

Saliency and the Response to Taxes

a toy model, after Chetty, Looney, and Kroft (2009)

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Two taxes of the same size can cut demand by different amounts, for no reason other than where the shopper meets the tax. A sales tax added at the register is easy to overlook; the same tax printed on the shelf tag is not. Chetty, Looney, and Kroft (2009) posted tax-inclusive prices on 750 products in a grocery store and demand for them fell by about 8 percent, although the tax itself had not moved. This note builds the simplest model of an inattentive shopper and shows that demand responds to the price she perceives, not the price she pays, so a tax she does not see moves her demand far less than a tax she does.

1 The model

A shopper buys a good at pretax price p , carrying an ad valorem tax τ . A fully attentive shopper reacts to the tax-inclusive price $p(1 + \tau)$. An inattentive one reacts to a *perceived* price

$$\hat{p} = p(1 + \theta\tau), \quad \theta \in [0, 1],$$

where θ is the weight she puts on the tax. At $\theta = 1$ she sees the tax in full, as she does when it is printed in the posted price; at $\theta = 0$ she ignores it, as she nearly does when it appears only at the register. Her demand depends on the price she perceives, $x(\hat{p})$, with x downward sloping. Chetty, Looney, and Kroft estimate $\theta \approx 0.35$ for the sales tax in their grocery experiment: shoppers act on barely a third of it.

2 A muted response

Compare how demand moves when the posted price p changes with how it moves when the tax τ changes. Demand depends on p and τ only through $\hat{p} = p(1 + \theta\tau)$, so by the chain rule each derivative is $x'(\hat{p})$ times the derivative of $\hat{p}$: $\frac{\partial \hat{p}}{\partial p} = 1 + \theta\tau$ and $\frac{\partial \hat{p}}{\partial \tau} = \theta p$. Hence

$$\frac{\partial x}{\partial p} = (1 + \theta\tau) x'(\hat{p}), \quad \frac{\partial x}{\partial \tau} = \theta p x'(\hat{p}).$$

A non-salient tax enters demand only through θ . To compare the two responses dollar for dollar, note that raising τ by $d\tau$ raises the tax bill by $p d\tau$ dollars, so the response per dollar of tax is $\frac{1}{p} \frac{\partial x}{\partial \tau} = \theta x'(\hat{p})$. Dividing by the response per dollar of price,

$$\frac{\theta x'(\hat{p})}{(1 + \theta\tau) x'(\hat{p})} = \frac{\theta}{1 + \theta\tau},$$

which equals θ for a small initial tax (τ near zero). The tax response is thus roughly a fraction θ of the price response: a dollar of tax the shopper half-ignores does less to her demand than a dollar she pays at the shelf.

Make the tax salient, raising θ toward 1, and the full response returns. This is why posting the tax in the price lowered demand even though the tax was already there: the posting did not change the tax, it changed θ .

A numerical example. Let demand be $x = 50 - 20\hat{p}$, with pretax price $p = 1$ and a tax $\tau = 0.20$. A fully attentive shopper would face a price of 1.20; an inattentive one with $\theta = 0.35$ perceives only $\hat{p} = 1 \times (1 + 0.35 \times 0.20) = 1.07$. Substituting each perceived price into demand:

- No tax: $x = 50 - 20(1.00) = 30.0$.
- Hidden tax: $x = 50 - 20(1.07) = 50 - 21.4 = 28.6$.
- Salient tax: $x = 50 - 20(1.20) = 50 - 24 = 26.0$.

Scenario	Perceived price $\hat{p}$	Quantity x
No tax	1.00	30.0
Tax at the register (hidden, $\theta = 0.35$)	1.07	28.6
Tax in the posted price (salient, $\theta = 1$)	1.20	26.0

Table 1. The same 20 percent tax, hidden and salient ($x = 50 - 20\hat{p}$, $p = 1$).

The hidden tax cuts demand by $30 - 28.6 = 1.4$ units, the salient tax by $30 - 26 = 4.0$. The first is $\frac{1.4}{4.0} = 0.35$ of the second, the attention weight θ exactly (exact here because demand is linear). Posting the tax moves the shopper the rest of the way, from 28.6 to 26.0, a drop of $\frac{2.6}{28.6} \approx 9$ percent that no change in the tax can explain.

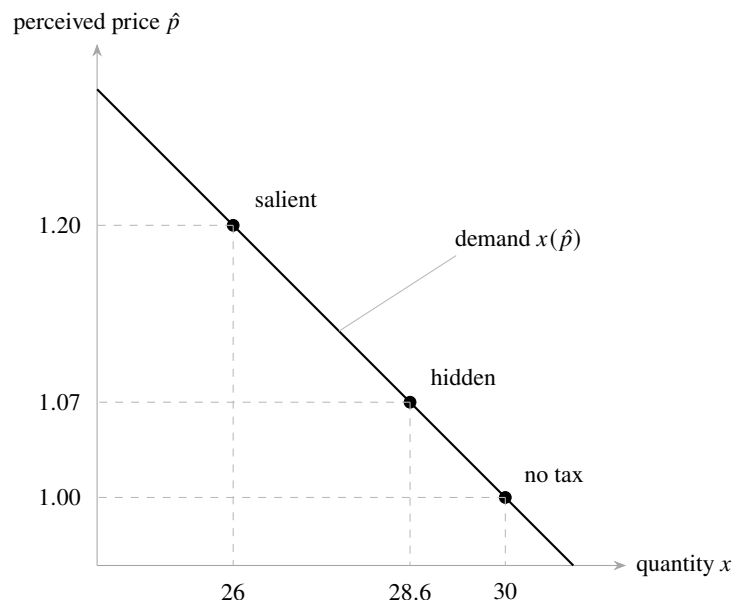


Figure 1: Demand as a function of the perceived price. A 20 percent tax, if hidden, raises the perceived price only to 1.07 and barely moves quantity (to 28.6); posted in the price it raises the perceived price to 1.20 and moves quantity the full distance (to 26).

Lesson: Demand responds to the price a shopper perceives, not the price she pays, so a tax's effect depends on how it is shown, not only on its rate. The elasticity of demand with respect to a quiet tax is θ

times its elasticity with respect to a posted price. A government that reads the small response to a hidden tax as a small efficiency cost forgets that the shopper is no longer at her fully-informed choice: she buys as if the tax were a third its size. $\square$

References

Chetty, R., A. Looney, and K. Kroft (2009) “Salience and Taxation: Theory and Evidence.” *American Economic Review* 99(4): 1145–1177.