Fiscal Research Program

**THE EFFECT OF THE GROWTH
IN ELDERLY POPULATION
IN GEORGIA TAX REVENUES**

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ON GEORGIA TAX REVENUES**

EXECUTIVE SUMMARY

The United States population continues to age. Baby boomers (those born between 1946 and 1964) are nearing retirement age in record numbers and over the next several decades the demographics of the tax paying public will change dramatically. In 1994, 13 percent of the national population was age 65 or older. By 2050 they will constitute 20 percent of the total United States population. During this same time period, the two age brackets 25-44 years and 45-64 years which are the largest and most economically powerful in terms of income and consumption, will, on a combined basis, be loosing ground, mainly to the 65 and older population group.

While much has been written about the effects of the aging population on the labor force and the Social Security program, the effects on state budgets and revenue remains largely unexplored. It is common for states to offer special personal income tax treatment to individuals over the age of 65. Many also offer exemptions from sales taxes for items which are heavily consumed by older individuals, such as prescription drugs. Since the state of Georgia offers both these exemptions, there is the potential for a significant effect on state revenues.

The purpose of this paper is to explore some of the revenue implications associated with an aging state population from the perspective of the state of Georgia. The main focus of the paper is to estimate future changes in income and consumption tax receipts, with special emphasis paid to how the aging population will affect these receipts. The paper, however, considers the effect of the forecasted changes in the entire age distribution, not just the effect of an increase in population over 65 years of age.

The driving component of change in the state population is the general aging of the state due to the sheer magnitude of the baby boom cohort. Between 1995 and 2025, the state population is expected to increase by 37 percent. The 65 and older cohort comprised 10 percent (or 717,912) of the state population in 1995.[1] By 2025 this cohort is forecasted to gain just under one million persons and comprise 17 percent (or 1,667,257) of the state population. This results in a 132 percent increase in the size of the 65 & older age cohort between 1995 and 2025. In contrast, the 24 to 44 age cohort is forecasted to increase by only 8 percent for the same period. This explosion of the 65 and older age cohort paired with the relatively low growth rates for the lower age cohorts serves to transform the shape of the age distribution from the traditional pyramid to a much more rectangular shape. During the 2025-2050 period, growth rates among the age cohorts are projected to be more even, with all groups increasing between 12 and 27 percent. This will serve to perpetuate the new rectangular age distribution.

It is the change in the population between the 45-64 and 65 and older cohorts over the 1995-2025 and 2025-2050 periods that is of particular interest in this paper. Between 1995 and 2025 these two age cohorts are forecasted to increase by a total of 1.9 million in Georgia, reflecting the passage of the baby boomers through the age distribution. There is projected to be a dramatic increase of 67 percent (953,512) in the 45 to 64 age cohort between 1995 and 2010. Between 2010 and 2025 there is another dramatic increase expected in the 65 and older cohort as the oldest baby boomers begin to reach age 65 in 2011. Ages 45 through 64 are peak earning periods for most individuals. Having such a large cohort in their prime earning years at one time will have a large positive effect on income and consumption tax revenues. By the same token, having such a large cohort in retirement at one time will have a negative impact on revenues.

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[1]The year 1995 is used as the benchmark year since that is the base year used by the Census Bureau for its population

The results of the revenue projection analysis are fairly straightforward and yield some interesting results. (Figure A shows income tax revenue projections for different simulations.) As a result of forecasted changes in the size and age distribution of Georgia's population, state income and consumption tax revenues are expected to increase throughout the 1995-2050 time frame (Initial simulation in Figure A). In fact, our simulations suggest that by 2050 annual income and consumption tax revenues will be 53.7 percent greater than in 1995 (1995 Baseline in Figure A) as a result of these changes to the state population. Because the analysis did not attempt to adjust the data for inflation, this growth in revenues should be viewed as real, i.e., inflation adjusted, growth. If adjusted for wage increases and price inflation, projected revenues would be significantly higher.

In addition to the initial forecast of income and consumption tax revenues, two alternative simulations were conducted. These alternative forecasts attempt to sort out the effects of changes in the size of the population (Alternative P in Figure A) and in the age distribution (Alternative A in Figure A) on tax revenues over time. Results from these experiments indicate that population growth has a much more significant impact on the revenue forecast than changes in the age distribution. In 2050, annual income and consumption tax revenues will be 60.8 percent larger than in 1995 due to just population growth. Over the 1995-2050 period increases to the state population are projected to increase cumulative income and consumption tax revenues by 24 percent, or $31.5 billion.

On the other hand, the general aging of the state population is estimated to have a very small effect on revenues from consumption and income taxes. By 2050, annual state income tax revenues would be 5.3 percent less than in 1995 and annual consumption tax revenues would be 1.8 percent less than in 1995 if the population aged but did not grow. Over the entire 1995-2050 period, the cumulative impact of the changes to the age distribution are projected to reduce income tax revenues
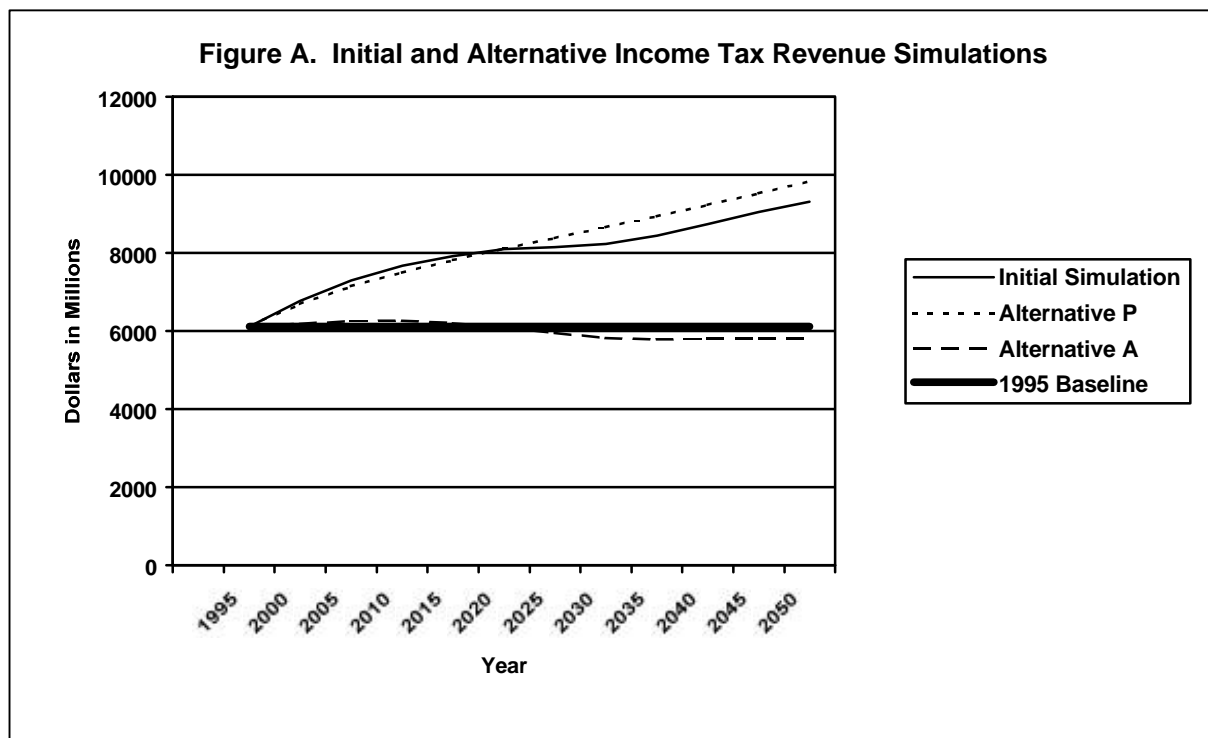
projections.

by just over $2.1 billion, or approximately 2 percent. The projected cumulative effect on consumption revenues is a reduction of $229 million, or less than 1 percent. Thus, the total revenue loss resulting from the aging of the state population, holding the size of the population constant, is a combined loss of $2.4 billion, or 1.9 percent, over the 1995-2050 time period.

Although the aging of the state population has a negative effect overall, it does have a period of positive effect on state revenues. As the population ages, the baby boom cohort first reaches its peak years of earnings, which is between 44 and 64 years of age. Because of this cohort's size and earning capacity, it is a large source of revenue to the state. In fact, prior to 2020 the state actually benefits from the aging of the state population as state revenues rise in conjunction with increases in the size of the 44 to 64 age cohort. After 2020, the state bears a cost for the aging of the population as a majority of the baby boomers will have retired, and consequently have lower incomes and consumption. Although the overall level of revenue continues to rise after 2020, it will rise at a slower rate and will be lower than the revenue that would have been obtained under a non-aging population distribution.

The results presented in this paper should be viewed in light of several caveats of the analysis, of which the following are the most important. First, this analysis implicitly assumes that within any age cohort lifetime consumption and earnings patterns will not change over time. Second, the analysis assumes that the average age of retirement will remain constant between 1995 and 2050.

The results of the analysis may not necessitate any drastic action on the part of policy makers since the results do not reveal any impending doom for the state. This analysis really provides information for policy makers in terms of future budget planning. As is clear from the analysis, changes in the age distribution will not have a large impact on the level of income and consumption tax revenues but will have a strong influence on the growth of those revenues over time. It is equally

clear that revenue growth for the state is largely dependent on increases in the state population. Both

pieces of this result will be useful to policy makers as they face issues concerning state growth in the

future. It has been in the past, and will be in the future, valuable to lawmakers to understand the

distribution of taxes among the public. As the 65 and older cohort increase in size, they will

contribute a larger portion of tax revenues. This may prove important to lawmakers as they design
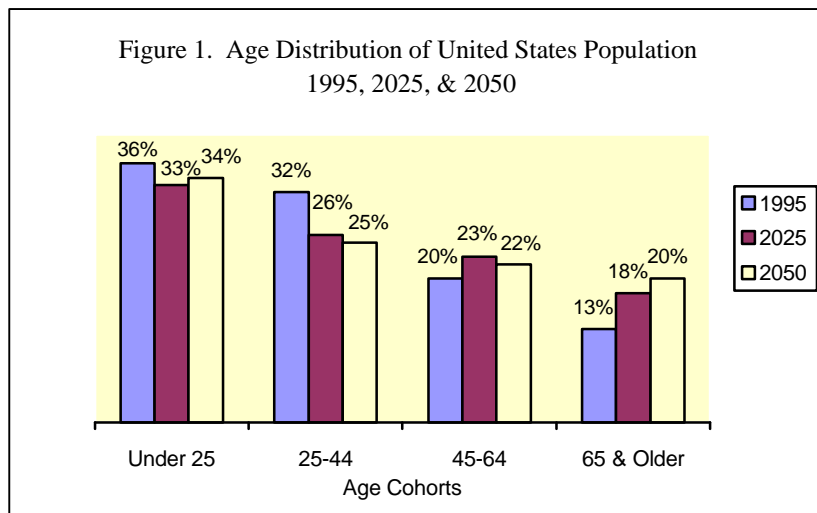
future income and consumption tax structures.

Figure A. Initial and Alternative Income Tax Revenue Simulations

THE EFFECT OF THE GROWTH IN ELDERLY POPULATION
ON GEORGIA TAX REVENUES

I. Introduction

In the United States population continues to age. Baby boomers (those persons born between 1946 and 1964 are nearing retirement age in record numbers and over the next several decades the demographics of the tax paying public will change dramatically. In 1994, 13 percent of the national population was age 65 or older. By 2025, this population cohort will have increased by 85 percent and constitute 18 percent of the national population (Figure 1). By 2050, this cohort will constitute 20 percent of the total United States population. During this same time period, the two age brackets, 25-44 years and 45-64 years, which are the largest and most economically powerful in terms of income and consumption, will, on a combined basis, be steadily loosing ground, mainly to the 65 and older population group (Figure 1).

Overall, the national population is forecasted to increase by 27 percent over the 1995-2025 time period, from 263 million persons in 1995 to around 335 million in 2025, and to 394

Figure 1. Age Distribution of United States Population
1995, 2025, & 2050

million in 2050.[1] Several factors will contribute to this expected increase in population. Based on official Census projections, the annual birth rates were forecasted to decrease slightly between 1995 and 2000 but to rise at an annual rate of 1.4 percent throughout the 2000–2025 time period.[2] This translates into 3.9 million children born in 2000 and 4.7 million born in 2025.[3] At the other end of the scale, death rates are forecasted to increase at an annual rate of about 0.9 percent throughout the 1995-2025 time period.[4] Net immigration is forecasted to remain constant at 0.2 percent annually.[5] Although projections of birth rates outweigh those of death rates, the median age nationally is forecasted to increase. The size of the baby boom cohort is so large (approximately 82 million persons or 31 percent of the population in 1995) that its aging will continue to dominate the age distribution of the national population well into the new millennium.

While much has been written about the effects of the aging population on the labor force and the Social Security program, the effects on state budgets and revenues remain largely unexplored. It is common for states to offer special personal income tax treatment to individuals over the age of 65. Many also offer exemptions from sales taxes for items which are heavily consumed by older individuals, such as prescription drugs. Since the state of Georgia offers both these exemptions, there is the potential for a significant effect on state revenues.

The purpose of this paper is to explore some of the revenue implications associated with an aging state population, from the perspective of the state of Georgia. The main focus of the paper is to estimate future changes in income and sales tax receipts, with special emphasis paid to how the aging population will affect the forecast of these receipts. The paper considers the

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[1]Current Population Reports: Population Projections of the United States by Age, Sex, Race, and Hispanic Origin: 1995 to 2025; P25-1130. February 1996.
[2]Current Population Reports P25-1130; Table 1. Annual Projections and Components of Change for the United States: 1995 to 2050 (Middle Series), p.32.
[3]Ibid.
[4]Ibid.
[5]Ibid.

effect of the changing age distribution, not just the effect of an increase in population over 65 years. The paper begins by exploring the changes to the state population as a result of births, deaths, and migration. Section III discusses the sources of revenue currently relied upon by the state. Section IV discusses data sources and methodology, while Section V presents simulation results of the effect of changes in the age distribution of the state population on state income and consumption tax revenues. That section also includes an estimate of the value in terms of foregone tax revenues of the retirement income tax exclusion. The final section summarizes the findings of the analysis.

II. Population Forecasts and Components of Change

Following the national trend, the population of the state of Georgia is aging, and growing as well. Currently, Georgia is ranked as the 10th most populous state in the nation with a population of 7.2 million.[6] The state population is expected to increase to 9.9 million by 2025, making it the 9th most populous state and ranking 4th as the state with the largest net increase in population for this time period.[7]

In terms of the components of change in the Georgian population, births are projected to increase by 16 percent over the 1995-2025 period and add 3.7 million persons to the total population.[8] Deaths are projected to increase by 39 percent over the 1995-2025 period and amount to a loss from the state population of 2.3 million.[9]   Net domestic migration is projected to add 953 thousand over this same period, making Georgia the 4th largest gainer through net domestic migration.[10] Lastly, net international migration is projected to increase by

[6]U.S. Bureau of the Census, Population Division, Population Paper Listing #47, Population Electronic Product #45.
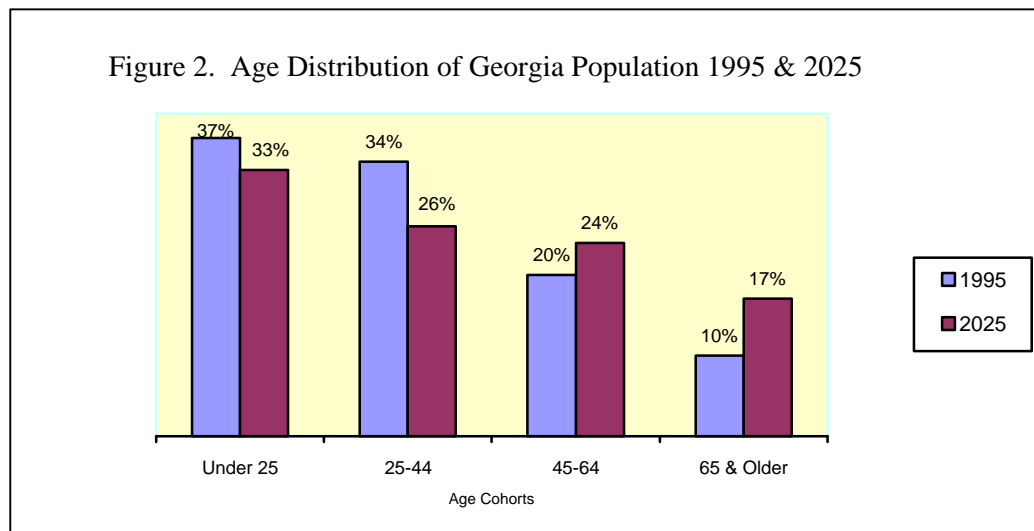[7]Ibid.
[8]Ibid.
[9]Ibid.
[10]Ibid.

13 percent and add approximately 300 thousand to the state population between 1995 and 2025.[11]
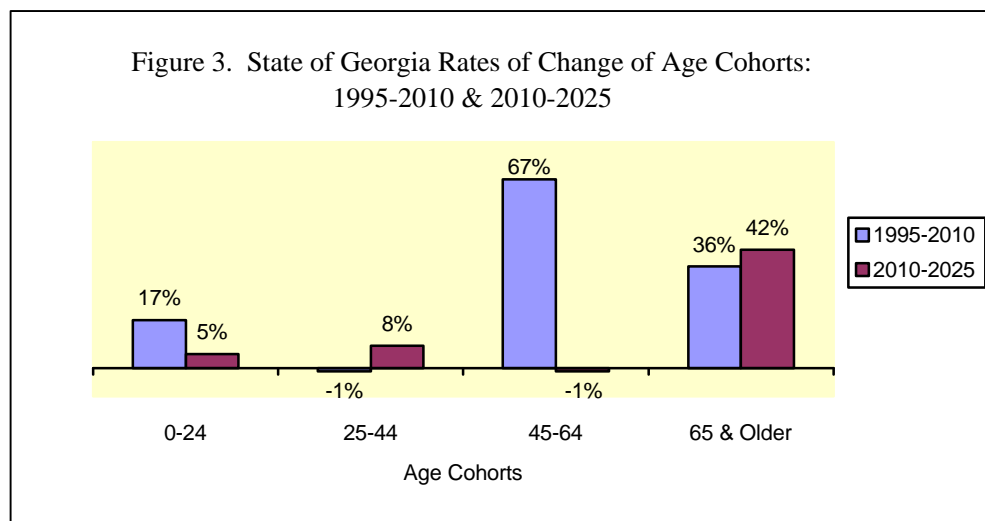
The driving component of change in the state population is the general aging of the state due to the sheer magnitude of the baby boom cohort. As seen in Figure 2, the 65 and older cohort comprised 10 percent (or 717,912) of the population in 1995.[12] By 2025 this cohort is forecasted to gain just under 1 million persons and comprise 17 percent (or 1,667,257) of the state population. Figure 2 also reveals a second significant issue, that the population distribution is becoming more rectangular in shape, i.e., the population will be more evenly distributed across age cohorts. In 1995, 70 percent of the state population was 44 years of age or younger. By 2025, this component of the population distribution will have declined to only 59 percent of the state population. The remainder of the population will be captured in the 45-64 and 65 and older cohorts, causing the distribution to become more top heavy.

Figure 2. Age Distribution of Georgia Population 1995 & 2025

It is the change in the population between the 45-64 and 65 and older cohorts over the 1995-2025 and 2025-2050 periods that is of particular interest in this paper. Between 1995 and 2025 these two age cohorts are projected to increase in size by 1.9 million. This is the effect of the baby boomers moving through the age distribution. By 2010, all of the baby boomers will fall into the 46-64 age cohort. By 2025, 72 percent will be 65 or older. As seen in Figure 3, the Census Bureau projects a dramatic increase of 67 percent (953,512) in the 45-64 age cohort between 1995 and 2010. Between 2010 and 2025 there is projected to be another dramatic increase in the 65 and older cohort as the oldest baby boomers begin to reach age 65 in 2011. As will be discussed in more detail later in the paper, both of these events will have profound influences on state revenues. Ages 45 through 64 are peak earning periods for most individuals. Having such a large cohort in their prime earning years at one time will have a large positive effect on income and consumption tax revenues. By the same token, having such a large cohort in retirement at one time will have a large negative impact on revenues. These offsetting influences are explored further in Section V.

Figure 3. State of Georgia Rates of Change of Age Cohorts: 1995-2010 & 2010-2025

Compared to the nation, the state population is presently younger, and is predicted to remain so. In 1995, 90 percent of the state population was under age 65. In 1995, only Alaska (95 percent) and Utah (91 percent) had a higher percentage of the population under age 65. For Georgia, this is probably due in great measure to the large domestic migration population in the state. Although there is little information on age of migrants by state, data on the age of migrant population as a whole leads one to expect that the migrant population is typically between the ages of 20 and 65.[13] Assuming migrants to Georgia follow this national pattern, relatively large influxes of this population will serve to somewhat offset the effect of the aging of the baby boom population on the state age distribution.

III. Sources of State Revenues

Georgia state tax revenue sources consist mainly of personal income taxes, corporate income taxes, general sales and use taxes, motor vehicle fees, estate taxes, property taxes, and selective sales taxes. These are shown in Figure 4 for fiscal year 1999. In 1999, revenues from personal income and consumption taxes[14] accounted for 90 percent of total state tax revenues. Receipts from the taxation of corporate income and "other" sources, consisting of estates, real and tangible property, and motor vehicle fees accounted for the remainder.

The amount of state revenues stemming from the taxation of income is influenced by the age of the taxpayers, sometimes directly and sometimes indirectly. Personal income tax receipts vary directly by the age of a taxpayer and indirectly as income varies with age. First, personal income tax varies directly with age since Georgia law (as of 1999) allows each taxpayer over age

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[13]Current Population Reports, P20-497. Table 3, p.7.
[14]Consumption taxes include tax receipts from General Sales and Use taxes and Selective Sales taxes. Selective sales tax receipts are generated from the taxation of motor fuels, cigars and cigarettes, liquor, beer, and wine.

Figure 4. Georgia State Revenue Sources – FY99

Selective Sales
5.3%

Corp. Income
and License
6.9%

Other
3.4%

General Sales &
Use
37.1%

Personal
Income
47.2%

61 to exempt from state tax up to $12,000 of retirement income.[15]   Second, the age of the taxpayer influences both the amount and type of income subject to taxation. As an individual matures, his labor income tends to increase as his knowledge and experience increases. So to does his capital income as his financial assets increase. In the typical case, this rise in income peaks just before retirement. After retirement, labor income falls with the cessation of work and capital income may diminish as the individual tends to spend down his savings. Although offset some by exemptions and deductions, tax receipts from such a representative individual should mimic this rise and decline pattern. Expanded to encompass the entire state taxpaying population, it becomes clear that as an increasing proportion of the population reaches these post-employment stages in life, tax receipts from the taxation of personal income can be expected to fall, assuming all other factors remain constant.

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[15]*Georgia's Taxes: A Summary of Major State and Local Government Taxes*, 4th Edition, Fiscal Research Program, Georgia State University.

Sales tax receipts are affected by the age of the taxpayer through indirect means only, as Georgia does not impose any age specific consumption tax exemptions. First, some items which are heavily consumed by the older population are exempt from tax, such as prescription drugs and eye glasses in Georgia. Second, consumption increases with income but also with increases

purchasing houses and providing for families. Consumption increases as the family grows and ages but is expected to decrease with decreases in income and family size. Thus, in the latter stages of life, consumption decreases so as to more closely follow income and to reflect a reduction in needs. Again based on this theory, a reduction in sales tax receipts is expected as a larger proportion of the population enters into the retirement cohort, all other factors remaining equal.

IV. Data and Estimation Methodology

The analysis presented in Section V employs three data sources. Information on income and earnings comes from the 1996 Current Population Survey, conducted by the U.S. Bureau of the Census, containing data on 1995 income levels. Information on consumer expenditure patterns by age comes from the 1995 Bureau of Labor Statistic's Consumer Expenditure Survey, containing 1995 consumption data. Lastly, population forecasts for the various age cohorts were obtained from various Census Bureau publications available from the Census Bureau web site.

Using the 1996 Current Population Survey micro dataset, individuals were placed into groups based on their age. We experimented with several age groupings, but there was little change in the findings. Age cohort groups for the results reported in this paper are: 0-24, 25-44, 45-64, and 65 and older.

In this analysis it was assumed that taxable income for purposes of Georgia state income tax was equal to taxable income for purposes of one's federal tax liability with two notable exceptions. The first was to allow for the $12,000 retirement income exemption allowed by the state. The second was for the state exemption of taxable social security benefits. The retirement exclusion, limited to $12,000 in 1995, applies to all types of income, but does limit the amount of earned income to a maximum of $4,000. The state also allows taxpayers to exempt from state taxation the portion of Social Security benefits taxed at the Federal level.

In practice, there are several additional adjustments which must be made to the Federal taxable income in order to arrive at Georgia taxable income. Lack of data prevented these items from being accounted for appropriately. For instance, interest from non-Georgia municipal bonds, certain loss carryforwards and lump sum payments from employee benefit plans are added to Federal taxable income when computing Georgia taxable income. On the other hand, the state allows several deductions from federal taxable income which were also not accounted for due to lack of data. These include interest and dividends on US bonds and Railroad retirement income included in Federal adjusted gross income (AGI). Several other more minor deductions are allowed as well but were not incorporated into the analysis due to insufficient data. The Georgia state income tax schedule was applied to each observation's taxable income to simulate a Georgia state tax liability. For each age category and filing status, an average tax liability, also referred to as an average tax share, was computed.[16] Then the average tax share for each age group was multiplied by the projected population for that age cohort for each of the years included in the analysis, i.e., 1995, 2015, 2025, and 2050, to yield an annual revenue

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[16]It should be noted that the average tax liability included nontax filers when computed. This tax share is multiplied by the number of persons in each age cohort, many of whom will be nonfilers.

s in prices due to inflation. The only difference

between the results for each year of the analysis is due to changes in the total population and

as simply revenue simulations under various age distributions instead of a forecast of revenues.

A similar analysis was conducted for the state sales and excise tax receipts. Using data

from the 1995 Consumer Expenditure Survey (CES), individual observations were a

into age cohorts. The analysis variable consisted of the annualized sum of all consumer

expenditures included in the Georgia state sales tax base. Special adjustments were made to the

these items are taxed at special rates.

Prescription drugs were excluded since sales of these items are exempt from the sales tax in

of specific data. The state applies different tax rates to the consumption of beer, liquor, and

it impossible to correctly apply the different tax rates. The computed tax shares were then

Summed up over the age cohorts for each year, these yielded consumption tax receipt

simulations for 1995, 2000, 2015, and 2025. Again, note that no adjustment was

increases in prices or changes in tax rates over the time period. Also note that these estimates are

for individuals only and do not include sales and excise taxes paid by businesses. The results are

V. Estimation Results

A. Calculation of Initial Tax Shares

The initial 1995 average tax liabilities by age cohorts are shown in Table 1. The income tax shares follow the overall expected pattern of increasing with the age of the cohort until retirement, at which point they decline. As stated earlier, the tax share is simply the average individual state tax liability for a given age cohort. It is calculated by summing up state tax liabilities, either income or consumption, for all cohort members and dividing by the total number of individuals in that age cohort, including individuals with no tax liability or a negative tax liability.[18]

Table 1. Average Tax Liability in 1995 by Age Cohort

Age Cohort	Tax Share – Income Tax	Tax Share - Consumption Tax	Adjusted Gross Income
0-24	$369	$195	$16,070
25-44	$1,210	$330	$36,651
45-64	$1,436	$342	$38,722
65 & Older	$245	$212	$12,865

The income tax share falls dramatically for the oldest age cohort, from $1,436 for the 45-64 age cohort to $245. This is due in part to the presence of the annual retirement income exemption of $12,000 per person, which allows a maximum tax reduction of $720, but also due to a decline in income. The exclusion of Social Security benefits plays a role as well. Exempting these benefits from the income tax lowers the state tax share of those 65 and older by $25 on average, but has almost no effect on the tax shares of the other cohorts.[19] Adjusted gross income (AGI) decreases by 66 percent between the 45-64 age cohort and the 65 and older cohort,

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[18]16 percent of the sample were nonfliers and 37 percent had a negative or zero state tax liability. In addition, 16 percent had a negative or zero AGI.

while income tax shares between these two cohorts decrease by 83 percent.[20] According to the analysis, the oldest cohort pays the smallest percentage, 1.9 percent, of their AGI in the form of income taxes.   The 45-64 age cohort pays the highest percentage at 3.7 percent, followed by the 25-44 and the 0-24 age cohorts at 3.3 percent and 2.3 percent, respectively.

The 1995 consumption tax shares, also shown in Table 1, indicate the average level of consumption taxes paid by members of the four age cohorts. The consumption tax shares also follow the expected pattern of highest consumption in the peak earning years (i.e., the 25-44 and the 45-64 age cohorts).   Compared to the income tax shares, the consumption tax shares exhibit much less variation across the cohorts. While the 65 and older age cohort income tax share is computed to be only 17 percent of the 45-64 cohort's income tax share, their consumption tax share is 62 percent of the 45-64 cohort's consumption tax share. This is largely due to the absence of targeted sales tax exemptions for older consumers. The implication of this result is that revenues from consumption taxes will be less sensitive to changes in the age distribution of the population than income tax revenues.

The data indicate that members of the oldest cohort pay a higher percentage of their AGI (1.6 percent) in the form of consumption taxes. This result provides the basis for the argument that consumption taxes are regressive.[21] The results reveal that the youngest age cohort pays 1.2

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[19]The exclusion by the state of Georgia of federally taxed Social Security benefits has no effect on the tax shares the first two cohorts and reduces average tax share of the 45-64 age cohort by $4.
[20]In this case AGI is computed by including the retirement income exclusion in the AGI calculation.
[21]Not all economists are in agreement on the regressive nature of consumption taxes. Services are usually exempt from taxation as they are in Georgia. If it is true that higher income individuals consume more services than those with less income, than the sales tax may not be naturally regressive but regressive only due to the exemption of these services.

percent of AGI while the middle two cohorts each pay about 1 percent of AGI. Unlike the income tax though, the ratio of consumption taxes paid to AGI is very similar among the four cohorts. This result affirms the greater constancy of consumption across age cohorts compared to income.

The consumption tax shares should be interpreted with some care. The data used to compute these shares are arranged by age of household heads. For each age cohort, the consumption tax share represents the average total household consumption. For example, in the case of a family of three with a 44 year old parent and two teenagers, total consumption by all members of this family would be represented in the 25-44 age cohort group. Thus, the two middle cohorts can be expected to contain a fair amount of consumption which can be attributed to individuals who are members of other (presumably younger) age cohorts.

B. Revenue Simulations for Projected Population

Results from the initial income tax and consumption tax simulations are shown in Table 2a and 2b, respectively; we refer to these as the Initial revenue simulations. These tables represent a projection of state income and consumption tax revenues based on the Census population forecast for the state of Georgia. These results yield an income and consumption tax revenue growth of 33.8 percent over the 1995-2025 time frame and a 53.7 percent growth over the 1995-2050 period.[22] This is real growth in that it is based solely on changes in the state population and does not adjust for increases in wages or prices due to inflation, nor does it allow for changes in labor force participation or attempt to predict the course of tax rates or laws. Because of this, it may be best to view these results not as a forecast of future revenues but as simulation of revenues.

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[22]Results based on author's extrapolation of state population for the 2025-2050 period.

Table 2a. Projected Total Annual Income Tax Revenue Simulation

| Years | Age Cohorts | | | | | Per Capita |
| | 0-24 | 25-44 | 45-64 | 65 & Older | Total | |
	$ in millions					
1995	$978	$2,924	$2,031	$176	$6,109	$848
2015	$1,156	$2,944	$3,527	$288	$7,915	$860
2025	$1,196	$3,151	$3,379	$409	$8,135	$824
2050	$1,426	$3,566	$3,795	$521	$9,308	$804

Table 2b. Projected Total Annual Consumption Tax Revenue

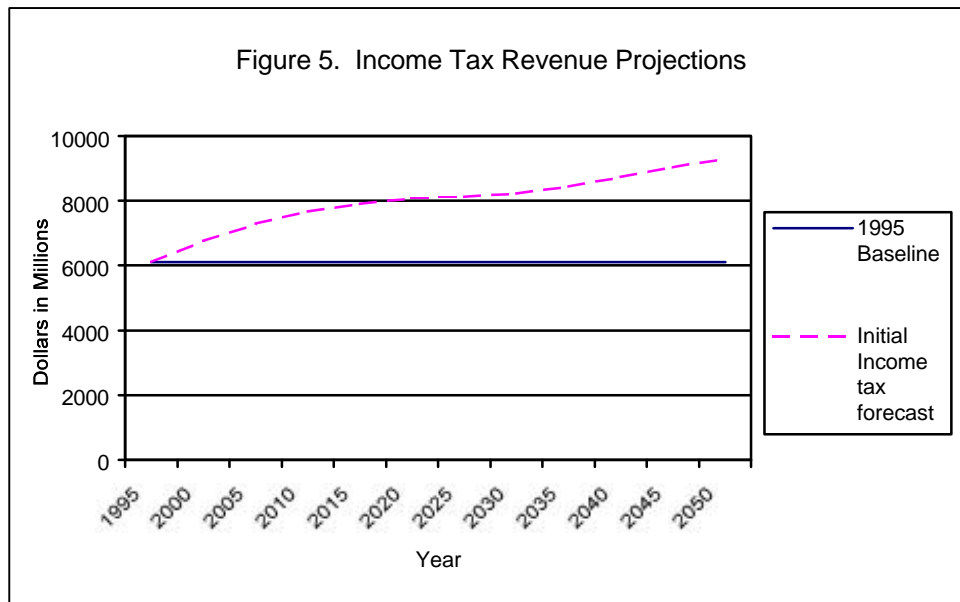| Years | Age Cohorts | | | | | Per Capita |
| | 0-24 | 25-44 | 45-64 | 65 & Older | Total | |
	$ in millions					
1995	$518	$797	$484	$152	$1,950	$271
2015	$613	$802	$840	$249	$2,503	$272
2025	$634	$859	$804	$353	$2,650	$268
2050	$755	$972	$904	$449	$3,080	$266

On their face, the results seem straightforward. Revenues rise over time as expected. The bulk of both taxes is paid by the members of the two middle cohorts. This is a result of both larger cohort populations and higher tax shares on the part of these cohorts. It should be noted that income tax revenue for 1995 exceeds the actual income tax collections as reported by the state. This is not an unexpected result given that the analysis data, Current Population Survey, is not a data set based on income tax returns. The relevant issue to this analysis is the change in the revenues over time, not necessarily the absolute values. By the same token, the consumption tax total for 1995 is below that collected by the state. This is in part due to the absence of sales taxes paid by businesses, which is not relevant to this analysis.[23]   In addition, the data set used to

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[23]In a study by Ring (1999), consumer's share of total sales tax receipts for Georgia was estimated to be 64 percent.

perform the analysis is subject to under reporting by survey respondents. Both of these reasons would lead the 1995 total to be less than the actual. But again, this analysis is reliant on relative changes over time as opposed to changes in absolute values.

The last column of Table 2a and 2b shows the per capita contribution to state income tax and consumption tax revenue for each of the analysis years. This figure is simply the total revenue from all age cohorts divided by the population for each year. The pattern of the per capita contribution over the 1995-2050 time span illustrates the effect of the baby boomers moving through the age distribution. As will be discussed again below, the oldest baby boomers will begin to retire in 2011, but by 2015 the majority of the baby boomers will be in their peak earning years and still under 65. These higher incomes will serve to offset changes in the age distribution occurring between 1995 and 2015. The result is an overall increase in per capita contributions to revenues. By 2025, the situation of the baby boomers will have changed, as the majority of the baby boomers will then be retired and out of the labor force. This will cause a reduction in incomes statewide, resulting in a drop of per person revenues. This scenario continues through 2050. An identical effect occurs in the case of consumption taxes.

The results from the Initial income tax revenue simulation are illustrated in Figure 5. The top (dashed) trendline is simply the total annual revenue, as reported in Table 2a for selective years. In this simulation both the population and age distribution are assumed to follow their forecasted paths. The lower (solid) line in Figure 5, referred to as the 1995 Baseline, represents the forecast of state revenues when neither the state population nor the age distribution is allowed to deviate from its 1995 status. Under this "no change" scenario, revenues each year would be the same as revenues in 1995, namely $6,109 million.

Figure 5. Income Tax Revenue Projections

Several results become apparent from Figure 5. First there is a large deviation between the revenues raised under the 1995 Baseline and the Initial revenue simulation. This indicates that the combination of changes in the age distribution and population have a large positive effect on the projected state revenues. Second, the trend of the Initial revenue simulation is not linear over the 1995-2050 time period. While increasing each year, the revenue trend does tend to "flatten out" between 2015 and 2035 creating three distinct regions along the revenue path.

The results of this analysis are driven by two effects: changes in the age distribution, and changes in the size of the population. Changes in the age distribution will have a more profound effect in the forecast of income tax revenues as the income tax shares are more sensitive to changes in the age distribution than the consumption tax shares. The interesting results of the paper which are discussed shortly stem from changes in the size of the various age cohorts, specifically the growth and decline of the 45-64 and 65 & older age cohorts. Since the tax share of the 45-64 age cohort is so large, increases in the size of this cohorts relative to the others will increase overall revenues. On the other hand, increases in the 65 and older cohort at the expense of the 45-64 age cohort will decrease revenues. Over the 1995-2050 period the baby boomers

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will first swell the ranks of the 45-65 age cohort and later the ranks of the 65 and older cohort. It is the interaction between these two groups that is at the crux of the analysis. While the consumption tax shares exhibit the same general pattern as the income tax shares, it is not of the same degree. Therefore, as will be shown later, the consumption tax forecasts will not be as sensitive to changes in the age distribution.

Between 1995 and 2015, annual income tax revenues under the Initial revenue simulation are projected to increase by 29.6 percent. This rise is due to the positive impact of increases in population and also to the positive impact from the aging of the state population. That is, between 1995 and 2015 the state will gain two million persons which will serve to increase state revenues. Furthermore, the age distribution will change such that there is a 74 percent increase in the population of the 45-64 age cohort. Since this group has the largest average tax contribution of any of the four cohorts, increases in the size of this group's population relative to the other age cohorts will also have a positive effect on state revenues.

Between the years 2015 and 2035, annual income tax revenue under the Initial revenue simulation is projected to grow at less than 7 percent. Population increases over this time amount to an increase of 1.3 million persons, and that will again have a positive effect on state revenues, though it will be less than that projected for the 1995 to 2015 period. On the other hand, the continued aging of the state population will begin in 2015 to have a negative impact on state revenues. Between 2015 and 2035 the baby boomers will have passed into the 65 and older age cohort. The 65 and older age cohort has the lowest average tax contribution (tax share) of any of the four age cohort groups, only 17 percent of the tax share of the 45-64 age cohort. While the 65 and over age cohort will only represent 19 percent of the total population in 2035, between 2015 and 2035 this cohort will increase by 68 percent. At the same time, the 45-64 age cohort is forecasted to decrease by 3 percent. These two changes in the age distribution work

together to decrease state revenues and offset the positive effect of increases in state population. Thus, the overall effect represented in the Initial revenue simulation is a combination of these two effects and results in a 20 year period of average growth of state income tax revenues of about 0.3 percent annually.

The last phase of the Initial revenue simulation occurs between 2035 and 2050. Over this time span projected income tax revenue increases by 10 percent. While this does not compare as favorably with the 30 percent growth in income tax revenue projected to occur between 1995 and 2015, it is an improvement over the 2015-2035 period. During the 2035-2050 period, state population is forecasted to increase by 1 million persons. During this same time period there is no significant change in the state's age distribution. Thus, the combined effect reflected in the Initial revenue simulation, is an increase in the state income tax revenues due almost entirely to increases in the state population.

Although smaller in magnitude, consumption tax revenue under the Initial revenue simulation is also projected to experience significant growth over the 1995-2050 period. Annual consumption tax revenues, based on the Initial revenue simulation are projected to increase by 35.9 percent between 1995 and 2025, and by 57.9 percent over the 1995-2050 period. The consumption tax revenue projection is less sensitive to changes in the age distribution than the income tax revenue projection. This is due to the fact that the consumption tax shares (shown in Table 1) do not differ drastically between the different age cohorts. Therefore, the revenue simulation of the consumption tax is reflective primarily of changes in the state population, and not to changes in the age distribution. This result leads to a much more constant revenue projection than that forecasted for income. That is, the consumption tax revenue projection does not flatten out between 2015 and 2035 as did the income tax projection, but continues to increase over the entire 1995-2050 period.

Between 1995 and 2015, annual consumption tax revenues are projected to increase by 28 percent, reflecting an increase of 2 million persons. Between 2015 and 2035, results of the Initial revenue simulation project an increase of 12 percent, which is consistent with an increase in population of 1.3 million. Over the 2035-2050 period, the simulation projects an increase of 10 percent in consumption tax revenue. The 1995-2015 and 2035-2050 growth rates for consumption taxes are comparable to those projected for the income tax revenues. The major difference between the two revenue projections lies with the 2015-2035 time period, during which time annual income tax revenues are projected to increase by about 6.7 percent while annual consumption tax revenues are projected to increase by 12 percent. Based on these results, the consumption tax is shown to be more stable over time with regards to changes in the age distribution.

C. Change in Revenue Compared to Changes in Population

As indicated in the previous section, the projections from the Initial revenue simulation is related to changes in the total population and in the age cohort distribution. Overall, the state population is expected to increase by 37 percent between 1995 and 2025 and by 17 percent between 2025 and 2050, according to Census Bureau projections.[24] This reveals that the overall population is forecasted to rise slightly faster than revenues from income and consumption taxes. The reason for this lies in the changes in the sizes of the age cohorts.

By construction, the estimated income and consumption revenue total for each cohort shown in Tables 2a and 2b is a monotonic transformation of the cohort population, and as such will rise at the same rate as the cohort's population. Thus, for any age cohort, population growth rate and revenue growth rate are equal. Total population growth rate and total revenue growth rate will differ because the population growth rates differ by age cohort. The forecasted growth

rates of population and revenue for each of the population cohorts are shown in Table 3. The large percentage increase reported for the 65 and older cohort between 1995 and 2025 illustrates the impact of the baby boomers on the age distribution. The oldest baby boomers will reach the age of 65 in 2011 and will continue to enter into this age category until 2029. By 2025, the 65 and over cohort captures 72 percent of the baby boom cohort, which accounts for the large increase in population in this group and in this group's revenue.

Several other pieces of information displayed in Table 3 deserve particular attention. The first is that while the 65 and older cohort is projected to grow by 132 percent, or 949,345 persons, over the 1995-2025 period, the 45-64 age cohort is projected to grow by an impressive 66 percent, or 938,076 individuals. This gain in the 45-64 age cohort will have a large positive impact on revenues since this cohort has such a large tax share. Second, during the 2025-2050 time period there occurs a decrease in the variation of population growth rates among the cohorts. This fact, coupled with the large growth rates experienced by the older two cohorts

Table 3. Growth Rates in Population and Revenue

Period	Population and Revenue Growth By Age Cohorts				Total Population Growth	Total Revenue Growth
	0-24	25-44	45-64	65 & Older		
1995-2025	22%	8%	60%	132%	37%	34%
2025-2050	19%	13%	12%	27%	17%	15%
1995-2050	46%	22%	87%	196%	61%	54%

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[24]As stated in footnote 17, the Census Bureau only projects state populations out to 2025. The author has used national population growth rates, which during the 1995-2025 time period differed from that of Georgia, to forecast Georgia's population out to the year 2050.

Table 4. Distribution of Population and Revenues by Age Cohorts

Age Cohorts	1995			2025			2050		
	Population	Revenues		Population	Revenues		Population	Revenues	
		Income	Consumption		Income	Consumption		Income	Consumption
0-24	37%	16%	27%	33%	15%	24%	33%	15%	25%
25-44	34%	48%	41%	26%	39%	32%	26%	38%	32%
45-64	20%	33%	25%	24%	42%	30%	23%	41%	29%
65 and Older	10%	3%	8%	17%	5%	13%	18%	6%	15%
Total*	100%	100%	100%	100%	100%	100%	100%	100%	100%

 *column may not sum to 100 because of rounding.

during the 1995-2025 period, work in combination to alter the shape of the age structure from its current pyramid shape to a much more rectangular one.

The difference between the growth rate of total population and total revenue can also be explained from information contained in Table 3. Population increases (in absolute terms) between 1995 and 2025 are mostly captured in the first age cohort, which increases by 22 percent in this time period. This growth, in combination with the strong growth of the 65 and older cohort, puts downward pressure on revenues since both of these cohorts have relatively lower tax shares than the 25-64 age cohorts. During this time period the middle two cohorts are forecasted to increase by a combined 1.1 million persons while the other two cohorts are forecasted to increase by 1.5 million. These two factors in combination will cause total revenue growth to lag total population growth.

Table 4 shows each cohort's contribution to total population and to revenue (both income and consumption) for 1995, 2025, and 2050. There is very little difference between 2025 and 2050 in the percentage distribution for either population or revenues due to the stability of the age distribution between 2025 and 2050. On the other hand between 1995 and 2025, there is a

great deal of change in the distribution. The first two cohorts become slightly less important in terms of their contributions to revenues while the older 2 cohorts become more important. Contributing 10 percent of population in 1995, the oldest cohort will make up 17 percent of the population in 2025. Furthermore, while in 1995 contributing only 3 percent of income tax revenues and 8 percent of consumption tax revenues, the cohort will contribute 5 percent of the income tax and 13 percent of the consumption tax revenues in 2025.

From this table the shape of the age and revenue distributions become clear. In the case of population, the age distribution in 1995 is still the traditional pyramid shape in which the largest population group is found at the youngest ages. By 2025, a more rectangular shape begins to appear and will still be prevalent in 2050. In this new distribution, though still not top heavy, the population is much more evenly distributed among all the age cohorts. This is compared to the distribution of revenues. In 1995, both the consumption and income tax revenue distributions exhibit the same bulge-like pattern in which the bulk of the revenues come from the 25-44 age cohort and revenues taper off for the youngest and oldest cohorts. By 2025, the bulge alters slightly as the middle two cohorts share the bulk of the revenue contributions.

D. The Effects of Population Growth and Change in Age Distribution

The results of the Initial revenue simulation shown in Tables 2a and 2b can be further examined so as to isolate the individual effects of the aging population and of population growth on the revenue projections. Two alternative revenue simulations are constructed. The first alternative simulation holds the state population constant at the 1995 level and allows the population to age as forecasted. This alternative revenue simulation is henceforth referred to as Alternative A. Under this alternative simulation there are no increases to the population from births or immigration nor are there any deletions due to deaths or emigration. While this is a completely hypothetical exercise, the Alternative A simulation provides a measure of the effects

of an aging population on the Initial revenue projection. These results are reported in Tables 5a and 5b. A second alternative simulation, Alternative P, is designed to isolate the effect of population growth on the Initial revenue simulation. These results are reported in Tables 6a and 6b. Figure 6 reproduces the information from Figure 5 and also incorporates the trendline of the two alternative revenue simulations for the case of income taxes. (See the Appendix for a technical discussion of the two alternatives.)

Comparing the 1995 Baseline and the Alternative A revenue shows the effect on revenue from the aging of population. As can be seen from Figure 6, projected revenues under Alternative A do not differ much from the 1995 Baseline. It is also clear from Figure 6 that projected revenues under Alternative A are substantially less than projected revenues under the Initial revenue simulation.
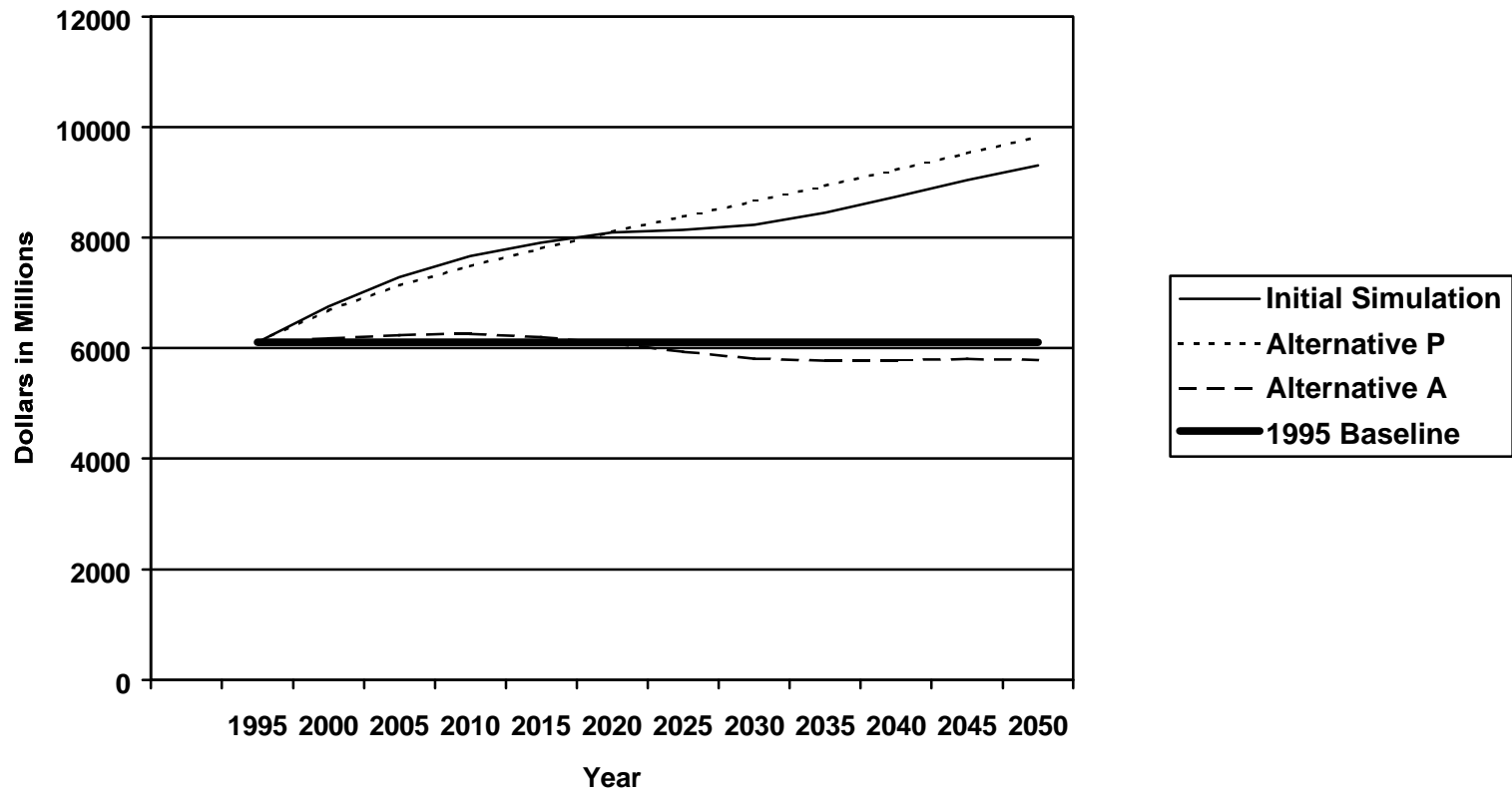
Table 5a. – Alternative A
Alternative Income Tax Revenue Simulation based on
Constant Total Population – ($ in millions)

Years	Age Group				Total
	0-24	25-44	45-64	65 & Older	
2015	$905	$2,304	$2,760	$226	$6,195
2025	$873	$2,299	$2,465	$298	$5,936
2050	$887	$2,218	$2,360	$324	$5,788

Table 5b – Alternative A
Alternative Consumption Tax Revenue Simulation based on
Constant Total Population – ($ in millions)

Years	Age Group				Total
	0-24	25-44	45-64	65 & Older	
2015	$479	$628	$657	$195	$1,959
2025	$462	$627	$587	$258	$1,933
2050	$470	$604	$562	$279	$1,915

Figure 6. Initial and Alternative Income Tax Revenue Simulations

Legend:
- Initial Simulation
- Alternative P
- Alternative A
- 1995 Baseline

Y-axis: Dollars in Millions (0, 2000, 4000, 6000, 8000, 10000, 12000)

X-axis: Year (1995, 2000, 2005, 2010, 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050)

We can use the simulations to determine the magnitude of the revenue that the aging of the population contributes to the projected revenues under the Initial revenue simulation. In 2015, changes to the age distribution contributed $110 million (1.4 percent) in income tax revenue and $11 million (less than 1 percent) in consumption tax revenue.[25] In other words, in the absence of the aging of the population annual revenues would be lower than the Initial revenue simulation by a combined $121 million, or 1.2 percent, in 2015.[26] By 2020, the impact of the aging state population begins to exhibit a negative effect on revenues as the size of the 65 and older age cohort increases. By 2035, the effect of changes in the age distribution is to reduce the Initial revenue forecast for income tax revenues by $492 million, or 5.8 percent, and for consumption tax revenues by $53 million, or 1.9 percent. By 2050, the effect of aging increases to a 5.5 percent reduction ($516 million) in income tax revenues and a 1.8 percent ($56 million) decline in consumption taxes relative to the Initial revenue forecast. Over the entire 1995-2050 period, the cumulative impact of the changes to the age distribution is projected to reduce income tax revenues by just over $2.1 billion, or approximately 2 percent, over the cumulative Initial revenue forecast. The projected cumulative effect on consumption revenues is a reduction of $229 million, or less than 1 percent. Thus, the total revenue effect from the aging of the state population, holding the size of the population constant, is to reduce the Initial revenue simulation by a combined $2.4 billion, or 1.9 percent, over the 1995-2050 time period.

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[25]These figures are computed by subtracting the income tax revenues associated with Alternative P (see Table 6a) from the income tax revenues associated with the Initial revenue simulation (see Table 2a) for 2015, i.e., $7,915 - $7,805. A similar calculation is performed for the figures relating to 2035 and 2050.

[26]The initial revenue simulation results, shown in Table 2a and 2b, cannot be obtained by the summation of the Alternative P and Alternative A effects due to the presence of interactive effects which are not explicitly estimated in this paper but which are relatively small in magnitude. See Appendix for more details.

The smaller effects on the consumption tax projection is because the consumption tax shares (Table 1) are not as sensitive to changes in the age cohort as the income tax shares. Therefore, the general aging of the state population, and specifically the movement of the baby boomers into the 65 and older age cohort, will have a small impact on consumption tax revenues. On the other hand, the tax shares for the income tax are much more sensitive to the age of the taxpayer. Thus, the movement of the baby boomers from the 45-64 age cohort and into the 65 and older age cohort will have a stronger effect on income tax revenue. However, as will be shown below, this effect is overshadowed by the effect of population growth.

While the projected effect of the change in the age distribution on revenue is small, the pattern of the changes in the age distribution over the 1995-2050 time period is responsible for forming the three regions of the Initial revenue simulation discussed earlier. In the initial period, 1995 to 2015, the Alternative A simulation implies that the aging of the population contributes 1.4 percent of income tax revenue projected by the Initial revenue simulation, due mainly to the increase in the size of the 45-64 age cohort.

There is a downward trend in revenues between 2015 and 2035 under Alternative A (Tables 5a and 5b). This corresponds to the shift of the baby boomers from the highest tax paying age cohort to the lowest. (All baby boomers will be 65 or older by 2029.) In fact, by 2030, income tax revenue projections under the Alternative A simulation are slightly less than the 1995 revenues, as seen in Figure 6. Thus, in a world with no population increases but where the population does age, state income tax revenues would be forecasted to decline by 7.3 percent over the 2015-2035 period.

During the remaining years, there is no significant change in the age distribution. This results in a flat revenue projection under Alternative A between 2035 and 2050. Based on the Alternative A revenue projection, annual revenues by 2050 will increase by a mere 0.25 percent

or $15 million over their 2035 level. That is, in the absence of population growth, revenues between 2035 and 2050 would increase by only $15 million. The pattern of change in consumption taxes is identical to that of the income taxes, but the revenue consequences are even smaller due to the relative insensitivity of the consumption tax shares to changes in age.

In order to determine the importance of population growth on the Initial revenue projection, a second alternative projection, Alternative P, was constructed under which the age distribution was held constant at its 1995 distribution but the population size was increased as forecasted. The results of this simulation are shown in Tables 6a and 6b and illustrated for income tax revenue in Figure 6.

Table 6a. – Alternative P
Alternative Income Tax Revenue Simulation based on
Constant Age Distribution – ($ in millions)

Years	Age Group				Total
	0-24	25-44	45-64	65 & Older	
2015	$1,249	$3,736	$2,595	$225	$7,805
2025	$1,340	$4,008	$2,784	$241	$8,373
2050	$1,572	$4,702	$3,266	$283	$9,823

Table 6b – Alternative P
Alternative Consumption Tax Revenue Simulation based on
Constant Age Distribution – ($ in millions)

Years	Age Group				Total
	0-24	25-44	45-64	65 & Older	
2015	$662	$1,018	$618	$194	$2,492
2025	$710	$1,092	$663	$208	$2,673
2050	$833	$1,281	$778	$244	$3,136

As seen from the above analysis, the effect of an aging population is very small in terms of its effect on total revenue but is significant in terms of the pattern of revenues over time. This implies that the vast majority of the growth in revenue is due to increases in the state population. Comparing the Alternative P simulation with the 1995 Baseline or the Initial revenue simulation shows how significant the effect of population growth is on revenues.

We can use the simulations to determine the magnitude of the revenue that the growth in population contributes to the projected revenues under the Initial revenue simulation. In 2015, increases to the population with no aging would contribute $1.7 billion in income tax revenues, or 22 percent of the Initial tax revenue forecast.[27] (Note that for 2015, 77.2 percent of the projected income tax revenue under the Initial revenue simulation is accounted for by the existing 1995 population size.) That is, in the absence of any growth in the population, the Initial revenue forecast for income taxes would be lower in 2015 by $1.7 billion. The population growth effect contributes $2.7 billion in income tax revenues, or 32 percent, by 2035, and $3.5 billion, or 38 percent, by 2050. Over the 1995-2050 period, increases to the state population are projected to add a cumulative $23.7 billion in income tax revenues. Thus, without increases in the population, the cumulative income tax revenue over the 1995-2050 period is projected to be 25 percent less than under the Initial revenue simulation.

In terms of consumption tax revenues the story is much the same. Increases in population account for an additional $0.5 billion in 2015, increasing to an additional $1.2 billion by 2050. Increases in population generate consumption tax revenue of a cumulative $7.7 billion over the 1995-2050 period.

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[27]These figures are computed by subtracting income tax revenues associated with Alternative A (see Table 5a) from the income tax revenues associated with the Initial revenue simulation (see Table 2a) for 2015, i.e. $7,915 - $6,195. A similar calculation is performed for the figures relating to 2035 and 2050 and for consumption taxes as well.

Unlike the Alternative A revenue projection, the Alternative P projection does not fluctuate over the period, but is a relatively linear projection. Under Alternative P, income and consumption tax revenues are projected to increase by 28 percent between 1995 and 2015 ($2.2 billion). This is compared to the 1.2 percent growth in combined revenues attributed to changes in the age distribution for this same time period. Between 2015 and 2035, revenues under Alternative P increase 14 percent ($1.5 billion) and offset the negative effect of changes in the age distribution. Over the 2035 to 2050 period, increases in population are almost the sole factor contributing to changes in revenues. As stated earlier, the age distribution remains nearly constant during this time period, and therefore, nearly all changes in the revenue projection between 2035 and 2050 stem from changes in the population. Under Alternative P, income and consumption tax revenues increase 10 percent ($1.2 billion) between 2035 and 2050.

The purpose of alternative simulations was to illustrate the size of the factors affecting the original revenue projection. Unequivocally, increases in the overall population serve to increase state tax revenues. Since there are no forecasted declines in the state population over the 1995-2050 period, changes in the population are shown to at all times have a positive effect on revenues. On the other hand, the general aging of the population has both positive and negative effects on state revenues. Between 1995 and 2015, the aging of the population was shown to have a positive effect on the Initial revenue forecast. After 2015, though, the additional aging of the state population was shown to have a negative effect on the revenue forecast of both income and consumption taxes. As demonstrated by the alternative simulation results, the vast majority of the revenue growth over the 1995-2050 time frame is due to increases in population. The pattern of intense growth between 1995 and 2015, very low growth between 2015 and 2035, and finally more moderate growth between 2035 and 2050 stems directly from changes in the age distribution.

E. Income Exclusion

The last piece of the analysis provides an estimate of the value of the tax expenditure stemming from the $12,000 income exclusion. A tax expenditure is the revenue loss associated with any tax provision which offers special tax relief to certain taxpayers or attempts to reward taxpayers for certain behaviors.   The $12,000 retirement income exclusion is a state tax expenditure designed to aid taxpayers over the age of 61.   The value of the expenditure is calculated by comparing a projection of the state revenues from income taxes assuming no retirement income exclusion to the original projection of state revenues shown in Table 2a. Based on the CPS data used in this analysis, the real (i.e., inflation adjusted) estimated value of the annual revenue loss to the state government stemming from this expenditure was $153 million in 1995. Between 1995 and 2025, the number of individuals over 62 is forecasted to increase by 137 percent. The value of this tax expenditure is projected to increase by 35 percent, or to $324 million, by 2025.   Elimination of this exclusion would have increased state income tax revenues by 2.5 percent in 1995 and would increase annual revenues by more than 4 percent by 2025.

VI. Conclusion

Over the 1995-2025 time period there will be significant changes in both the total population and the age distribution of the population of Georgia. Relatively smaller changes in both are forecasted to occur over the 2025-2050 period.   Between 1995-2025, the state population is expected to increase by 37 percent. In particular, the 65 and older age cohort will increase by 132 percent due to the aging of the baby boomers. In contrast, the combined increase forecasted for the 24-44 age cohort and the 45-64 age cohort is 29 percent for the same period. This explosion of the 65 and older age cohort paired with the relatively low growth rates at the lower age cohorts serves to transform the shape of the age distribution from the traditional

pyramid to a much more rectangular shape. During the 2025-2050 period, growth rates among the age cohorts are more even, with all groups increasing between 12 and 27 percent. This will serve to perpetuate the new rectangular age distribution.

The results of the revenue forecast analysis are fairly straightforward. As a result of projected changes in the size and age distribution of Georgia's population, revenues are expected to increase throughout the 1995-2050 time frame in Georgia. In fact, over the 55-year span, our simulations suggest that annual income and consumption tax revenues will increase by 54 percent. Because the analysis did not attempt to adjust the data for inflation, this growth in revenues should be viewed as real growth. When adjusted for wage and price inflation as well as other sources of growth of income and consumption, revenues will be significantly higher.

In addition to the overall growth in revenues, the pattern of this growth was also found to be interesting. Between 1995 and 2015, the combined growth in income and consumption taxes is projected to be 29 percent. Based on the analysis presented in this paper the combined growth rate is scheduled to fall to 8 percent between 2015 and 2035 and rise back to 10 percent between 2035 and 2050. The oscillating pattern of the 1995-2050 revenue forecast can be contributed to the fluctuations in the age distribution caused by the general aging of the state population and specifically because of the aging of the baby boomers. While the changes in the age distribution were found to have both positive and negative effects on revenues, over the entire 55 year time period changes in the age distribution were found to have only a very small effect on the magnitude of state revenues. The significant impact of the aging of the state population is on the growth of these revenues over time. Results from an alternative simulation designed to isolate the effects of the aging population on the Initial revenue forecast indicated that the aging of the state population over the 1995-2050 period will reduce income and consumption tax revenues by

a combined $2.4 billion or 1.9 percent. Perhaps more importantly though, the aging of the state population will create a 20-year period of extremely low growth.

The 54 percent combined growth in income and consumption tax revenues can be almost entirely contributed to increases in the state population over the 1995-2050 period. Results from an alternative simulation reveal that in the hypothetical case where the state population was allowed to increase as forecasted but not age, Initial forecasted revenues from income and consumption taxes would be 38 percent higher. The cumulative effect of the population increases over the 1995-2050 period is to increase income and consumption tax revenues by 25 percent or $31 billion.

The results presented in this paper should be viewed in light of several caveats of the analysis. First, this analysis implicitly assumes that all cohorts will experience the same lifetime consumption and earnings patterns. For 1995, data was used to estimate the income and consumption tax shares of all cohorts. These tax shares were assumed to be constant over the 1995-2050 period. This is a very strong assumption and is unlikely to hold completely over the entire time span. For instance, there is evidence to suggest that the baby boomers have had their lifetime earnings suppressed because their age cohort is so large. This creates a large labor pool in which they must compete, dampening wages for the cohort members. By the same token, members of subsequent cohorts which are smaller in size may have higher per capita lifetime earnings. This will cause the income tax shares of the younger cohorts to increase over time. In terms of consumption, the individuals who in 1995 were over 65 were born in a time of depression and their current consumption patterns still reflect this. On the contrary, individuals who in 1995 were in the youngest cohorts were born in a time of relative prosperity. Their consumption tends to be greater and this may continue even in their retirement years. This

would cause the consumption tax shares to rise over time and with it, revenues from consumption taxes.

Second, the analysis assumes that the average age of retirement will remain constant between 1995 and 2050. Again this is not likely to be true throughout the whole time period. There is now research supporting the hypothesis that the working life of individuals will increase. Increases in the working life will lead to increases in the tax revenues from both the consumption and income taxes from older cohorts. For all these limitations and others, it remains that this simulation provides a basic forecast of future revenues from consumption and income taxes.

The results of the analysis may not necessitate any drastic action on the part of policy makers since the results do not reveal any impending doom for the state since the effect of the aging of the state population was found to be relatively small. Policymakers should take note of the pattern of these revenues. Specifically, that the strong revenue growth being experienced today is likely to continue for a number of years but that it will be followed by a long period of negligible growth. In addition, this research should make clear the importance to the state in maintaining a high level of population growth. Strong population growth is the driving factor behind the rise in revenues over time. Lastly, it has been valuable in the past, and will be so in the future, that lawmakers understand the distribution of taxes among the public. As the 65 and older cohort increase in size, they will contribute a larger portion of tax revenues. This may prove important to lawmakers as they design future income and consumption tax structures.

The effect of changes in the size and age distribution of population on tax revenue can be expressed as

$$R_I = \sum_i \left[(P + \Delta P)(f_i + \Delta f_i) t_i \right] \quad (1)$$

Where R_I is total revenue in the Initial simulation

P is initial total population

ΔP is the change in total population

f_i is the initial fraction of the population in age cohort i

Δf is the change in the fraction of the population in age cohort i

t_i is the tax share for age cohort i

Equation (1) can be expanded to:

$$R_I = \sum P \times f_i \times t_i + \sum \left(P \times \Delta f_i \times t_i \right) + \sum \left(\Delta P \times f_i \times t_i \right) + \sum \left(\Delta P \times \Delta f_i \times t_i \right) \quad (2)$$

The first term on the right hand side of equation (2) is the initial revenue, i.e., the 1995 Base revenue, denoted R_{1995}.

For Alternative A simulation ΔP is set equal to zero; let the resulting revenue be R_A. Subtracting R_{1995} from R_A yields the effect on revenue from changes in P, assuming no change in the age distribution. For Alternative P simulation, the Δf's are set equal to zero; let the resulting revenue be R_1. Thus, subtracting R_{1995} from R_P yields the effect on revenue from the aging of the population.

Note that $(R_A - R_{1995}) + (R_P - R_{1995})$ does not equal $(R_I - R_{1995})$, i.e., the combined effect of the population increase and the change in the age distribution, since the 4th term on the right hand side of equation 2 is not included in either alternative simulation.

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