Excise Taxation in a Competitive Market

TheoryGuru applications

Load Economicreasoning package only if it is not already loaded

```
If[Length@Names["PLTools`*"] < 10,
 Get["http://economicreasoning.com"]]
```

Setup

Chain-rule proofs

```
equilibrium = d[p + t] == s[p];
```

```
revenue = t d[p + t];
```

Global proofs (no calculus)

```
equilibriumrp = d[p# + t#] == s[p#] & /@ {L, H}
```

$\{d[p_L + t_L] == s[p_L], d[p_H + t_H] == s[p_H]\}$

$\text{supslopesup} = (s[p_H] - s[p_L])\,(p_H - p_L) > 0;$

$\text{dmdslopesdown} = \left(d[p_H + t_H] - d[p_L + t_L]\right)\,(p_H + t_H - (p_L + t_L)) < 0;$

$\text{rev}_{x\_} := t_x\, d[p_x + t_x]$

Results obtained with chain rule

Quantity depressed

$$\text{TheoryGuru}\left[\left\{\frac{d\,\text{equilibrium}}{d\,t},\ d'[p+t]<0,\ s'[p]>0\right\},\ \frac{d\,s[p]}{d\,t}<0\right]$$

True

Supply price depressed

Demand and supply with no quantitative restrictions

$$\text{TheoryGuru}\left[\left\{\frac{d\,\text{equilibrium}}{d\,t},\ d'[p+t]<0,\ s'[p]>0\right\},\ -1<\frac{d\,p}{d\,t}<0\right]$$

True

With a specific demand elasticity

$$\text{TheoryGuru}\left[\left\{\frac{d\,\text{equilibrium}}{d\,t},\ d'[p+t]\ \frac{p+t}{d[p+t]}==-\frac{1}{7},\ d[p+t]>0,\ p+t>0,\ s'[p]>0\right\},\ -1<\frac{d\,p}{d\,t}<0\right]$$

True

Find sufficient conditions for upward-sloping Laffer curve

$$\text{TheoryExtra}\left[\left\{\frac{d\,\text{equilibrium}}{d\,t},\ d[p+t]>0,\ d'[p+t]<0,\ s'[p]>0\right\},\ \frac{d\,\text{revenue}}{d\,t}>0,\ \{t,\ s'[p],\ d'[p+t]\}\right]$$

$$t\le 0\ ||\ d[p+t]>\frac{t\,d'[p+t]\,s'[p]}{d'[p+t]-s'[p]}$$

```
TheoryGuru[{ⅆequilibrium/ⅆt, d[p + t] > 0, d'[p + t] < 0, s'[p] > 0, t == 0},
 ⅆrevenue/ⅆt > 0]
```

True

Variable interpretations

Global results (no calculus)

Supply price depressed

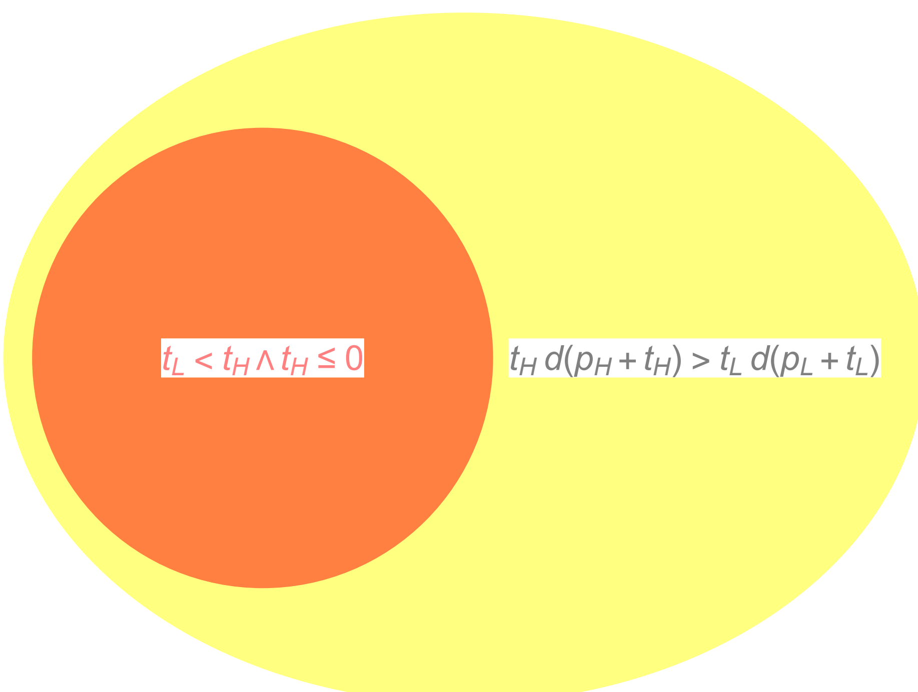
```
TheoryGuru[{equilibriumrp, supslopesup, dmdslopesdown, t_H > t_L}, p_L > p_H > p_L - (t_H - t_L)]
```

True

Sufficient conditions for upward-sloping Laffer curve

```
TheoryOverlapp[{equilibriumrp, dmdslopesdown, supslopesup, d[p_H + t_H] > 0},
 t_L < t_H ≤ 0,
 rev_H > rev_L]
```

Euler diagram: not to scale



$t_H\, d(p_H + t_H) > t_L\, d(p_L + t_L)$ is necessary but not sufficient for $t_L < t_H \wedge t_H \leq 0$

Variable interpretations