

Pyramiding, Productive Efficiency, and Revenue under a Gross Receipts Tax

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Definitions

Gross receipts tax

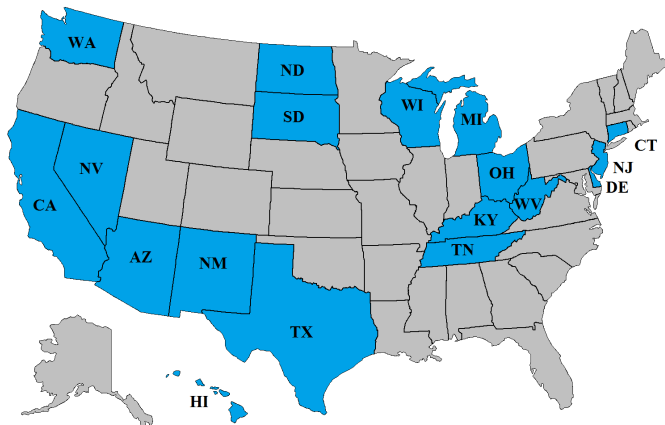
- A gross receipts tax (GRT) is a tax on the gross receipts (total revenue) of firms
- Also known as a turnover tax
- Equivalent to a tax on sales to other firms (intermediate goods) or consumers (final goods)

Retail sales tax (RST), in principle, only taxes sales to consumers (final goods)

History of Gross Receipts Taxes

- 1200s: First gross receipts taxes in Europe
- 1800s: Pennsylvania, Virginia, Connecticut, and Delaware implement small gross receipts taxes
- 1921s: West Virginia is first state to implement a fiscally significant gross receipts tax
- 1960-1980: European countries replace gross receipts taxes with national value added taxes

Statutory Gross Receipt Taxes in 2002-2007



Tax Pyramiding

Tax pyramiding is the taxation of a good multiple times as it moves through the supply chain before finally reaching consumers
Also known as tax cascading

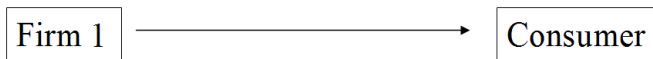
Caused by taxation of intermediate goods

- Gross receipts tax: if no deduction for intermediate good purchases
- Sales tax: if taxes sales of intermediate goods

Pyramiding Example

Effect of a 10% GRT on the price of a good initially costing \$1
 Perfectly competitive market

Supply Chain with No Pyramiding:

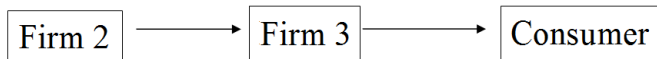


Price: \$1.10

Tax increases price of first good by 10%

Supply Chain with Pyramiding:

Firm value added equals 0 for simplicity



Price: \$1.10 \$1.21

Tax increases price of second good by 21% when statutory rate is only 10%

Pyramiding Consequences I

Literature is very negative towards GRT because of problems caused by tax pyramiding

Arbitrary Rates

- As seen in example
- Higher effective rates for goods with high value added early in production and many firms in supply chain
- Rates are not based on economic criteria such as firms' ability to pay

Pyramiding Consequences II

Productive Inefficiency

- Diamond and Mirrlees (1971)
- Taxes on intermediate goods are inefficient
- The tax on intermediate goods is still reflected in the price of final goods
- Firms substitute away from more heavily taxed intermediate goods to more lightly taxed goods
- This substitution minimized the post-tax cost of inputs, not the pre-tax cost of inputs

Transparency

- Consumers do not know how much tax will pyramid and thus how much prices will be increased

Previous Work

Little quantitative analysis

New Mexico GRT

- del Valle (2005)
- 5% statutory rate. 6.35% effective rate
- 27% increase in tax due to pyramiding

Washington GRT

- Washington State Tax Structure Committee (2002)
- 0.6% statutory rate. 1.5% effective rate
- 150% increase in tax due to pyramiding

Limitations of Previous Work

Do not account for productive inefficiency

- Producer substitution is not allowed
- Productive inefficiency is zero by assumption

External validity

- Tax features and economy parameters are state specific

Modeling issues

- Consumer substitution
- Labor supply

Compare GRT to no tax state instead of an alternative method of raising the tax revenue such as a sales tax

Our Contribution

Compare efficiency of GRT to retail sales tax

Model Features

- Allow for producer substitution to include technical inefficiency
- Allow for consumer substitution
- Model labor supply

Parameter Features

- Estimate using data from many years instead of calibrating to a specific year
- National data

Overall Methodology I

Create general equilibrium model of representative US state economy

Production:

- 21 industries, one for each 2-digit NAICS sector
- All industries perfectly competitive
- Each industry has a cost function for producing output using capital, labor, and the outputs of the 21 industries as inputs
- Labor supply is fixed but capital is mobile
- Imports and exports held constant

Overall Methodology II

Consumers:

- Expenditure function for one representative consumer
- Consumers receive income from labor and capital

Calculate the effect of replacing an existing sales tax with a gross receipts tax

- Use a 1% GRT and a revenue neutral sales tax
- Sales tax applies to all final good sales to consumers
- Gross receipts tax applies to all revenue of all firms

Share Equation

Standard translog cost and expenditure functions

Share of industry x costs spent on input i :

$$s_i = \sum_{j=1}^N \beta_{ij}^{substitution} \ln(p_j) + \beta_i^{shareyear} t + \beta_i^{shareconstant} \quad (1)$$

N is the total number of inputs, t is the year, and p_j is the price of input j to industry x

Share spent on input i depends on price of all inputs, substitutability of those inputs and i , the year, and a constant term

Cost and Expenditure Function

Log cost function for industry x output:

$$\ln(c_x) = \frac{1}{2} \sum_{i=1}^N \sum_{j=1}^N \beta_{ij}^{substitution} \ln(p_i) \ln(p_j) + \sum_{i=1}^N \beta_i^{shareyear} \ln(p_i) t + \sum_{i=1}^N \beta_i^{shareconstant} \ln(p_i) + \beta_x^{costyear} t + \beta_x^{costconstant} \quad (2)$$

N is the total number of inputs, t is the year, p_i is the price of input i , and variables i and j index inputs

Then add taxes to get final price of output

For GRT: $p_x = 1.01 c_x$

Parameter Estimation

Data Sources:

- US national accounts from 1960-2005 from Jorgenson (2007)
- 1997 Economic Census Bridge between NAICS and SIC
- BEA Tables of the Use of Commodities by Industries 1997-2010
- BEA Gross Output Price Index 1987-2010

Regressions run using iterated 3-stage least squares

Overall Results

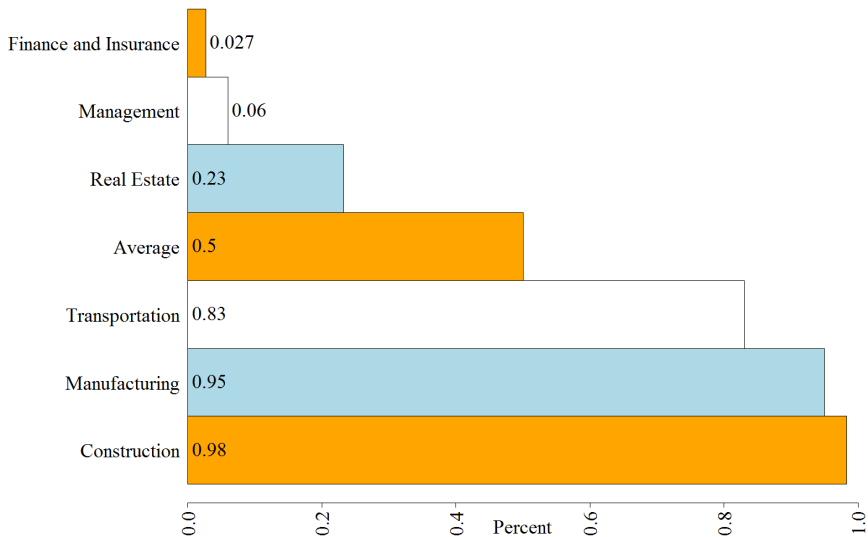
Revenue neutral sales tax rate is 1.78%

Impact of the GRT is negative

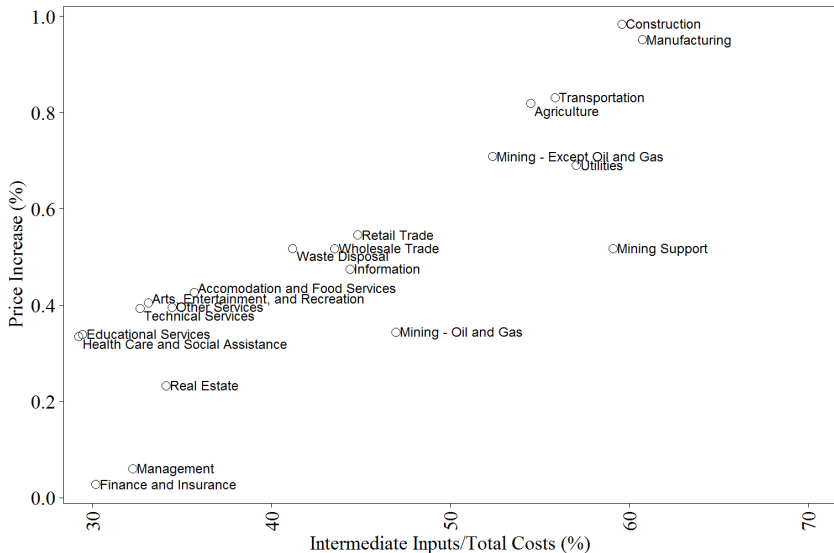
- Increases average prices by 0.50%
- Decrease in average quantity demanded of 1.29%
- Increases excess burden by 6.0% of revenue

Large variation in price and demand changes by sector

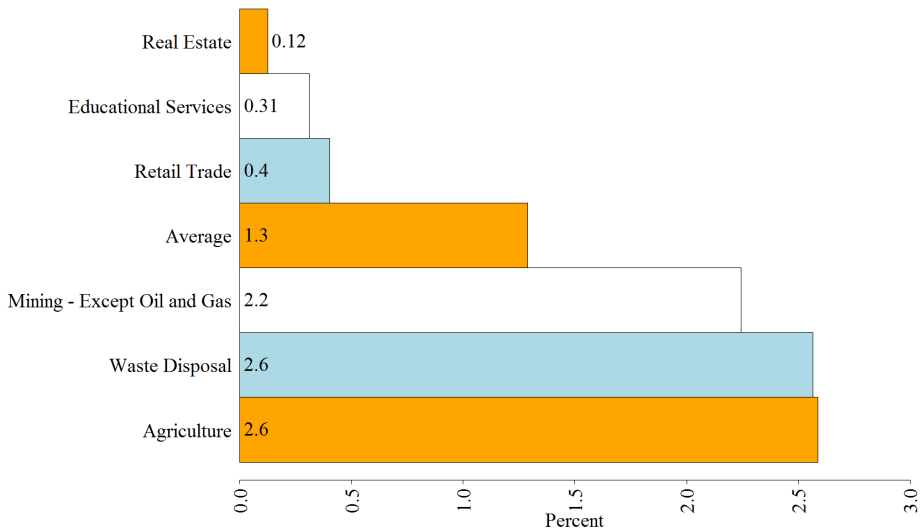
Increase in Prices



Increase in Prices and Intermediate Inputs



Decrease in Demand



Sensitivity of Revenue Estimates

Specification	Baseline	1	2	3
Producer Substitution	yes	yes	yes	no
Consumer Substitution	yes	yes	no	no
Price of Labor Constant	no	yes	yes	yes
Quantity of Labor Constant	yes	no	no	no
Increase in GRT Revenue (%)	0	0	3.5	4.5

Modeling labor supply has a negligible effect on revenue

Not allowing for substitution leads to higher revenue estimates

Summary

Efficiency problems of gross receipts taxes are significant

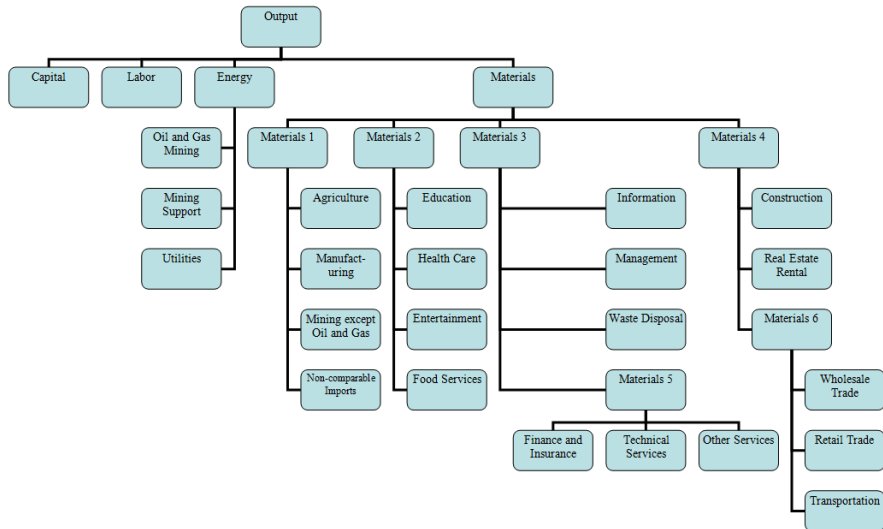
Higher prices, higher excess burden, lower demand, lower utility

Future Work

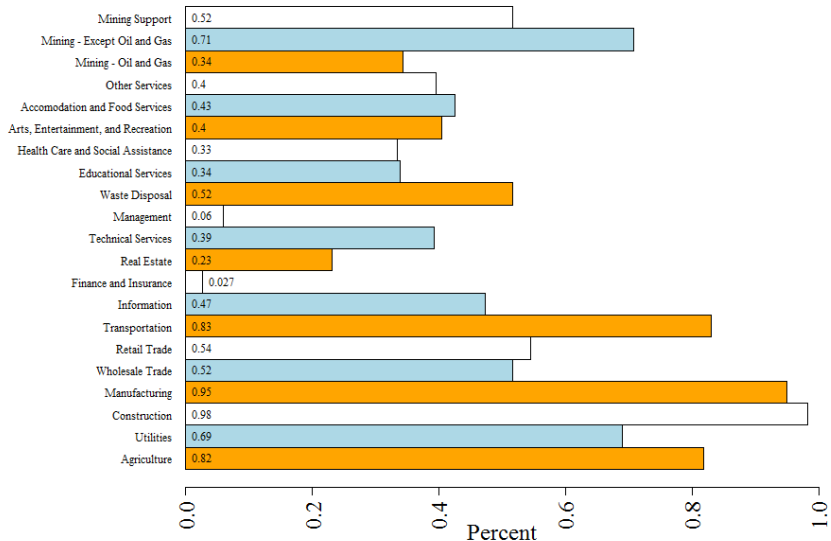
- Interstate trade
- Less efficient retail sales tax

Thank You

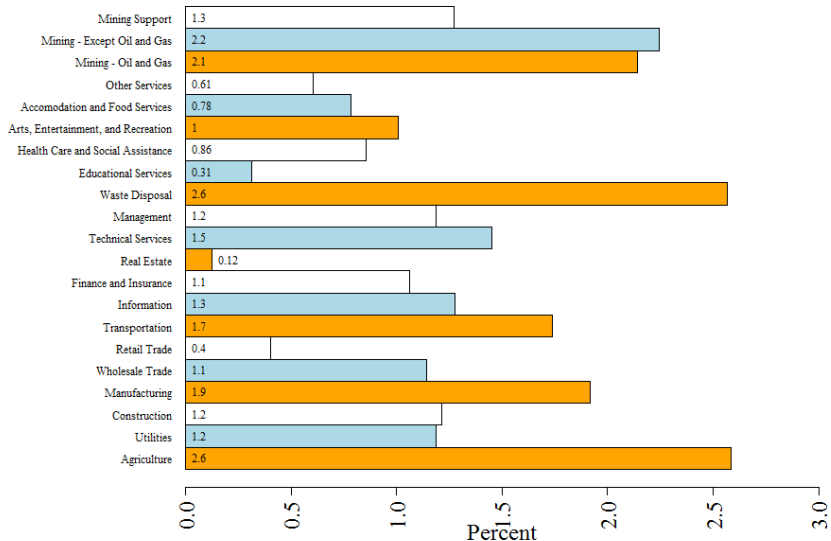
Tier Structure of Production



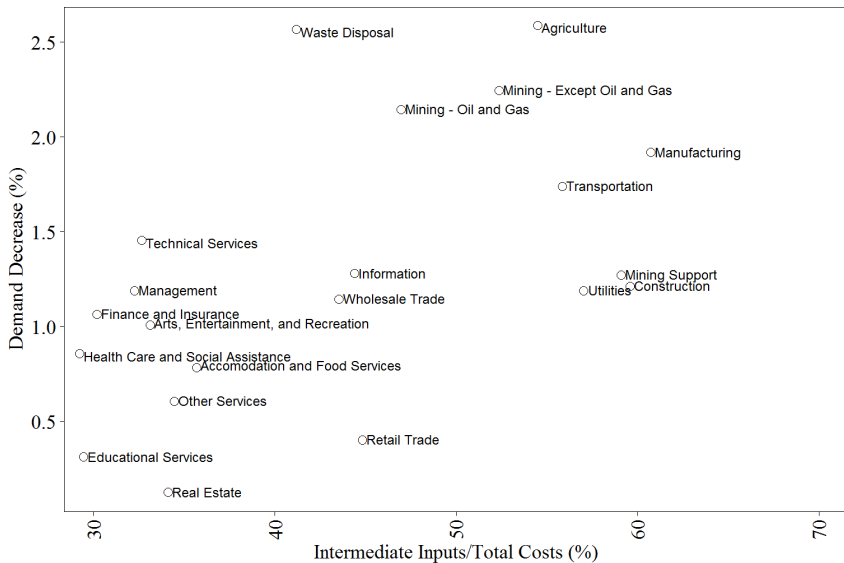
Increase in Price by Sector, All Sectors



Decrease in Demand by Sector, All Sectors



Decrease in Demand and Intermediate Inputs



Decrease in Demand and Price

