal income varies widely across Georgia's counties. As described above, both previous studies were designed to determine how much of the variation in county per capita personal income is explained by the variation in the rate of high school non-completion. This approach has one advantage and one weakness.

The weakness is that in addition to salaries and wages, per capita personal income includes a variety of other sources of income such as transfer payments, interest, and dividends. Among transfer payments, which would be included in per capita personal income, are unemployment compensation and welfare payments. Typically, those with less than a high school education are more frequently unemployed than those with higher levels of education. The *payment of transfers for unemployment and welfare artificially reduces the gap in incomes between those with less than a high school education and those with high school or more education*. In fact, these payments are part of the external costs non-graduates impose on the rest of society. The result is that the economic impact of high school non-completion as estimated, is biased, and *underestimates the costs* of high school non-completion.

The advantage to using per capita personal income is that it focuses on the costs imposed at the local level on everyone by the non-graduate. Education is a mixed public good.[10] On the one hand, individuals invest in education because it is the individual who reaps the majority of the benefits in the form of higher income and greater job satisfaction. However, there are spillover benefits when individuals invest in education. Education increases productivity, and as productivity increases, more goods and services and/or higher quality goods and services can be produced with the same amount of labor. Greater efficiency contributes to everyone's economic welfare. However, since some of the benefits of investing in education are not captured by the individual making the investment decision there is under-investment in education.

[10] Education here should be interpreted broadly to include not only formal education, but all investment in human capital.

Using Percent of Population Age 25 and Older Without a High School Education or Its Equivalent: Caution About the Limits of What May Be Said

When both previous studies were prepared, they were explicitly designed to show the important connection between investments in human capital, education, and economic prosperity or hardship. It is important to note that both studies were designed only to document the extent to which **levels** of economic development, as measured by per capita income, were explained by **levels** of educational attainment. The only policy issue on which either study could comment was that greater homogeneity in the levels of educational attainment should result in greater homogeneity of per capita income.

Both studies ignored a dynamic element of labor markets. Workers are free to move to capture higher paying opportunities. The movement of workers between locations that have lower rewards to higher levels of education, and locations that have higher rewards for higher levels of education have a feedback impact overtime time on the independent variable, county percent high school non-completion for ages 25 and older. None of the studies, including the present study, addresses questions of causality, i.e. which comes first, low income creating, poor job market conditions, creating low incentives for increased education attainment or vice versa, low educational attainment creating a poor environment for attracting better paying jobs, creating lower per capita income.

In the present public policy environment, with initiatives such as "No Child Left Behind," much more of the public debate is focused on the performance of local schools. It must be noted that the previous studies, as well as the present study, addresses only how variations in local levels of educational attainment are systematically correlated with variations in per capita income. It will be incorrect to impute any connection between the quality of local educational institutions and the level of local educational attainment across time. Reliance solely on a static, stock variable, like the percent high school non-completion for ages 25 and older may produce false signals, lead to inappropriate conclusion, and misdirected policies. Following the estimation of the economic impact of high school non-completion, a detailed cautionary note regarding observations on the percent of the population high school non-completion for ages 25 and older is presented.

THE ECONOMIC IMPACT OF HIGH SCHOOL NON-COMPLETION: 2005 ESTIMATES

This chapter will focus on the estimation of the direct and total impact of high school non-completion. The impacts estimated here depend on the previously estimated relationship between variations in high school non-completion and variations in county per capita income, but are updated to 2006 dollars. In addition, this section will identify the economic impact of high school non-completion as measured both by output and employment.

Base Data

For the purposes of this study, estimates of the rate of high school non-completion includes all people living in the U.S., regardless of citizenry, over the age 25 with less than a high school degree or equivalent, i.e. General Educational Development (GED). It should be noted that the 2003 study employed a slightly different measure based solely on American citizens age 25 or older.

The only current data available for high school non-completion is from the 2005 American Community Survey. This provides state level data and some partial reporting for large urban areas, but for the most part data is not available at the sub-state level. To create comparability between the 2005 data and previous studies, high school non-completion was recalculated for the 2000 and 1990 Census, as shown in Table 1.

TABLE 1
Percent of HS Non-Completion

	*2005		**2000		***1990	
	Georgia	**US**	**Georgia**	**US**	**Georgia**	**US**
Population	8,821,142	288,378,137	8,186,453	281,421,906	6,478,216	248,709,873
Population 25 +	5,632,169	188,950,759	5,185,965	182,211,639	4,023,420	158,868,436
Less than HS	970,452	29,782,329	1,111,349	35,715,625	1,169,815	39,343,718
% less than HS	17.23	15.76	21.43	19.60	29.08	24.76

*2005 American Community Survey

**2000 Census of Housing and Population: Summary File 3

***1990 Census of Housing and Population: Summary File 3

In 1990, the percent of the population age 25 and older with less than a high school degree was 24.76% for the U.S. and 29.08% for Georgia, a difference of 4.32 percentage points. In 2000, both the national and state levels of high school non-completion shifted downward to19.6% and 21.43%, respectively. Although both sifted downward, Georgia narrowed the gap to a difference of only1.83 percentage points. In 2005, according the American Community Survey, the levels of non-completion again shifted downward. This time the U.S. rate of high school non-completion was 15.76% and for Georgia the rate of high school non-completion was 17.23%. Therefore, the gap between the U.S. and Georgia rate of high school non-completion decreased to a 1.47 percentage point difference.

The statistics are clear; Georgia has made progress in achieving parody with the nation in terms of the percent of the population age 25 and older with a high school education or its equivalent. There are multiple explanations for the growth in parody and these will be discussed in chapter three.[11]

Table 2 shows the calculation of the percent of high school non-completion by region. The regions used in this study were State Service Delivery Regions, shown in Figure 2. The two regions with the highest rate of high school non-completion were 9 and 1 at 33.2% and 30.9%, respectively. The two regions with the lowest rates were 3 and 12 at 14.5% and 19.3%, respectively.

FIGURE 2
State Service Delivery Regions

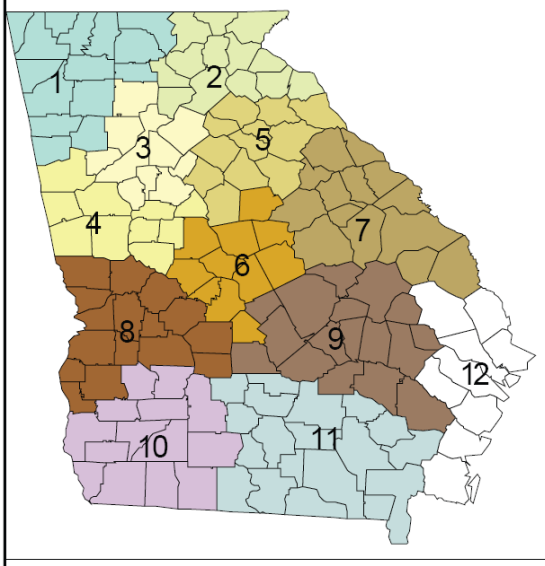

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TABLE 2
***High School Non-Completion for 2000 by Region**

Region	Population 25+	Less than HS	% less than HS
1	451,889	139,655	30.9%
2	298,037	75,487	25.3%
3	2,196,389	318,077	14.5%
4	256,104	70,325	27.5%
5	268,250	68,040	25.4%
6	279,206	63,077	22.6%
7	272,222	66,727	24.5%
8	217,247	55,518	25.6%
9	174,703	58,047	33.2%
10	220,284	64,663	29.4%
11	225,402	68,711	30.5%
12	326,232	63,022	19.3%
Georgia	**5,185,965**	**1,111,349**	**21.4%**

*2000 Census of Housing and Population: Summary File 3

[11] For more detailed information on high school non-completion by age and gender, refer to Appendix A.

Direct Impacts

The direct impacts were calculated using the same regression equation estimated in the 2003 study. Since the equation was based on the 2000 Census of Housing and Population, the per capita income value was based on 1999 dollars.[12] For comparison purposes, this study recalculated the previous and current estimates of high school non-completion using both 1999 dollars and 2006 dollars.[13]

Statewide Losses

Tables 3 and 4 show the statewide and regional direct losses in 1999 dollars and in 2006 dollars.[14] As shown, the statewide impact in 1990, using the 2006 dollars, was $22.4 billion.[15] Ten years later, the statewide loss was $20.8 billion, a reduction of $1.6 billion in foregone income. However, in 2005, a difference of only five years, the economic impact was $18.1 billion, an additional reduction in foregone income of $2.7 billion. In short, from a statewide perspective, as Georgia closes the gap to achieve parody with the U.S., the economic impact of high school non-completion, in 2006 dollars, has been dropping. The cost of non-completion, however, remains high, and as shown above in Table 2 it is not evenly distributed the among sub-regions of the state.

TABLE 3
Direct Impact - HS Non-Completion by Region (1999$)

	2005	2000	1990
Region 1	1,832,255,311	2,114,849,413	2,270,596,867
Region 2	984,868,210	1,136,767,318	1,220,484,208
Region 3	3,461,126,614	3,994,946,305	4,289,152,935
Region 4	943,580,958	1,089,112,211	1,169,319,556
Region 5	933,195,781	1,077,125,299	1,156,449,870
Region 6	844,960,752	975,281,522	1,047,105,839
Region 7	905,619,686	1,045,296,061	1,122,276,578
Region 8	761,048,070	878,426,742	943,118,217
Region 9	772,174,722	891,269,490	956,906,766
Region 10	1,654,212,555	1,909,346,601	2,049,959,862
Region 11	944,099,587	1,089,710,830	1,169,962,260
Region 12	888,556,873	1,025,601,601	1,101,131,725
Total	14,925,699,119	17,227,733,393	18,496,464,683

[12] There are some weaknesses to this assumption since there are always shifts occurring in the economy, the variables (income, non-completion, rural vrs. urban, and others) would change this estimate from not only decade to decade, but also year to year. However, with limited data in 2005 American Community Survey, it is not possible to estimate the regression equation.

[13] This study used the Consumer Priced Index to estimate the inflation of the 1999 estimated per capita income loss (98.2), which becomes 118.83 in 2006 dollars.

[14] The allocation of the impact by region was based on the distribution of the impact estimated from the 2000 Census of Housing and Population. Therefore, this does not account for any regional shifts over time.

[15] The total direct impact is measured from the regression equation shown in the previous chapter (Total Population X $118.83 X Percent HS Non-completion = Direct Loss). Example: 8,821,142 X $118.30 X 17.23 = $18,061,311,877.

TABLE 4
Direct Impact - HS Non-Completion by Region (2006$)

	2005	2000	1990
Region 1	2,217,178,194	2,559,140,078	2,747,607,187
Region 2	1,191,770,768	1,375,581,063	1,476,885,320
Region 3	4,188,245,168	4,834,210,483	5,190,224,473
Region 4	1,141,809,829	1,317,914,502	1,414,971,922
Region 5	1,129,242,919	1,303,409,361	1,399,398,555
Region 6	1,022,471,346	1,180,170,095	1,267,083,370
Region 7	1,095,873,597	1,264,893,391	1,358,046,087
Region 8	920,930,164	1,062,967,919	1,141,249,875
Region 9	934,394,320	1,078,508,692	1,157,935,143
Region 10	2,001,731,955	2,310,464,935	2,480,618,436
Region 11	1,142,437,412	1,318,638,879	1,415,749,647
Region 12	1,075,226,203	1,241,061,489	1,332,459,092
Total	18,061,311,877	20,846,960,887	22,382,229,107

Losses by Region

It is important to note that the direct loss by region reflects both total population and the rate of high school non-completion for a region. A region with a very high rate of high school non-completion and a small population, like Region 9, may appear to have a low direct loss, but in fact has a relatively high direct loss per person. On the other hand, a region with a lower rate of high school non-completion, but with a large population, like Region 3, will appear to have a large absolute loss. The estimates for the regions are not fully updated to reflect sub-state changes in the rate of high school non-completion.

Economic Benefit of Reaching Parody with the Nation

Table 5 shows the statewide direct impact of high school non-completion from above along with an estimate that assumes that the state reaches the national rate of high school non-completion. That is instead of a non-completion rate of 17.23% (2005 estimate), what if Georgia had 15.76%, the national rate in 2005. [16] How much would Georgia gain if the goal of parody with the U.S. were attained?

In 1990, additional income of $3.3 billion (2006$) would have accrued to Georgia if its non-completion rate were the same as the nation in 1990. By 2000, the additional income gained would have been $1.8 billion, and in 2005 the gain would have been $1.5 billion. The decreased magnitude of the gain in subsequent years is due to the smaller gap between high school non-completion in Georgia and U.S. in each year. However, with a potential gain on the order of $1.5 billion, policies that promote the completion of a high school education represent substantial potential benefits yet to be gained.

[16] It should be noted that each time period (1990, 2000 and 2005), has a different national rate of high school non-completion.

TABLE 5

HS Non-Completion (1999$)

	2005	2000	1990
HS Non-Completion	14,925,699,119	17,227,733,393	18,496,464,683
US rate	13,653,573,016	15,757,575,634	15,754,502,398
Difference	**1,272,126,103**	**1,470,157,759**	**2,741,962,286**

HS Non-Completion (2006$)

	2005	2000	1990
HS Non-Completion	18,061,311,877	20,846,960,887	22,382,229,107
US rate	16,521,935,657	19,067,950,230	19,064,231,364
Difference	**1,539,376,220**	**1,779,010,657**	**3,317,997,743**

In order to better understand the effects of the direct impacts, Table 6 shows the direct impacts on a per person basis. Therefore, the direct loss of $3.3 billion in 1990, when dividing by the total population, is a $3,455 per person loss in the form of foregone income. That is high school non-completion cost every Georgian over $3,000 a person in just on year, 1990. If the state had a rate of high school non-completion of 24.76% instead of 29.08% in 1990, the cost per person would have been reduced to $2,943, a difference of $512. In 2005, the total direct loss per person was estimated at $2,048, or in 2000 high school non-completion cost each Georgian $2,048 in foregone income. In 2005, attaining the national rate of high school non-completion would have reduced the loss to only $1,873. Note that foregone income is an underestimate of the true economic impact of high school non-completion. As noted in chapter one, high rates of high school non-completion result in increased unemployment, raises welfare costs, and increases the cost associated with crime and poor health.

TABLE 6

Per Capita HS Non-Completion (1999$)

	2005	2000	1990
HS Non-Completion	$ 1,692	$ 2,104	$ 2,855
US rate	$ 1,548	$ 1,925	$ 2,432
Difference	$ 144	$ 180	$ 423

Per Capita HS Non-Completion (2006$)

	2005	2000	1990
HS Non-Completion	$ 2,048	$ 2,547	$ 3,455
US rate	$ 1,873	$ 2,329	$ 2,943
Difference	$ 175	$ 217	$ 512

Total Economic Impacts

As with the previous studies, the total economic impact of the direct losses were estimated with the regional input-output model IMPLAN. This model is discussed in Appendix B.

The statewide economic impact of high school non-completion is shown with two different economic measures, employment and output. Although this report analyzed the economic impact of high school non-completion for both 2000 and 2005 estimates, both are shown in 2006 dollars for comparison purposes.

Table 7 shows the total impact by sector.[17] The 2000 estimated direct cost of high school non-completion of over $20 billion, has a total economic impact on the state economy of $28.3 billion.[18] This $28.3 billion loss effects every sector of the economy, even governmental services. The multiplier, the way in which a dollar moves through the economy, was 1.41. That is for every $100 lost, there is an additional $41 due to high school non-completion.

When looking at Table 7, several sectors deserve special discussion. First, the largest portion of the economic impact is the on services sector, which accounts for 60% of the total impact. This is due to the loss of income to consumers. [19] Second, Institutions, which account for 24% of the total impact, reflect the final consumption demand of federal, state, and local governments. Third, the losses in the manufacturing sector were 8% of the total economic impact, accounting for $2.2 billion.

TABLE 7
Output (2006$): 2000 Estimate

	Direct	Indirect	Induced	Total
Nat Res, Mining, Util, Const	55,888,615	124,138,189	44,836,501	224,863,292
Manufacturing	1,081,746,048	641,544,384	435,033,280	2,158,323,712
Trade	19,938,323	16,294,291	8,793,367	45,025,981
Transp, Inform, Fin Act	202,598,454	168,724,757	96,680,873	468,004,067
Services				
Profess, Tech Services	2,337,404,672	624,597,312	752,163,328	3,714,165,248
Mngmt of Co, Enter	477,195,840	12,330,794	126,103,064	615,629,696
Admin, Waste Services	2,935,563,520	551,886,848	929,949,376	4,417,399,296
Educational Services	2,312,403,712	415,405,888	714,310,016	3,442,119,680
Health Care, Social Asst	265,487,088	214,906,480	123,910,592	604,304,128
Arts, Enter, Rec	113,109,424	425,713,440	140,219,568	679,042,432
Accom, Food Services	190,940,880	32,013,884	61,270,592	284,225,344
Other Services (excl Gov)	2,471,123,968	171,559,344	668,378,688	3,311,062,016
Government	835,252,255	386,997,862	330,404,049	1,552,654,140
Domestic Services	38,526,132	0	11,771,951	50,298,084
Instutitions	6,735,098,880	0	0	6,735,098,880
Total	**20,072,277,811**	**3,786,113,473**	**4,443,825,245**	**28,302,215,996**

In addition to the total economic impact of output, IMPLAN calculates an estimated loss of employment associated with the loss of transactions within the economy. Table 8 shows that the $20.1 billion in direct loses in income are tied to over 145,000 jobs in the economy. When looking at the economic linkages to within the sectors, the total economic impact creates a loss of 225,000 jobs. The employment multiplier was 1.54. Therefore, for every 100 jobs lost because of high school non-completion, or gained due to a decrease in the rate of non-completion, there were another 54 jobs lost/gained in the economy.

[17] Indirect effects include the inter-industry purchases necessary to produce the product or service. Induced effects include the changes associated with the household income generated by the direct and indirect effects. The total impact is the summation of direct, indirect, and induced effects.
[18] The direct impact is slightly different in this table due to IMPLAN's estimation of inflation.
[19] Domestic Services comprises private households which employ workers who serve on or about the premises in occupations usually considered as domestic services.

TABLE 8
Employment: 2000 Estimate

	Direct	Indirect	Induced	Total
Nat Res, Mining, Util, Const	742	2,000	696	3,437
Manufacturing	4,466	4,775	2,381	11,621
Trade	114	73	46	233
Transp, Inform, Fin Act	1,839	1,304	813	3,956
Services				
Profess, Tech Services	26,569	3,008	7,610	37,187
Mngmt of Co, Enter	5,453	141	1,441	7,034
Admin, Waste Services	42,979	5,201	12,915	61,095
Educational Services	4,913	2,163	1,694	8,770
Health Care, Social Asst	6,115	2,131	2,102	10,348
Arts, Enter, Rec	1,637	6,368	2,078	10,083
Accom, Food Services	1,954	326	627	2,907
Other Services (excl Gov)	30,793	1,692	8,091	40,577
Government	14,607	4,078	5,174	23,859
Domestic Services	3,177	0	971	4,148
Total	**145,357**	**33,261**	**46,636**	**225,254**

The 2005 estimated impact of high school non-completion is less than the 2000 estimated impact of high school non-completion, due to the previously noted reduction in the state's rate of high school non-completion. As shown in Table 9, the direct loss of $17.4 billion, when circulated through the economy, creates a total loss of $24.5 billion. This is $3.8 billion less than the 2000 estimate, when comparing them both in 2006 dollars. The output multiplier was 1.41.

TABLE 9
Output (2006$): 2005 Estimate

	Direct	Indirect	Induced	Total
Nat Res, Mining, Util, Const	48,420,567	107,550,377	38,845,278	194,816,222
Manufacturing	937,199,104	555,818,816	376,902,496	1,869,920,384
Trade	17,274,089	14,116,986	7,618,364	39,009,438
Transp, Inform, Fin Act	175,526,477	146,179,125	83,762,019	405,467,614
Services				
Profess, Tech Services	2,025,071,872	541,136,384	651,656,448	3,217,864,704
Mngmt of Co, Enter	413,431,168	10,683,095	109,252,704	533,366,976
Admin, Waste Services	2,543,302,400	478,141,536	805,686,016	3,827,129,856
Educational Services	2,003,411,840	359,897,792	618,861,248	2,982,170,624
Health Care, Social Asst	230,011,696	186,189,872	107,353,192	523,554,752
Arts, Enter, Rec	97,995,320	368,828,000	121,482,904	588,306,240
Accom, Food Services	165,426,640	27,736,066	53,083,384	246,246,096
Other Services (excl Gov)	2,140,923,136	148,634,912	579,067,456	2,868,625,408
Government	723,642,706	335,285,754	286,254,213	1,345,182,707
Domestic Services	33,378,126	0	10,198,939	43,577,064
Instutitions	5,835,129,856	0	0	5,835,129,856
Total	**17,390,144,997**	**3,280,198,715**	**3,850,024,661**	**24,520,367,941**

As shown in Table 10, the direct employment impact associated with the loss of output was 125,900 jobs using the 2005 estimate. Those 125,900 jobs created an additional loss within the economy of about 69,000 jobs, for a total impact of 195,000 jobs. The job multiplier was 1.55. Therefore, for every 100 jobs lost due to high school non-completion, there is an additional loss of about 55 jobs throughout the economy.

TABLE 10
Employment: 2005 Estimate

	Direct	Indirect	Induced	Total
Nat Res, Mining, Util, Const	643	1,733	603	2,978
Manufacturing	3,870	4,137	2,062	10,069
Trade	99	64	39	202
Transp, Inform, Fin Act	1,593	1,130	704	3,428
Services				
Profess, Tech Services	23,019	2,606	6,593	32,218
Mngmt of Co, Enter	4,724	122	1,248	6,094
Admin, Waste Services	37,236	4,506	11,189	52,931
Educational Services	4,256	1,874	1,468	7,598
Health Care, Social Asst	5,298	1,846	1,821	8,965
Arts, Enter, Rec	1,418	5,517	1,801	8,736
Accom, Food Services	1,693	283	543	2,519
Other Services (excl Gov)	26,679	1,466	7,010	35,155
Government	12,655	3,533	4,482	20,670
Domestic Services	2,753	0	841	3,594
Total	**125,934**	**28,817**	**40,405**	**195,155**

Conclusions

Georgia has closed the gap between the state's rate of high school non-completion and the U.S. every year between 1990 and 2005. However, high school non-completion continues to cost Georgia on the order of $24.5 billion per year in foregone output/income. The foregone output reduces state employment by approximately 200,000 jobs. As was concluded in previous studies, increasing graduation rates in the state is an essential economic development policy.

The estimated losses calculated here, underestimate the full cost of high school non-completion. Other costs are associated with high rates of high school non-completion. These include higher rates of unemployment, higher welfare cost, higher crime and poorer health.

Finally, not fully discussed here is that costs of a high rate of high school non-completion across the state. Central cities and rural communities represent regions that have higher than average rates of high school non-completion, higher than average rates of unemployment and lower than average incomes.

MEASURING AND INTERPRETING HIGH SCHOOL NON-COMPLETION RATES: POTENTIAL PITFALLS

High school non-completion rates have been measured in each decennial census since 1940. In essence, this point-in-time measure is a static number, a stock variable, indicating the percent of the U.S. population age 25 and older that has a high school diploma or its equivalent.

The high school non-completion rate is a measure of workforce quality. Historically, decreases in the high school non-completion rate have been interpreted as an indicator of improvements in the stock of workforce human capital. This remains true when looking at the aggregate picture, such as for the U.S. as a whole. However, there is a fallacy of composition if this interpretation is extended to the sub-national or sub-state regions across time. As a brief example, consider the following impact of retiree migration. On average the 'baby boom' generation has more education than both the currently retired generation and the generation following the 'baby boomers' the 'baby bust' generation. If in retirement, the 'baby boom' generation continues the trend of retiree migration to the south and west, there will be no effect on the national rate of high school non-completion. However, southern and western states are likely to note decreases in state rates of high school non-completion. Further note, that there is then a disconnection between the observed improvement in a state's rate of high school non-completion and improvements in the state's workforce, since retiree by definition are not in the workforce.

Like all static or stock variables, dynamic processes produce adjustments in the level of the stock variable. In the case of non-completion of high school, there are several forces that cause changes in the level, or rate, of non-completion. The first, and perhaps the most obvious of these adjusting factors, are changes in the rates of graduation from high school. Graduation rates are typically interpreted as measures of performance of the educational system.

Several other forces also cause changes in the level of high school non-completion. Principle among these, are relative migration rates and the socio-demographic distribution of migrants. The re-alignment of nation's population to the south and west has resulted in Georgia moving from the 16th largest state in the nation in 1960 to the 9th largest state in the nation in 2000. The level of educational attainment of these migrants has been a positive force, increasing the percent of the population age 25 and older that has completed high school.

In the past 20 years Georgia has also been gaining as a destination for international migrants. The impact of international migration on the state's high school non-completion rate is less clear than the impact of internal U.S. migration.

Care must be taken in interpreting changes in the level of high school non-completion rate over time, particularly at the sub-national level. In a closed economy in which no migration occurs, then there would be a direct link between improvements in high school graduation rates and decreases in high school non-completion. However, in an open economy in which labor

migrates freely among states or within a state among counties, improvements in high school graduation rates may have little or no effect on high school non-completion rates.

High School Graduation Rates: Overview of Georgia and the Nation

In 2006, the National Center for Education Statistics (NCES), produced a study, "Dropout Rates in the United States: 2004."[20] The study presented an analysis of national and state trends in high school completion rates and dropout rates. The study presented data and analyses for four measures of completion/dropout. These are: the event dropout rate; the status dropout rate; the status completion rate; and, the average freshman graduation rate.

> ***The event dropout rate***: estimates the percentage of public and private high school students who leave high school between the beginning of one year and the beginning of the next year without earning a diploma or its equivalent.
>
> ***The status dropout rate***: reports the percentage of individuals in a given age range, typically 16 to 24, who are not in school and have not earned a high school diploma or its equivalent. When they dropped is not relevant.
>
> ***The status completion rate***: estimates the percentage of individuals in a given age range, typically 18 to 24, who are not in high school and who have earned high school diploma or its equivalent.
>
> ***The average freshman graduation rate***: estimates the proportion of public high school freshman that graduate with a regular diploma, 4 years after starting 9th grade. This is an on-time measure of high school graduation.

[20] "Dropout Rates in the United States: 2004." November 2006, U.S. Department of Education, NCES 2007-024.

Event Dropout Rates: National[21]

Between October 2003 and October 2004, 4.7 students dropped out. The rate of change in the event dropout rate declined steadily between 1972 and approximately 1990 when it reached 4.0%. After 1990 that the rate rose slightly and has tended to an average of 4.5% to 5.0%. Between October 2001 and October 2002, the national event dropout rate was 3.6%.

Status Dropout Rates: National[22] [23]

In October 2004, the status dropout rate was 10.3 percent of the population age 16 to 24. The rate has declined steadily from 14.6% in 1972 to 10.3% in 2004.

Event Dropout Rates: Georgia[24]

Based on the October 2001 to October 2002, the state event dropout rates ranged from a low of 1.9% for Wisconsin to 10.5% for Arizona. Georgia, at 6.5%, was one of nine states with an estimated event dropout rate of 6% or more. See Table 11 for Georgia's performance over time.

Status Dropout Rates: State

Not available for individual states, but for the south as a region the rate was 11.4% in 2004.

[21] The estimate for the nation in any one year is calculated from the CPS. Specifically, the national event dropout rate is the percentage of youths ages 15 to 24 who dropped out of grades 10-12 in the 12 months between October 2003 and October 2004.

[22] The estimate for the status dropout rate is the percentage of young people between the ages of 16 and 24 who were not in high school and who have not earned a high school diploma or its equivalent. Its measure is based on the CPS.

[23] This is a measure of overall attainment and it must be noted that it include anyone in the population including those who never attended school in the U.S.

[24] The state event dropout rate is calculated from the Common Core Data and reflects the percentage of school student enrolled in grades 9-12 in October 2001 and were not enrolled in October 2002 and who had not earned a diploma of its equivalent. Since, all states do not have National Educations Statistics reporting rules, the national rate cannot be estimated from the state data.

Status Completion Rates: National[25]

In 2004, 86.8% of the population 18 through 24 not enrolled in high school had a high school diploma or its equivalent. Completion rates have risen steadily between 1972 and 2004.

Average Freshman Graduation Rates: National[26]

The average freshman graduation rate in 2004 was 74.3%.

Status Completion Rates: State

Not available for individual states, but for the south as a region the status completion rate was 85.5%.

Average Freshman Graduation Rate: State

The range for 2004 was from an average freshman graduation rate of 57.4% in Nevada to 87.6% in Nebraska. Georgia was among the eleven states plus the District of Columbia with an average freshmen graduation rates below 70%.

[25] This is calculated from the CPS and is the percentage of those ages 18 to 24 who are not enrolled in high school and who have earned a high school diploma or its equivalent.

[26] The average freshman graduation rate is estimated from the Common Core Data. It is not estimated based on the 9th grade to graduation cohort method.

Relative to the nation, Georgia has higher dropout rates and lower graduation rates. However, Georgia has made continual progress in closing the gap with the nation. Table 11 shows the event dropout rates and average freshman graduation rates across time.

TABLE 11
Time Series: Event Dropout Rates and Average Freshman Graduation Rates,Georgia

	Event Droupout Rates		Average Freshman Graduation Rates	
	U.S.	Georgia	U.S.	Georgia
1993/94	5.3	8.7	na	na
1994/95	5.7	9.0	na	na
1995/96	5.0	8.5	na	na
1996/97	4.6	8.2	na	na
1997/98	4.8	7.3	na	na
1998/99	5.0	7.4	na	na
1999/2000	4.8	7.2	na	na
2000/01	5.0	7.2	na	na
2001/02	3.6	6.5	72.6	61.1
2002/03	na	na	73.9	60.8
2003/04	na	na	74.3	61.2

From Table 5, Dropout Rates in the United States: 2004, National Center for Educational Statistics, U.S. Department of Education, NCES 2007-024.

Georgia's event dropout rate has decreased by 2.5% between a high in 1995 of 9.0% and it low of 6.5% in 2002. The *event dropout rate* for the nation during the same period decreased by only 1.7%. However, between 2002 and 2004 Georgia's average freshman graduation rate was virtually stagnant changing less than 0.1%, while average freshman graduation rates rose from 72.6% in 2002 to 74.3% in 2004, a change of 1.7%.

The south on average has higher status dropout rates than the nation and lower status high school completion rates than the nation. State level data for these measures are not available. But, to the extent that the status dropout rate is higher one should expect that this cohort will raise the high school non-completion rate as they mature.

Conclusions

It is difficult to definitively state that Georgia is making progress toward parody with the nation in terms of comparable proportions of adult population with a high school diploma or its equivalent. Different systems of measurement among states and different data collection methodologies result in measures that are imperfect for comparisons across time and among states. However imperfect the measures, Georgia appears to have cut its event dropout rate which suggests that the education system's performance has improved. There are unfortunately no state level estimates of the status dropout rates and status completion rates, but the south as a region lags the nation in status completion rates. But assuming that Georgia like the rest of the south has a higher status non-completion rates

and a lower status completion rate, there will be upward pressure the state's high school non-completion rate for the population age 25 and older.

As will be discussed below, however, when migration in considered, changes in the state's high school non-completion rate is no longer influenced solely by state policy and the performance of the educational system.

Migration and Socio-Demographic Forces Affecting the Rate of High School Non-Completion

The re-alignment of nation's population to the south and west has resulted in Georgia moving from the 16th largest state in the nation in 1960 to the 9th largest state in the nation in 2000. This internal migration has largely been due to economic forces, population following re-located and newly created jobs. Additionally, some significant components of migration have been non-economic. The retiree boom moved Florida from the 10th largest state in 1960 to the 4th largest state in 2000. In the last twenty years, Georgia has become an increasingly popular destination for retiree migrants. The balance of this chapter provides a discussion of the direction in which the economic and non-economic migrants are likely to move the percent of the population without a high school education or its equivalent.

A prosperous economy generates net-migration. Job seekers from other markets perceive increases probability of employment and/or wage premiums associated with a tight labor supply, move to take advantage of expanding opportunities. For example, Table 12 shows that for 2005, Georgia attracted both migrants from other U.S. states as well as international migrants. Also, shown is the educational attainment status of the migrants. The internal U.S. migrants to Georgia had a slightly higher occurrence of less than a high school education than for all movers between states, 87.2 were high school graduates. Yet, new U.S. migrants to Georgia had a roughly 5% higher prevalence of high school graduation than prevalence of high school graduation in the general Georgia population, 82.7%, as of 2005. Migration from other U.S. states puts downward pressure on the state's rate of high school non-completion.

TABLE 12
***Migration (residence from previous year) for HS Non-Completion**

	Moved from different state	
	Georgia	United States
Percent	12.8%	11.0%
Number	23,186	462,377

	Moved from abroad	
	Georgia	United States
Percent	31.3%	25.4%
Number	9,152	261,542

*2005 American Community Survey

International migration in 2005, had the opposite effect of internal U.S. migration. For both the U.S. and Georgia, international migration put upward pressure on the rate of high school non-completion. For the U.S., approximately 25% of the migrants had less than a high school education. Of the international migrants to Georgia, 31.3% had less than a high school education.

Migration de-couples any direct correlation between increases in high school graduation rates and decreases in the rate of high school non-completion for the population age 25 and older. Table 12 also points to a need for a more detailed understanding of the educational attainment by age cohort by migration status as it may shed light on state status dropout rates.

Again, a prosperous economy generates net-migration. Job seekers from other markets perceive increases probability of employment and/or wage premiums associated with a tight labor supply, move to take advantage of expanding opportunities. The structure of a region's economy influences not only its rate of growth, but also the structure of its growth. The dynamic policy model, REMI provides forecasts that show the impact of the projected growth of the Georgia economy on migration to Georgia.[27] As is show Table 13, Georgia is expected to have a robust economy with a net increase in jobs by 2010 of 291,755 and a net increase in jobs by 2050 of 1.4 million. But the economy is also expected to continue a structural change. The structural change will result in continued destruction of low skilled agricultural and textile jobs. Most of these low skilled jobs will be replaced by low skilled jobs in the service sector. On the other side of the change, growth in the number high skilled, high education job growth will outpace decreases in low skilled jobs. The robust employment opportunities in the high skilled, high education occupation will induce migration to fill the jobs in those sectors.

[27] REMI is a dynamic regional economic forecasting model. It is the product of REMI, Inc., Amherst, MA. An overview of the model is contained in Appendix B.

TABLE 13

REMI Baseline Forecast: Top Ten Job Losers and Top Ten Job Gainers By Sector

Sector	2007	2010	2020	2030	2040	2050	Abs Chg 10-20	Abs Chg 10-50	2010-2020	2010-2050
Apparel mfg	8,588	7,434	5,527	4,649	3,894	3,084	-1,907	-878	-26%	-59%
Oil, gas extraction	340	311	304	275	227	156	-7	-29	-2%	-50%
Leather, allied prod mfg	747	752	828	751	613	410	76	-77	10%	-45%
Textile mills	31,901	26,186	18,931	17,849	16,725	15,520	-7,255	-1,082	-28%	-41%
Textile prod mills	38,782	36,513	30,951	28,796	26,646	24,475	-5,562	-2,155	-15%	-33%
Rail transportation	4,688	4,589	4,149	3,768	3,491	3,253	-440	-381	-10%	-29%
Computer, electronic prod mfg	9,937	10,035	9,818	8,486	7,749	7,173	-217	-1,332	-2%	-29%
Broadcasting, exc Int; Telecomm	67,877	66,815	61,530	56,456	53,041	49,908	-5,285	-5,074	-8%	-25%
Miscellaneous mfg	15,761	15,447	14,896	14,299	13,301	11,670	-551	-597	-4%	-24%
Electrical equip, appliance mfg	15,755	14,729	13,505	13,424	12,671	11,531	-1,224	-81	-8%	-22%
Beverage, tobacco prod mfg	5,745	5,550	5,516	6,242	7,396	8,985	-34	726	-1%	62%
Food services, drinking places	348,289	367,494	401,210	443,180	511,706	597,780	33,716	41,970	9%	63%
Waste mgmnt, remed services	9,994	10,368	11,925	13,711	15,663	17,476	1,557	1,786	15%	69%
Museums et al.	2,369	2,498	2,773	3,107	3,620	4,251	275	334	11%	70%
Transit, ground pass transp	10,273	10,957	12,798	14,627	16,802	18,999	1,841	1,829	17%	73%
Pipeline transportation	306	300	323	389	468	556	23	66	8%	85%
Ambulatory health care services	179,294	199,196	256,852	320,763	380,917	407,895	57,656	63,911	29%	105%
Social assistance	87,125	94,575	115,637	142,021	180,723	230,565	21,062	26,384	22%	144%
Educational services	97,569	106,026	133,139	169,199	221,621	291,815	27,113	36,060	26%	175%
Nursing, residential care facilities	61,758	66,874	86,751	117,724	155,898	192,841	19,877	30,973	30%	188%

The top ten sectors in which jobs are expected to be lost are in the low-skill manufacturing sectors, the type of process jobs that are expected to continue to move overseas. By 2010 these sectors are expected to lose 23,372 jobs. By 2050 the losses will rise to 55,631. In the next tier of losers, not shown in the table, are sectors expected to decline in employment by between 10% and 20% by 2050. Among the sectors in this group are also low-skill manufacturing processors such as plastics and transportation equipment manufactures. Also in this group are wholesale and retail trade, internet service providers, and forestry. For the 14 sectors losing between 10% and 20% of jobs, by 2010 they will lose 29,286 job and job losses will increase to 198,297 by 2050.

On the gaining jobs side of the picture, the top ten sectors in terms of increases in jobs are shown in the bottom half of Table 13. Some of these sectors tend to generate low skill jobs and some generate high skill jobs. The top ten gainers will add 163,086 jobs by 2010 and by 2050 the increase in jobs will rise to 962,176.

There are 21 sectors, not shown in the table, that are expected to have between 61% and 25% increase in jobs by 2050. These 21 sectors will add 178,322 jobs by 2010 and the number of jobs added will increase to 686,761 by 2050.

Job creation and loss by sector does not truly tell the story of changes in the level of workforce skill or education. To understand the human capital demands associated with the jobs lost and the created, the expected changes in jobs by sector must be converted to changes in occupational demand.

TABLE 14

REMI Baseline Forecast: Occupations

Occupation Classification	2007	2010	2020	2030	2040	2050	Abs Chg 10-20	Abs Chg 10-50	2010-2020	2010-2050
Fishing and hunting workers	1,607	1,439	1,193	1,073	960	844	-246	-120	-17%	-41%
Communications equipment operators	9,477	9,024	7,602	6,485	5,286	3,847	-1,422	-1,117	-16%	-57%
Textile, apparel, and furnishings o	51,848	47,489	40,205	37,954	36,262	34,533	-7,284	-2,251	-15%	-27%
Material recording, scheduling, dis	140,972	139,503	129,301	119,710	112,586	105,681	-10,202	-9,591	-7%	-24%
Agricultural workers	52,618	52,069	49,210	46,465	44,642	43,423	-2,859	-2,745	-5%	-17%
Rail transportation occupations	2,536	2,520	2,401	2,285	2,225	2,185	-119	-116	-5%	-13%
Supervisors, farming, fishing, and	3,194	3,176	3,050	2,897	2,782	2,689	-126	-153	-4%	-15%
Woodworkers	11,433	11,080	10,647	10,852	10,648	10,110	-433	205	-4%	-9%
Electrical and electronic equipment	25,569	25,552	24,742	23,842	23,492	23,069	-810	-900	-3%	-10%
Other transportation workers	13,492	13,587	13,233	12,847	12,796	12,745	-354	-386	-3%	-6%
Health technologists and technician	81,425	87,300	102,584	118,453	133,783	141,328	15,284	15,869	18%	62%
Counselors, social workers	36,159	38,484	45,385	53,082	62,723	72,608	6,901	7,697	18%	89%
Other personal care and service wor	86,770	92,347	109,297	130,612	158,216	187,190	16,950	21,315	18%	103%
Fire fighting and prevention worker	9,381	10,044	11,944	13,323	14,903	16,489	1,900	1,379	19%	64%
Misc community and social service	19,661	21,148	25,513	30,331	36,714	43,939	4,365	4,818	21%	108%
Health diagnosing and treating prac	128,742	139,517	168,725	199,344	229,395	245,527	29,208	30,619	21%	76%
Other healthcare support occupation	40,928	44,960	56,101	68,028	79,945	86,465	11,141	11,927	25%	92%
Postsecondary teachers	53,950	58,947	74,079	89,601	110,648	137,239	15,132	15,522	26%	133%
Nursing, psychiatric, and home heal	61,330	67,028	85,096	107,733	133,882	156,166	18,068	22,637	27%	133%
Occupational and physical therapist	4,170	4,626	5,978	7,511	9,092	10,087	1,352	1,533	29%	118%

Table 14 shows the number of jobs by occupation as derived from the expected growth in employment by sector. Underlying the changes in occupational demand is the combination of changes in the employment in certain sectors of the economy along with changes in employment patterns induced by technological changes and changes in worker productivity.

The top ten loser occupations are shown in the top of Table 14. The next highest loser in terms of percent loss by 2050 is Supervisors of Sales Workers. The largest absolute loser in terms of total lost jobs is Retail Sales Workers, with an expected decrease in this occupation of 27,645 by 2050. Including these two occupational categories, the decrease in jobs in the loser occupations will by 26,107 by 2010. The losses will rise to 101,543 by 2050.

On the side of the picture of occupation that will gain jobs, the top ten gainers are shown in the lower half of Table 14. The occupations in the top ten of job growth will add 120,301 jobs by 2010 and 532,637 jobs 2050. As will be shown Table 15 the majority of these jobs require at least some college and with the balance requiring a high school education.

Ten other occupations will generate 30,000 or more jobs by 2050. These occupations include: Primary, Secondary and Vocational Education; Computer Specialists; Other Education, Training and Literacy Workers; Other Business Operations Specialists; Food and Beverage Serving Workers; Cooks and food Preparation Workers; Building Cleaning and Pest Control; Other Installation and Maintenance Workers; Construction Trades and Related Workers; and Motor Vehicle Operators. Of the jobs in these occupations, all of the jobs in the first four require at least a college education. For the other six the majority of the workers will not have more than a high school education. Adding these gains to those of the top ten, by 2010 279,027 jobs will be added approximately occupations. By 2050, the number of jobs added to those same twenty occupations will be 1.3 million, the bulk of all jobs added to the Georgia economy by 2050.

TABLE 15

Loser and Gainer Occupations: Educational Requirements and Median Income

Occupation	Losses/Gains 2010	Losses/Gains 2050	Education	Median Income
Fishing and hunting workers	-246	-595	HS	$26,730
Communications equipment operators	-1,422	-5,177	HS/SC	$31,680
Textile, apparel, and furnishings operators	-7,284	-12,956	HS	$17,330
Material recording, scheduling, distribution	-10,202	-33,822	HS/SC	$24,570 - $36,340
Agricultural workers	-2,859	-8,646	HS	$16,030 - $21,120
Rail transportation occupations	-119	-335	HS/SC	$46,340 -$50,540
Supervisors, farming, fishing, workers	-126	-487	HS	$33,720
Woodworkers	-433	-970	HS	$23,610 - $30,950
Electrical and electronic equipment	-810	-2,483	HS/SC	$24,290
Other transportation workers	-354	-842	HS/SC	$44,810
Supervisors, sales workers	-1,269	-7,585	HS/SC	
Retail sales workers	-983	-27,645	HS/SC	$18,680
Information and record clerks	8,739	31,145	HS/SC	$21,830 - $32,110
Motor vehicle operators	8,717	31,056	HS	$19,650
Construction trades and related workers	12,311	67,255	HS/SC	$21,310 - $25,160
Other installation, maintenance	8,834	38,026	HS/SC	$21,310 - $33,760
Building cleaning and pest control	14,423	61,076	HS	$16,900 - $26,220
Cooks and food preparation workers	10,180	62,620	HS	$14,700 - $20,990
Food and beverage serving workers	19,949	125,855	HS/SC	$14,050 - $16,540
Other management occupations	10,437	45,247	SC/C	$67,430 - $81,810
Business operations specialists	14,986	59,824	C	$50,770
Other education, training, and libr	7,252	33,446	C	$29,720
Computer specialists	19,125	61,962	DOCTORAL	$85,190
Primary, secondary, and special edu	23,773	103,167	C	$27,060 - $45,920
Health technologists and technician	15,284	54,028	HS/SC/C	$34,230
Counselors, social workers	6,901	34,124	C	$40,080
Other personal care and service workers	16,950	94,843	HS/SC	$16,760
Fire fighting and prevention worker	1,900	6,445	SC/C	$38,330 - $58920
Misc community and social service	4,365	22,791	C	$34,995
Health diagnosing and treating prac	29,208	106,010	C	$57,970
Other healthcare support occupation	11,141	41,505	C	$42,130 - $51,570
Postsecondary teachers	15,132	78,292	DOCTORAL	$51,800
Nursing, psychiatric, and home health	18,068	89,138	HS/SC	$16,900 - $33,970
Occupational and physical therapist	1,352	5,461	SC/C	$21,380 - $38,430
Total Jobs Lost	-26,107	-101,543		
Total Jobs Gained	279,027	1,253,316		
Total Jobs Lost HS and HS/SC	-26,107	-101,543		
Total Jobs Gained HS and HS/SC	118,171	601,014		

Table 15 shows two things.[28] First, there is support for the notion that for those workers who are losing jobs in textiles, apparel, furnishing, retail sales and such things as electrical assembly, the jobs for which they qualify are largely in the low-skill, low wage service sectors. Second, of the 279,027 and 1.3 million jobs gained by 2010 and 2050 more than half of those jobs will be in occupations requiring some college.

With the Georgia economy producing many more high educational attainment jobs than lower educational attainment jobs, there is a net positive flow of economic migrants. Table 16 shows population growth and migration caused by Georgia's economic growth.

[28] Educational attainment levels were taken from the Bureau of Labor Statistics, published in www.bls.gov/emp/optd/opt004.pdf.

TABLE 16
Population and Migration

	2007	2010	2020	2030	2040	2050
Starting Population	9,261,251	9,725,038	10,976,120	12,013,110	13,132,142	14,285,224
Births	144,625	149,079	154,840	166,190	181,431	194,229
Deaths	69,638	74,586	90,593	108,738	128,300	144,615
Natural Growth	74,987	74,493	64,247	57,451	53,132	49,614
Population Before Migrants	9,336,238	9,799,531	11,040,366	12,070,562	13,185,274	14,334,838
Total Migrants	87,300	69,517	43,048	48,539	65,602	60,384
Economic Migrants	45,473	29,816	4,475	4,790	20,913	15,113
Retired Migrants	3,160	3,316	4,204	5,429	6,301	7,234
International Migrants	33,973	34,481	36,401	37,841	36,595	35,924
Total Special Pops	719,254	723,242	717,107	710,073	721,991	741,264
Total Population	**9,423,538**	**9,869,049**	**11,083,416**	**12,119,101**	**13,250,876**	**14,395,222**

Annually, Georgia's population due to migration is expected to grow by between approximately 70,000 and 60,000 migrants per year between 2010 and 2050. Over that time period international migration is expected to make-up a growing percent of total migration ranging between 39% and 60%.

Internal U.S. *economic* migration is expected to be cyclical, but will range from between approximately 30,000 in 2010 to 15,000 by 2050. At its lowest, internal U.S. *economic* migration will represent 10% of total migration. At its highest, internal U.S. *economic* migration will represent approximately 43% of total migration.

Retiree migration is expected to increase slightly from about 3,000 per year to about 7,000 per year between 2010 and 2050. The Bureau believes this is a low estimate of retiree migration to Georgia. The estimate does not adequately reflect the expected increase in retiree migration associated with the expected higher propensity of 'baby boomers' to migrate post-retirement.[29] Additionally, Georgia moved from 8th to 7th place as a preferred destination for retirees. Further improvements in desirability of Georgia as an attractive destination for retirees are expect to be confirmed by the 2010 decennial census.

Internal U.S. migration, of course does not affect the national rate of high school non-completion for the population age 25 and older. However, it is argued in this study that both economic migration and retiree migration are likely to increase the Georgia rate of high school non-completion for the population age 25 and older. While, the exact quantitative effect cannot be estimated, the following explains the reasons for the expectation that these components of migration will reduce the rate of high school non-completion for the population age 25 and older.

First, economic migration is expensive, so one should expect that it is workers with high capital and higher earning power that will be able to undertake moving. It should be expected that these workers will have higher than average educational attainment.

[29] See "Retirement Communities: An Innovative Retiree Attraction and Eldercare Living Strategy for Rural Georgia." Georgia Tech: Enterprise Innovation Strategy with BBRED, 2006, www.livingoak.org.

Second, as shown in Table 15, the Georgia economy is expected to create far more demand for college or more qualified workers than it will create for high school qualified workers. The rate of return for moving for a high educational attainment job will justify the risk of a costly move. This creates a bias toward movers with higher educational attainment.

Third, with respect to retiree migration, some of the same arguments apply. Moving is costly, so one should expect that retirees who move are likely to be higher educational attainment retirees, because they are more likely to be able to afford the move.

Fourth, 'baby boomers' on average have more education than both the currently retired generation and the generation that follows the 'boomers' the 'baby bust' generation. With 77 million 'baby boomers' entering retirement over the next 20 years, southern and western states should all experience a decrease in the high school non-completion rate for ages 25 and older.[30]

With respect to international migration a portion of the immigrants are likely to have the same effect as economic migrants and retirees. Shortages in high educational attainment professions pull qualified migrants to the U.S. Currently, immigration policy favors and is biased toward, facilitating the movement of these migrants. Again, based on the high expected rate of growth in Georgia of jobs requiring high educational attainment, some portion to the international migration will have the effect of decreasing the rate of high school non-completion for the population age 25 and older.

However, some portion of the international migration to Georgia is associated with low-skill, low-wage agriculture and the processing of agricultural commodities, e.g. Georgia's poultry and food processing jobs. These migrants are typically a younger cohort and typically have less than a high school education. To the extent that these immigrants are age 25 or older, their presence is likely to result in upward pressure on the rate of high school non-completion for age 25 and older. To the extent that they are less than age 25, they are likely to cause Georgia *status dropout rate* to increase,[31] even while the dropout rate decreases.

Conclusions

In a closed system, with no migration, changes in a state's rate of high school non-completion are directly effected by changes in the state's high school graduation rates and changes in opportunities for a General Education Diploma. However, in a open economy with migration between regions with different percentages of the population with high school educations, changes in a state's rate of high school non-completion

[30] As noted earlier, historically decreases in the rate high school non-completion for ages 25 and older, have been correlated with higher human capital and higher productivity. However, when these gains to a region are associated with retiree migration, there will be less of a direct correlation between reductions in high school non-completion and improvement in workforce skills and productivity.

[31] The status dropout rate is the equivalent of the high school non-completion rate, but it is for ages 16 to 24.

depend on both changes in the state's high school graduation rate and the educational attainment of migrants.

As discussed above, it is expected that most migrants to Georgia will have higher than average educational attainment, thus reducing the state's rate of high school non-completion for age 25 and older. Extrapolating the migration effect to the county level, one should expect a potential for growing divergence between the state's rural and urban counties. The low-skill, low-wage jobs being destroyed in the Georgia economy are largely concentrated in rural communities. The higher skill, higher educational attainment jobs are largely being created in urban economies. Therefore, one should expect those workers in rural communities with the highest educational attainment to migrate to the better paying higher attainment jobs being created in urban areas.

In both cases, whether at the state level or the county level, there is a weakening of the direct link between changes in high school graduation rates and the rate of high school non-completion for age 25 and older. While the rate of high school non-completion for age 25 and older in general remains a valuable measure of the workforce's stock of human capital skills, it means that one cannot directly assume that decreases in rates of high school non-completion in the population age 25 and older arise from improvements in the performance on the education system. Moreover, with respect to rural areas, higher than average rates of high school non-completion in the population age 25 and older may be unrelated to school system performance. If, for example, high school graduates moved to urban locations where more high educational attainment jobs are created, then improvements in graduation rates for rural schools, may actually result in rising rates of high school non-completion in the population age 25 or older.

APPENDIX A

Detailed analyses of the educational characteristics of internal and international migrants are only available for 2004 and 2005. The tables below are for 2005. The differences in educational attainment by gender are some what expected, with males both internationally and in Georgia having a slightly higher rate than females of less than a high school education. However, females have a higher rate than males of high school completion or its equivalent.

Also of interest, note that for ages 25 through 44, Georgia is roughly on parody with the U.S. in all levels of educational attainment. For ages 45 and up however, compared to the U.S. Georgia has higher percent of the population with less than a high school education. On the other end of the age spectrum, compared to the U.S., Georgia also has a much higher percent of the population age 18 to 24 with less than a high school education. In Georgia, the impact of this shows up in the all age groups in the form of lower rates of completion for all levels of college.

Age by Educational Attainment for the Population 18 Years and Over

	United States				
	18 to 24	**25 to 34**	**35 to 44**	**45 to 64**	**65 +**
Less than HS	20%	14%	13%	13%	28%
HS/Equivalent	34%	27%	29%	30%	34%
Some College	37%	30%	29%	29%	20%
Bachelor's	9%	22%	19%	17%	11%
More College	1%	8%	10%	12%	8%
	Georgia				
	18 to 24	**25 to 34**	**35 to 44**	**45 to 64**	**65 +**
Less than HS	24%	14%	13%	16%	33%
HS/Equivalent	34%	28%	30%	30%	32%
Some College	33%	28%	27%	27%	18%
Bachelor's	7%	22%	20%	16%	10%
More College	1%	8%	10%	11%	7%

*2005 American Community Survey

Sex by Educational Attainment for the Population 25 Years and Over

Male	**Georgia**		**U.S.**	
Less than HS	486,075	18%	14,621,052	16%
HS/Equivalent	789,844	29%	26,292,062	29%
Some College	666,742	25%	23,824,806	26%
Bachelor's	492,200	18%	15,967,978	18%
More College	263,214	10%	9,800,876	11%
Population 25+	**2,698,075**	**100%**	**90,506,774**	**100%**

Female	**Georgia**		**U.S.**	
Less than HS	484,377	17%	15,161,277	15%
HS/Equivalent	879,841	30%	29,564,874	30%
Some College	796,428	27%	28,119,858	29%
Bachelor's	500,629	17%	16,568,208	17%
More College	272,819	9%	9,029,768	9%
Population 25+	**2,934,094**	**100%**	**98,443,985**	**100%**

*2005 American Community Survey

APPENDIX B

The REMI Model

REMI is a dynamic regional economic modeling system. There are three important attributes of REMI which make it a preferred means of forecasting economic and population growth. First, it models market behaviors. Second, it includes measures based on the New Economic Geography[32] that captures the forces of agglomeration. Third, the model is a policy analysis model designed to allow one to examine the potential impacts of changes in economic development conditions.

- ***REMI Models Market Behaviors***

Methodologically REMI is a macroeconomic modeling system for small open economies which recognizes that regional open economies do not share all of the policy parameters or barriers to factor mobility that small open national economies face. The focus of the model is on the interactions between the regions of interest, in this case the coastal region of Georgia, and all other regions, national and global. However, unlike counterpart models of small open economies in an international framework, the free movement between regions of goods, services, capital, labor and population is assumed. It is an important aspect of the model that labor moves in response to changes in economic conditions that makes REMI particularly powerful for forecasting changes in population.

REMI's regional modeling system is built on market behaviors. Firms make decisions about what and where to produce goods and services based on relative wages, prices, profits, and amenities. Households make decisions about where to live and work based on the net demand for labor, relative wages, relative prices and amenities. Based on the movement of jobs and capital, labor moves between regions. Movement between regions results in changes in the market shares of regions, changes in gross regional output, changes in residential housing and changes in business capital stock. Increases in population and deepening regional economy results in increases in economies of agglomeration. All of these changes in economic conditions result in changes in relative prices and wages. The result is that forecasts are not totally dependent on past trends, but rather are dependent on a region's expected relative competitiveness.

- **REMI Models New Economic Geography Forces**

New Economic Geography adds the dimension that there are powerful forces which tend to create and sustain growth in clusters of centralized development. Typically classified as economies of agglomeration, the New Economic

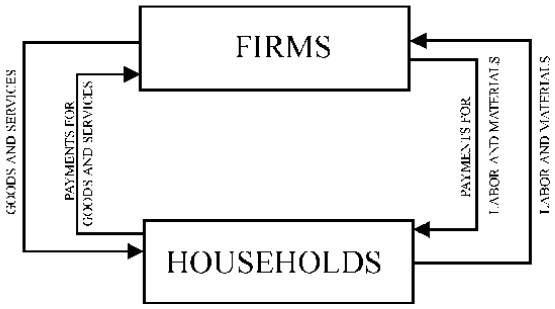
[32]See Paul Krugman: *Development, Geography and Economic Theory*; *Geography and Trade*; and, *The Spatial Economy* (with Masahisa Fujita and Anthony Venerables).

Geography components of the REMI model captures the forces of agglomeration on the relative costs of labor, the relative costs of other supplier inputs, and the relative costs of transportation. To give an example of a cluster, the Silicone Valley is a self-sustaining cluster of economic growth in high-technology. On the surface, the costs of doing business and the costs of living in the area appear prohibitively high for attracting new firms. However, because of the very high productivity of labor created by the effect of pooling highly specialized knowledge-workers in one location, the region is actually a low cost area for high-technology firms. This effect, high relative productivity, makes real costs of doing certain types of business to be relatively low thus sustaining the power of the cluster to draw new businesses to the region. In Coastal Georgia, the high quality access to inter-modal transportation facilities has had the effect of creating a transportation/warehouse/distribution cluster.

- **REMI Models the Impact of Changes in Economic Conditions or Competitiveness**

State Governments, Development Authorities and Communities constantly seek to change regional competitiveness to attract new firms or to diversity economies. The policies implemented are specifically designed to make the economic future of a region look different from its past. As a dynamic modeling system, REMI can incorporate policy changes and simulate the effect of alterations in the framework of development.

IMPLAN



After gathering the previous information, the total number of potential employees was entered into a regional model built from the program, IMPLAN. IMpact Analysis for PLANning is nationally recognized as one of the best input-output modeling systems and includes a database for the state of Georgia and each of its counties. The estimates were prepared using the 1997 database, which is the most current database available. Since the expenditures data is in year 2000 dollars, the program automatically deflates the dollars to 1997. Therefore, all of the estimated impacts are reported in base year 1997 dollars.

Input-output analysis, a branch of economic modeling and statistics, has the ability to illustrate and quantify the economic interdependence of producing industries in any regional or local economy. Just as each industry produces goods and services, it is also a consumer by purchasing other goods and services for use in the production process. Using the input-output analysis technique, the impact of a specific industry or economic activity can be traced throughout all sectors of the economy.

Economists often view the economy as if it were a series of transactions that flowed in a circle. In order to understand the theory behind input-output models, it is best to understand the Circular Flow of Transactions in a basic economy.
Economists often summarize the economy by describing it as a series of transactions. Each transaction by one sector has a counterbalancing transaction in at least one other sector. In Figure 1.1, the outside loop refers to such things as goods, services, labor and capital. The households provide firms with such things as labor and materials. In return, the firms provide households with such things as goods and services for sale. The inner loop, on the other hand, identifies the payments for the transaction of the goods and services, which are part of the outer loop. The firm pays the household wages and other payments for labor and materials. The household, however, provides payments back to firms for the goods and services it produces.

Equilibrium in this simple economy will be maintained as long as there are no leakages from the system. Leakages include savings, imports and taxes. A leakage means that the amount of payments going to the firm for its goods and services is less than the income obtained by the household. When leakages occur the total amount of income and goods will shrink unless new spending injections occur which offset the losses. Some examples of these injections are: 1) the investment of savings by the firms; 2) consumers from outside of the region buying the firm's goods, exports; and/or, 3) government purchases of goods with generated tax revenue. The economy will balance if injections continue to equal leakages. If injections are greater than leakages, the economy will grow. When leakages exceed injections, the economy will shrink.

HYPOTHETICAL TRANSACTIONS TABLE

Outputs* / Inputs*	[1] A	[2] B	[3] C	[4] D	[5] E	[6] F	[7] Gross inventory accumul-ation(+)	[8] Exports to foreign countries	[9] Govern-ment purchases	[10] Gross private capital formation	[11] House-holds	[12] Total Gross Output
[1] Industry A	10	15	1	2	5	6	2	5	1	3	14	64
[2] Industry B	5	4	7	1	3	8	1	6	3	4	17	59
[3] Industry C	7	2	8	1	5	3	2	3	1	3	5	40
[4] Industry D	11	1	2	8	6	4	0	0	1	2	4	39
[5] Industry E	4	0	1	14	3	2	1	2	1	3	9	40
[6] Industry F	2	6	7	6	2	6	2	4	2	1	8	46
[7] Gross inventory depletion (-)	1	2	1	0	2	1	0	1	0	0	0	8
[8] Imports	2	1	3	0	3	2	0	0	0	0	2	13
[9] Payments to government	2	3	2	2	1	2	3	2	1	2	12	32
[10] Depreciation allowances	1	2	1	0	1	0	0	0	0	0	0	5
[11] Households	19	23	7	5	9	12	1	0	8	0	1	85
[12] Total Gross Outlays	64	59	40	39	40	46	12	23	18	18	72	431

*Sales to industries and sectors along the top of the table from the industry listed in each row at the left of the table.
**Purchases from industries and sectors at the left of the table by the industry listed at the top of each column.

Input-output models begin by simply assigning dollars to the flow of transactions between businesses, households and other major consumer groups in the economy such as governments.

These transactions are recorded in the hypothetical transactions table shown in Table 2. The rows display the transaction of things, goods, and services. The columns reveal the payments associated with each transaction. The system balances in that all injections and leakages are accounted for. In other words, Total Output (Expenditure) is equal to Total Payments (Income/Revenue).

The transactions table is more than a numerical version of the Circular Flow diagram. The table is actually a set of equations that depict the linkages between the final demand for goods and services and the payments, income or revenue, associated with the production of those goods and services. The solution of the system of equations results in a set of multipliers which show the relationships between the final demand for a good or service and the intermediate demand among the producers who supply goods and services at the various stages of production. The mathematical manipulation required to solve the set of equations will not be discussed here.
Input-output models are driven by final demand (consumption). Industries selling to consumers respond to the demand for their products by supplying consumers directly. However, in order to supply consumer demand, the directly impacted industries must buy

goods and services from other businesses. Hence, indirectly impacted producers supply goods and services to the industries responding to direct demand, which means that in turn they must buy goods and
services from yet other producers. Each industry that produces goods and services generates demands for other goods and services and so on, in a round by round fashion. These round by round incremental effects are described as multipliers. Within the general framework of input-output analysis, various methodologies can be employed to solve the mathematical equations and derive the multipliers.

IMPLAN relies on a complex database of linked expenditure patterns between 528 processing sectors in the economy. Using data specific down to the county level for the state of Georgia, the program is capable of generating five separate impact measures in the form of multipliers. These are: 1) output multipliers; 2) personal income multipliers; 3) total income multipliers; 4) value-added multipliers; and, 5) employment multipliers. Each of the multipliers is composed of several components or effects. These effects are denoted: 1) direct effects; 2) indirect effects; and, 3) induced effects.

There are three types of multipliers which may be estimated in a system of input-output equations. These are termed Type I, Type II and Type III Leontief multipliers. Only Type I and II multipliers are estimated in the version of IMPLAN used in this study. Type I multipliers include only the direct and indirect effects. The Type II multipliers used in this study demonstrate the full impact of the direct, indirect, and induced effects, where the induced effects are based on income.

The direct effects on any given producer or industry are the output and employment associated with the immediate effects of a change in final demand. Final demands consist of purchases of goods and services for final consumption, as opposed to an intermediate purchase where the goods will be further re-manufactured by a supplier of final demand. For example, expenditures for new bridge construction are direct final demand.

The indirect effects are the output or employment associated with backward linkages in industry demand. These are the inter-industry effects, i.e. producers buying from other local businesses. To produce the output necessary to serve final demand, directly impacted industries must demand inputs from supporting producers. In order for supporting businesses to produce the intermediate demand for the output going to the directly impacted industries, they require the input of goods and services from other business and employment. Therefore, some portion of the demand for each intermediate producer is attributable to the primary supplier of final demand.

The induced effects are changes in demand associated with the household income generated by the direct and indirect effects of output or employment. Household consumption is related to household income in a stable way and is typically estimated by the propensity to consume. Hence, employment and output generate income which the household uses in turn to demand goods and services. Some part of each region's

consumption, therefore, is dependent on household income generated by the owners and employees of both directly and indirectly impacted producers. Returning to Figure 1-1 and Table 2, input-output analysis traces how the final demand for goods and services has direct, indirect, and induced effects on industry final demand, total industry output and employment.