FISCAL RESEARCH CENTER

Georgia's Tax Portfolio: Present and Future

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I. Introduction

A government can consider its choice of taxes as a portfolio. Just as individual financial portfolios are planned conditional on macroeconomic environments and individual investor characteristics, Georgia's tax portfolio should be designed to match the unique characteristics of its economy and budget. Likewise, when considering tax policy decisions, government officials should consider the fiscal impacts well beyond just short-run revenue changes.

Analogous to personal investors, states should select tax portfolios that balance objectives that sometimes conflict. These objectives include growth, volatility, adequacy, equity, and compliance. This discussion focuses only on the tradeoff between growth and volatility.

This report proposes a portfolio framework to guide future tax reform in Georgia. This methodology recognizes that two main factors affect a state's tax receipts over the business cycle: its economy and its tax portfolio. The presentation of this framework first begins with a basic illustration of the growth and volatility of tax revenues. Second, because of the preeminent effect of the state economy on tax receipts, the discussion next considers the historical characteristics of Georgia's economy. The third section discusses how different possible combinations of revenue sources affect the growth and volatility of the tax portfolio. The fourth section demonstrates how Georgia's economy and tax policy interact to affect its revenue growth and volatility. Finally, an issue recently considered by the Special Council on Tax Reform and Fairness for Georgians illustrates how the portfolio framework could be implemented.

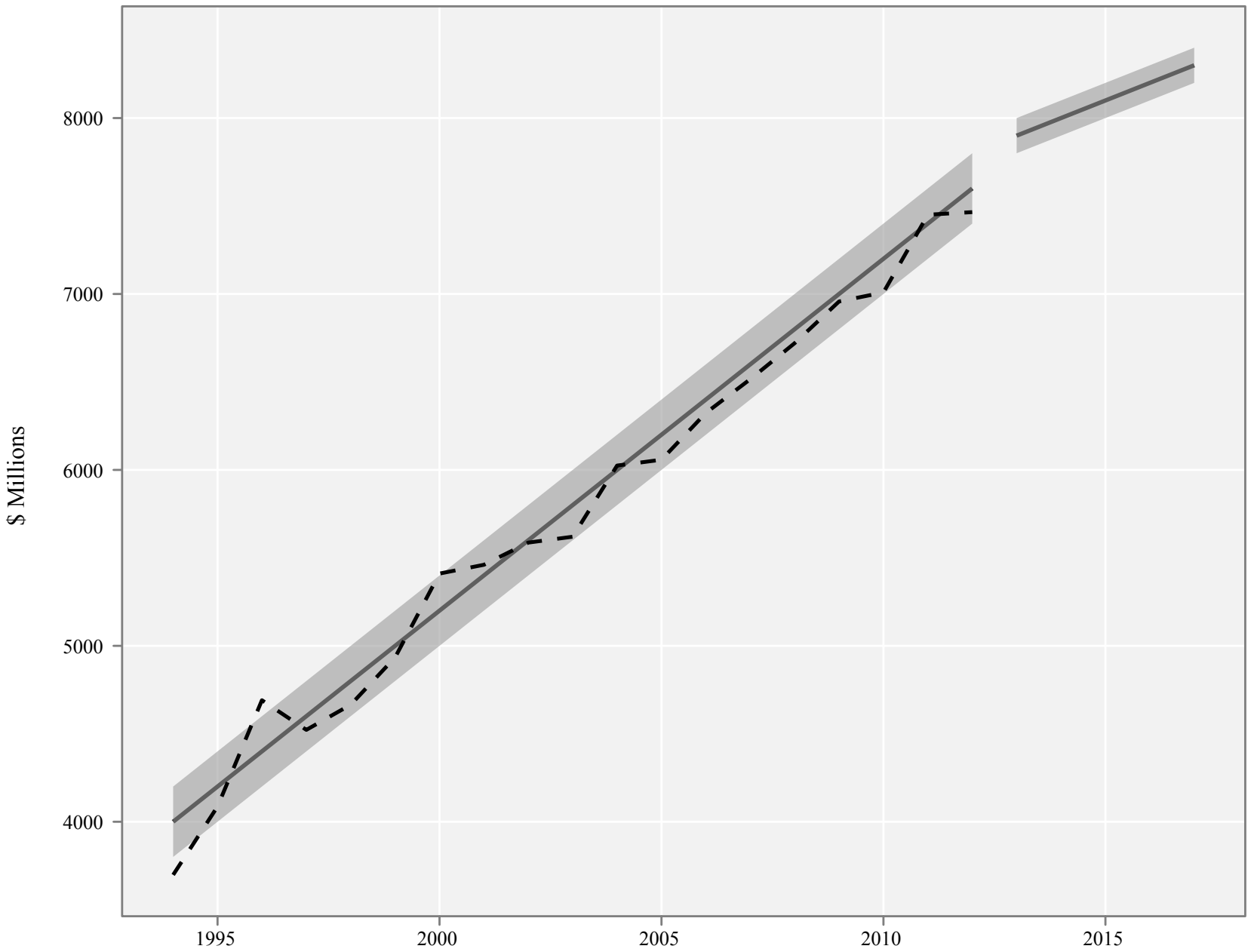
II. Tax Growth and Volatility

State government financial practices share similarities with the personal investing paradigm. (See Appendix A) Like the individual anticipating future financial demands, state governments must choose a tax portfolio that will generate adequate revenue to fund the desired level and mix of government services. Adequate revenue depends on the expected growth rate and volatility of tax receipts.

Whenever Georgia lawmakers debate possible tax policy changes, it is important to anticipate how Georgia's economy and tax system impact its revenues. Because tax legislation by definition alters the tax portfolio, these changes affect the expected growth and volatility of the state's future revenue stream. Consider the diagram in Figure 1 which depicts the growth and volatility of a tax portfolio before and after a tax policy change. In order to illustrate the potential effect of a tax change, the graph shows how tax legislation might alter the long-term growth and volatility of the tax portfolio. In this example, the width of the band around the expected growth, which is graphed as the dashed line, depicts the degree of uncertainty that accompanies the trend for revenue. The solid line shows how actual observations might deviate from the expected long-term trend.

As an illustration, consider the case where the legislature passes tax reform that expands the tax base with more stable components. Under some circumstances, this might simultaneously decrease the growth and uncertainty of tax receipts. Such legislation might cause a one-time upward shift in the level of the long-term trend. With a lower growth rate, total taxes will increase at a diminished rate as depicted by the flatter slope of the total revenue line. The smaller volatility is represented by the narrower band that surrounds the growth rate.

Figure 1
Effect of Tax Policy Change on Level, Trend, and Uncertainty



III. Economic Fluctuations

Although tax policy can alter the expected growth and uncertainty of taxes, the macroeconomic characteristics of the economy primarily determine historical and future revenue streams. Because tax revenues naturally depend on the level of macroeconomic activity, total state tax revenues tend to move synchronously with the business cycle. For this reason, consider some historical characteristics of Georgia's economy.

Historical Patterns

The information in Figure 2 benchmarks Georgia's historical economic patterns against their U.S. economy analogs. This chart depicts the rates of change in the Philadelphia Fed's coincident indicators (see Appendix B) for the U.S. and Georgia. The gray bars signify periods of U.S. recessions. For this analysis, a business cycle starts with its growth phase as the economy emerges from a recession. The business cycle includes the recession that ends the expansion phase. This comparison provides insights into the potential influence on the growth and volatility of Georgia's tax receipts.

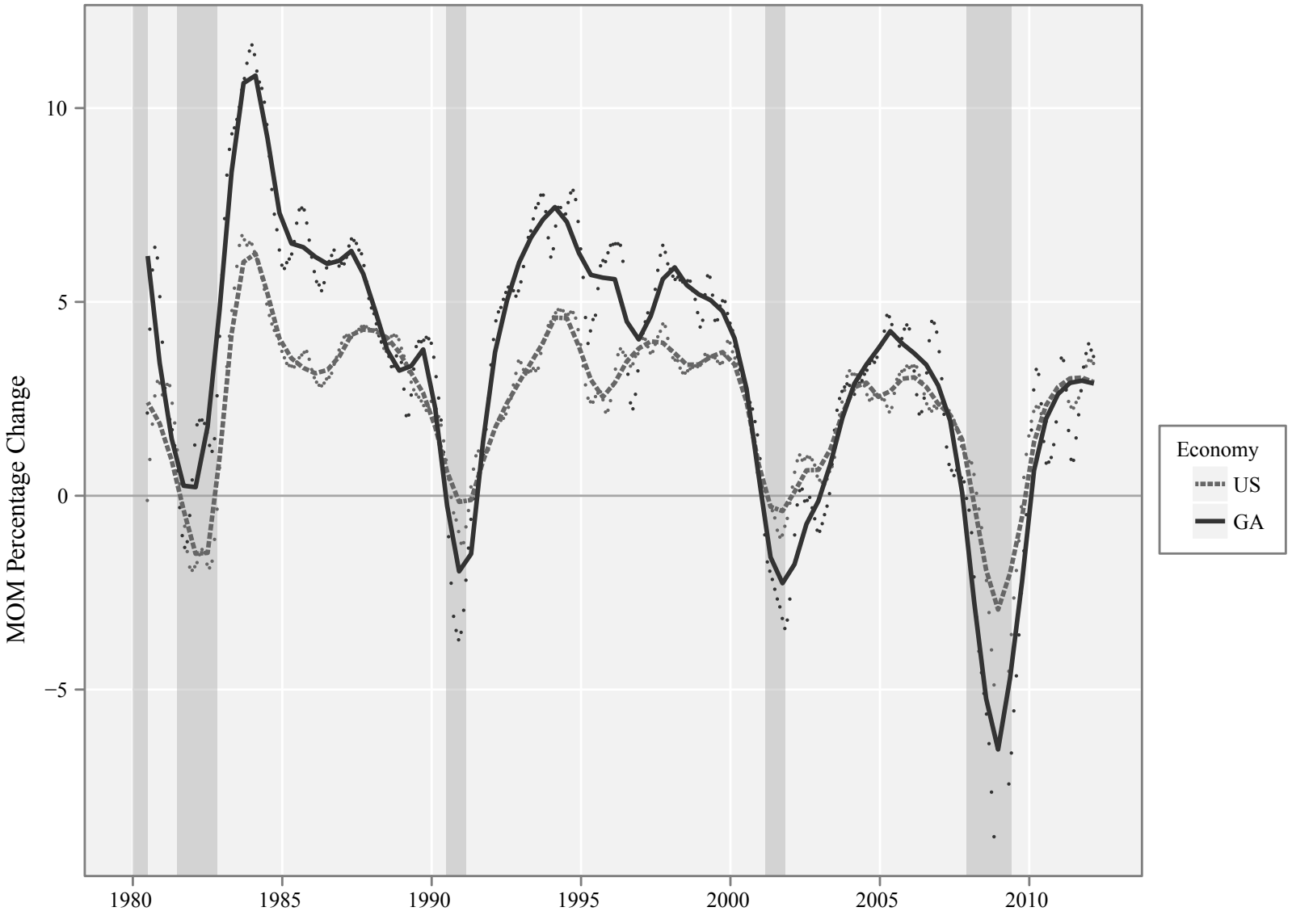
The four complete business cycles shown in Figure 2 vary significantly in their severity and duration. The 1990-91 and 2000-01 recessions were shorter and milder than the other two. The most recent 2007-09 downturn was especially severe and prolonged. The current expansion is best characterized as anemic. Comparisons of Georgia with the U.S. imply the following observations:

- For the time span between 1980 and 2009, the Georgia economy grew faster and was more volatile than the U.S. economy. During this time period, there were instances when Georgia continued to grow even when the rest of the U.S. was in decline.
- During the recovery that began in 2001, Georgia's growth rate remained negative while the rest of the U.S. expanded.
- Since the end of the Great Recession, Georgia's economy has closely followed national patterns.

Volatility

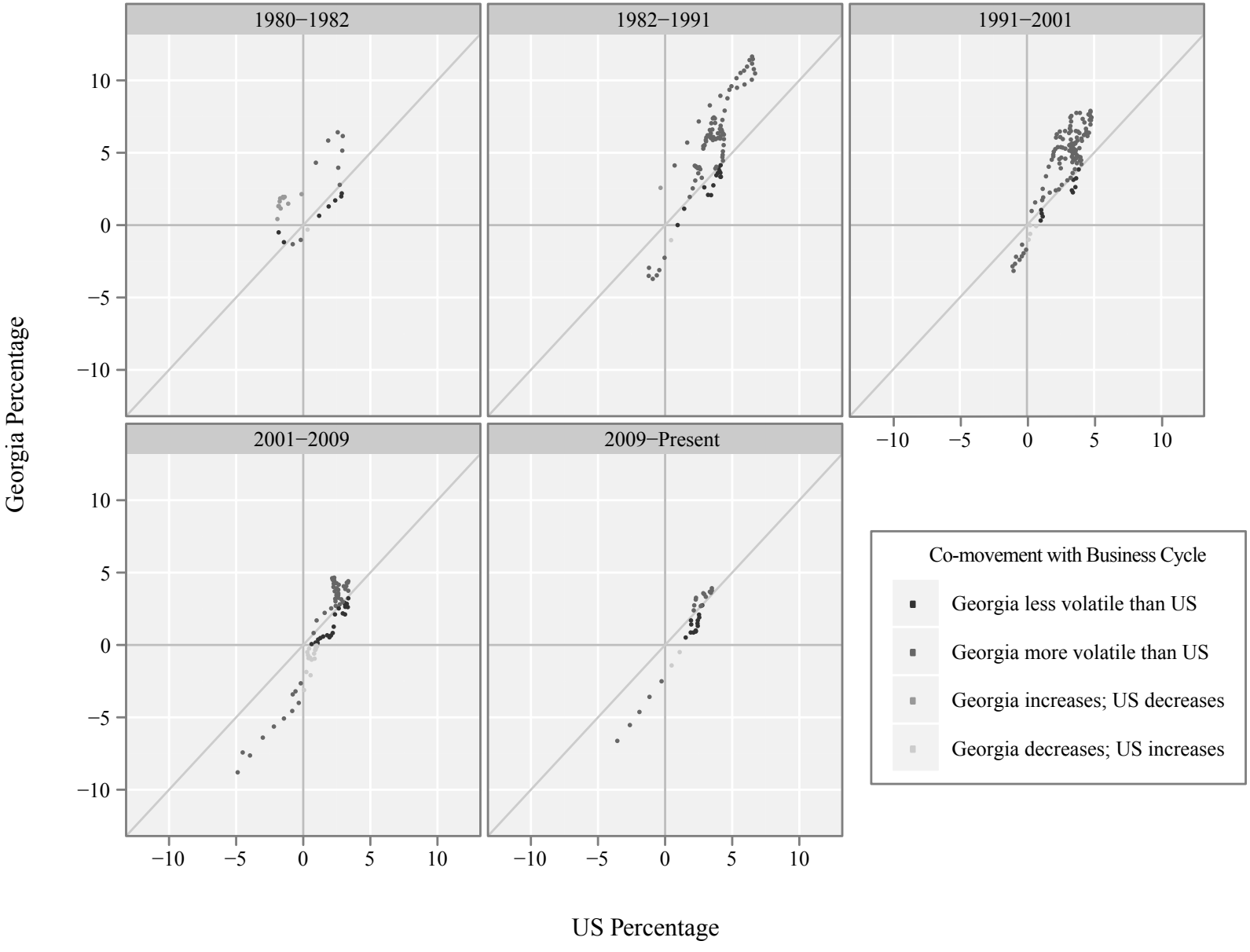
Further graphs and analysis clarify the above generalities. First, consider the charts shown in Figure 3, which relate month-over-month growth rates for U.S. and Georgia

Figure 2
Georgia and US Business Cycles



Data Source: Coincident Indicators, Philadelphia Federal Reserve

Figure 3
Georgia Relative to National Business Cycle
Month over Month Percentage Change



Data Source: Coincident Indicators, Philadelphia Federal Reserve

coincident indicators. The intent of this panel of diagrams is to compare the average growth rates and volatility of Georgia with the same features of the U.S. economy.

Each of the panels in Figure 3 corresponds to a business cycle. Each panel pairs Georgia's monthly growth rate with its U.S. economy counterpart. Using traditional Cartesian coordinates, the first and third quadrants indicate synchronous movements between Georgia and the U.S.. Points that locate in Quadrant I (upper right) correspond to increases in both variables and those in Quadrant III (lower left) correspond to decreases in both. A 45 degree line through these two quadrants helps compare growth rates and volatility. Points that locate above the 45 degree boundary in Quadrant I or below it in Quadrant III correspond to months where the changes in Georgia's economy exceed those of the U.S. A large number of points matching these conditions would suggest that the Georgia economy was more volatile than that of the U.S. Using similar reasoning, Georgia's economy would be less volatile when growth rates locate below the reference line in Quadrant I and above the reference line in Quadrant III.

In contrast, evidence of asynchronous movements materializes when points locate in the even quadrants. In Quadrant II (upper left), Georgia increases while the U.S. economy declines. The worst situation occurs in Quadrant IV (lower right) where Georgia declines while the U.S. increases.

As shown in Figure 3, the majority of U.S.-Georgia growth combinations during 1982-1991 and 1991-2001 locate in preferable positions in Quadrants I and III. For this reason, these business cycles constitute a golden era for Georgia. In general, not only did the entire U.S. economy grow during this time, except for very brief and mild recession, but Georgia grew even faster.

The less desirable growth rate combinations occur when the declines in Georgia's economy exceed those of the U.S. economy. Even worse circumstances result when Georgia contracts even though the U.S. as a whole expands. These combinations locate below the 45 degree reference line in Quadrant III or anywhere in Quadrant IV. Unfortunately, in Figure 3 the panel for the most recent expansion reveals that a number of growth rate pairs locate in these inferior areas.

Georgia's superior performance previous to the turn of the century began to diminish during the 2001-2009 business cycle. Although the concurrent increases shown in Quadrant I locate on both sides of the 45 degree reference line, it does appear that when both economies

were expanding during this period, Georgia's growth vacillated back and forth relative to overall U.S. growth. Unfortunately, when both economics declined, Georgia's economy fell much faster than the U.S. Returning to Figure 2 clearly reveals that when the U.S. economy slowed into recession in this period, Georgia suffered even deeper declines.

The current expansion shows that Georgia and U.S. coincident indicators continued to decline even after the official end of the Great Recession. This occurred because the coincident indicators heavily weight labor market conditions. The clustering of points along the 45 degree reference line also indicate that Georgia is closely following national patterns during the post Great Recession growth period.

Southeast Expected Growth and Volatility Comparisons

A common practice when evaluating financial portfolios makes comparisons using an expected return and risk grid. Financial portfolio analysis compares expected return and growth to derive an efficiency frontier.[1] Expected return is usually graphed on the vertical axis and risk on the horizontal axis. Because expected return is desirable and risk is unwelcome, the objective is to locate portfolios as high and as far to the left as possible. Portfolios with the lowest risk for each level of expected growth are preferred. This means that points which combine low expected return with low risk or high expected return with high risk are those on the efficiency frontier.

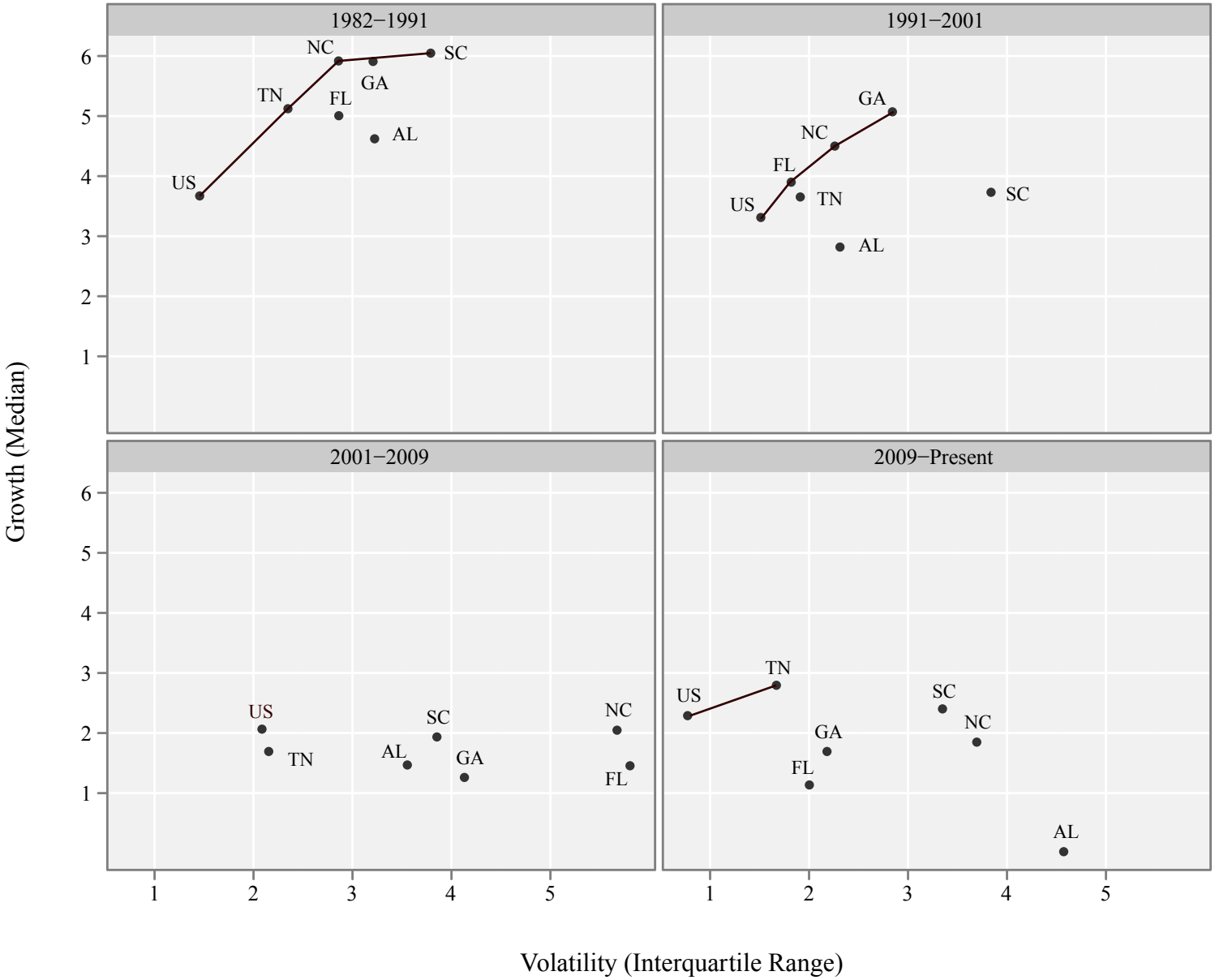
A similar construction for state economies graphs the growth rate of the economy on the vertical axis and volatility on the horizontal axis as shown in Figure 4. Once again each panel depicts the growth-volatility combinations that correspond to each business cycle. Rather than using the mean growth rate and standard deviations as the measures of return and risk, this analysis uses the median and the interquartile range.[2]

The data shown in Figure 4 reaffirm previous observations. During both the 1982-1991 and 1992-2001 business cycles, Georgia's combinations of growth and volatility place

[1] The term efficiency frontier usually connotes that decision makers can influence their position in the expected return and risk grid. Of course, this isn't true when comparing economies. When such comparisons occur in this paper with regard to economies, the intent is to communicate preferable expected growth and uncertainty combinations.

[2] The interquartile range is the difference between the third and first quartiles. Since quartiles divide the ordered data into four equal groups, the second quartile is the median. The interquartile range excludes the smallest and largest 25 percent of the observations. Thus the interquartile range measures the span of the middle 50 percent of the observations. The median and interquartile range are resistant statistics since they are less affected by extreme, outlying observations.

Figure 4
Southeast Economic Growth and Volatility Efficiency Frontiers



Data Source: Coincident Indicators, Philadelphia Federal Reserve

it in a preferable position when compared with its neighboring states. During 1982-1991, Georgia grew faster but with smaller levels of volatility than Florida, Alabama, and the U.S. as a whole. Tennessee and North Carolina enjoyed more stable economies; but their growth rates were not as large as that of Georgia. South Carolina grew faster than Georgia but experienced greater volatility. Similar comparisons for the 1992-2001 business cycle shows Georgia, once again, on the efficiency frontier with relatively high rates of growth and proportionately higher volatility.

Since 2001, however, Georgia's combination of growth and volatility remove it from the efficiency frontier. During the 2001-2009 business cycle, Tennessee, the U.S., Alabama, and South Carolina all enjoyed better growth-volatility positions than Georgia. Georgia's inferior position matched the lowest growth rate with significant variability. North Carolina and Florida weren't dominant because they had more uncertainty than Georgia.

Since the beginning of the expansion in 2009, Tennessee has enjoyed a dominant position when compared with other southeastern states. During this time period, Tennessee grew at a relatively high rate but didn't suffer from increased volatility. If Tennessee were excluded, then Georgia would move back on the efficiency frontier.

IV. Tax Revenue Fluctuations and Tax Portfolios

As mentioned, the growth rate and variability of total tax revenues depends on both the underlying economy and the choice of taxes (and their characteristics) included in the state's tax portfolio. The characteristics of tax types combine to influence the growth and volatility of the tax portfolio. While it is true that individual taxes have distinct growth and volatility profiles, a state can partially influence these dimensions through their choice of tax base and tax rate. Decision makers can target a growth rate and then tailor their tax portfolio to minimize the uncertainty for that level of growth.

Analyzing state tax revenue in the context of a tax portfolio offers analytical advantages. It fosters comparisons of the growth and volatility of individual taxes. The same risk-return construct used to compare economies can also be used to delineate efficiency frontiers and determine preferable tax combinations. Analysis of tax revenue data aggregated over all states concludes that:

- Sales taxes contribute low growth and stability to the tax portfolio.
- Personal income taxes grow faster than other revenue sources but also fluctuate more in the economy.
- Corporate income taxes are extremely volatile.
- Including a variety of taxes in the portfolio gives potentially efficient outcomes because of diversification.

These general findings provide context and invite further investigation using Georgia data.

Variety in State Tax Portfolios

The Constitution of the United States allows substantial freedom for states to adopt different tax schemes. The variety of embraced tax policies reflects a wide spectrum of political preferences among state populations. The state of Oregon, for example, has resisted adopting a retail sales tax. This contrasts with neighboring state, Washington, which has a retail sales tax but no income tax.

Even among the 44 states that have a retail sales tax, its implementation is far from uniform. Retail sales tax rates start from below 4 percent and range into double digit magnitudes. Sales tax bases also show similar variety. About 75 percent of states exempt food purchases from the retail sales tax. Although the desire to mitigate the regressive

nature of the retail sales tax justifies those states that choose the food exemption, this decision can affect the long run growth and volatility of the entire tax portfolio. In many cases, the food exemption eventually requires higher rates on smaller bases. The retail sales tax base generally includes some services. Even in this case, however, differences arise because some states aggressively tax services whereas most tax only a few.

The personal income tax has a similar pattern of heterogeneity. A few states do not impose any income tax at the state level. Those states with a personal income tax choose a variety of tax rates and bases. In general, citizens in most states begin their income tax preparations with adjusted gross income as calculated on their federal return but then adopt different levels of exemptions and deductions based their unique state codes. Marginal tax rates range from under 5 percent to over 10 percent. Some states have income brackets that are taxed at different rates, whereas others apply one rate to all taxable income. These differences in tax bases and rates cause a variety of responses of state tax revenue to macroeconomic changes.

The standard theme in state tax design prescribes keeping tax bases as broad as possible while keeping tax rates as low as possible. Many believe that broad bases and low rates generate less revenue growth during upswings in the economy but also result in smaller revenue shortfalls during economic downturns.

State Tax Growth and Volatility Efficiency Frontier

Just because an individual tax might be dominated by other taxes when comparing growth and volatility, this does not necessarily exclude it from consideration in the tax portfolio. The inclusion of multiple assets in financial portfolios produces the potential for diversification. Because all asset values don't change in tandem, price increases on some assets can counter the negative effect of price decreases for others. When stocks are independent or negatively correlated, profits on some positions counteract losses on others. This diversification effect can greatly reduce the risk of the portfolio.

Just as investors probably shouldn't put all of their eggs in the same basket by holding only one asset, states can reap similar diversification benefits by deriving revenue from a multitude of taxes, licenses, and fees. The amount of risk reduction realized depends on the correlations among revenue sources. The proportion of revenue that comes from each

source also influences the degree of diversification. In the context of portfolio methodology, these proportions are known as portfolio weights.

Each tax has a growth rate and variability associated with it. Consider the growth-volatility estimates for the major state tax categories shown in Figure 5. (Appendix C documents and addresses complications that arise in these growth and volatility calculations.) Revenues derived from alcohol locate in the lower left corner which represents low growth and very low risk, i.e., little fluctuations over the business cycle. Corporate income taxes constitute an especially volatile revenue resource. Sales taxes have low risk and medium expected growth. The personal income tax has the highest growth rate and a moderate risk level.

Just like the comparison of economies, the lowest level of risk for each potential growth rate represents a dominant outcome. This means those points that locate in the upper left corner of the coordinate system are preferable. The dashed line in Figure 5 represents the efficiency frontier without any portfolio effects. If a state were to depend entirely on one source, then the alcohol, motor vehicle licenses, sales, and personal income taxes dominate the other categories.

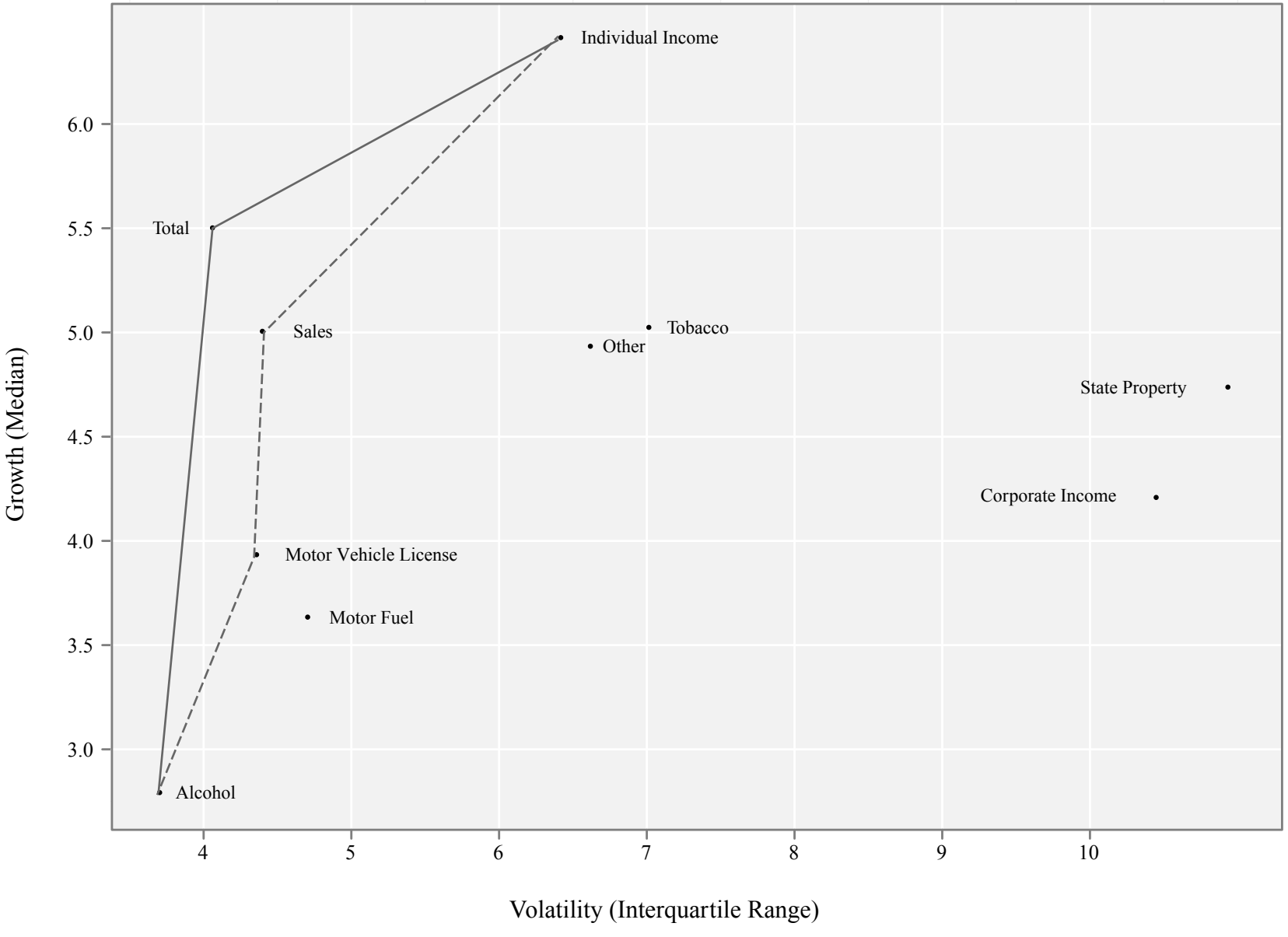
The total taxes category shows the power of diversification in a portfolio of taxes that are not perfectly correlated. By combining all taxes into a revenue portfolio, the total category extends the efficiency frontier in the preferable direction. Since sales and personal income taxes comprise such a prominent proportion of total revenue, they have very large portfolio weights. The diversification that occurs by having both sales and personal income taxes in the same portfolio gives a lower risk and higher growth combination.

Volatility of Sales and Income Taxes

Once again, further volatility analysis confirms the relative risk rankings of sales, income, and corporate taxes. These conclusions flow from charts similar to those used to meter the volatility of Georgia's economy relative to that of the U.S.'s. In this case, however, the panels in Figure 6 compare percentage change in sales, personal income, and corporate income with similar calculations for total tax revenues.

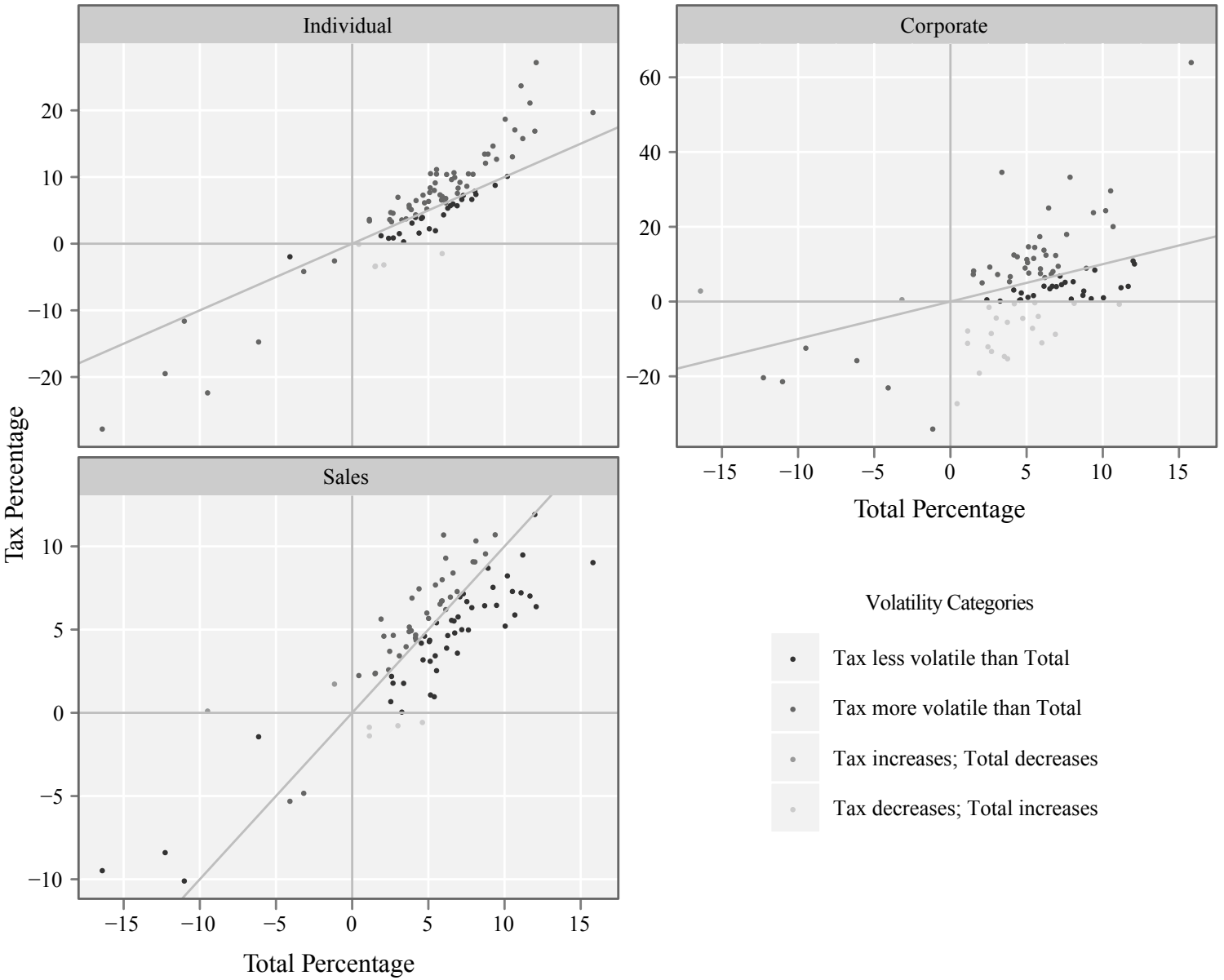
First, consider the personal income panel shown in Figure 6. The majority of points in the first quadrant are above the reference line. This means that the personal income tax tends to increase faster than all other taxes. Similarly, when total taxes decline, the decreases

Figure 5
Major State Tax Growth and Volatility Efficiency Frontiers



Data Source: State and Local Government Tax Revenues, Bureau of Census

Figure 6
Volatility of Major State Tax Revenues Relative to Total Tax Revenues
Month over Month Percentage Change



Data Source: State and Local Government Tax Revenues, Bureau of Census

are greater for the personal income tax than all taxes in general. This confirms the high growth and volatility characteristics of the personal income tax.

For sales tax revenues, almost all of the observations for quarterly growth locate in Quadrants I or III. In contrast to the personal income tax, the sales tax observations are equally likely to lie above the reference line as below the line. This means that half the time sales taxes grow faster than total revenue and the other half they grow more slowly. After taking into consideration the scale of the axes, it is also true that the sales tax observations are clustered much more closely along the reference line.

Corporate income taxes supply significant revenue to states, although substantially less than income and sales taxes. This tax, however, may adversely affect the growth and volatility of the tax portfolio. Corporate income taxes have a tendency to decrease even when total taxes are increasing (due at least in part to discretionary changes to corporate income taxes by states). The number of points in Quadrant IV in the panel that corresponds to the corporate income indicates that this phenomenon occurs with high frequency. Inclusion of corporate income revenues in the tax portfolio can decrease the expected growth and increase the volatility. Although the revenue derived from this tax resource has budgetary significance, the impact on the growth and volatility of the tax portfolio also deserves consideration.

V. Georgia's Economy and Tax Portfolio

With an understanding of the relative strengths and challenges of Georgia's economy and the characteristics of aggregate state tax revenues, it is now possible to combine these two inquiries as background that is necessary to understand Georgia's historical fiscal performance. This gives the perspective needed to investigate how Georgia's economy and tax portfolio interact to determine the historical growth and volatility of its tax revenues. This investigation suggests the following:

- Since 1950, the combination of sales and personal income taxes has provided Georgia with approximately 80 to 90 percent of its state tax revenue.
- Because the personal income tax tend to grow faster than sales taxes, the weight of personal income in Georgia's tax portfolio will continue to rise, assuming the state does not change the structure of the income tax.
- The increasing proportion of taxes coming from the personal income tax implies that the volatility and uncertainty of Georgia's total tax revenue will continue to grow.
- Since the turn of the century, despite Georgia's relatively favorable position when compared to its southeastern state neighbors, Georgia's tax policy has caused it to move away from the tax revenue efficiency frontier.

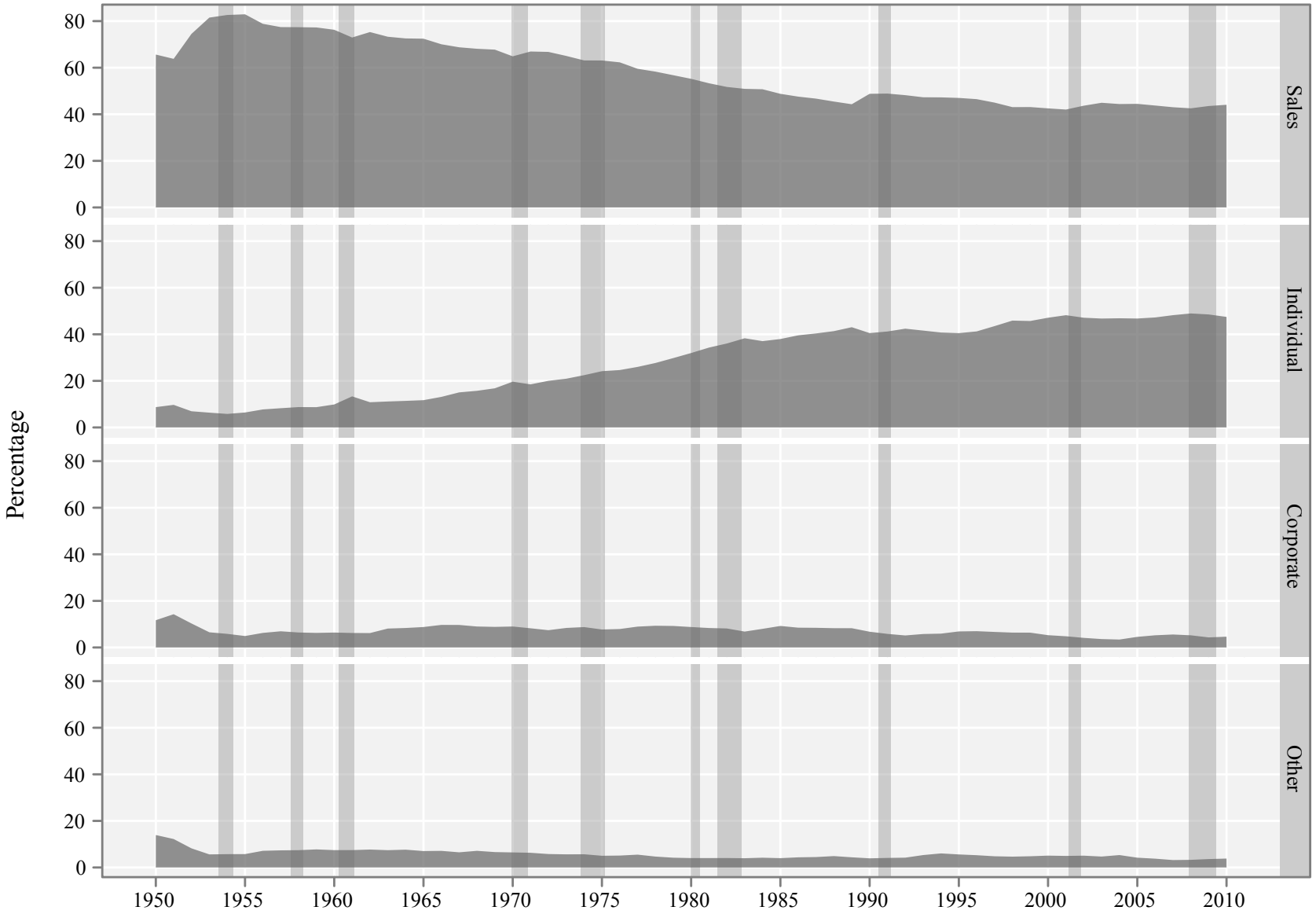
Portfolio Weights

First consider the evolution of the percentage of tax revenue received from the alternative sources shown in Figure 7. The graph reveals that during the 1950s, Georgia derived most of its revenue from the sales tax. Since 1955, the personal income tax has increased more rapidly than the sales tax until it has taken over as the most important revenue source. The importance of the combination of sales and personal income taxes is clear because of the large share of tax revenue that these two sources now generate. The corporate income tax, similar to national trends, has diminished in importance over time. The increase in the portfolio weight of the personal income tax means that Georgia increasingly depends on more volatile taxes with higher growth rates.

Components of Georgia's Tax Portfolio

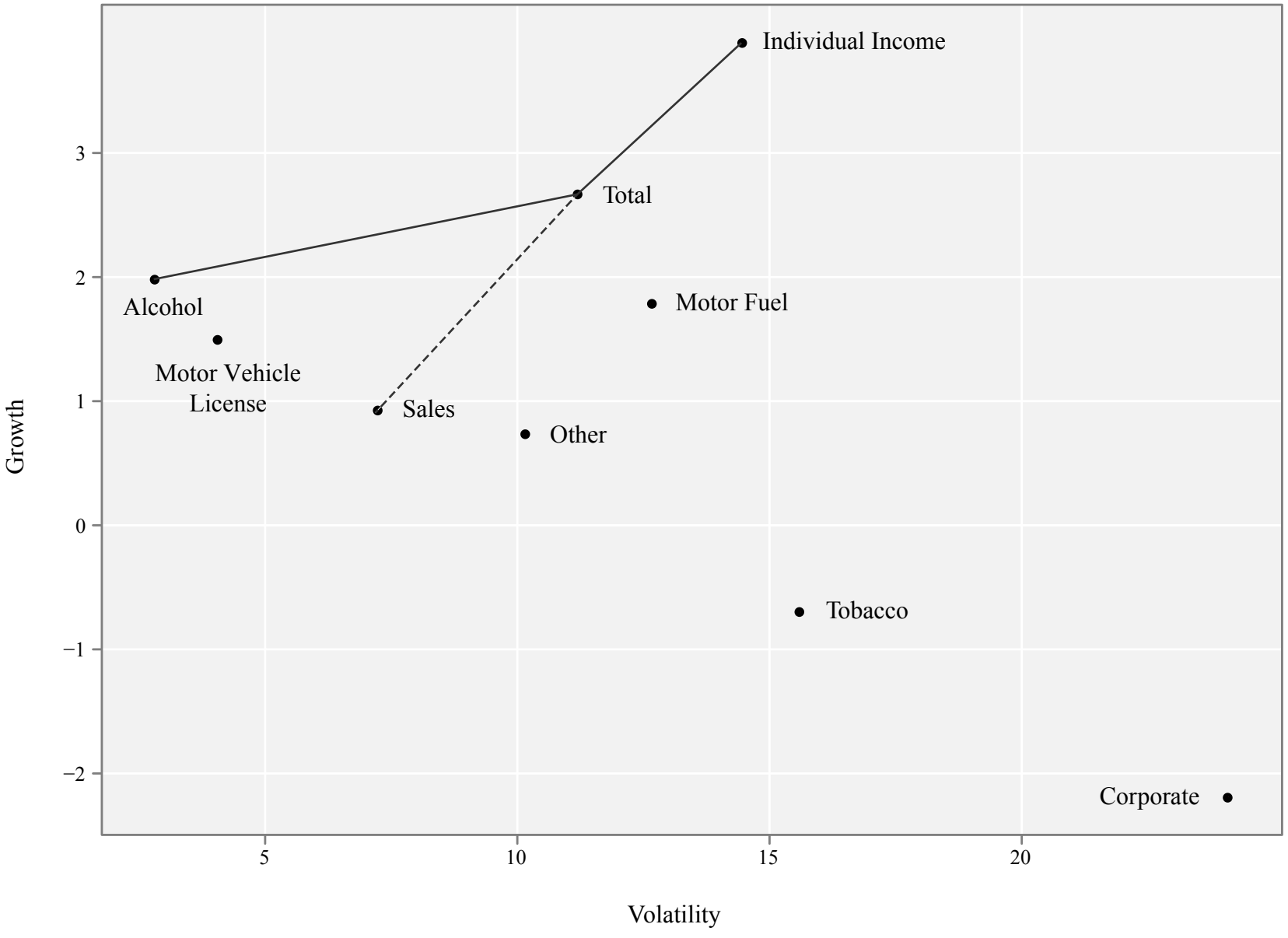
Because of the high proportions of revenue derived from sales and personal income taxes, their position is critical in the tax revenue efficiency frontier shown in Figure 8. Consistent with the general trends, the personal income tax has a dominant high growth and

Figure 7
Georgia Tax Portfolio Revenue Shares



Data Source: State and Local Government Tax Revenues, Bureau of Census

Figure 8
Georgia Tax Growth and Volatility Efficiency Frontier



Data Source: State and Local Government Tax Revenues, Bureau of Census

high volatility position in the efficiency space. Sales tax revenues grow more modestly but have less variation than the personal income tax. Because of the dominance of these two revenue sources, it comes as no surprise that the growth and volatility of the total revenue approximately locates on a line that connects these two points in the efficiency graph. This is as would be suspected, since that growth rate and volatility of the total is approximately a linear combination of sales and personal income tax receipts.

As an aside, notice the attractive growth and volatility characteristics of alcohol and motor vehicle licenses shown in Figure 8. Both manifest moderate growth with low volatility. This means that if Georgia increased the portfolio weights of these two revenue sources, the state budget would benefit from a tax portfolio with more rapid growth and less volatility. Although rate increases for these revenue sources would generate additional funds, the potential to achieve a substantial increase in either of these sources probably isn't feasible because of the limited sizes of their tax bases. Although these two revenue sources wouldn't significantly impact the characteristics of the tax portfolio, moderate rate increases for these two revenue sources might constitute "low hanging fruit." Not only would this supplement Georgia's state budget but would also have minor salutary fiscal effects on the growth rate and volatility of the tax portfolio.

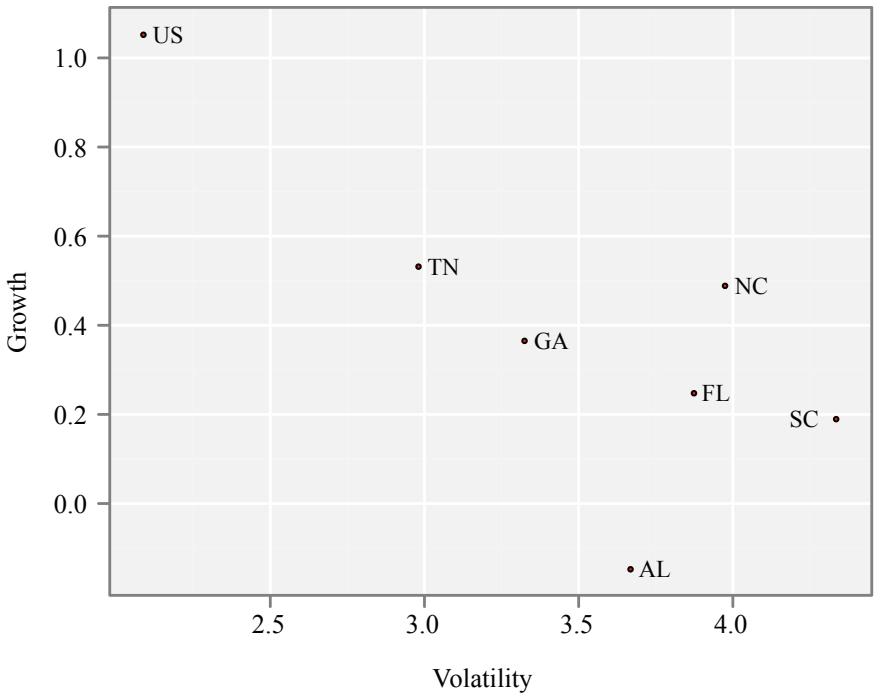
Southeast Comparison

Finally, the analysis investigates how Georgia's tax portfolio alters its initial growth and volatility position. The first graph in Figure 9 compares Georgia's economy with its neighboring states in the southeast region. The comparisons of economies since 2000 show that relative to the U.S., all neighboring states have faced challenging economic conditions. Compared to the other southeastern states, Tennessee has been favored with relatively high growth and little volatility. Although challenged when compared to national trends, when compared with its neighbors, Georgia has the second most stable and third fastest growing economy.

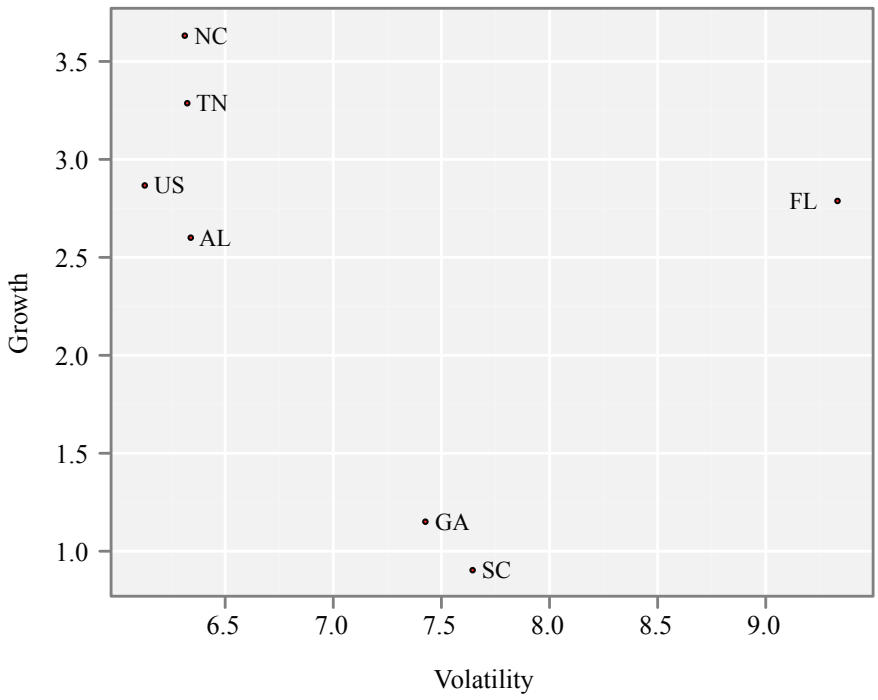
As mentioned, the second efficiency frontier in Figure 9 reports the effects of combining a state's economy with its tax portfolio. This causes significant migrations within the growth and volatility grid. The graph indicates that Georgia moves from a relatively high growth and low volatility position to a low growth and moderate volatility ranking. Another noteworthy shifting occurs with North Carolina as it moves to a superior overall growth and

Figure 9
Growth and Volatility Efficiency Frontiers
Comparison of Georgia with Neighboring States

a) State Economies



b) Total State Tax Revenue



Sources: Coincident Indicators, Philadelphia Federal Reserve
Quarterly State and Local Tax Receipts, Bureau of Census

volatility position relative to its neighbors. Apparently Alabama's tax policy allows it to maneuver from a low growth and high volatility position to the preferred situation of higher growth and lower volatility.

VI. Tax Portfolio Illustration: Addition of Food to Georgia's Sales Tax Base

The recent policy recommendation to add food to the sales tax base by the Special Council on Tax Reform and Fairness for Georgians provides the context to illustrate the potential of the tax portfolio framework to anticipate the long term implications of tax policy. Because the sales tax base is itself a portfolio composed of different types of products and services, portfolio analysis of categories of personal consumption expenditures (PCE) yields the following insights:

- The order of personal consumption expenditure categories (PCE) ranked from least to most volatility is services, nondurable goods, and durable goods. This is true during each one of the business cycles since 1980.
- The rankings for services, nondurable, and durable goods by growth rate differ across the different business cycles.
- The growth and volatility dimension of services often dominant durable and nondurable goods.
- Since food is an important component of nondurable consumption, it can contribute steady, low growth to the sales tax base and revenues.

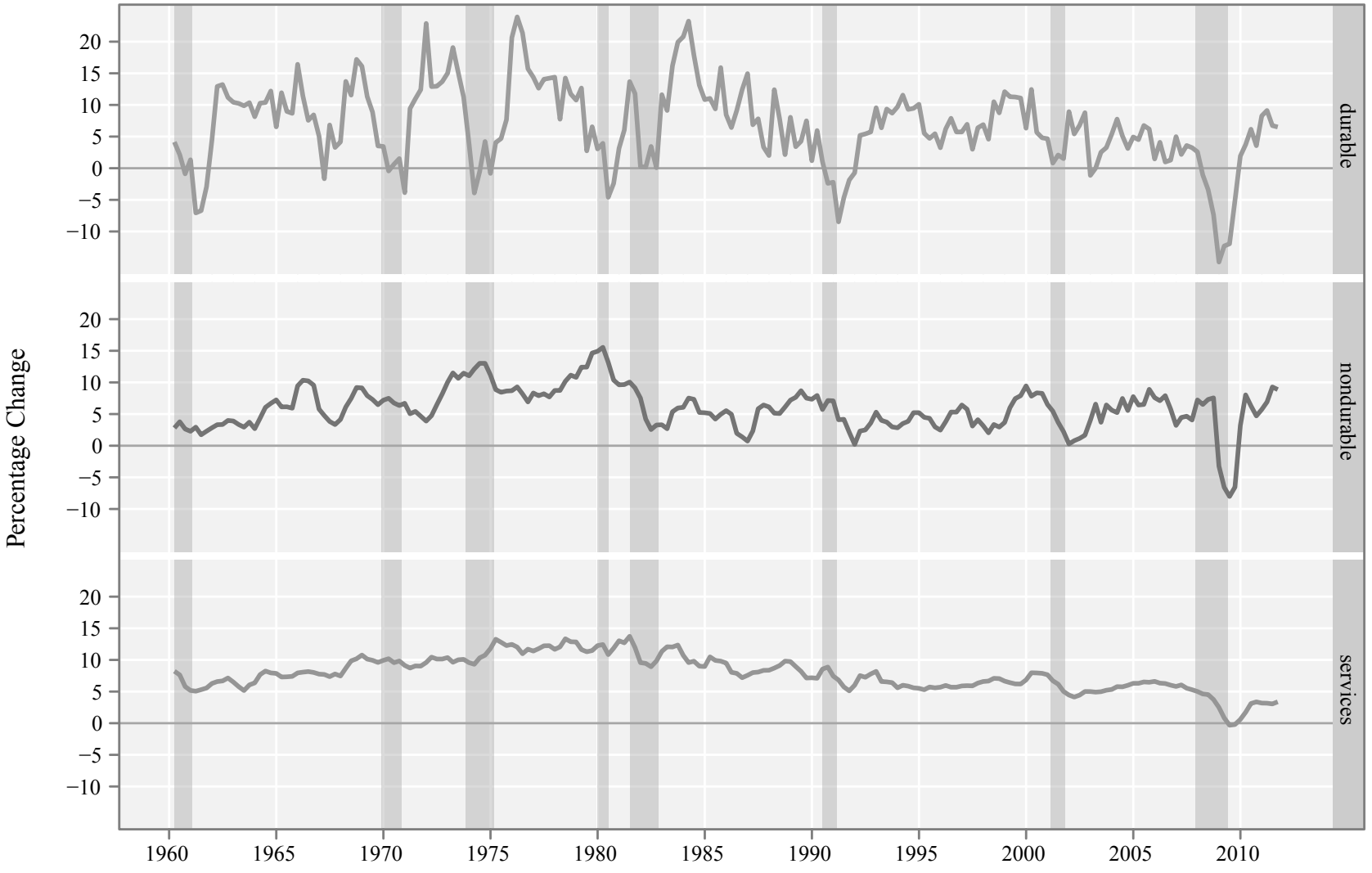
The tax portfolio framework utilizes these findings to illustrate the effect of augmenting Georgia's sales tax base with food and services categories.

Growth and Volatility of Personal Consumption Expenditures

Insights into Georgia's sales tax base result from analyzing the main PCE categories for the United States. The information in Figure 10 reveals that services, nondurable goods, and durable goods react to the business cycle with very different degrees of volatility. Because durable goods represent a discretionary purchase that can be postponed during difficult macroeconomic conditions, the rates of growth vary significantly throughout different phases of the business cycle. Because nondurable goods include necessities such as food, clothing, and energy, the magnitude of their fluctuations over the business cycle is much more attenuated than durable goods. Similarly, the amplitude of variation in services over the business cycle is moderated.

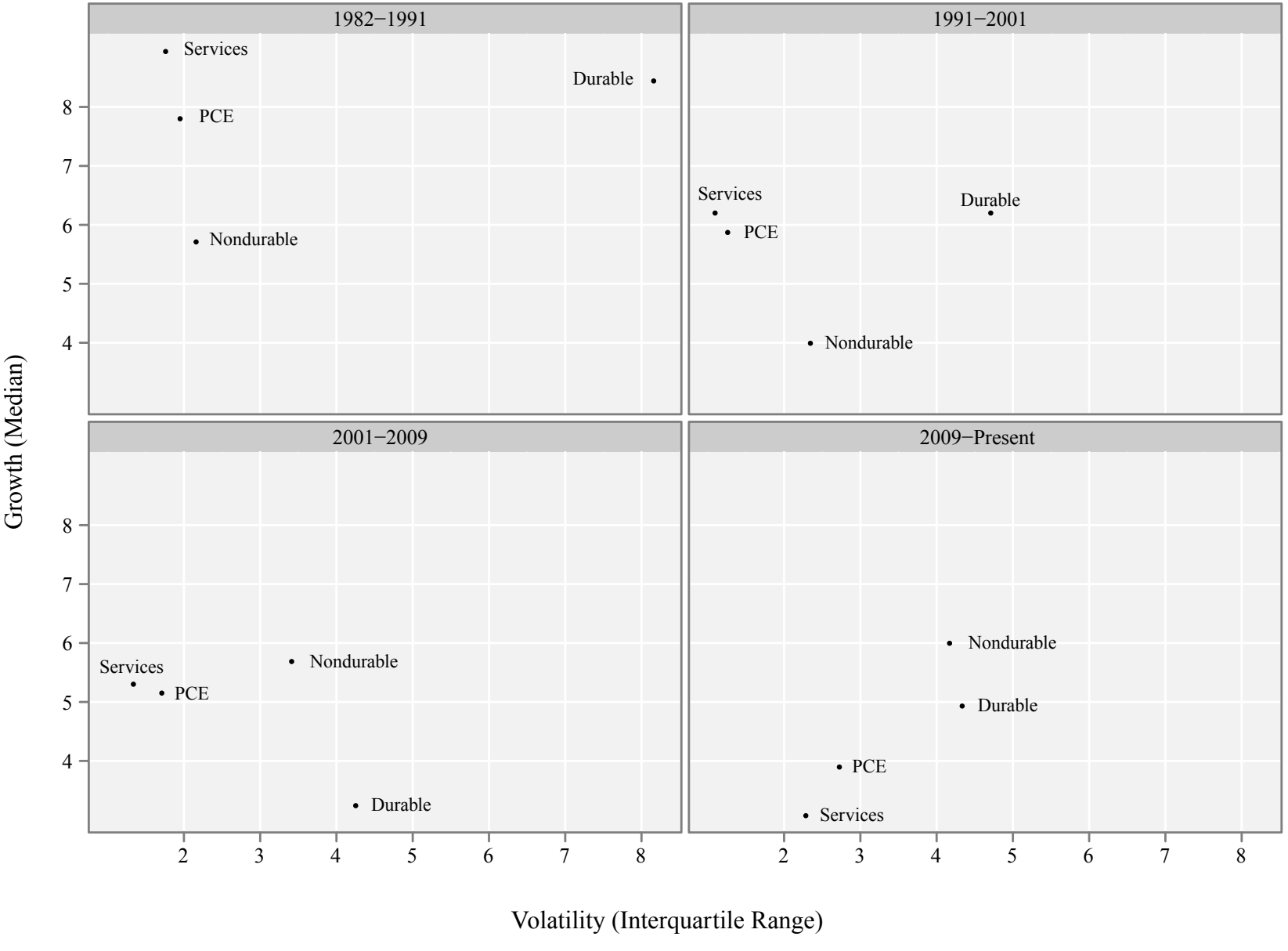
Extracting expected growth and volatility estimates from the time-series graphs yields the efficiency frontiers in Figure 11. Once again, each panel corresponds to one of four

Figure 10
Personal Consumption Expenditures Over the Business Cycle



Source: Personal Consumption Expenditures, Bureau of Economic Analysis, Department of Commerce

Figure 11
Personal Consumption Growth and Volatility Efficiency Frontiers
Various Business Cycles 1961 - Present



Source: Source: Personal Consumption Expenditures, Bureau of Economic Analysis, Department of Commerce

different business cycles. In each business cycle, services fluctuated less than nondurable and durable goods. It is also true that nondurable goods oscillated less than durable goods.

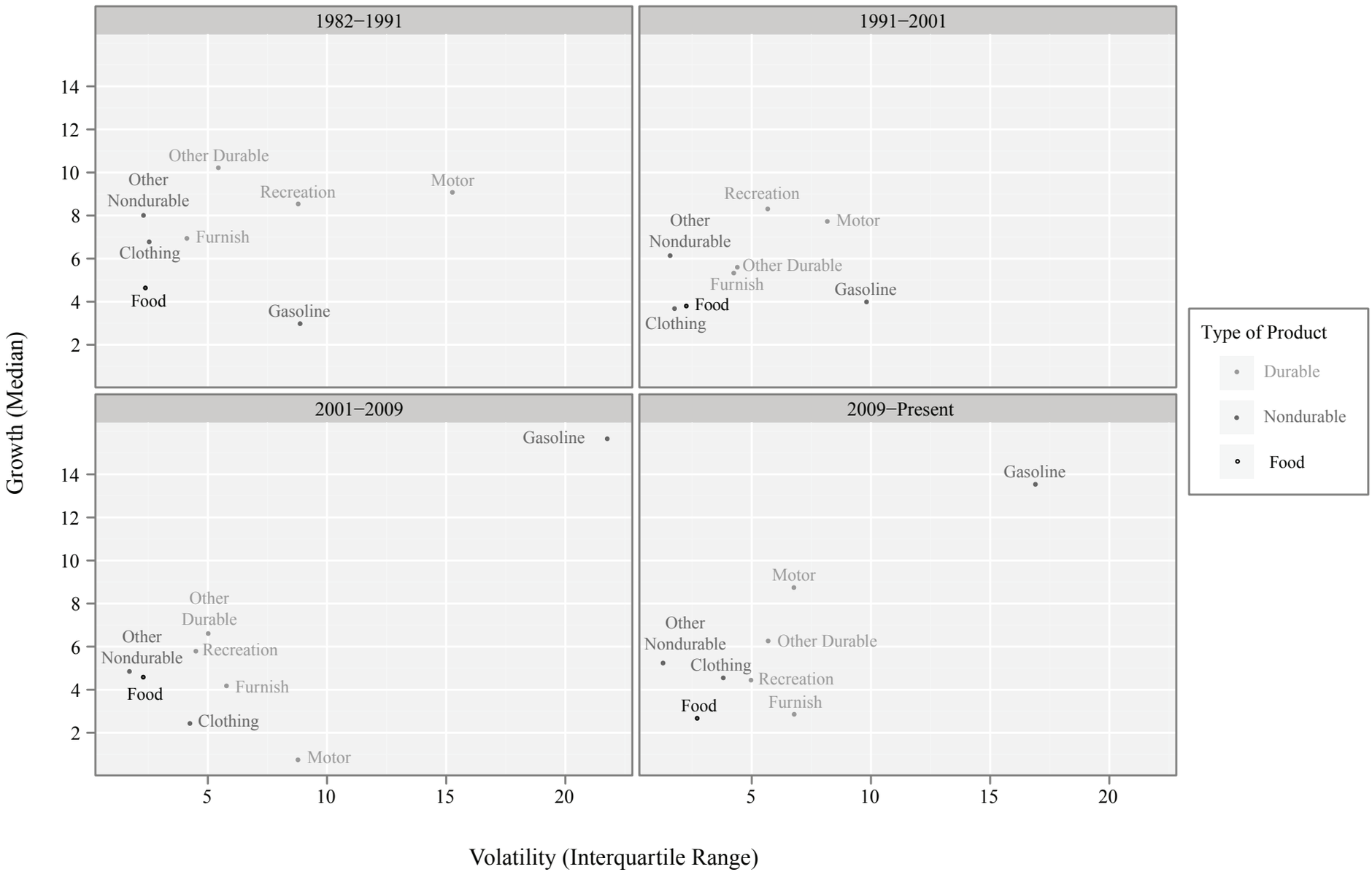
The same pattern of consistency is not true, however, for relative growth rates. During the time period 1960-1980, durable goods grew faster than nondurable goods and services. Beginning in 1980, however, services became the fastest growing category. This pattern changed in 2001 as increases in nondurable goods have eclipsed the other two. Interestingly, since the Great Recession ended, services have lagged behind the growth in goods. This is undoubtedly due to the fact that services declined only slightly during the Great Recession in comparison to the dramatic declines in both durable and nondurable goods. The significant decreases in these later two goods during the Great Recession probably created significant pent-up demand. This accelerated consumption as the economy finally emerged into recovery but this trend might not continue into the future.

For states considering the inclusion of food in the sales tax base, it is important to know how the growth and volatility of food compare to similar measurements for nondurable good subcategories. Likewise, similar contrasts with products in the durable subcategories reveal instructive insights. The growth rates and volatilities for these goods are reported in Table 1 and graphed in Figure 12. The efficiency comparisons reveal consistent patterns.

TABLE 1. GROWTH AND VOLATILITY FOR SALES TAX PORTFOLIO COMPONENTS

	Growth	Volatility	Minimum	Maximum	Portfolio Weights
All Personal Consumption	4.21	2.35	-3.41	6.97	
Durable Goods	2.26	5.54	-14.83	9.12	
Motor	0.64	9.43	-27.00	18.54	3.41
Furnishings	1.85	4.89	-11.67	7.93	2.45
Recreation	3.69	5.29	-12.52	12.40	3.31
Other Durable	4.99	5.27	-6.79	13.99	1.72
Nondurable Goods	4.45	4.10	-8.02	9.28	
Food	3.76	1.85	-1.42	6.45	7.69
Clothing	2.03	3.42	-7.37	6.81	3.35
Gasoline	9.47	19.10	-37.95	42.12	3.55
Other Nondurable	4.78	1.38	1.29	7.03	8.50
Household Services	4.50	1.86	-0.26	6.87	
Housing	4.48	2.36	0.88	9.62	19.00
Health	6.01	1.61	3.42	9.12	16.73
Transportation	1.41	3.59	-7.80	4.95	2.97
Recreation	4.20	3.25	-4.13	9.13	3.84
Food	4.68	2.70	-2.22	8.77	6.40
Financial	3.29	4.68	-9.20	9.14	7.83
Other Household	4.47	2.01	-0.10	8.25	9.25

Figure 12
Durable and Nondurable Goods Growth and Volatility Efficiency Frontiers
Various Business Cycles 1982 - Present



Source: Source: Personal Consumption Expenditures, Bureau of Economic Analysis, Department of Commerce

Other than gasoline, the nondurable categories are much less volatile than their durable counterparts. As would be expected, in each of the business cycles, both food and clothing generate moderate growth with relatively little volatility. It is especially true that since the turn of the century, food, clothing, and other nondurable purchases have provided an especially stable revenue source with moderate growth.

These desirable growth and volatility dimensions for food contrast with the volatility of gasoline and the durable sub-categories. As shown in Figure 12, in some business cycles, rapid increases in oil prices have generated windfall revenues from general sales tax or excise taxes. The diagram also emphasizes, however, that rapid declines in energy prices mean that the variability of the revenue could significantly complicate the budgeting process. The growth rate in motor and recreational equipment similarly present challenges.

Growth and Volatility of Food in Sales Tax Base

An understanding of the relative growth and volatility of PCE components leads to the final part of the analysis, which assesses the potential impact on Georgia's tax portfolio and revenues from changing the sales tax base. Table 2 reports the results of augmenting the sales tax base with additional PCE components. The calculations utilize the framework and equations detailed in Appendix D, the information in Table 1, and the associated correlations among the different components. Specifically, the calculations investigate how the expected growth and risk of the sales tax base and rate react to the inclusion of additional components such as services or the exclusion of product groups such as food. The appendix outlines the framework used to complete these calculations. The calculated expected growth rates uses 2010 portfolio weights in equation (5) from Appendix D. Similarly, equation (6) gives the calculated risk measures.

TABLE 2. CALCULATED PORTFOLIOS WITH ADDITION OF FOOD AND SERVICES TO SALES TAX BASE

Sales Tax Portfolio	Growth	Volatility
No Food or Service	4.13	23.12
Add Food	4.05	15.78
Add Service	4.41	5.34

The first portfolio gives the expected growth and volatility for a sales tax portfolio that includes all PCE categories except food and services. This serves as the benchmark against which the addition of food and services can be evaluated. Food causes the expected

return of the second portfolio to decrease slightly but also appreciably decreases the volatility.

If Georgia were to include food in its general sales tax portfolio, then long term it would alter the growth path of its taxes in a manner similar to the one shown in Figure 1. Remember that the pattern shown in Figure 1 does not represent historical data. Rather, it depicts the situation when a state's tax policy is hypothetically held constant. Adding food to the sales tax base would alter this global trend in three ways. First, the immediate impact would be a direct effect to increase the level of tax revenue by the amount of taxable food multiplied by the sales tax rate. Since the demand for food is probably inelastic, few consumers would probably change their behavior. This suggests that the indirect effect of this tax policy would be negligible. Second, the addition of food to the tax portfolio would decrease the slope of the long-term trend. Third, the inclusion of food would cause the band of uncertainty to constrict around the trend as tax revenues in aggregate would become less volatile.

A very positive potential outcome occurs in the third portfolio. This alternative includes all services and gives a significantly higher expected growth rate and substantial reduction in risk than the initial portfolio. From a portfolio standpoint, services contribute growth and stability to the sales tax base. Among services, medical services have especially large potential since it has a relative attractive growth rate but a low level of risk. In addition, broadening the tax base by including services would allow reductions in the tax rate.

VII. Conclusions and Suggestions

As Georgia government officials consider future tax changes, it is important to remember that legislative decisions that adjust the tax base or rates not only affect immediate tax receipts, but also alter the long-term expected growth and volatility of revenue streams. In considering the characteristics of Georgia's economy and its current tax portfolio, the following findings suggest insights that might foster tax policy improvements.

- Although Georgia and southeastern states have enjoyed preferable growth and volatility combinations in the past, recent history shows that the economies of Georgia and other southeastern states are growing more slowly with higher volatility than other states.

- Like most other states, Georgia depends on a combination of income and sales taxes. The income tax imparts both high growth and risk to the stream of tax revenues. Although sales taxes grow more slowly, they do have less uncertainty and volatility. Currently, Georgia's tax portfolio combines the growth and volatility of these two tax sources equally.

- Because of the higher expected growth rate of personal income taxes, it should be expected that the importance of personal income taxes as measured by their portfolio percentage will continue to rise if no changes are made to the tax structure.

- Georgia's economy gives it a favorable position in the growth and volatility grid. Its tax portfolio, however, causes it to move to an inferior position relative to some of its bordering states.

- Adding food to the sales tax base will slightly decrease the growth rate of taxes after giving an initial infusion of tax revenue. In other words, tax revenues will grow from a new, higher level but at a slower rate. Because of the stability of food purchases, this addition to the sales tax base will also cause revenues to be less volatile.

- In order to raise additional revenue, Georgia might also want to investigate the potential higher growth rates and lower volatility inherent in any services not already taxed.

Appendix A. Basic Portfolio Concepts

Modern financial management techniques recognize the joint importance of return and risk when combining financial securities into a portfolio. Risk-adverse investors value expected growth and dislike uncertainty. Empirical findings establish a tradeoff between return and risk. This means that investors must usually accept greater levels of risk in order to achieve higher levels of expected return. As investors buy and sell equity and credit market assets, they alter the expected return and risk of their portfolios.

Because citizens find themselves in different stages of their life cycle, significant variety exists among them. Their attitudes toward risk and return vary depending on their employment status. These attitudes affect their investment choices. For example, mature, conservative investors whose assets meet their long-term financial goals might heavily weight their portfolios with short term federal and municipal government bonds. In contrast, aging workers whose portfolios aren't large enough to support anticipated retirement lifestyles might be forced to aggressively invest in more risky assets with larger expected returns. Similarly, younger workers with many years remaining in their working careers might pursue a buy-and-hold strategy by loading their portfolios with more risky small capitalization stocks.

Sales and income taxes comprise the core components of most state tax portfolios. States augment these two revenue sources with various other taxes, licenses, and fees. Just like equity and credit market assets vary in their associated expected return and risk, different taxes likewise have distinguishing levels or expected growth and volatility.

Many tax policy investigations focus on the interaction between the rate and the base as joint determinants of tax revenue. This gives the well-known relationship

$$R = r \cdot B \tag{1}$$

where R is the total tax revenue, r is the tax rate, and B is the tax base. As mentioned, those charged with planning and executing state budgets concern themselves with the expected growth rates and their accompanying uncertainty that is often measured as a variance. Using the expectations operator, this gives

$$E\left[R\right] = r \cdot E\left[B\right] \tag{2}$$

Similarly the variance of the rate of change in tax revenues is

$$Var[R] = r^2 \cdot Var[B] \tag{3}$$

This means that the tax rate alters the expected value and variance of the tax base by a proportion due to the tax rate. Because sales tax rates are usually less than 10%, however, it can safely be concluded that the variation in sales tax revenues is mostly due to changes in the tax base rather than the tax rate.

Appendix B. Coincident Indicators

It is common to focus on the National Bureau of Economic Research (NBER) declarations when studying business cycles. The NBER's leading, coincident, and lagging indicators establish the beginning, end, and duration of national expansions and recessions. The NBER cycle analysis works well at the national level. However, because state business cycles don't synchronize perfectly with national patterns, state-level measures are needed to make interstate business cycle comparisons. Fortunately, the Federal Reserve Bank of Philadelphia publishes monthly coincident indexes which measure economic activity consistently across state borders.

The Philadelphia Index provides an insightful indicator for anticipating state tax revenues. The methodology implemented by the Philadelphia Fed builds on the pioneering work of Stock and Watson (1989). Crone and Clayton-Matthews (2005) adapt this methodology to state level data. They collapse (1) nonfarm payroll employment, (2) average hours worked in manufacturing, (3) the unemployment rate, and (4) real wage and salary disbursements into a single indicator by using a dynamic single-factor model. The method uses a Kalman filter to extract a major component from each of these four different time series. This approach constructs the index so that the trend for each state's index correlates with each state's gross state product. With careful implementation, the long-term growth in the states index closely tracks the overall state business-cycle patterns. Because the model and the input variables are consistent across all 50 states, the resulting state indexes are comparable.

Appendix C. Individual Tax Growth and Volatility Measurement

As mentioned, business cycle phases cause state governments to regularly alter their tax structure. Frequent and substantial changes to tax codes influence the growth rate and volatility of tax sources. Although calculating growth and volatility estimates based on a uniform tax policy would yield accurate and informative results, unfortunately such ideal data don't exist. It is true that one might try collecting fiscal note analyses to adjust for tax rate and base changes for an individual state. Such an approach, however, suffers from both accuracy and feasibility concerns. The inherent inaccuracy of fiscal note estimates can itself potentially bias growth and volatility estimates. Even if fiscal notes where totally accurate, the task of collecting such data from states with such a diversity of analytical procedures would likely not be practical.

For this reason, when interpreting and comparing growth and volatility estimates for various taxes, it is important to remember that these measures include two components. First, the growth rates and risk of each tax depend on the inherent characteristics of the tax category. Second, the estimates also include the propensity of government officials to alter the tax structure. As will be shown subsequently, major and frequent changes to the tobacco tax base and rate significantly influence the mean and standard deviation of tax revenues. For this reason, it is important to use resistant statistics, median and IQR, to describe the historical distribution of rates of change. These statistics can effectively exclude extreme rate and base changes from the estimation process.

Appendix D. Sales Taxes as a Portfolio

Analogous to equity portfolios that are composed of an assortment of companies, sales taxes generate revenue from a variety of retail products. Just as industry groups react differently to the phases of the business cycle, likewise different classes of retail products exhibit unique covariation with the aggregate economy.

Formal representation of sales tax revenues as a portfolio of different types of products and services begins by defining B as the total of the individual components where $B = \sum_i B_i$ and B_i is the tax base for the i th category of products. If b_i is the continuously compounded growth rate or $b_i = \Delta \ln(B_i)$ and x_i is the proportion of the revenue coming from the ith category, then the continuously compounded rate of growth for the sales tax portfolio is:

$$b = \sum_t x_i b_i \tag{4}$$

This means that the total growth rate is the weighted average of the growth rates for each individual tax. The expected growth rate for sales tax receipts b is simply the weighted sum of the expected growth rates

$$b = \sum_i x_i E[b_i] \tag{5}$$

Since risk is often measured by the variance of the growth rate, this gives the following equation:

$$Var[b] = \sum_i x_i^2 \sigma_i^2 + \sum_i \sum_{i \neq j} x_i x_j \rho_{ij} \sigma_i \sigma_j \tag{6}$$

where σ_i is the standard deviation of the ith category and ρ_{ij} is the correlation between the ith and jth categories.

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