Review

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This issue of the *Review* is going digital—it will not be printed and mailed, just published on the Commission's website. In the future, articles and other items of interest will be published on the website directly, rather than being compiled into an issue of the *Review*. This will reduce our printing and distribution costs, and items of interest will become available sooner. We welcome your suggestions for topics as well as submissions for the publishing on our website.

This issue contains three articles written by current MTC staff members and by former policy research interns.

The first article, "**The Überexpert,"** by Harold Jennings, Senior Audit Supervisor, and Robert Schauer, Computer Audit Specialist, is different from the usual articles which appear in this *Review.* This article describes two types of top experts in their fields and how one type can be detrimental to an organization's efforts while the other can be quite beneficial.

Yi Feng and Matthew Wade were Policy Research Interns during the summer of 2012. Yi and Matt adapted the method used by Professor Robert Strauss of Carnegie Mellon University to estimate the loss of sales and use tax revenue for all state and local governments for fiscal year 2010. They found that the difficulty in collecting these taxes from residents who use electronic commerce resulted in a revenue shortfall ranging from $14.2 billion and $20.8 billion. You can read about their work in **"An Analysis of Business to Consumer Electronic Commerce Sales."**

Andre Barbe, Policy Research Intern, summer 2011 and Ph.D. candidate in Economics, Rice University, authored the last article "**Pyramiding, Productive Efficiency, and Revenue under a Gross Receipts Tax."** This article is derived from Andre's doctoral dissertation at Rice University. The major findings are that a gross receipts tax raises prices by an average of 0.5 percent; and, that a retail sales tax would require a statutory rate of 1.78 percent in order to raise the same revenue as a 1.0 percent gross receipts tax.

I'd also like to note some recent personnel changes at the Commission:

Amber Kirby, Assistant to the Director of the National Nexus Program, left the Commission on January 1st to join PriceWaterhouseCoopers.   Ben Abalos joined the National Nexus Program as Associate Director on January 1st. Ben is a member of the Pennsylvania bar, a CPA, and graduated from Temple University Law School. He was formerly working for the Commission on a special project to assist the Joint Audit Program.

Amyia McCarthy has joined the Commission as an extern for the National Nexus Program and the legal division for the spring semester. She is a candidate for a 2013 juris doctorate from the John Marshall School of Law.

The Joint Audit Program hired Alexis Douglas to fill a vacancy in the sales and use tax audit group. She has five years' experience with Texas Comptroller as sales tax auditor. And Michelle Becker was hired to succeed the Joint Audit Program's long-time administrative assistant, Jerry Schleeter, who retired last fall.

Joe Huddleston
Executive Director
Multistate Tax Commission

The **Ü**berexpert

by Harold Jennings, Senior Audit Supervisor, and
Robert Schauer, Computer Audit Specialist
Multistate Tax Commission

As governments have entered into the digital age, agencies have recognized that specially trained staff is needed to effectively deal with electronic records in an audit. This staff performs certain technical functions and/or assists the rank and file auditors in performing their audits. Frequently, some emerge at being especially skillful, and often are formally or informally recognized as in-house experts. This may be a few, or just one person. To describe this individual, we will use the phrase Über**expert**.[1] Typically, this Überexpert has the final say on technical matters, and may have control of policy as it concerns their area of expertise. This article is primarily written for these administrators to help them recognize whether their Überexpert is acting in the agency's best interest and not just themselves. There are revealing characteristics that differentiate between the two kinds, even for those not in the know.

The emergence of the Überexpert seems commonplace, especially with regard to two technical areas that are related in audit applications, but are really two completely different fields of knowledge: the computer savvy individual who understands the processing of electronic data (the Computer Audit Specialist), and the person who understands statistics so that sampling procedures can be properly applied when necessary (the Sampling Specialist). The Überexpert may be the same person in both areas.

We at the Multistate Tax Commission (MTC) Audit Division often come in contact with the Überexpert. They can be classified in roughly two ways. One type will use their knowledge for the benefit of the agency – having such an expert is almost always a big advantage. Unfortunately, the other kind will use their position to their own ends, whose primary purpose seems to be to control and preserve status as the in-house expert – this ultimately will be detrimental to the agency in many cases. Before discussing what traits that expose the selfish from the selfless, we need to look closer at the phenomenon itself, and particularly why it seems to play out many times over. First, and foremost, ***knowledge is power***. The selfish one understands this intrinsically, and will almost always diminish opportunities for anyone else from gaining the necessary knowledge and experience that they have. The second ingredient to this is that the agency administrators usually lack this specialized knowledge, and are completely dependent on their Überexpert. Another big factor with regard to these two areas is that they are relatively new or newly applied

knowledge is power

fields to auditing. Other technical experts are required in auditing, such as legal staff. However, the field of law is a distinct profession and has long history when compared to that of a computer audit specialist (the auditor with computer skills) or sampling specialist (the auditor who understands statistical theory). The fortunate individual who finds themselves in such a position of the "keeper of the special knowledge" can easily take advantage of these factors – and humans being opportunists – some will perpetuate their careers at the expense of others and the agency for which they work.

Another aspect to all this is the "magical" appearance of such technical skills. When the car and the airplane first emerged in our society, those that operated and maintained

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[1] *A made-up Germanic word which describes the "top dog" amongst the experts. It should be noted that überexperts exist in most fields of endeavor.*

these craft were viewed as somehow having miraculous qualities, giving status to those associated with these new devices. In the same way, those audit specialists who process electronic data or understand complex mathematical formula in sampling are viewed as "doing magic". In fact, all these fields, while capable of doing marvelous things when compared to the past, have absolutely nothing to do with magic, and everything to do with science. The "keys to the kingdom" are the science. Understanding the underlying science permits **anyone** to understand – even the ordinary everyday auditor who has trouble with making complex spreadsheets or who paid no attention at their college-level statistics class. And herein lays the best way to expose the one acting against the interest of the agency: science is about sharing of knowledge while "magic" is about secrecy. Does the Überexpert promote the general sharing of the knowledge on the subject or does this person take steps to limit opportunities on internal discussions concerning policy on issues in these areas? Does this person advocate general training of all audit staff on the fundamental science concerning computer technology or statistics, or do they take the position that the average auditor just is not capable? Is the specialized software available to all, or is it unduly limited to just a few at the advice of the Überexpert? Finally, does the Überexpert hawkishly insist that all the technical procedures be done exclusively by them (or their close associates), or do they allow for a more general application of the techniques? Note, there is a wide gulf between having a centralized review function of all agency work overseen by an expert (probably a real good thing to do), and a situation where the work papers and formulas are hidden like the famous fried chicken recipe of a national chain of fast-food restaurants so that no one except a few individuals can really understand what is going on.

We are not naïve to think that administrators with this problem may not already realize what they have on their hand – common sense can lead one to the same questions mentioned herein. But we can say, due to the unique position of the Commission, we have observed many times over what the long-term

destructive consequence of the Überexpert acting out of self-interest. Allowing exclusivity to persist will necessarily limit others from proving their abilities and perpetuating this expertise beyond the career of one individual. Either the agency loses the expertise, or it is passed along. Expanding the universe of those using the techniques will likely expose the best at using them, benefitting the agency. The converse of this is true too: limiting the universe of those who use these techniques will likely not expose the best at using them, harming the agency.

There is another issue inherent to this topic that should be considered. That is, should anyone at all be anointed status as in-house expert on computer data issues or audit sampling? Certainly there is an inherent risk that such a person will be tempted to perpetuate their position to the agency's harm. We cannot adequately answer the question, but have some points to consider. Certainly, someone needs to understand these areas well enough to execute them competently. Technical skills do not tend to suddenly emerge uniformly and equally throughout the staff. Leadership is vital to the whole process. This necessarily creates specialties and areas of expertise which happens either officially or unofficially. We believe the key to this function is how the position held by the Überexpert is integrated within the agency. If one of the goals or stated job descriptions is promotion and training of the general staff on the underlying science, this will lessen the opportunity for these individuals to act out of self-interest. Possibly the best candidate for the Überexpert is the one that best understands the science **and** at the same time tends to be open to sharing of the knowledge. From the agency's long term view, the best person for the job may not be the one that is the most exceptional at applying the science. Will this person have other important attributes such as: the willingness to teach and promote the use of the techniques; a personality that allows them to work well with others including experts outside the agency; and most importantly, the possession of the deeper wisdom that the sharing of the science may be just as important as the science itself? If your

person has a problem in any of these other areas, we submit that your agency may later have a problem. One thing that can be done is to insist that others get training.

To serve this need, the MTC has developed a number of technical classes in these areas. But over the years, we have noticed that some states will send only one or two individuals to the classes, and certain characteristics are noted within some of these states. First and foremost, there is an absence of other personnel attending the classes (and we freely admit here our bias that we would like to have the opportunity to train as many people as possible). Second, there seems to be no in-house training for staff in these same states to the fill the need. And finally, the method or manner in which these technical areas are applied has peculiarities that distinguish them from other states that involve many individuals that operate more out of consensus. So, as can be seen, we have a stake in all this too. And hence, the reason for this article: it seems that these individuals abuse their position very much tend to limit training opportunities for others. This has a direct impact on us – our classes are not always filled like we feel they should be.

An Analysis of Business to Consumer Electronic Commerce Sales and Use Tax Compliance on Revenue Collections

Yi Feng and Matthew Wade[1]

Abstract

The recent financial crisis has put the states in a difficult position. With tax revenues down from their 2008 pre-crisis levels and expenses rising, states are scrambling to find a way to balance their budgets. To compound the difficulties faced by state and local governments, the Federal government is likely to cut a percentage of its funding of state programs according to the State Budget Crisis Task Force.[2] This leaves the states on their own to find ways to lower expenditures or raise tax revenues. A focus on increasing sales and use tax compliance for ecommerce sales could help with this problem by raising billions of dollars of currently uncollected tax revenues each year.

I.   **Introduction**

States have been grappling with their most serious fiscal crises since the Great Depression. Even before the 2008 financial collapse, many states faced long-term structural problems, and now they face additional threats. Our federal system gives state governments responsibility for providing most domestic governmental functions such as public education, health and welfare services, public safety and corrections and essential infrastructure for transportation, water supply, sanitation and environment. States oversee the elementary and secondary school systems that educate the nation's future voters, jurors, and workforce and, together with localities, pay more than 90 percent of the cost of this education. State and local public colleges and universities educate more than 70 percent of the students enrolled in this country's degree-granting institutions. States spend more than $200 billion annually for health care for the poor and medically needy. States and their localities finance nearly three-quarters of all public infrastructure — schools, highways and transit systems, drinking water, and other projects crucial to economic growth and public health and safety. They employ 19 million workers - 15 percent of the nation's workforce and six times as many workers as the federal government employs. In total, state and local governments combined spent $2.5 trillion in 2009, which is more than the federal government spent on direct implementation of domestic policy.[3]

Ever since electronic commerce (ecommerce) became a significant form of commerce, the states have had trouble collecting the sales and use taxes legally due from it. The 1992 Supreme Court case *Quill V. North Dakota* is the main cause of this trouble by ruling that for a state to require a company to collect and remit sales taxes, the company must have a physical presence or nexus in the state. This means that anytime an online retailer sells products to a customer in a state in which they do not have nexus, the retailer is not required to collect the sales tax and the responsibility of recording and paying the sales tax to the state falls on the consumer. However, as the individual use taxes resulting from this are generally very small amounts of money per

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[1] *Yi Feng and Matthew Wade were MTC Policy Research Interns during the summer of 2012.*
[2] *http://www.statebudgetcrisis.org/wpcms/wp-content/images/Report-of-the-State-Budget-Crisis-Task-Force-Full.pdf*
[3] *Ibid.*

person, the governments have never put much emphasis on enforcing the tax and because of this very few people actually pay it or even know about it.

Moving forward, the sales and use taxes on ecommerce will become increasingly significant since ecommerce sales are growing and becoming a larger percentage of total sales. Some progress has been made recently with the Streamlined Sales and Use Tax Agreement, a coalition of states and retailers working to make it easy for businesses to calculate and remit sales and use taxes correctly. Another promising sign is a major retailer which had not been collecting and remitting sales and use taxes has begun working with more states to start collecting sales and use taxes and backing legislation to make sales tax collection required for all online retailers regardless of whether they have nexus in the state, given that a simplified system for collecting the tax is created.[4]

Because of the increasing value and importance of ecommerce sales and use taxes we have estimated the taxes lost in each state and the effect of increased business and consumer compliance in an effort to show how much extra revenue the states could collect by enforcing these taxes better. The extra tax revenues gained from this source of commerce could help with the states' financial problems with the benefit of not requiring raising tax rates or reducing expenditures on important programs such as the public school system or Medicaid.

II.   **Methodology**

In an earlier article, Professor Robert Strauss introduced a means to estimate the amount of revenue losses from uncollected sales and use taxes derived from online vendor purchases for both business to business (B2B) and business

to consumer (B2C) transactions.[5] We have adopted and expanded his methodology to other states and utilized updated data to come up with new estimates. All the figures can be found in **Table 1** (see the appendix), which is the estimated total state and local sales and use tax revenue loss for the year 2010. Since we are replicating Strauss' study, we will omit some of the intermediary steps and only highlight the different estimates that we used in this article. The highlights will be marked in asterisks. To begin the analysis, the first step is to compute the total e-commerce state and local taxes due using the formula below.

$$T = M \bullet \alpha \bullet \beta \bullet \gamma \bullet t$$

T*: Total e-commerce state and local taxes due in each respective state
M: Market size for e-commerce
α: percentage of the market proportional to states that charge sales taxes
β: percentage of e-commerce attributed to the state
γ*: percentage of the market share that is taxable
t: individual state's average tax rate

As Strauss explained, estimating the entire e-commerce market for the United States is important for approximating the sales and use tax base (Strauss, 2011). We used the most recent data from the U.S. Census Bureau e-stats report[6]. In order to compute the percentage of e-commerce attributed to each individual state, we use the state and local government finances data from the U.S. Census [7] to estimate the percentage of national shares that is apportioned into each state. We then enter this data into the formula to obtain the information on the total e-commerce state and local taxes due in each state. We repeat the same process for total B2C e-commerce

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[4]http://www.forbes.com/sites/robertwood/2012/07/26/sweeping-online-sales-tax-fast-approaching/?partner=yahootix

[5]http://www.andrew.cmu.edu/user/rs9f/RP_Strauss_Final_Alliance_Internet%20Tax_Report_5_3_2011.pdf
[6]http://www.census.gov//econ/estats/2010/2010reportfinal.pdf
[7]http://www.census.gov/govs/estimate/

state and local taxes due in each state by replacing the national market for e-commerce (indicated as M in the formula) with B2C market for e-commerce to compute for B2C state and local taxes due in each state. We subtract B2C state and local taxes due from the total e-commerce taxes due to get the B2B taxes due for each state.

Once we have determined the amount of taxes due in each state the next step is to estimate the amount that is collected. Sales tax compliance on Internet purchases can be approximated by multiplying the percentage of each group of firms in each state by the compliance rate for each group of firms. Based on Bruce, Fox, and Luna's study in 2009[8], large firms make up 37% of e-commerce market share, while medium and small-sized firms make up 20% and 43% of market share, respectively. Strauss on the other hand, employed annual web sales as a measurement, in which he concluded that the top 500 largest Internet retailers are consisted of 88.1% of the e-market for B2C transactions. Both estimates are examined in this paper as indicated in Method I and Method II. For B2C sales large vendor compliance rate estimates for each state can be found in Bruce, Fox and Luna's paper on page 22, table 9. Medium-sized vendor compliance rate is evaluated as a weighted average on an equal factor basis of paid number of employees, annual payroll and establishments except for Alaska, Hawaii and Indiana[9]. Small vendor compliance rate is assumed to be only half of medium-sized vendor compliance rate. Medium and small-sized vendor compliance rates are averaged over a five-year period using the County Business Patterns data from the Census[10]. The three exceptions to this methodology occur because the Census Bureau does not have definitive figures for those three states mentioned above for the entirety of the five

year period that we examined. We used all of the factors that had data for the whole time period and ignored any factor which had limited data for accuracy purposes.

Half of B2B sales face vendor compliance and the rest of the sales face use tax only. In terms of use tax compliance, it is understood that individuals rarely pay use tax to their states. We found a study[11] done by Minnesota Research Department, which analyzes the 25 states whose use tax collections are attached on income tax returns. Their study evidences 22 states' use tax collections in dollars in 2009. We incorporated the data from their study for those states when computing use tax collections from individuals. For the rest of the states, we assume 1% compliance rate on use tax collections from individuals. Later in discussions, we will run a sensitivity analysis if we change the individual use tax compliance rate and observe the impact on total revenue losses. We also assume there is 77% use tax collections from business vendors. This estimate is from the most recent Washington State compliance study in 2010[12]. Total B2B (B2C) e-commerce uncollected taxes due equals the total taxes due in each state less sales tax compliance on Internet purchases less individual (vendor) use tax compliance.

III.   Discussion of the Findings

If we assume large firms make up 37%of the market based on total sales, then the total e-commerce revenue loss for 2010 is a little over $20 billion. If we assume large firms make up 88% of the market, then the total e-commerce revenue loss drops to around $14 billion. The disparity between the two results from large firms having much greater compliance rates as they are more likely to get audited and large firms tend to keep better records for future audit needs. Among the states, California is the largest state in population and has the highest revenue

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[8]http://cber.bus.utk.edu/ecomm.htm
[9]Alaska is evaluated on a combined factor of annual payroll and total establishments; Hawaii is evaluated on a single factor—total establishment; Indiana is evaluated on a combined factor of paid number of employees and annual payroll.
[10]http://www.census.gov/econ/cbp/index.html
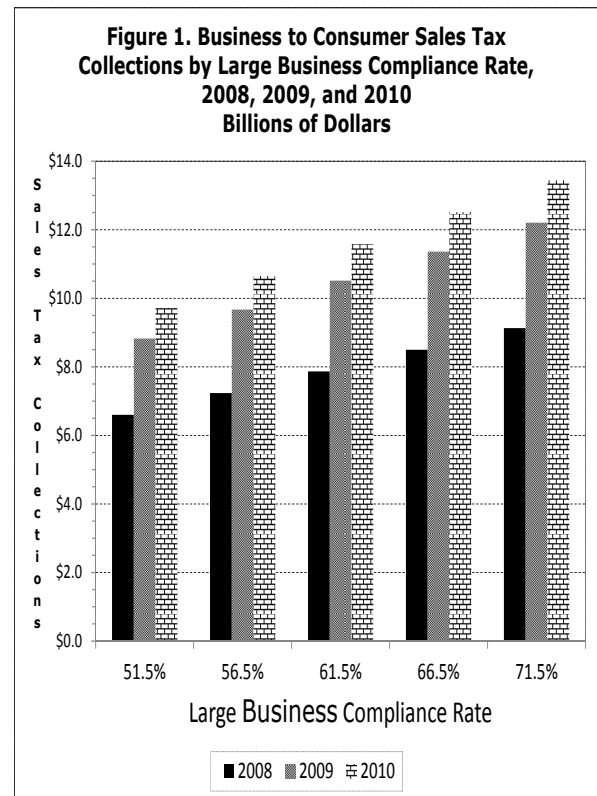
[11]http://www.house.leg.state.mn.us/hrd/pubs/usetax.pdf
[12]http://dor.wa.gov/Docs/Reports/Compliance_Study/compliance_study_2010.pdf

loss—ranging from $2.2 billion to $3.1 billion depending on different estimates that we used. Arkansas has the lowest revenue loss—between $1.6 million and $2.6 million. Interestingly nearly half of the losses occur in just 6 states with California, New York, Texas, Florida, Illinois, and Washington totaling 47% of the total revenue losses.

Next, we focus our analysis on the distribution of total sales and use taxes due and the estimated amount that was collected and remitted by vendors in terms of both B2B and B2C transactions. B2B has a much greater amount of sales and use taxes due than B2C in a majority of the states because B2B sales far exceed the value of B2C sales. However, total sales and use taxes *uncollected* in B2C is thrice as much as B2B taxes lost as measured by the Bruce, Fox and Luna method, and B2C losses are twice as much as B2B losses using the Strauss method. Both estimates show that the amount of uncollected B2C sales and use taxes is significantly higher than uncollected B2B sales and use taxes. Additionally, we found that having a greater percentage of large firms leads to a higher overall compliance rate than smaller sized firms. This finding reinforces our analysis about big firms having better record keeping and understanding of the law. In order to examine the impact of large business tax compliance rate on total revenue losses, we decided to isolate all other factors in the calculation and only change the large vendor sales tax compliance rate in this case. According to Strauss, large vendor compliance rate in 2010 was 61.5%, so we take that as a baseline scenario and we tested compliance rates in increasing and decreasing increments of 5%to see how the total B2C sales tax collections would change.

From the information we obtained, we noticed that a 5% increase or decrease in large business sales tax compliance rate results in an average 15% increase or decrease in total sales tax revenue collections over the past three years. A 10% increase or decrease in large business sales tax compliance rate results in an average 20% increase or decrease

in total sales tax collections over the past three years. The result is consistent over preceding years in 2008 and 2009, that is, for every 5% change in either directions in B2C sales and use tax collections from large vendors, states are able to collect 8% more sales tax in total from the vendors.

Figure 1. Business to Consumer Sales Tax Collections by Large Business Compliance Rate, 2008, 2009, and 2010. Billions of Dollars

We also wanted to analyze how much of an effect effort to enforce the individual use tax would have. To test this we ran the calculations using an 83% compliance rate and graphed the results to compare it to our original 1% estimate.

Under the current condition, we assume average 1% use tax collections among states. This estimate is based on the states whose use taxes are collected in combined report with their income tax returns. As Bruce, Fox, Luna put it in their paper: "individuals seldom apply even when they are offered the opportunity to pay through their individual income tax

Figure 2. Estimated Total Use Tax Revenue Lost at Compliance Rates of 1% and 83%, 2008, 2009, 2012, billions of dollars
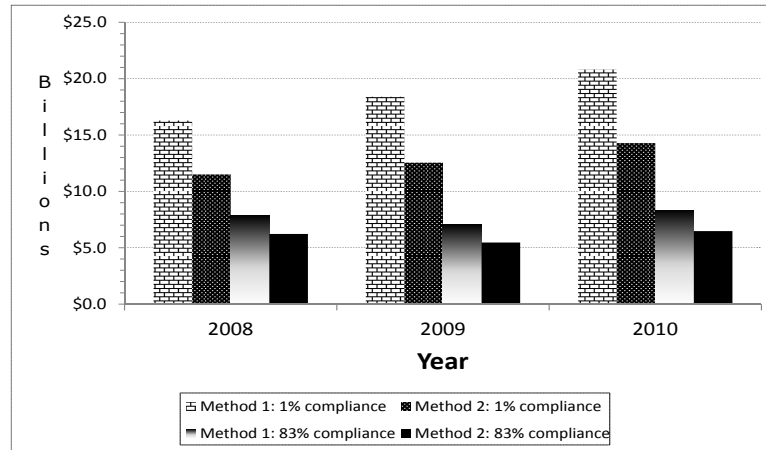
return."[13] We compare the current 1% to the federal income tax compliance for the year 2006. The idea is if the states try to enforce the use tax, then they can reasonably expect the same compliance rate as the federal income tax, which is 83%.[14] From this study, we found that with the compliance rate of 83%, the total revenue lost decreased by nearly 80% using method I, and 70% using method II. We estimated that the total revenue collections for all states can be increased by $8.5 billion to $9.8 billion from sales and use tax from B2C transactions, which is 50% to 70% reduction in total revenue losses.

IV.   **Summary and Conclusion**

This paper analyzes the impact of B2C compliance on total revenue lost from e-commerce sales and use taxes. The total state and local sales and use tax revenue losses for the year 2010 ranges from $14 billion to $21 billion. The revenue losses in each state ranges from $2.7 million in Arkansas to $3.2 billion in California. B2B

e-commerce accounted for 56% of the total taxes due while B2C makes up the rest. However, B2C is responsible for an average of 68% of the total revenue lost. The huge revenue disparity between B2B and B2C indicates there is a compliance issue in B2C e-commerce. The results demonstrate that the possible gain in revenue is so significant that we believe states can raise substantial amounts of revenue from consumer use tax compliance if they put more effort into enforcing it. Within B2C compliance, a 5% increase in large businesses compliance will result in a 15% increase in total revenue collections, on average. Enforcement in individual use tax compliance could cause total revenue collections to increase by up to 80%. Overall, states could increase revenues by $8.5 to $9.8 billion if they start to enforce individual use tax compliance and large business sales tax compliance.

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[13]http://cber.bus.utk.edu/ecomm.htm
[14]http://www.irs.gov/newsroom/article/0,,id=252038,00.html

Table 1 Total e-commerce state and local sales and use tax revenue losses for the year 2010, millions of dollars						
	Method I			Method II		
State	**B2C**	**B2B**	**Total Taxes Lost**	**B2C**	**B2B**	**Total Taxes Lost**
Alabama	$290.7	$119.0	$409.6	$174.4	$99.4	$273.7
Alaska	$2.0	$.8	$2.8	$1.2	$.7	$1.9
Arizona	$499.7	$203.4	$703.1	$298.2	$170.2	$468.4
Arkansas	$2.3	$.4	$2.7	$1.4	$.3	$1.7
California	$2,194.8	$981.9	$3,176.7	$1,426.9	$838.1	$2,265.0
Colorado	$233.0	$79.3	$312.2	$141.8	$66.4	$208.1
Connecticut	$145.1	$18.7	$163.8	$87.7	$15.7	$103.3
District of Columbia	$29.6	$17.5	$47.1	$17.9	$14.6	$32.5
Florida	$874.4	$330.9	$1,205.3	$550.2	$279.2	$829.4
Georgia	$465.4	$196.3	$661.7	$285.2	$164.3	$449.5
Hawaii	$98.0	$39.5	$137.5	$57.4	$32.9	$90.3
Idaho	$54.7	$22.8	$77.4	$32.5	$19.0	$51.5
Illinois	$566.1	$355.4	$921.5	$354.9	$298.5	$653.5
Indiana	$285.4	$120.0	$405.5	$174.7	$100.5	$275.2
Iowa	$123.9	$50.9	$174.8	$74.0	$42.5	$116.4
Kansas	$157.4	$93.8	$251.2	$104.7	$78.4	$183.0
Kentucky	$112.7	$49.5	$162.2	$74.5	$41.3	$115.8
Louisiana	$447.9	$255.3	$703.2	$263.3	$213.1	$476.5
Maine	$36.0	$15.9	$51.9	$20.2	$13.3	$33.5
Maryland	$159.1	$66.6	$225.7	$96.8	$55.7	$152.5
Massachusetts	$183.8	$80.7	$264.4	$109.8	$67.5	$177.3
Michigan	$398.0	$27.6	$425.6	$241.8	$23.1	$265.0
Minnesota	$275.1	$141.3	$416.3	$164.2	$118.3	$282.6
Mississippi	$170.8	$69.7	$240.5	$101.4	$58.2	$159.6
Missouri	$272.4	$114.4	$386.8	$166.2	$95.7	$262.0
Nebraska	$92.9	$31.9	$124.8	$55.2	$26.6	$81.8
Nevada	$187.3	$109.0	$296.3	$115.4	$91.1	$206.5
New Jersey	$398.9	$50.4	$449.2	$243.3	$42.3	$285.6
New Mexico	$126.8	$52.4	$179.2	$76.1	$43.7	$119.8
New York	$1,161.4	$572.4	$1,733.8	$804.7	$482.7	$1,287.4
North Carolina	$369.6	$157.4	$527.0	$226.2	$131.7	$357.9
North Dakota	$24.1	$4.5	$28.6	$15.4	$3.8	$19.1
Ohio	$466.7	$147.5	$614.2	$287.1	$124.0	$411.1
Oklahoma	$223.0	$68.7	$291.7	$132.4	$57.4	$189.7

	Method I			Method II		
State	**B2C**	**B2B**	**Total Taxes Lost**	**B2C**	**B2B**	**Total Taxes Lost**
Pennsylvania	$413.8	$185.8	$599.6	$250.8	$156.2	$407.0
Rhode Island	$46.8	$11.5	$58.3	$27.1	$9.6	$36.7
South Carolina	$173.0	$71.9	$244.9	$103.9	$60.0	$164.0
South Dakota	$42.8	$12.4	$55.2	$23.8	$10.3	$34.2
Tennessee	$574.8	$201.5	$776.3	$353.7	$168.6	$522.3
Texas	$1,381.8	$250.4	$1,632.1	$866.8	$210.6	$1,077.4
Utah	$120.4	$50.3	$170.8	$73.4	$42.1	$115.5
Vermont	$15.7	$5.2	$20.9	$8.3	$4.3	$12.6
Virginia	$161.8	$68.6	$230.4	$99.2	$57.4	$156.6
Washington	$713.2	$164.4	$877.6	$487.0	$137.6	$624.6
West Virginia	$52.6	$22.9	$75.5	$30.6	$19.1	$49.7
Wisconsin	$175.6	$73.7	$249.3	$106.4	$61.8	$168.2
Wyoming	$39.2	$15.5	$54.7	$22.5	$12.9	$35.4
Total	**$15,040.5**	**$5,779.5**	**$20,820.0**	**$9,430.5**	**$4,860.9**	**$14,291.4**

Table 1
Total e-commerce state and local sales and use tax revenue losses for the year 2010, millions of dollars

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

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Abstract

Although gross receipts taxes (GRTs) have been a major source of revenue for states since before the Great Depression, the scholarly literature has come to view them as highly inefficient because they distort consumer and producer behavior in multiple ways. And yet, recent years have seen a number of states implementing new gross receipts taxes. However quantitative analysis of GRTs, either to prove or disprove their inefficiency, is very limited. The comparisons between GRTs and any other business tax is further complicated because the actual burden imposed by a GRT is hidden by tax pyramiding – multiple levels of taxation at various stages of the production process in addition to the taxation of final sales to consumers. To resolve these problems, we construct a general equilibrium model of a state economy and use it to view the effects of replacing a retail sales tax with a GRT. The major findings are: (1) a retail sales tax would need a statutory rate of 1.78 percent in order to be revenue neutral with a 1 percent GRT; (2) the GRT raises average prices by 0.5 percent;(3) the GRT reduces average demand by 1.3 percent; (4) failing to account for consumer and producer substitution would overstate the expected revenue of the GRT by 3.5 to 4.5 percent; and, (5) the excess burden of the GRT is 19 percent of revenue while it would only be 13 percent of revenues for the sales tax. However there is substantial variation by industry with the largest price increases for industries that use large amounts of intermediate inputs. But the drop in demand is not as concentrated in firms that use large amounts of intermediate goods as the price increase is. Taken together, these results indicate that the burden of a GRT varies widely across sectors and that a GRT is substantially less efficient than a sales tax on final goods.[1]

I. Introduction

A gross receipts tax is a tax levied on the gross receipts (total revenue) of a firm, or equivalently, a tax on all of a firm's sales to other firms (intermediate goods) and also to consumers (final goods). This differs from a retail sales tax which, in principle, is applied only on sales to consumers. The consequence of intermediate good taxation is tax pyramiding, the process by which a good is taxed multiple times as it is sold from firm to firm through the production process before finally being sold to a consumer and taxed again. Previous literature has identified the types of inefficiencies caused by tax pyramiding but has not quantitatively estimated how significant this inefficiency is in a gross receipts tax.

In this study, we utilize a general equilibrium model that allows for substitution between inputs by both consumers and producers to estimate how much the price of goods will rise and demand will fall due to the imposition of a GRT. Additionally, we estimate the sales tax rate required to yield the same revenue as a GRT and how ignoring the ability of consumers

and producers to substitute away from highly taxed goods biases revenue estimates. Finally we calculate the excess burden of a GRT and that of a revenue neutral sales tax.[2] To our knowledge, this is the first paper to estimate the price effects of a GRT with a cost function that allows for the substitution between inputs, and the first to estimate by any means a GRT's revenue equivalency, demand effects, excess burden, or sensitivity of revenue estimates.
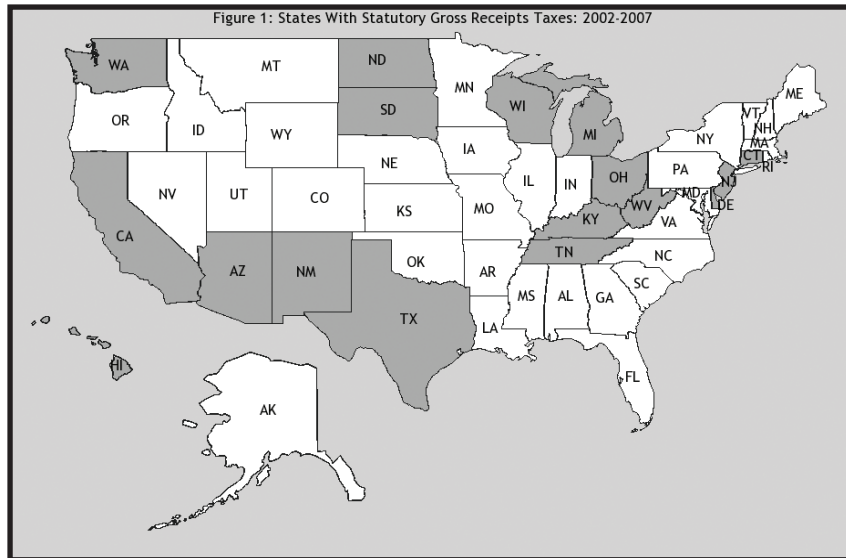
This paper is organized as follows. Section II surveys features of gross receipts taxes and their use in US states.[3] Special emphasis is placed on the relative advantages of GRTs and sales taxes compared to each other. Section III briefly summarizes the methodology used in the model and the assumptions used to calculate price changes from the production function. Section IV describes the results in detail. Section V summarizes the paper and concludes.

II.   Background

The history of gross receipts taxes stretches back to the 13th century when the first gross receipts taxes were implemented in medieval Europe. And like today,

they were historically a subject of scholarly criticism. For example, in the 18th century Adam Smith commented unfavorably on the Spanish gross receipts tax and suggested that the country's lack of development compared to Great Britain was due to the tax's high administrative burden.[4] However, gross receipts taxes did not become fiscally important to US states until just before the Great Depression.

And although the end of the 20th century saw a decline in their use in Europe, a number of states have experimented with GRTs in the last decade, as shown in **Figure 1**. During that time period, broad base GRTs existed in

Figure 1: States With Statutory Gross Receipts Taxes: 2002-2007

at least 18 states, and 4 of those were newly implemented GRTs.[5],[6], [7] Despite a number of attractive features that have motivated

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[2] In economics, the excess burden of a tax is a loss of economic efficiency that can occur when the tax causes firms and consumers to change their behavior to activities they found less desirable before the tax, simply because it lowers their tax payment. It is a cost of the tax to business firms and consumers that is over and above the actual tax payments to the government. We measure average excess burden as the equivalent variation that consumers would be willing to pay in order to avoid the price increase brought on by the tax divided by actual tax revenues.

[3] For a survey of the literature on retail sales taxes, see Fox, W. F., & Luna, L. A. (2006). How Broad Should State Sales Tax Bases Be? A Review of the Empirical Literature. State Tax Notes, 41, 639. See also McLure, C. E. (2000). Rethinking State and Local Reliance on the Retail Sales Tax: Should We Fix the Sales Tax or Discard It? Brigham Young University Law Review, 77(107), 77–137.

[4] Smith, A. (1937). The Wealth of Nations. New York: Modern Library, p. 850.

[5] Mikesell, J. L. (2007). Gross Receipts Taxes in State Government Finances: A Review of Their History and Performance. Tax Foundation Background Paper, No. 53. Retrieved from http://www.taxfoundation.org/files/bp53.pdf

[6] Pogue, T. F. (2007). The Gross Receipts Tax: A New Approach to Business Taxation? National Tax Journal, 60(No. 4), 799–879.

[7] Mikesell actually defines many of these taxes as retail sales taxes, despite their statutory incidence, because of other features they have.

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the adoption of GRTs in recent years, the general academic consensus is that they are undesirable due to pyramiding and its consequences.[8] But advocates of GRTs stress the size of their base and their revenue stability.

A GRT does indeed have the capacity to have an extremely broad base. If the GRT does not distinguish among businesses on organizational form or have special provisions to reduce pyramiding, then the basis of the tax is as broad as the revenue of all businesses in the state. For economists, a broad tax base is usually desirable in order to ensure that it includes all goods, to limit the possibility for consumers to substitute away from the tax. But as we shall see, the base of a GRT is likely to be too broad, as the application of the tax to every transaction results in the taxation of intermediate goods and thus inefficient tax pyramiding.

Also because of the size of the base, a large amount of revenue can be raised even if the statutory rate is very low. For policy makers a low statutory rate can make the tax more palatable. But for economists the statutory rate is relevant only in so much as it determines the effective tax rate, and a GRT will have an effective rate higher than the statutory rate. The disconnect between the statutory rate and the effective rate is related to the problem GRTs have with transparency that is discussed later.

In addition, a GRT is likely to be a stable source of income since a firm's total revenue fluctuates much less than firm profits. Mikesell reviews state government finances, including GRTs, and finds that revenue of a statewide GRT is about as stable as a retail sales tax and is much more stable than a corporate income tax.[9]

Previous academic literature has been overwhelmingly negative in its assessment of GRTs, primarily due to intermediate good taxation and its consequence, tax pyramiding. An intermediate good making its way through a supply chain will be sold multiple times. Since businesses are taxed on total revenue, each time the good is sold it is counted in the revenue of the selling firm and thus subject to gross receipts taxation. This repeated taxation of a good is referred to as tax pyramiding. Previous literature has identified three main problems with tax pyramiding: arbitrary rates, productive inefficiency, and transparency.

The first problem is that the effective tax rates faced by each industry due to the gross receipts tax are not equal to the statutory rate. Because of pyramiding, the amount of tax included in the final price of the good depends not only on the statutory rate but also the number of transactions involved in its production and how early in the supply chain value added is imparted into the good. If the industry is structured so a good passes through a large number of firms before reaching consumers or if value added is created very early in the production process, the GRT will impose a larger tax on the final good than if it was produced by fewer firms or has more of its value added later in the production process. While externalities and differences in demand elasticities may justify imposing different tax rates on different goods, a GRT applies such differentials arbitrarily, leading to inefficient variation in tax rates.

But even if we assumed these arbitrarily chosen tax rates for various industries created by the GRT were optimal, a GRT achieves these rates in manner that causes productive inefficiency. Diamond and Mirrlees showed that in an optimal tax structure for a competitive industry, there are no taxes on intermediate goods.[10] Their intuitive explanation is that the taxation of intermediate goods causes firms to inefficiently substitute away from more

[8] For a more detailed examination of the problems of GRTs see Testa, W., & Mattoon, R. H. (2007). Is There a Role for Gross Receipts Taxation? National Tax Journal, 60(No. 4), 821–840.
[9] Mikesell, op. cit.

[10] Diamond, P. A., & Mirrlees, J. A. (1971). Optimal Taxation and Public Production I: Production Efficiency. The American Economic Review, 61(1), 8–27.

heavily taxed inputs.[11] And the burden of the tax is passed on to the final good market anyway through changes in the prices of the intermediate goods used to make the final goods. Since it is passed on, the revenue collected from intermediate good taxation could have instead been collected through an equivalent tax on final goods without changing final good prices. But a tax on final goods only would not have caused productive inefficiency since it would not create incentives for firms to inefficiently substitute away from highly taxed intermediate inputs.

In addition, pyramiding diminishes the transparency of the GRT because it is not obvious how much the tax has increased the price of a good above the statutory rate. Firms cannot tell how much their costs will increase since the effect of the tax on the firm is not just the amount of new taxes it pays but the higher intermediate good prices it faces from earlier pyramiding of the tax. For the same reason, consumers will not know how much the prices of goods will increase. Without this information, taxpayers cannot make informed decisions about the tradeoff between the provision of government services and the taxes levied to pay for those services. Some consumers may not even see any connection between a tax on firm gross receipts and increases in price. A cynical interpretation would argue that this as an advantage of GRTs from the viewpoint of policymakers as it reduces the opposition to taxation.

Most of the previous literature on GRTs, such as the papers by Mikesell and Pogue, has been qualitative and descriptive. [12], [13] But two previous papers have quantitatively examined the degree of pyramiding under specific state GRTs. Del Valle analyzed New Mexico's GRT by comparing the revenue of a hypothetical GRT with no pyramiding relief to the current law

GRT's revenue.[14] They use a fixed coefficient input-output model to calculate the total dollar amount each sector spends on business inputs. They then apply the GRT rate and deduct from this amount the total inputs that are not taxed by the GRT in order to calculate the maximum possible pyramiding and the actual pyramiding under current law. They find pyramiding increases the effective tax rate an average of 1.35 percentage points on top of the 5 percent statutory rate, a 27 percent increase.

Washington State Tax Structure Committee performs a similar study for Washington.[15] They use a fixed coefficient input-output model to estimate the increase in final good prices due to the pyramiding of the Washington GRT. They find pyramiding results in an effective tax rate on value added that is on average 0.9 percentage points higher than the average statutory rate of 0.6 percent, a 150 percent increase. Since the New Mexico GTR is much older than the Washington GTR, Pogue postulates that its lower level of pyramiding may reflect an evolution of tax law over time as the firms that face the worst pyramiding petition policymakers for relief.[16]

However, taxing intermediate goods and thus pyramiding is not unique to GRTs. Ring estimates that only 59 percent of the statutory incidence of state sales taxes falls on resident consumers, with the remaining 41 percent falling on all other sources, mainly business purchases but also government and nonprofit purchases.[17] Cline et al. estimates that 43 percent of the statutory incidence falls on

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[11]*This substitution is socially inefficient because as firms substitute lightly taxed goods for heavily taxed goods, they use a mix of inputs with a higher pre-tax cost but lower post-tax cost. That is, the inputs they are now using are less effective at producing output. This difference in costs is a socially inefficient deadweight loss.*
[12]*Mikesell, op. cit.*
[13]*Pogue, op. cit.*

[14]*del Valle, M. (2005, September). A Report on the Gross Receipts Tax. New Mexico Tax Research Institute. Retrieved from http://www.nmtri.org/associations/3740/files/Pyramiding%20Report-Final2.pdf*
[15]*Washington State Tax Structure Committee. (2002). Tax Alternatives for Washington State: A Report to the Legislature. Olympia, Washington.*
[16]*Pogue, op. cit.*
[17]*Ring, R. (1999). Consumers' Share and Producers' Share of the General Sales Tax. National Tax Journal, 52(1), 79–90.*

business purchases.[18] If roughly 40 percent of the typical sales tax base is business purchases, then these sales taxes will suffer from many of the same problems as a GRT, although a sales tax that only applied to final goods would not.

III. Methodology

In this section, we briefly describe the construction of the model we will use to determine the severity of the aforementioned problems with gross receipts taxes. We begin by estimating cost functions for each industry and an expenditure function for consumers. We then insert the cost and expenditure functions into a simple general equilibrium model of a representative state. Finally, we look at the model under a retail sales tax and compare the prices, sales, and excess burden that would result if the same amount of revenue was raised using a gross receipts tax instead. Our general methodology is a simplified version of the model used by Jorgenson, Slesnick, and Wilcoxen.[19] [20]

The data used in the regressions and simulation come from several sources. The first is a system of U.S. national accounts covering the years 1960 to 2005 compiled by Jorgenson.[21] The data includes the quantity and price of output produced by all industries and all inputs purchased by all industries. This data is converted to NAICS basis using the 1997 Economic Census's Bridge between NAICS and SIC. Additional data comes from the BEA Tables of the Use of Commodities by Industries from 1997-2010 and the BEA Gross Output
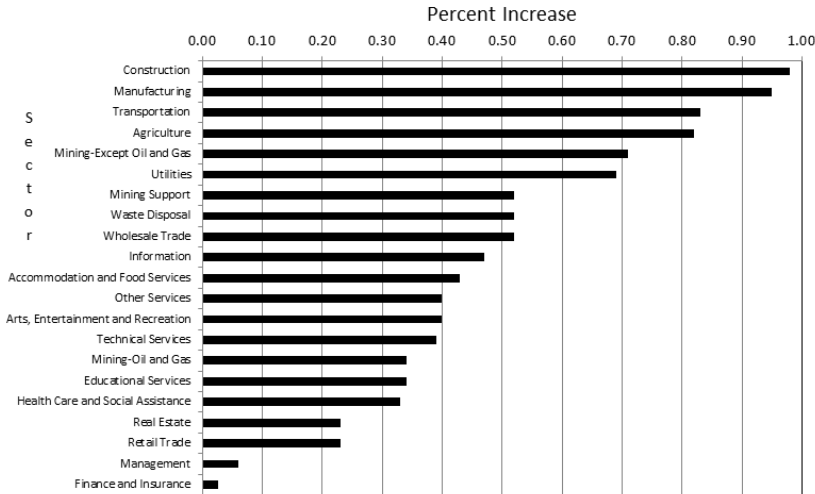
Price Index from 1987-2010.

The cost function for any industry is a mathematical expression that relates the price of the output of each industry to the cost of the inputs – labor, capital, and all the outputs produced by each industry. Although the functional form of the translog cost function is quite complex, its key features can be described simply: it allows varying degrees of substitution between all inputs, change in the relative importance of particular inputs over time due to technological progress, and change in overall productivity due to technological progress. The cost function is exactly the same whether a particular unit produced by an industry is used by consumers or as an intermediate good by another industry. However, the cost function varies across industries. In order to simplify the model, we assume these industries are perfectly competitive with constant returns to scale. These two assumptions ensure that the price and post-tax cost of the output for each industry are identical. To get the post-tax (final) price, we multiply the pre-tax cost by the tax rate. With each industry's cost function, we can now calculate how much a GRT will pyramid and thus the effect on prices of imposing a 1% gross receipts tax.[22]

IV. Results

We find that in order to raise as much revenue as the 1 percent GRT, a retail sales tax would need to be levied at a 1.78 percent rate. However, despite having a higher statutory rate, post-tax prices would in fact be lower under the retail sales tax. The actual post-tax price increase due to the gross receipts tax compared to post-tax prices under a revenue neutral sales tax is show in **Figure 2**. On average, prices increase by 0.5 percent. There is substantial variation by industry with, for example, a 0.02 percent increase for finance and insurance and a 1.0 percent increase for construction. Further investigation shows that industries with heavy use of intermediate

[18]Cline, R., Mikesell, J. L., Neubig, T., Phillips, A., Ernst & Young LLP, & Council on State Taxation. (2005). Sales Taxation of Business Inputs: Existing Tax Distortions and the Consequences of Extending the Sales Tax to Business Services. State Tax Notes, 35, 457.

[19]Jorgenson, D., & Slesnick, D. T. (2008). Consumption and labor supply. Journal of Econometrics, 147(2), 326–335.

[20]Wilcoxen, P. (1988). The Effects of Environmental Regulation and Energy Prices on U.S. Economic Performance (Ph.D. Dissertation). Harvard University, Cambridge, MA.

[21]Jorgenson, D. W. (2007). 35 Sector KLEM. Retrieved September 12, 2011, from http://hdl.handle.net/1902.1/10684

[22]Note that GRT rates are typically expressed as tax-inclusive while this definition is tax-exclusive. That means this 1% tax-exclusive GRT would actually be a 0.9900990099… tax-inclusive GRT.

Figure 2: Percent Increase After-Tax Prices From Moving to a Gross Receipts Tax from a Retail Sales Tax, by Sector

Percent Increase

| | 0.00 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 |

Sector:
Construction
Manufacturing
Transportation
Agriculture
Mining-Except Oil and Gas
Utilities
Mining Support
Waste Disposal
Wholesale Trade
Information
Accommodation and Food Services
Other Services
Arts, Entertainment and Recreation
Technical Services
Mining-Oil and Gas
Educational Services
Health Care and Social Assistance
Real Estate
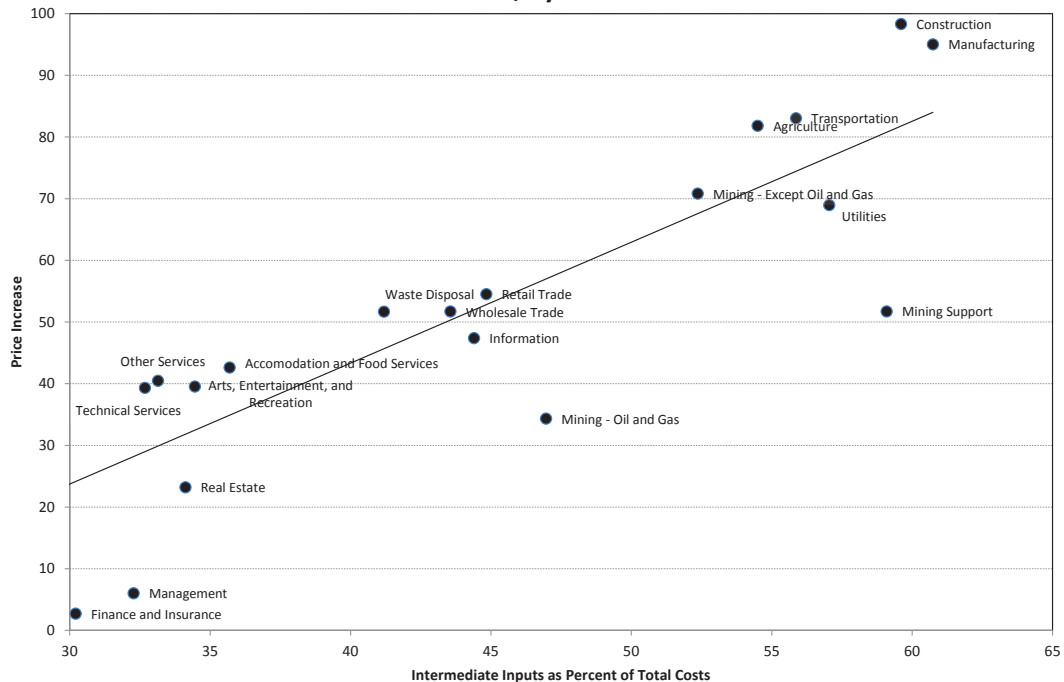Retail Trade
Management
Finance and Insurance

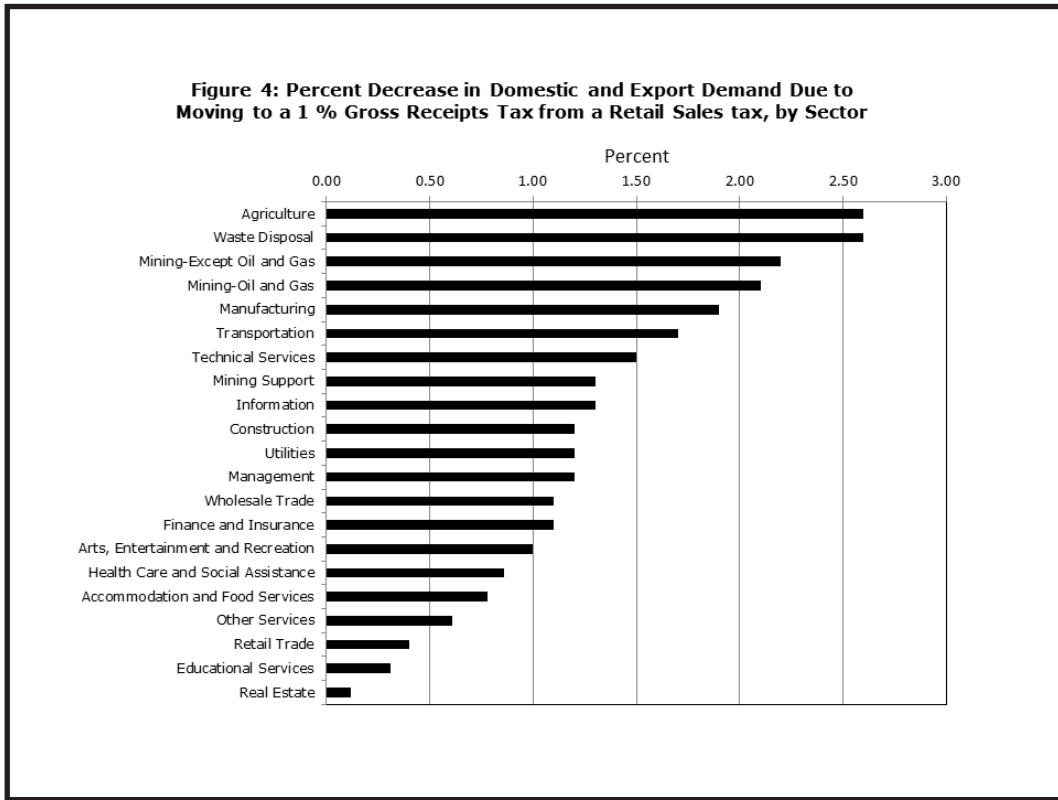coefficient between the two is quite high at 0.85.

The changes in domestic and export demand for each good are shown in **Figure 4**. On average, demand falls by 1.3 percent. This decrease is smallest for real estate rental and leasing at 0.1 percent. Agriculture has the largest decrease at 2.6 percent. However, unlike for price, there is no simple explanation for why some industries have large demand decreases and others have small decreases.

goods face the largest price increase while the price increase is smallest for industries with the least intermediate good usage. **Figure 3** plots the price increase of each industry versus the fraction of that industry's costs spent on intermediate goods. Industries such as construction, transportation, manufacturing, and agriculture have high use of the intermediate goods and the highest price increase. Conversely, management and finance and insurance have low usage and low price increases. The correlation

The result is a combination of the effects of the price increase for the industry, the elasticity of demand for the industry, and the price increase of substitutes and compliments for that

Figure 3: Percent Increase in After-Tax Prices and Usage of Intermediate Goods, by Sector

Price Increase (y-axis): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Intermediate Inputs as Percent of Total Costs (x-axis): 30, 35, 40, 45, 50, 55, 60, 65

Construction, Manufacturing, Transportation, Agriculture, Mining - Except Oil and Gas, Utilities, Mining Support, Waste Disposal, Retail Trade, Wholesale Trade, Information, Other Services, Accomodation and Food Services, Arts, Entertainment, and Recreation, Technical Services, Mining - Oil and Gas, Real Estate, Management, Finance and Insurance

Figure 4: Percent Decrease in Domestic and Export Demand Due to Moving to a 1 % Gross Receipts Tax from a Retail Sales tax, by Sector

industry's output.

Table 1: 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
Revenue Change (%)	0	0	3.5	4.5

Notes: *Revenue change is equal to percent increase in GRT tax revenue compared to the GRT tax revenue of the baseline specification.*

Table 1 shows how estimates for the revenue of the 1 percent GRT change under the different assumptions. The baseline specification to which the others are compared is the version of the model described in the methodology section and assumes that producers and consumers can substitute in response to the tax and that the total quantity of labor supplied to the economy is fixed. We compare it to other specifications where stronger assumptions are made on behavior. In specification 1, instead of setting the quantity of labor in the economy constant, the price of labor is set constant and firms are allowed to hire as many workers as they want at the pre-tax price wage rate. Changing this assumption does not affect the revenue estimate. In specification 2, consumers are also not allowed to substitute in response to the tax change. This increases the revenue

estimate by 3.5 percent. In specification 3, producers are also not allowed to substitute in response to the tax change, equivalent to using a fixed coefficient input-output table instead of a translog production function. In this specification, revenue is estimated to be 4.5 percent higher than in the baseline. This indicates that models attempting to estimate the revenue to be gained from a gross receipts tax will over-estimate the revenue of the tax by 3.5 to 4.5 percent if the model does not allow consumer or producer substitution.

Finally, we calculate the average excess burden of the tax. For the 1 percent GRT, the excess burden is 19 percent of revenues. For the sales tax, it is 13 percent of revenues. Switching to a GRT from a sales tax would thus increase the excess burden of taxation by 6 percent of revenues.

V. Conclusions

Scholars have identified a number of major problems with gross receipts taxation and concluded that it is an economically inefficient tax. However, the quantitative analysis to confirm this conclusion has been extremely limited. In order to test this hypothesis quantitatively, we construct a general equilibrium model of a representative state economy and use it to assess the efficiency of a gross receipts tax. With his model, we confirm the literature's supposition that a gross receipts tax is inefficient compared to a retail sales tax. The excess burden of taxation is 6 percent higher, prices are on average 0.5 percent higher, and demand 1.6 percent lower. In addition, there is great variation by sector in the incidence of the tax, which tends to fall more heavily on industries that use a large amount of intermediate goods.

States Host MTC Training

Most Commission training courses are hosted by a state—recent courses have been hosted by Hawaii (Corporate Income Tax), Minnesota (Nexus), Utah (Nexus), Alabama (Statistical Sampling for Sales and Use Tax Audits) and South Dakota (Computer Assisted Audit Training Using Excel). The host state receives a credit against the fees for its students. Given the scheduling limitations for our MTC instructors, it is helpful to contact us early--as much as a year in advance of when the training is needed.

For further information on our training program, contact our Training Manager, Antonio Soto, at asoto@mtc.gov or 202-650-0296 or our Training Director, Ken Beier, at kbeier@mtc.gov or 954-372-0381.

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October 2013 in Washington, DC

Nexus School
April 2013 in Arizona
June 2013 in North Dakota

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Calendar of Events

Winter Committee Meetings
March 5-8, 2013
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46th Annual Conference and Committee Meetings
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