

# Consumers' Share and Producers' Share of the General Sales Tax

***Abstract** - We estimate, for each state with a general sales tax, the percentage of that tax that is levied directly on final consumption spending of the state's residents. State by state, the consumers' share ranges from 28 to 89 percent. For all states together, it is 59 percent, findings that generally agree with expectations and with other estimates for single states. Most of the remaining sales tax is on producer inputs. Between 1979 and 1989, the consumers' share increased for 28 states, fell for 17 states, and was unchanged in 1 state.*

## INTRODUCTION

While the state general sales tax is a tax on final consumption, its base also includes substantial sales to businesses, raising the specter of tax pyramiding/cascading. Suppose, for example, that a state taxes electricity used in production. Depending on market conditions, a manufacturer's production costs, and ultimately its selling price, might include tax already paid. Taxing the output at retail imposes a "tax more than once on the same piece of value added" (Graeser and Maury, 1992).

Besides current production costs, "state and local sales taxes extend to the acquisition of capital assets. They are far from uniform across investments" (Joulfaian and Mackie, 1992). Joulfaian and Mackie found that national average effective sales tax rates for different types of business equipment and structures varied from 5.9 percent to zero. State-to-state differences in tax rates and in taxation or exemption of capital purchases add further distortions, especially in location decisions. These and other examples (such as tax incidence and tax exporting) illustrate the importance of recognizing that sales taxes affect business purchases, as well as consumption, and of knowing the amount of sales tax on each part.

This paper reports estimates, for each state with a general sales tax, of how much of that tax was levied on personal consumption spending of in-state residents in 1989. (Here and henceforth, reference to "states" with a general sales tax includes the District of Columbia.) These update my earlier estimates for 1979 (Ring, 1989), incorporating several im-

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improvements in data and methodology. The next section briefly explains the improvements and shortcomings. The section after that contains the estimates and an analysis of them. The paper concludes with a summary and conclusions.

## METHODOLOGY

The consumers' share of the general sales tax (*SHARE*) is given by

$$[1] \quad \textit{SHARE} = CP / (CP + BP)$$

where *CP* represents sales tax on purchases by resident consumers and *BP* represents other sales tax revenue. *BP* includes primarily business purchases, but also any other items a state taxes, such as purchases by governments and nonprofit organizations. For a thorough discussion of *SHARE* and the factors that affect it, please see Ring (1989).

To estimate each state's *SHARE* in 1989, we used 1990 U.S. Census data on the number of each state's households in 1989 income classes (U.S. Department of Commerce, 1993), Consumer Expenditure Survey (CES) tabulations of average 1989 spending by consumer units in eight income classes (U.S. Department of Labor, 1991, Table 1), and information on how each state defines its tax base. (Appendix B lists sources of state-specific information.) See Ring (1989) for a detailed explanation of the methodology and elaboration of its advantages and shortcomings. The major advantage is the ability to account for state-to-state differences, providing consistent estimates of *SHARE* for all states.

### *Improvements*

This study incorporates several improvements over my earlier work. The earlier study used 1972–3 CES data “updated” to 1979 (Ring, 1989); the estimates presented here incorporate actual

1989 CES data. This is unlikely to greatly affect the results, but does increase confidence in the estimates.

This update also includes several refinements in how each state defines its sales tax base. Ring (1989) fit all states into general tax base categories according to whether they taxed or exempted food at home, clothing, utilities, and gasoline. This update retains those general categories, but distinguishes state-by-state treatment of four utilities (electric; natural gas, fuel oil, etc.; water and sewer; and telephone), instead of treating each state as taxing or exempting all utilities. Ring assumed that all states taxed the same consumer services: a few services taxed by nearly all states in 1979. Greater detail in the 1989 CES (70 spending categories compared to 41 in the 1972–3 CES) allows us to account for each state's treatment of nine categories of consumer services. We also now include more precise treatment of alcohol, tobacco, prescription drugs, and nonprescription drugs. Table 1 indicates the broad categories into which each state falls; the finer distinctions used for utilities, services, alcohol, etc. are available upon request.

We also treated unrelated individuals differently for this study than for the earlier one. Earlier, we used the number of unrelated individuals (from the Census) directly, treating each as a “consumer unit” as defined in the CES. For this study, we distinguish financially independent consumer units from those that pool their income. Appendix A explains this adjustment. Without it, the number of consumer units (and thus estimated consumer spending) would be understated.

The CES spending figures include sales and excise taxes; without adjustment, our methodology would overestimate the consumers' part of the sales tax base. Adjusting Joulfaian and Mackie's 1987 estimates (1992), we find the weighted average state and local rate (weighted by gross state product (GSP)) for states with a gen-

## Consumers' Share and Producers' Share

**TABLE 1**  
CONSUMERS' SHARE CALCULATIONS FOR 1989

	Tax Rates (Percent)	Consumers' Sales Tax (\$m)	Total Sales Tax (\$m)	Consumers' Share (Percent)	Tax Base <sup>a</sup>
Alabama	4.00	709.5	970.8	73	E
Arizona	5.00	893.4	1,794.8	50	D
Arkansas	4.00	454.0	756.2	60	H
California	4.77	6,679.5	12,681.4	53	C
Colorado	3.00	441.2	733.3	60	B
Connecticut	7.75	1,205.8	2,066.6	58	A
Washington, D.C.	6.00	191.8	434.0	44	B
Florida	6.00	3,448.5	6,930.1	50	B
Georgia	3.75	1,438.7	2,264.7	64	J
Hawaii	4.00	280.6	1,006.2	28	G
Idaho	5.00	218.9	351.8	62	E
Illinois	5.00	2,574.4	3,765.7	68	C
Indiana	5.00	1,348.3	2,475.1	54	F
Iowa	4.00	519.5	883.2	59	D
Kansas	4.13	535.1	799.4	67	E
Kentucky	5.00	666.8	1,230.5	54	B
Louisiana	4.00	737.0	1,443.4	51	H
Maine	5.00	264.8	461.5	57	B
Maryland	5.00	1,104.7	1,836.2	60	B
Massachusetts	5.00	1,176.3	1,902.5	62	A
Michigan	4.00	1,833.5	3,137.0	58	F
Minnesota	6.00	1,112.9	1,974.4	56	A
Mississippi	6.00	672.9	1,022.9	66	E
Missouri	4.28	1,119.5	1,743.9	64	E
Nebraska	4.00	283.2	470.3	60	D
Nevada	5.75	294.2	666.7	44	B
New Jersey	6.00	1,857.2	3,016.9	62	A
New Mexico	4.75	428.1	848.1	50	H
New York	4.00	3,818.7	5,793.9	66	C
North Carolina	3.00	1,036.5	1,672.7	62	H
North Dakota	5.75	141.5	234.3	60	B
Ohio	5.00	2,258.1	3,401.8	66	B
Oklahoma	4.00	616.4	936.7	66	E
Pennsylvania	6.00	2,533.0	3,947.2	64	A
Rhode Island	6.00	222.7	377.2	59	A
South Carolina	5.00	801.4	1,315.4	61	E
South Dakota	4.00	149.6	247.2	61	H
Tennessee	5.50	1,391.2	2,194.0	63	E
Texas	6.00	4,296.1	8,055.9	53	B
Utah	5.09	421.1	667.0	63	E
Vermont	4.00	85.7	152.7	56	B
Virginia	3.50	1,115.6	1,585.5	70	E
Washington	6.50	1,505.4	3,088.4	49	B
West Virginia	6.00	496	554.7	89	E
Wisconsin	5.00	1,136.9	1,833.4	62	B
Wyoming	3.00	76.6	142.6	54	H
Total		56,560.5	95,888.0	59	

<sup>a</sup>Tax base key:

- A: exempt food, clothing, utilities, gasoline
- B: exempt food, utilities, gasoline
- C: exempt food, utilities
- D: exempt food, gasoline
- E: exempt utilities, gasoline
- F: exempt food
- G: exempt utilities
- H: exempt gasoline
- J: exempt none

eral sales tax to be 6.06 percent in 1989.<sup>1</sup> To account for the over-estimate, we divided each state's estimated consumer sales tax base by 1.0606.

The CES figures also include travel spending, so our *CP* estimates (as described so far) include what each state's residents spent out of state. State sales tax revenues include taxes paid by nonresidents, which are thus included in *BP*. To adjust for both of these, we used Mutti and Morgan's (1983) estimates of "General Sales Taxes Paid by Residents Traveling Out-of-State" and "General Sales Taxes Paid by Out-of-State Travelers," adjusting them to account for state taxes only and for growth between 1980 and 1989. This adjustment removes one of the sources of uncertainty in how closely *BP* approximates business purchases, leaving government and nonprofit purchases as the only potentially significant elements besides business purchases.

#### Limitations

This study suffers from several limitations. Due to the absence of state-specific CES data, we must attribute national spending patterns to each state. For more discussion of this problem, please see Ring (1989).<sup>2</sup> The CES under-reports consumer spending, which in itself might be expected to result in underestimates of *SHARE*. However, both the Census and the CES suffer from under-reporting of income. Absent any good way to adjust for these problems, we must hope that they are roughly offsetting.

The adjustment to reconcile Census households and CES consumer units (Appendix A) should provide better esti-

mates (than were in Ring (1989)) of the number of consumer units in each income class. Unfortunately, there is no clear way to adjust for the fact that CES consumer units will have lower incomes (and thus spend less) than will Census nonfamily households. Consequently, this method still somewhat overstates spending. The magnitude of this overstatement should be relatively small.<sup>3</sup>

#### FINDINGS

We turn now to the findings, how they compare to independent estimates and how *SHARE* changed between 1979 and 1989. As Table 1 shows, in 1989, *SHARE* ranged from a low of 28 percent in Hawaii to a high of 89 percent in West Virginia, and averaged 59 percent for all states. (Figure 1 illustrates regional variations in the values of *SHARE*.) All estimates meet the simple—but critical—a priori condition that they be less than 100 percent.

#### Comparison to Other Estimates

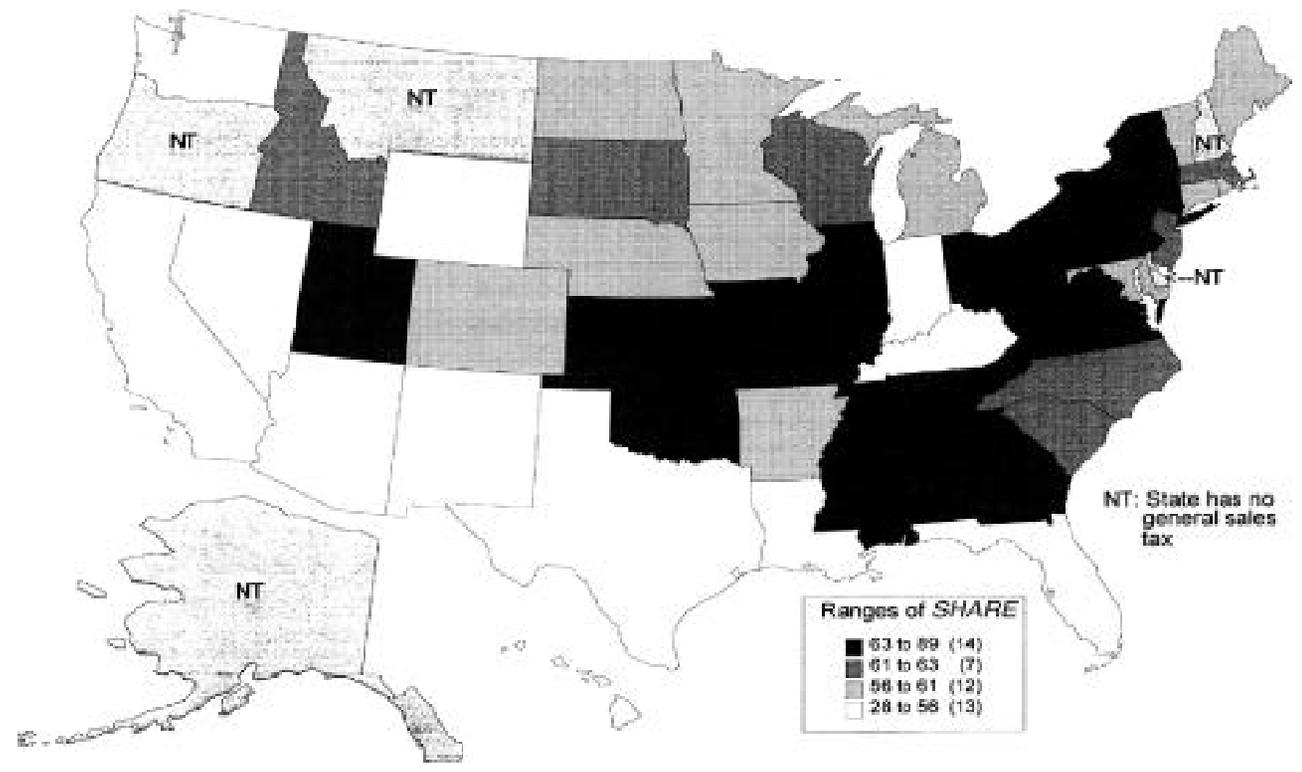
Given the uncertainties discussed above, it is important to test our methodology by comparing these estimates to independently produced ones for single states. Santi (1994), using a method much like ours, but more aggregated data, estimated the 1989 consumers' share to be 61.7 percent for Arkansas, close to our 60 percent. The Minnesota Department of Revenue (1993), using a somewhat different technique, found a 1990 consumers' share of 54 percent for sales tax and motor vehicle excise tax together (which is consistent with the method used here);

<sup>1</sup> Joulfaian and Mackie (1992) estimated 1987 local general sales tax rates for each state and added statutory state rates. We used state rates and kept Joulfaian and Mackie's local estimates, to estimate effective state and local rates for states with a general sales tax. (Effective local rates probably also increased slightly between 1987 and 1989.) Our estimate of 6.06 percent in 1989 for states with a general sales tax compares to their finding of 5.89 percent for all states in 1987.

<sup>2</sup> Another possible approach would be to use regional CES spending data. However, each of the four regions reported in the CES includes widely different states, and it is not clear that regional averages approximate individual states' spending any better than do national averages.

<sup>3</sup> Nationally, nonfamily households account for about 40 percent of total households.

Figure 1. Regional Variation in Consumers' Share for 1989



this is also close to our 56 percent estimate for Minnesota. Derrick and Scott (1989), using a “technique comparable to that used” in Ring (1989), found a 44 percent consumers’ share for Maryland in 1986–7, substantially different from our 60 percent. Derrick and Scott did not include vehicle purchases in their estimates; we did include vehicle purchases, but this difference is unlikely to account for the discrepancy. It appears from their description that they used more aggregated data. It is not clear whether they used 1986–7 household distribution figures or unadjusted Census figures for 1979. If the latter data were used, that could explain their lower estimate.

In the only other application to all states of a methodology roughly similar to that used here, Uhimchuk estimated percent of “Sales Tax Falling on Consumer Purchases” in 1982 (1986). Uhimchuk’s values range from 33.80 percent (Wyoming) to 85.89 percent (West Virginia), with a national average of 61.57 percent.<sup>4</sup>

Several authors have directly estimated the producers’ share.<sup>5</sup> In making comparisons, it is important to keep in mind that the implied producers’ share generated here (1.0 – *SHARE*) includes sales to governmental and nonprofit entities (for those states that tax them). A Texas study found “about 46 percent” producers’ share for

that state in 1987. (“Texas Business Taxes,” 1988). Using a “Dynamic Analysis Model,” Clayton-Matthews (1993) estimates that “Massachusetts’ businesses pay roughly 22% of total sales and excise tax revenues.” A study of Iowa found a producers’ share of 39 percent (Due and Mikesell (1994), citing a study by KPMG Peat Marwick). It is not clear whether these estimates include sales to nonbusiness entities; except for Massachusetts, they probably do not include sales to non-resident consumers.<sup>6</sup> For Texas and Iowa, the sums of *SHARE* and these independently developed estimates of producers’ share are close to 100—surprisingly consistent, given the widely varying methodologies. The Massachusetts estimate is less consistent.

#### *Producer Exemptions*

Everything else equal, states with more consumer exemptions have lower values of *SHARE*. However, Table 2, with states arranged by consumer tax base categories, reveals no such relationship. The “Exemptions” columns show why: states that exempt more consumer purchases also tend to exempt more business purchases.<sup>7</sup> Table 2 also shows that, within consumer exemption categories (i.e., holding constant those legal provisions that affect *CP*),

<sup>4</sup> Uhimchuk (1986) used less detailed and more aggregated data (e.g., average income for each state, while we used eight income classes). Uhimchuk’s data sources were less closely related to what was being measured.

<sup>5</sup> For earlier estimates not discussed here, see Ring (1989).

<sup>6</sup> Mutti and Morgan (1983), using “travel data, broken down by the place of a trip’s origin” estimate “General Sales Taxes Paid by Out-of-State Travelers” at 3.9 percent of total general state and local sales taxes in 1980, for all states together. For individual states, the proportion ranges up to about 11 percent for Hawaii, Nevada, and Washington, D.C. (calculated from their Tables 1 and 2).

<sup>7</sup> In the “Exemptions” columns of Table 2, states indicated by “X” define the sales tax base more narrowly; that is, they define the exemption more broadly, as follows.

DU (direct use/ingredient test): States with X allow exemptions for business inputs “directly used in production” of items that will then be subject to the sales tax. Other states exempt only items that become a “physical ingredient of the final product.” All states exempt purchases for resale (Fisher, 1996). See also Due and Mikesell (1994).

IE (industrial equipment): States with X fully exempt manufacturing and industrial equipment purchases from the general sales tax. Others allow partial or reduced rate exemptions as indicated.

MU (manufacturing utilities): States with X fully exempt manufacturers’ purchases of electricity, natural gas, etc. from utilities.

NP (nonprofit organizations): States with X provide “exemption for religious, charitable, and educational non-profit organizations” (Mikesell, 1992).

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**TABLE 2**  
PRODUCERS' AND NONPROFIT EXEMPTIONS, 1989

Tax Base <sup>a</sup>	State	Consumers' Share (Percent)	Exemptions <sup>b</sup>			
			DU	IE	MU	NP
A	Pennsylvania	64	X	X	X	X
A	Massachusetts	62	X	X	X	X
A	New Jersey	62		X	X	X
A	Rhode Island	59		X	X	X
A	Connecticut	58	X	X	X	X
A	Minnesota	56	X	P	X	X
B	Ohio	66	X	X	X	X
B	Wisconsin	62		X	X	X
B	North Dakota	60		P	P	
B	Colorado	60		X	X	X
B	Maryland	60		X	X	X
B	Maine	57	X	X	P	
B	Vermont	56		X		X
B	Kentucky	54		N	P	X
B	Texas	53			X	X
B	Florida	50		N	X	X
B	Washington	49			X	
B	Washington, D.C.	44			X	
B	Nevada	44			X	
C	Illinois	68		X	X	X
C	New York	66	X	X	X	X
C	California	53			X	
D	Nebraska	60		N	X	
D	Iowa	59		X	P	
D	Arizona	50		X		
E	West Virginia	89	X	X	X	X
E	Alabama	73		P	X	
E	Virginia	70		X	X	
E	Kansas	67		X	X	
E	Oklahoma	66	X	X	X	
E	Mississippi	66	X	P	P	
E	Missouri	64		N		X
E	Tennessee	63	X	X	P	X
E	Utah	63		N	X	
E	Idaho	62		X	X	
E	South Carolina	61		X	X	
F	Michigan	58		X	X	X
F	Indiana	54		X	X	X
G	Hawaii	28			X	
H	North Carolina	62		P		
H	South Dakota	61				
H	Arkansas	60	X	X		
H	Wyoming	54			X	
H	Louisiana	51	X	X	P	
H	New Mexico	50			P	X
J	Georgia	64		N		

X: fully exempt

P: partial exemption or reduced rate

<sup>a</sup>Tax base index: see Table 1.

<sup>b</sup>Type of exemption:

DU: direct use test

IE: industrial equipment

MU: manufacturers' utilities

NP: nonprofit organizations

See footnote 7 for more detail.

states that exempt more purchases by producers and nonprofit entities (i.e., states with lower values of *BP*) generally have higher values of *SHARE*, as expected. For more explanation of these patterns, see Ring (1989).

#### *Comparison to 1979 Estimates*

The overall value of *SHARE* in Table 1 is the same as its 1979 counterpart; however, this is deceptive, because the 1979 estimates were not adjusted for sales tax included in the CES data, for residents' out-of-state purchases, or for nonresidents' in-state purchases.<sup>8</sup> Without those adjustments, the 1989 figures would be about three to six percentage points higher than those in Table 1. Differences between 1979 and 1989 estimates for individual states can be attributed to changes in methodology, tax rates, tax base definitions, and economic conditions.

*SHARE* increased for 28 of the 46 states, fell for 17, and remained the same for one. Nine states saw increases of nine percentage points or more; nine had decreases of like size. (This somewhat arbitrary criterion was guided by the standard deviation of the differences, which is 9.3.)

One likely methodological source of change is that, for the 1979 estimates, we assumed that all states taxed only a few services (and all treated services the same), but for 1989, we included more consumer services (and included differences in how each state treats services). This improvement should (*ceteris paribus*) make 1989 estimates higher for those states that tax more consumer services. For comparing 1979 and 1989 estimates, we used Mikesell's (1991) classification of states according to how broadly they tax services. Of the 24 states in Mikesell's broadest three classes, six saw *SHARE* in-

crease nine points or more. Of the 22 states that tax very few services, only 3 had such high *SHARE* changes, but other factors (discussed in the next paragraph) explain these "outliers."

Two states with narrow service taxation but large changes in *SHARE* had proportionately large increases in the sales tax rate. Oklahoma's rate doubled from 2 to 4 percent and its value of share rose by 15 percentage points; North Dakota's rate rose from 3 to 5.75 percent and its *SHARE* climbed 20 points (the greatest increase). Georgia's rate rose less dramatically (3 to 3.75 percent) and its *SHARE* rose by 9 points.

Tax rate increases appear to help explain other changes in *SHARE*. Thirty-one states saw rate increases between 1979 and 1989; *SHARE* rose for all but eight of them. Of the 18 states that raised rates by more than one-fourth, none experienced a decline in *SHARE*. This suggests that increasing the sales tax rate causes an increase in *SHARE*, probably because it is easier for businesses to avoid the sales tax than for consumers to do so. When a state raises its rates, some businesses, especially multistate entities, may (at least over time) move heavily taxed activities from that state to other places that tax the activities less heavily.

Tax base changes also affect *SHARE*. Louisiana added food to its sales tax base, which helps explain its 16-point increase in *SHARE*; raising the rate by one-third, taxing a substantial amount of services, and (perhaps) adding utilities also contributed to this large increase. Three states took food out of their tax bases and increased rates modestly; two saw very slight increases in *SHARE*; and one had a small decrease. The one state that exempted food but did not change its rate saw a larger—albeit still modest—in-

<sup>8</sup> The overall value of *SHARE* in Table 1 is not adjusted for residents' out-of-state purchases or for nonresidents' in-state purchases, because for all states taken together, these should "wash out" (except for purchases by the five states with no general sales tax). Summing the third and fourth columns of Table 1, then calculating *SHARE*, gives a value of 58.

crease of six percentage points. Most other base changes between 1979 and 1989 involved adding or deleting gasoline or utilities, affecting business purchases as well as consumer purchases, thus creating ambiguous *a priori* expectations.

States also changed the business part of the tax base, affecting the denominator of *SHARE*. In the most common change between 1979 and 1989, 16 states switched from the direct use test to the ingredient test,<sup>9</sup> broadening the producers' part of the base and, *ceteris paribus*, decreasing *SHARE*. Of these, seven did not change tax rates or increased them only slightly. *SHARE* fell, as expected, for all but one; it fell by nine percentage points or more for four of these. The other nine states that switched to the ingredient test also raised rates by one-fourth or more; *SHARE* rose in all but two, despite broadening of the business part of the sales tax base, again suggesting that rate increases affect business purchases more than consumer purchases.

Two states that made the opposite change (from ingredient test to direct use) and raised tax rates experienced increases in *SHARE*, as expected. New York made the same base change (but no rate change) but experienced a small, unexplained decrease. This may fit an anomaly of two nearby states: Massachusetts and Connecticut saw large drops in *SHARE*, with no rate or (major) base changes. Major shifts in economic conditions may have affected all three states similarly.

#### SUMMARY AND CONCLUSIONS

On average, in-state resident consumers pay (directly) about 59 percent of state general sales tax revenues. Most of the remainder is sales tax on business purchases, with sales to governments and nonprofit organizations accounting for the rest. Consumers' shares range from 89

percent in West Virginia to 28 percent in Hawaii. Results generally agree with other researchers' findings for specific states. Because states that exempt more consumer items usually also exempt more producer goods, consumers' share has little relationship to how broadly the tax base is defined.

Changes in consumers' share estimates for 1979 and 1989 generally fit *a priori* expectations, reflecting changes in methodology and in tax base definitions. One intriguing result (and—we hope—a topic of future research) is the suggestion that states that substantially raise sales tax rates see an increase in consumers' share—perhaps because businesses are more successful than consumers in avoiding the tax.

Treating the general sales tax as a consumption tax—when business purchases account for over a third of its base—overlooks potentially major ramifications, beginning with cascading. Widely varying effective tax rates on business inputs distort resource allocation among industries and geographical regions. Distributional patterns and tax exporting are likely to be much different for the business share than for the consumers' share.

If business taxes are to follow the benefit principle, the general sales tax is not a good candidate, because it is usually limited to retail sales. Furthermore, in 1992, "states in every Census region appear to have taxed business in excess of direct business service expenditures" (Oakland and Testa, 1996). By most counts, then, further reducing the business share of the sales tax makes sense, and in recent decades, several states have done so. "In 1971, 22 states applied the full tax [to industrial machinery]; in 1983, 12 states; in 1994, only 6 do" (Due and Mikesell, 1994). If policymakers become more conscious of the sales tax as a business tax, they may take more steps in this direction. On the

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<sup>9</sup> Footnote 7 contains an explanation of these terms; Table 2 shows which states use each test.

other hand, they may find such change quite difficult, given current pressures on state and local tax sources, the political expediency of a "hidden" tax (and producers' share is probably even more hidden than consumers' share), and "the very substantial amount of revenue that can be obtained by including at least some production inputs" (Due and Mikesell, 1994).

### Acknowledgments

The author thanks Carolyn Voller for programming, data management, and other research assistance, and Randall Waldron and John Powell for valuable comments. Three referees and two editors also provided many valuable suggestions. This research was supported by the University of South Dakota General Research Fund.

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APPENDIX A

*Reconciling Census and CES Data*

For this study, it was necessary to reconcile the data sources’ differing units of analysis: Census’ household (HH) and CES’s consumer unit (CU). Each family and each person living alone constitute an HH and a CU; for these living arrangements, the definitions are comparable. However, while the Census treats unrelated persons occupying a single housing unit as one HH (called a nonfamily household) in all cases, the CES treats them as a single CU only if they “pool their income to make joint expenditure decisions.” Persons who share living quarters but are “financially independent” are separate CUs, but a single nonfamily HH. Consequently, there are more CUs than HHs. Since numbers of CUs in each state are not available, they were estimated as follows.

Let  $CUTOT$  be all consumer units;  $CUFI$  be CUs made up of financially independent persons living together;  $HHTOT$  be total (family and nonfamily) households;  $HHNF$  be nonfamily (single-member and multiple-member) households; and  $PERNF$  be (unrelated) persons living in nonfamily, multiple-member households (i.e., excluding persons living alone or in families). Let the subscript  $US$  indicate United States totals and the subscript  $i$  indicate state  $i$ . From  $CUTOT_{US}$  (in U.S. Department of Labor, 1991, Table 1) and  $HHTOT$  and  $PERNF$  (provided for the United States and each state in U.S. Department of Commerce, 1993),  $CUFI_{US}$  can be estimated as

$$CUFI_{US} = CUTOT_{US} - HHTOT_{US}$$

and the ratio of the number of financially independent, unrelated CUs to the number of unrelated persons living together can be given by

$$RATFI_{US} = CUFI_{US} / PERNF_{US}$$

Assuming this ratio holds for all states,

$$CUFI_i = RATFI_{US} \times PERNF_i$$

A state's total nonfamily CU is thus given by

$$CUNF_i = CUF_i + HHNF_i.$$

U.S. Department of Commerce (1993) provides, for each state, numbers of families and nonfamily households in each of several income classes. Since families are defined essentially the same by Census and the CES, the family income distribution is used "as-is" for this study. To adjust the nonfamily household (*HHNF*) distribution (because  $CUNF_i > HHNF_i$ ), we assumed the income distribution for *CUFI* to be the same as the distribution for *HHNF*. Defining  $CUFI_{ij}$  and  $HHNF_{ij}$  as before, and adding subscript *j* to indicate income classes,

$$CUNF_{ij} = HHNF_{ij} \times (CUNF_i / HHNF_i).$$

## APPENDIX B

### Data Sources

Figures for total sales tax collections are from U.S. Department of Commerce, *Quarterly Summary of Federal, State, and Local Tax Revenue* (1990). This source gives state revenues by calendar year, the period used for all other data in this study. Tax rates are based on ACIR (1992, Table 31); U.S. Department of Commerce, *State Government Tax Collections: 1989 and 1990* (Table 8); and U.S. Department of Commerce, *Quarterly Summary of Federal, State, and Local Tax Revenue* (various issues).

Tax base definitions are based primarily on the following.

Food and clothing: ACIR (1990, Table 24); Mikesell (1992, Table 1).

Consumer utilities (electric, gas, water, and telephone); other consumer services: Mikesell (1992, Table 2); Mikesell (1991, Table 1); Federation of Tax Administrators (1990).

Alcoholic beverages: ACIR (1990, Table 30). Gasoline: ACIR (1992, Table 34); U.S. Department of Transportation (1989).

Tobacco: Tobacco Institute (1992, Table 15). Services: Mikesell (1991); Graeser (1990).

Ingredient/direct use test: ACIR (1990, Table 24, n. 15).

Manufacturing utilities: Federation of Tax Administrators (1990); Mississippi State Tax Commission (1990).

Manufacturing/industrial equipment, farm machinery: Due and Mikesell (1994); Young and Piper (1990).

Nonprofit organizations: Mikesell (1992). (Footnote 7 contains explanations of the last four terms.)

We consulted various sources describing state provisions; where descriptions conflicted, we used whatever other information helped resolve the conflicts. Commerce Clearing House, *State Tax Guide*, and Young and Piper (1990) helped clarify some difficult points. Calls to state revenue departments were necessary in a few cases.