Estimating Grocery Sales as a Proportion of Total Sales

[An earlier version of this technical note described an approximate calculation of grocery sales as a percent of total sales. This revision (9/7/2010) provides a more detailed and accurate derivation, with clarified notation. This more accurate calculation represents a change in the estimated grocery sales ratio of about two-tenths of a percentage point.]

Total sales tax receipts in Arkansas represent a mix of taxes on groceries (at a current tax rate of 2 percent) and taxes on non-groceries (at a tax rate of 6 percent). Changes in the mix of these two categories alter the effective tax rate on total sales.

Because it is written into the Arkansas constitution, the Conservation Tax was not altered by reductions in the tax rate on groceries in July 2007 (from 6 percent to 3 percent) and in July 2009 (from 3 percent to 2 percent). Instead, the lower sales tax on groceries is reflected in proportional reductions in the other three components of Arkansas' Sales and Use Tax (the General Sales Tax of 4.5 percent, the Educational Adequacy Tax of 0.875 percent, and the Property Tax Relief Tax of 0.5 percent).

It is possible to estimate the proportion of grocery sales relative to total sales by comparing the receipts from the Conservation Tax to one of the other components of overall sales taxes.

Total tax receipts from any one of the three affected components of Arkansas' sales tax ($T_i = T_1, T_2, T_3$) can be represented as:

$$T_i = \tau_i (G + N) - \left(\frac{\tau_i}{\tau_1 + \tau_2 + \tau_3} \right) (n - g) G$$

where T_i represents total tax collections from the specific tax, G represents grocery purchases, N represents non-grocery purchases, and g and n represent tax rates on grocery and non-grocery items, respectively.

In contrast, receipts from the Conservation Tax, T_c, are:

$$T_c = \tau_c (G + N)$$

(for the Conservation Tax, all sales are taxed at the statutory rate, τ_c=0.125 percent).

Let S_i represent the total sales implied under the (counterfactual) assumption that all sales are taxed at non-grocery rates, $S_i = T_i / \tau_i$:

$$S_i = \frac{T_i}{\tau_i} = (G+N) - \left(\frac{n-g}{\tau_1+\tau_2+\tau_3}\right)G$$

for i=1,2,3 and

$$S_C = \frac{T_c}{\tau_c} = (G+N)$$

for the conservation tax.

After some basic algebraic manipulation (making use of the fact that $n=t_1+t_2+t_3+t_c$), these two expressions can be used to find the ratio of grocery sales to total sales, *R*, as:

$$R \equiv \frac{G}{G+N} = \left(\frac{n-\tau_c}{n-g}\right) * \left(\frac{S_c - S_i}{S_c}\right)$$

The chart of grocery sales as a percent of total sales presented in the Arkansas Economist post, *Arkansas Taxable Sales - Revised Data for 2010:Q2*, uses data for revenue collections from the Property Tax Relief Tax to represent T_i and S_i. The timing convention assumed for the relationship between actual sales and sales tax receipts (a one month lag) is incorporated in the application of tax-rate changes to the calculations.

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