Do Rising Gasoline Prices Yield Increased State Sales Tax Revenues?
Evidence from New York State*

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Introduction

It would be hard to find a more vexing problem facing the U. S. economy now than the current high levels of crude oil and gasoline prices. Oil and gasoline prices are in the multi-media news daily – impacting stock market prices, consumer confidence and costs in many sectors of the economy. Particularly compelling are the record high gasoline pump prices (in nominal terms) we have seen this spring and summer (e.g., over $3 per gallon for regular gasoline in much of the U.S. in early September). While gasoline prices have experienced several spikes over the last four years, the trend line has clearly been up, and at current record levels, this has become a serious national economic problem.[1]

State and federal chief executives and lawmakers are hearing from their constituent consumers about the burden of these prices. And, while Congress recently passed and the President signed federal energy legislation aimed at the Nation's short and long run energy problems, no clear solution to the high gasoline price situation has been advanced for the short term.[2]

This paper is aimed at a particular gasoline price-related question being posed both by the media and consumers to state policy makers – namely: Are states with gasoline in their sales tax base benefiting from increased net state sales tax revenues as the gasoline price increases?[3] The paper introduces an empirical analysis to try and answer this question. Using quarterly data from 1993 through 2005, the analysis decomposes the incremental effect of increased gasoline prices on total New York State (NYS) sales tax collections – while incorporating other traditional factors which influence these collections into the analysis (e.g., personal income, household wealth, seasonal consumption patterns).

The paper is organized as follows. The second section provides further background on the gasoline price problem and related policy issues. The third section introduces a brief discussion of micro-economic consumer theory and, in particular, the familiar household budget constraint. This discussion includes the relevant short-run price elasticity of demand for gasoline and its impact on household consumption choices. The fourth section presents a brief description of the data used in the empirical model and the fifth section presents the model. The sixth section provides an analysis and interpretation of the regression results and addresses the policy question of net State sales tax impact from increased gasoline prices. The final section presents our conclusions and policy implications for states with gasoline in their sales tax base and offers some thoughts for the other states as well.

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[1] See for example, "*Surge in Gasoline Prices Sparks Dire Comparisons and Forecasts*", Wall St. Journal (8/31/05)

[2] H.R. 6 was signed into law by President Bush on August 8, 2005. It provides credits and other tax incentives for oil, natural gas, electric, nuclear and alternative fuel industries.

[3] The analysis here could also be extended to local sales taxes where motor fuel is included in the base but this paper is focused on state tax impacts.

Background & Policy Issues

Motor gasoline prices have increased significantly over the last three years resulting in record high prices (in nominal terms) in most of the U.S. late this summer[4]. Chart 1 shows New York State average monthly regular gasoline prices for the last four years.[5]

Chart 1: NYS Average Monthly Regular Gasoline Prices (December 2001-September 2005)

These price increases have been particularly well documented in the print and electronic media during the summer of 2005 as the U.S average price for regular grade gasoline rose to over $3 per gallon. Consumer sentiment and concern has also been expressed both through media interviews and through responses to consumer confidence surveys. In NYS, we have experienced the media interest in an intensive way over the last few years. In particular, each time the price has spiked, the Tax Department has received a multitude of inquiries from media outlets asking about the various taxes on a gallon of gasoline. These inquiries have also extended to asking if the State is benefiting from the high gasoline prices because New York is one of the seven states which include motor fuels in their sales tax base. The other six states in this category are: California, Georgia, Hawaii, Illinois, Indiana and Michigan.[6]

NYS legislators responding to these media reports and to inquiries from their constituents have also asked the Department questions about the total federal, State, and local taxes on a gallon of gasoline and about the potential revenue surplus accruing to the State with the increased gasoline prices. Chart 2 shows the total taxes on a gallon of gasoline sold in NYS with a pump price of $3.00 and, for comparison purposes, also provides such taxes with a pump price of $1.50. The

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[4] Even in real terms, the early September 2005 average gasoline prices have nearly reached record levels. The previous highs were in March 1981 when gasoline prices hit $3.11 gallon in inflation adjusted (today's dollars) terms. The U.S average gasoline prices approached the $3.11 threshold.

[5] Source: U. S. Department of Energy, EIA weekly retail gasoline price survey for NYS for regular grade fuel.

[6] Several other states have excise taxes that are periodically adjusted by reference to petroleum price indices but these are infrequent adjustments and not tied directly to the pump price.

juxtaposed charts reveal the majority of federal and State taxes do not change with the pump prices (they are fixed amounts per gallon). However, the State and local sales tax is ad valorem and does increase in cents per gallon as the pump price rises.

Chart 2
Total New York State, Local & Federal Taxes on a Gallon of Motor Fuel

PUMP PRICE: $3.00

Tax Component	Tax Rate Cents Per Gallon
Excise Tax	8 cents
Petroleum Business Tax (PBT)	15.2 cents
State Sales Tax*	10.8 cents
Petroleum Testing Fee	.05 cents
Spill Tax	.3 cents
Total State Tax	**34.35 cents**
Local sales tax (4 % jurisdiction)**	10.8 cents
Federal Excise Tax	**18.4 cents**

* This rate is calculated based on a pump price of $3.00 per gallon; State rate is 4%. The State sales tax base includes the PBT, petroleum testing fee, spill tax and federal excise tax; it does not include the State excise tax. ** Assumes 4% local sales tax jurisdiction.

PUMP PRICE: $1.50

Tax Component	Tax Rate Cents Per Gallon
Excise Tax	8 cents
Petroleum Business Tax (PBT)	15.2 cents
State Sales Tax*	5.3 cents
Petroleum Testing Fee	.05 cents
Spill Tax	.3 cents
Total State Tax	**28.85 cents**
Local sales tax (4 % jurisdiction)**	5.3 cents
Federal Excise Tax	**18.4 cents**

4

* This rate is calculated based on a pump price of $1.50 per gallon; State rate is 4%.

Some NYS legislators have responded to the gasoline price spikes, and to constituent calls for relief from the high prices, by offering legislative proposals to suspend or cap the State's sales tax on motor fuel. The underlying premise for these arguments is that the State is benefiting from the higher gasoline prices and accruing surplus State revenues at the expense of consumers. The State sales tax becomes the instrument for fuel tax relief because the revenues from the State's fuel excise taxes are dedicated to highway, bridge, and mass transportation trust funds.

Other states with gasoline in their sales tax base have also experienced these inquiries and, in fact, in prior years some of these states have enacted temporary sales tax suspensions for gasoline. Indiana and Illinois enacted such legislation in 2000 and Florida (where the tax functions more like an indexed excise tax) offered a one-month suspension of its sales tax in August 2004. Recently, the FTA revenue estimators' list-serve received a flurry of action on this issue as state revenue estimators traded information regarding the fiscal impact of the increased gasoline prices on sales tax revenues.[7] Further, on September 6th, in the aftermath of Hurricane Katrina, Governor Perdue of Georgia signed an executive order that will exempt consumers from state motor fuel taxes, which includes the state sales tax on gas, effective at midnight on September 2, 2005, through September 30, 2005.[8] Legislators in states such as Michigan, Illinois and Maine have also recently advanced proposals to suspend or cap the state's gas taxes.

These media and legislative inquiries and legislative proposals provide the motivation for this study – an attempt to quantify the impact of increasing gasoline prices on overall state sales tax revenue – using an econometric model. To date, we are not aware of any specific empirical research on this issue.[9] The econometric model was formulated from microeconomic consumption theory.

Micro-Economic – Consumer Theory[10]

Basic microeconomic consumer theory is instructive on the rising gasoline price issue. The traditional consumer (or household) budget constraint is illustrated in Figure 1. This graph shows the household's monthly income budget constraint which indicates the quantities of gasoline (gallons) that can be purchased by the household (given its fixed income) on the vertical axis, and the quantities of other goods and services, that the household's income allows the household to purchase in the month, on the horizontal axis. For example, at the current monthly income level for this household of $2,000, the household has consumption alternatives between gasoline and other goods and services ranging from 1,000 gallons of gasoline (assuming pump price of $2.00 per gallon), should all income be spent on gasoline, to 0 gallons of gasoline should all income be spent on other goods and services. These are the two endpoints of the budget line. Points along the line show alternative combinations of gasoline and other goods that can be purchased by the household. Point C on this graph shows a position where the household chooses to purchase 300 gallons of gasoline per month which, at the current price of $2.00 per

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[7] List-serve responses were received from several states on September 8, 2005.

[8] Under Georgia state law, the Governor's decision must be ratified by the General Assembly. The General Assembly ratified the decision in special session on Saturday, September 10th.

[9] The authors used various literature searches on econ lit databases and used Google searches and found no directly relevant work.

[10] This section draws on Mankiw (1998) and Samuelson (1989).

gallon, consumes $600 of the monthly household income.[11] This leaves $1,400 available for the other goods and services the household may desire that month. Essentially, the budget constraint shows what the household's consumption choices are given its fixed income.
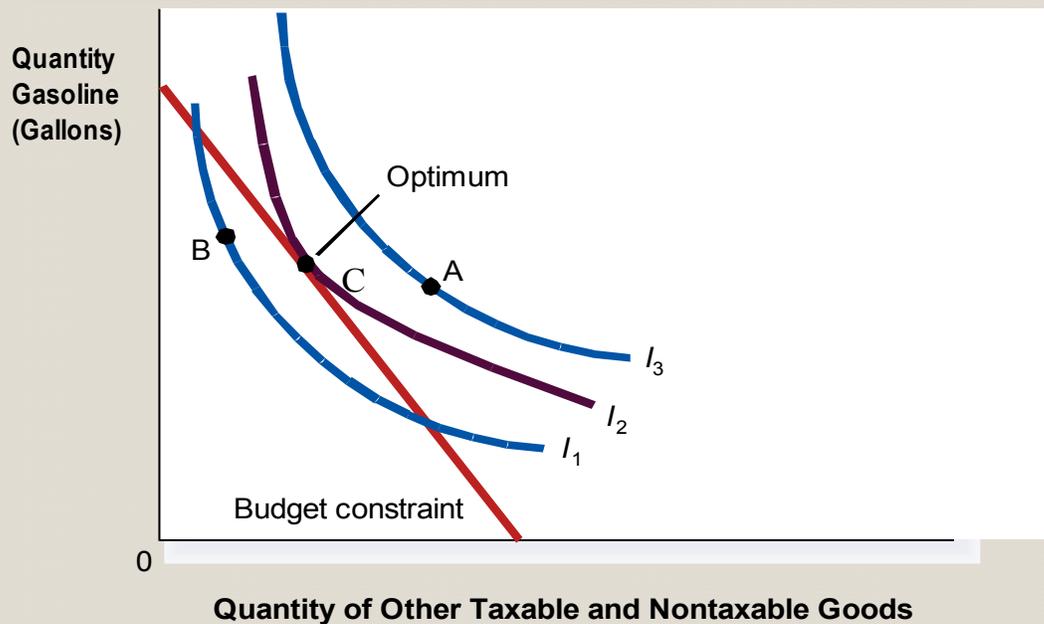

Figure 1 The Household Budget Constraint
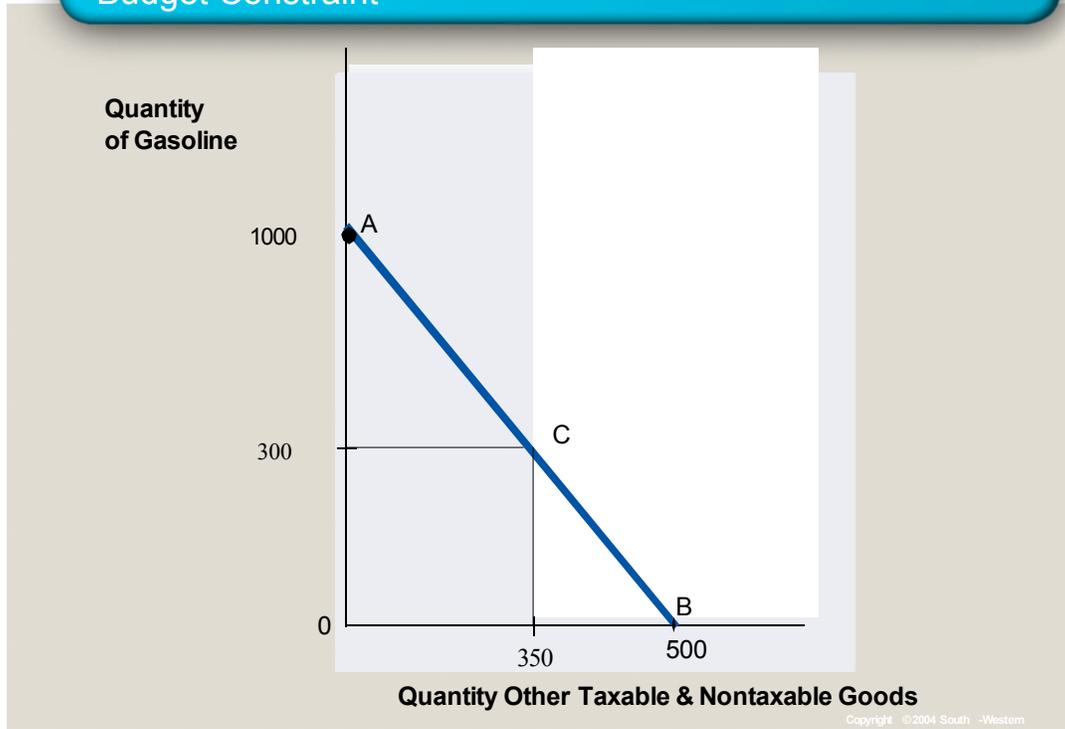
Comparatively, the household's indifference curves, illustrated in Figure 2, show what the household would like to consume. The indifference curves represent the set of consumption choices that make the consumer equally happy. For example, in Figure 2, the consumer would be equally happy or indifferent between point B and all other combinations of gasoline and other goods and services on curve I_1. The shape of curve I_1 shows the rate at which the household is willing to trade gasoline for the other goods and services as the amounts of gasoline consumed change. Point A represents a household consumption choice on a higher indifference curve I_3. The consumer would be equally happy or indifferent between point A and all other combinations of gasoline and other goods and services on the I_3 curve.   However, the household would prefer all points on I_3 to points on I_1. That is, households prefer more consumption to less; they prefer higher indifference curves to lower ones. It is the household budget constraint that restricts the household's consumption wants; that is, it restricts what level indifference curve the household can reach.

The optimal choice for this household is point C in Figure 2, where its household budget constraint just touches its highest indifference curve (I_2).   Point C, where the household's indifference curve is just tangent to the budget constraint, is the consumption choice that maximizes this household's satisfaction (or utility).

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[11] For example, 300 gallons per month for two vehicles in a household would represent 37 gallons per week for each vehicle (i.e., two fill-ups per week).

Figure 2 The Household Optimum

Using the analytical tools of indifference curves and the household budget constraint, we can examine the impact on the household's decision making with an increase in the price of gasoline. As illustrated in Figure 3, an increase in the price of gasoline relative to other goods and services will pivot the budget constraint down the vertical axis from the 1,000 gallon maximum consumption point. The household will be able to purchase less gasoline using all its income and each gallon of gasoline consumed will cost more in terms of other goods and services given up. For most normal goods, the substitution effect would lead the household to substitute the relatively cheaper other good for the more expensive gasoline. However, as illustrated in Figure 3, gasoline is a necessary commodity which is very price inelastic in the short run (i.e., there are few close substitutes for its use).[12] Point D shows the household's new optimum consumption choice. The shape of the indifference curves reflects both the relative price inelasticity of demand for gasoline and the household's tastes and preferences. The household continues to purchase similar amounts of gasoline even at the higher price and more of the decrease in consumption has fallen on other goods and services.

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[12] Professional empirical research on this issue suggests short run price elastcities of demand for gasoline in the range of -.12 to -.25. However, the recent substantial increases in the price of gasoline in the U.S. have been accompanied by only moderate reductions in the quantity of gasoline consumed in the U.S.

Figure 3 Increase in Price of Gasoline
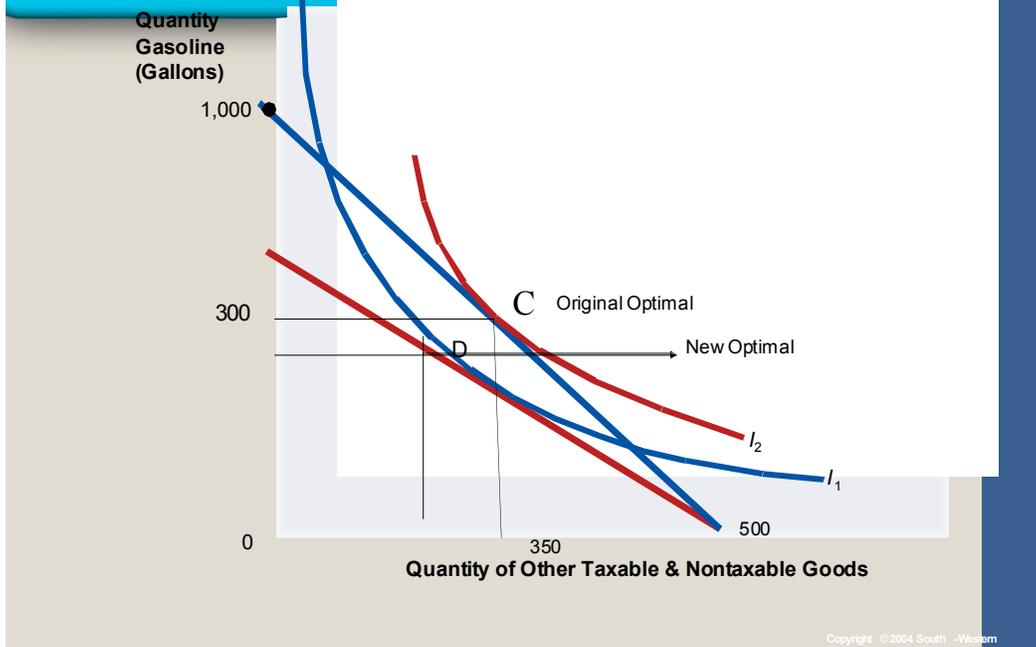
The instructiveness of this primer on basic economic theory is that it illustrates that the question of whether states with gasoline in their sales tax base are benefiting from extra tax revenues is an empirical one. Economic theory is ambiguous on this issue. The answer depends on the aggregation of individual household decisions relative to their preferences and income budget constraints and whether changes in their consumption choices involve taxable versus non-taxable goods and services. For example, in NYS, if consumers use more of their budget to consume gasoline (due to the increased prices) and less to dine out in restaurants (also a taxable transaction), then NYS will not benefit in surplus revenue from this consumption reallocation. However, if consumers make this same shift to gasoline but offset this in their household budget with reduced purchases of movie admissions (not a taxable transaction), then NYS will incur a net benefit in sales tax revenue from this reallocation.

Of course, at higher incomes, more consumers and households are likely to be able to increase their budgets or budget constraints, and increase their spending on gasoline and other taxable goods and services when prices rise. These households are more likely to have the personal financial wherewithal to spend more in the short term even when their incomes do not change. Current saving rates, savings or wealth in the form of liquid assets, lines of available credit from credit cards, home equity loans and 401-K loans all tend to increase with household income. Many higher income households can also benefit from inter-family transfers and or intergenerational transfers (i.e., inheritances) to maintain the same quantities of goods and services as prices rise.

However, lower and middle income individuals and households are more likely to face rather fixed budget constraints. Many of these households or families can not raise their spending when prices rise substantially because they tend to have saving rates that are either closer to zero or even negative in some cases. They tend to have little or no accumulated (liquid) wealth, and

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many have virtually "tapped out" any lines of available credit. These households are not likely to have access to inter-family transfers or intergenerational transfers of any significance. When gasoline prices rise, especially significantly, these households are the most likely to face some difficult economic choices between spending more on gasoline for necessary everyday driving, and spending less on all other taxable and nontaxable goods and services. Any reduction in spending on other taxable goods and services will bring about a partial offset to the increase in sales tax collections from motor fuel. It is this expected reduction in the sales tax on other taxable goods and services that the study estimates.

Data Description

This section provides a short description of the quarterly time series data used in this analysis. All data series are for the quarterly periods beginning with the April through June 1993 quarter and ending with the January through March 2005 quarter:

New York State quarterly net sales and use tax collections ($ millions) – This time series was derived from the monthly State sales and compensating use tax net collections reported in the Tax Department's Accounting Bureau Report, *"Monthly Report of Sales Tax Receipts*." This information was adjusted to remove the State share of compliance assessments, penalties, and interest and to add back the vendor allowance credit (the New York State credit for partially reimbursing vendors for their filing costs) and summed for the quarterly collection periods ending March, June, September, and December. In addition, we normalized this series to adjust for the temporary ¼% increase in the State sales tax rate which began on June 1, 2003 and ended on May 31, 2005.

New York State quarterly sales and use tax collections on motor fuels ($ millions) – This series was derived from the information obtained from the Department's Accounting Bureau Report, *"Sales and Use Tax Statement, Distribution Detail Report, Quarter Ended (March, June, September, December)"* that we normalized to adjust for the temporary ¼% increase in the State sales tax rate that began on June 1, 2003 and ended on May 31, 2005.

New York State quarterly sales tax collections excluding collections on motor fuel ($ millions) – This is a time series derived by subtracting New York State sales tax collections on motor fuels from the series for the New York State net sales and use tax collections.

New York State quarterly taxable motor fuel sales ($ millions) – This series was derived by dividing the series for New York State sales and use tax collections on motor fuels by 4%.

New York State quarterly disposable personal income (nominal $ million) – This series begins with the quarterly period ending December 1992 and stops with the quarter ending December 2004. Source: U.S. Department of Commerce, *"Survey of Current Business"* advanced tables and unpublished materials.

New York State quarterly household financial assets: (nominal $ millions) – We constructed a time series using a share down of the US quarterly stock of household financial assets (deposits; federal government securities; equity shares; mutual fund shares; pension fund reserves). The share down was based on the ratio of New York State disposable personal income to U.S. Disposable Personal Income. Data on the Quarterly U.S. household financial assets was taken

from the household sector data within the *U.S. Federal Flow of Funds Accounts*, published quarterly by the Federal Reserve Board.

Model

The premise of this study is that some households in the economy have budgets or budget constraints that are either fixed or have limited ability to increase in the short term in response to rising gasoline prices. When gasoline prices (or the prices of other taxable goods or services) rise substantially, these households will have to make some difficult choices between purchasing a smaller quantity of gasoline and/or spending less on some other taxable and/or nontaxable goods and services. This section explains our attempt to model this effect to estimate the reduction in consumption of all other taxable goods and services from a rise in gasoline prices. The decrease in consumption of other taxable goods and services acts as a partial offset to the revenue increase from the sales tax on gasoline when gasoline prices increase. We believe this offset will cause the impact of a rise in gasoline prices on sales tax revenue to fall below a "static estimate" of sales tax revenue on motor fuel in isolation.

Analytically, in specifying the model, we are looking for the impact of increased taxable sales of motor fuel on the purchases of other taxable goods and services. The Tax Department's sales tax reporting system provides us with the quarterly sales tax collections attributable to motor fuels so this component of the fiscal impact is known. It is the impact from the rising gasoline prices on the household reallocation of resources – subject to the budget constraint – that we are interested in.

Using household consumption theory and practical experience, we attempted several different formulations. After numerous model specification attempts involving quarterly State sales tax collections regressed on disposable personal income, household financial assets, interest rates, personal consumption, housing starts, business investment, consumer debt as well as motor fuel taxable sales, it became apparent that our explanatory data series were collinear in many cases. In particular, NYS disposable personal income was highly correlated with motor fuel taxable sales. We recognized this from looking at the multi-variable correlation matrix and from the partial correlation coefficients appearing on the motor fuel taxable sales variable. The coefficient on this variable is a known parameter from an accounting identity embedded in the relationship with the dependent variable – motor fuel taxable sales x 4 percent equals the portion of quarterly sales tax collections derived from these sales. Given that both economic theory, practical experience and our particular needs require that both the personal income and motor fuel taxable sales variables appear in the right hand side of the model, the multicollinearity statistical problem provides a roadblock.

Many readers will recognize that one of the basic assumptions of the classical normal linear regression model is that there is no multicollinearity among the explanatory variables (i.e., the variables on the right hand side of the equation). While the presence of this condition, in theory, may still yield best linear unbiased estimators (BLUE) of the true population coefficients, in any given sample, the high collinearity may preclude the separation of the effect of the independent variables on the dependent variable.[13] Given our *a priori* knowledge on the coefficient for

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[13] This discussion draws on Gujarati (1988, p 279-290). The collinearity problem may well be a sampling problem and with additional data this problem may be ameliorated. Unfortunately, the Department's data series on motor fuel taxable sales only extends back to 1993.

motor fuel taxable sales, we believe this multicollinearity problem was material in this way in our sample and needed remediation.

The collinearity problem led us to the following model specification:

Equation 1: SALESTXCOLL=

$\beta_0 + (.04)$ MFTAXSAL + (β_2) YDNYNMF + (β_3) HHFASSETSNY + (β_4) DCLOTHING + (β_5) DQTR2 + (β_6) DQTR3 + (β_7) DQTR4

Where: SALESTXCOLL = Quarterly total State sales tax collections
MFTAXSALE = Quarterly motor fuel taxable sales (coefficient is known information from accounting identity and separate regression-see appendix)
YDNYNMF = Quarterly NYS disposable personal income less motor fuel taxable sales (please note that the motor fuel taxable sales were subtracted from quarterly disposable income so as not to count this income twice in the purchasing power from the right side of the equation)
HHFASSETSNY = Quarterly U.S. household financial assets shared to NYS with NYS income share of U.S. total disposable income
DCLOTHING = A dummy variable coded 1 when the State 's permanent clothing exemption was in place (March 2000 thru May 2003)
DQTR2= A dummy variable coded 1 for the second quarter sales tax collection period for each year
DQTR3= A dummy variable coded 1 for the third quarter sales tax collection period for each year
DQTR4= A dummy variable coded 1 for the fourth quarter sales tax collection period for each year
β_0= Constant Term

A second equation was then developed to focus on our empirical question.   Because we are interested in the interaction of rising gasoline prices and household budget constraints, we modeled the following relationship: Let GASIMPACT = (the rate of quarterly change in disposable personal income minus the rate of quarterly change in motor fuel taxable sales) * quarterly motor fuel taxable sales[14]. This formulation allows us to examine the impact of conditions both where personal income is growing faster than motor fuel costs and where motor fuel costs are growing faster than personal income. We posit that if the rate of increase of gasoline costs is greater than the rate of growth in income, then the budget constraint will become operable. We expect, *a priori*, that this would cause some households to reduce consumption of other goods and services (some taxable). The consumption reduction is captured in the variable formulation as the rate of increase in gasoline sales exceeds the rate of increase of income and the GASIMPACT variable captures the negative effect of this on other taxable sales in NYS.   We expect that the coefficient on GASIMPACT will capture this effect. It will reflect the impact of relatively increasing shares of household gasoline costs on the sales tax collections from other taxable goods and services, holding other factors such as income and wealth constant. Equation 2 is modeled as follows:

Equation 2: SALESTXCOLLNMF=

$\beta_0 + (\beta_1)$ GASIMPACT + (β_2) YDNYNMF + (β_3) HHFASSETSNY + (β_4) DCLOTHING + (β_5) DQTR2 + (β_6) DQTR3 + (β_7) DQTR4 + (β_8) AR(1)

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[14] The rate of quarterly change is measured year over year versus prior year quarter.

Where:

SALESTXCOLLNMF = Quarterly total State sales tax collections less motor fuel component of collections

GASIMPACT = The percentage change in quarterly disposable income versus prior year quarter less the percentage change in quarterly motor fuel taxable sales versus prior year quarter multiplied by quarterly motor fuel taxable sales

YDNYNMF = Quarterly NYS disposable personal income less motor fuel taxable sales

HHFASSETSNY = Quarterly household financial assets shared to NYS

DCLOTHING = A dummy variable coded 1 when the State's permanent clothing sales tax exemption was in place (March 2000 thru May 2003)

DQTR2 = A dummy variable coded 1 for the second quarter sales tax collection period for each year

DQTR3 = A dummy variable coded 1 for the third quarter sales tax collection period for each year

DQTR4 = A dummy variable coded 1 for the fourth quarter sales tax collection period for each year

AR(1) term to adjust for a slight serial correlation problem

β_0 = Constant Term

The equation 1 model specification is based on theory and practical experience with the sales tax. Several independent explanatory variables were tested to most fully capture the economic and special factors impacting quarterly State sales tax collections. *A priori*, we would expect disposable income and household financial assets to be positively correlated with sales tax collections. Similarly, we know the coefficient on the motor fuel taxable sales variable is .04 because it is an accounting identity based on the statutory state sales tax rate. In the regression analysis in the next section, we will discuss the method of restricted least squares regression which was used, given the known parameter on the motor fuel taxable sales variable. The clothing dummy variable should have a negative coefficient from the regression because the exemption resulted in a reduction in State sales tax during the period it was applicable. The quarterly dummy variables reflect the inherent seasonality in sales tax collections.

The equation 2 model specification introduces the GASIMPACT variable to capture the impact of relatively increasing shares of household gasoline costs on the sales tax collections from other taxable goods and services. This allows the empirical analysis to focus on the question of whether increased gasoline prices are yielding increased net state sales tax revenues. In this formulation, we use the same independent explanatory variables from equation 1 and introduce the GASIMPACT variable to the equation.[15] The posited relationships to the dependent variable are identical to those in equation 1 with the exception of the GASIMPACT. The coefficient on this variable is expected to be negative where the relative increase in gasoline costs exceeds the increase in income. This coefficient should reveal information to answer our fiscal impact question. The next section provides the results of the least squares regressions run on the model variables as specified.

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[15] The motor fuel taxable sales variable from equation 1 is omitted from equation 2 because the dependent variable in equation 2 excludes sales tax collections from motor fuel sales and so the sales that generate those collections are also excluded.

Analysis of Regression Results

As indicated above, the statistical methodology employed in our analysis of equation 1 uses restricted least squares regression. That is, the regression technique makes use of both sample and non-sample information in the estimation procedure.[16]

Table 1 presents the estimation results from equation 1. The dependent variable is total quarterly State sales tax collection (SALESTXCOLL) and the known coefficient (.04) on quarterly motor fuel taxable sales (MFTAXSALE) is treated as a constraint or restriction on the regression.   The adjusted R^2 for the regression is .95, meaning 95% of the variation in the dependent variable is explained by the variation in the explanatory variables. While adjusted $R^{2's}$ are commonly high in time series analysis, this result appears a good overall fit for the model.   The coefficients on the unrestricted independent variables are all properly signed and are statistically significant at the 95% confidence level.[17] The T-statistics are all over 2 in absolute value.

Table 1

Sample: 1 47
Included observations: 47
SALESTXCOLL = B(0) +.04*MFTAXSALE+ B(2)*YDNYNMF +B(3)
    *HHFASSETSNY +B(4)*CLOTHING +B(5)*SECONDQTR +B(6)
    *THIRDQTR +B(7)*FOURTHQTR

	Coefficient	Std. Error	t-Statistic	Prob.
C	120.6081	63.34849	1.903883	0.0641
YDNYNMF	0.012199	0.000838	14.55840	0.0000
HHFASSETSNY	0.137064	0.042829	3.200252	0.0027
CLOTHING	-66.16035	22.20164	-2.979976	0.0049
SECONDQTR	86.36820	25.84043	3.342367	0.0018
THIRDQTR	-40.19314	26.90849	-1.493697	0.1431
FOURTHQTR	-170.5777	27.84804	-6.125301	0.0000
R-squared	0.957425	Mean dependent var		1909.124
Adjusted R-squared	0.951038	S.D. dependent var		277.8905
S.E. of regression	61.48954	Akaike info criterion		11.21222
Sum squared resid	151238.5	Schwarz criterion		11.48777
Log likelihood	-256.4871	Durbin-Watson stat		2.468704

The tests for serial correlation in the error terms, which is a common problem when using time series data, do not reveal this problem in our empirical results. While the Durbin-Watson test for first order serial correlation revealed no positive serial correlation, the test stat for negative serial correlation was in the no decision range. More general tests using the Breusch-Godfrey serial correlation LM test yielded test stats which did not reject the null hypothesis of no serial correlation (i.e., no evidence of serial correlation detected).   Similarly, examination of a correlogram plot of the regression residuals did not reveal a serial correlation problem.

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[16] For a description of restricted least squares regression, see for example Griffiiths, Hill & Judge (1993, Chapter 11).

[17] The exception is the coefficient on the dummy variable for the third quarter period which has a T-stat of -1.49. This variable was left in the model , however, as past experience with the sales tax indicates that a full complement of quarterly dummies should be used to capture seasonal effects.

The coefficient on quarterly NYS disposable personal income variable is positively signed and highly statistical significant. Evaluated at the mean, this coefficient, .012199, implies that a $1 billion increase in quarterly disposable personal income (excluding the income spent on motor fuel) would be associated with a $305 million increase in quarterly taxable sales. Given the shares of income that are consumed and the share of consumption that would be taxable (e.g., groceries, residential energy costs, medicine, public transportation, and most services are not taxable in NYS) this coefficient appears reasonable. Similarly, the coefficient on quarterly household financial assets shared to NYS is properly signed positive and statistically significant. This meets our *a priori* expectation since one would expect this variable to affect consumption of both taxable and non-taxable goods and services since it is a measure of a household's wealth and its ability to consume in the short run.

The clothing dummy variable is properly negatively signed reflecting the reduction in quarterly State sales tax revenues attributable to the State exemptions for clothing and footwear costing less than $110 per item, holding all other explanatory variables (e.g., income) constant. Similarly, the seasonal dummy variables reflect the effect of taxable sales occurring in a particular quarter. In summary, the estimation results reflect a model that is consistent with *a priori* expectations and a good overall fit in explaining changes in total quarterly sales tax collections.

Table 2 presents the estimation results from equation 2. The estimation procedure used was ordinary least squares regression. The dependent variable is quarterly total State sales tax collections less the motor fuel component collections (SALESTXCOLLNMF). The adjusted R^2 for the regression is .948, again, a good overall fit for the model. The coefficients for each of the explanatory variables are properly signed and statistically significant at the 95% confidence level[18]. Diagnostic tests and examination of a correlogram of the residuals from the original regression indicated a potential slight 1st order serial correlation problem. Therefore, an AR(1) autoregressive term was added and the overall fit of the regression improved .

Table 2

Dependent Variable: SALESTXCOLLNMF
Method: Least Squares
Date: 09/21/05   Time: 14:28
Sample(adjusted): 6 47
Included observations: 42 after adjusting endpoints
Convergence achieved after 7 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	136.4147	55.71013	2.448652	0.0198
GASIMPACT	-0.100052	0.039412	-2.538645	0.0160
YDNYNMF	0.012707	0.000598	21.25347	0.0000
HHFASSETSNY	0.096421	0.031682	3.043401	0.0046
CLOTHING	-74.29344	15.32692	-4.847253	0.0000
SECONDQTR	83.60306	32.24941	2.592390	0.0141
THIRDQTR	-40.11970	23.76368	-1.688278	0.1008
FOURTHQTR	-181.1667	32.79830	-5.523662	0.0000
AR(1)	-0.363547	0.168742	-2.154453	0.0386
R-squared	0.958811	Mean dependent var	1882.983
Adjusted R-squared	0.948826	S.D. dependent var	245.8381
S.E. of regression	55.61293	Akaike info criterion	11.06212

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[18] The exception is the coefficient on the third quarter dummy variable which is not statistically significant at the 90 confidence level (see footnote 17 above).

Sum squared resid	102062.3	Schwarz criterion	11.43448
Log likelihood	-223.3045	F-statistic	96.02264
Durbin-Watson stat	2.215387	Prob(F-statistic)	0.000000
Inverted AR Roots	-.36		

The coefficient on the GASIMPACT variable is (-.100052) and is highly statistically significant at the 95% confidence level. The sign on the coefficient is negative and is consistent with our posit that when the rate of increase of gasoline costs exceeds the rate of increase in income, this will cause a reduction in sales tax collections from other goods and services. The interpretation of this coefficient, for SFY 2004-05, is that when motor fuel expenditures rise more rapidly than income, 75 percent of the increased gasoline expenditures are financed by reductions in purchases of other taxable goods and services. The remaining 25 percent is explained by reductions in the purchases of non-taxable goods and services. However, the 75 percent estimate should be viewed with some caution because it is somewhat overstated in that the analysis has not included the effects of an increase in consumer debt.

As an illustration of the interpretation of the GASIMPACT coefficient, evaluated at the mean, during the annual April 2004 through March 2005 collection period, the estimated reduction in State sales tax collections from taxable non-motor fuel sales is approximately $33 million. This is compared with the known increase in State sales tax collections from motor fuel of $44 million during this period – or roughly a 75 percent offset to the motor fuel sales tax increase.

Our data series on NYS taxable motor fuel sales, in this study, extends only through the first quarter of 2005. This reflects both the availability of complete data in the Tax Department and the time needed for the analysis and preparation of this paper. We believe that additional data (e.g., including quarters extending through calendar 2005) may yield further insight into the relationship posited in this paper. The spring and summer of 2005 have witnessed record gasoline price increases with only moderate declines in gasoline consumption. Also, consumers and non-motor fuel retailers have increasingly been offering concerns about the financial burden of the rising prices. Clearly, this issue requires further study and we will be updating our work to reflect additional data as it becomes available.

Conclusion & Policy Implications

This paper examined the policy question: Are states with gasoline in their sales tax base benefiting from net increased State sales tax revenues as the gasoline price increases? We are not aware of any prior empirical work on this issue; therefore, this paper is a first attempt at investigating the fiscal impact of this issue.

The empirical analysis conducted in this paper suggests that there is likely some level of increased net State sales tax revenues accruing to New York State due to the increased gasoline prices. While the statistical results from the analysis done in this study are powerful enough to draw inferences about the magnitude of this impact, because this is a first attempt at measuring this impact, we are cautious about making definitive statements about this relationship.

As stated in our analysis section, the coefficient on the GASIMPACT variable is signed negative and highly statistically significant at the 95 percent confidence level. For the April 2004 through March 2005 period, it suggests that roughly 75 percent of increased gasoline expenditures are financed by reductions in purchases of other taxable goods and services. The remaining

25 percent of the increased gasoline expenditures are financed through reductions in the purchases of non-taxable goods and services.

We believe that this modeling approach has yielded interesting insight into the impact of rising gasoline prices on the reductions in purchases of other taxable goods and services in NYS, at least in the data periods used in our analysis. We do not yet have data from the April through September 2005 periods in our sample. These periods have seen record gasoline price increases. This suggests that our study would benefit further from inclusion of these additional quarters of data in the analysis. We intend to revisit this work in early 2006 when this additional data becomes available.

For states with motor fuel in their state sales tax base, our study suggests that there may be some net increase accruing to state sales tax collections from the increased gasoline prices. However, the net impact includes a reduction in State sales tax collected from other goods and services as the household budget constrains some purchases of other taxable goods and services. We have estimated this effect, in NYS, at roughly a $33 million offset to the $44 million increase in State sales tax collected from motor fuel during the April 2004 through March 2005 collection period. The implications of this finding for the six other states which include gasoline in their sales tax base are less clear. These states likely have different sales tax bases than NYS's tax base. Therefore, impacts from increased gasoline sales, resulting in reductions in consumption of other goods and services, may differ across states. That is, the composition of this reduction between taxable and non-taxable goods and services may differ.

For states without motor fuel in their sales tax base, our study suggests that the net fiscal impact is unambiguously negative. As increased gasoline sales draw increasing shares of household budgets, less spending power will be available to purchase other goods and services – both taxable and non-taxable in that state.

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