Revenue-Maximising Elasticities of Taxable Income: Evidence for the US Income Tax

John Creedy and Norman Gemmell
Motivation

A common policy-maker’s question:

• ‘If one or more marginal tax rates are raised:
  (a) who will be affected?;
  (b) how much extra revenue will *those* taxpayers pay?;
  (b) how much extra revenue will we gain from *all* taxpayers?’

• Policy-makers increasingly aware of both a ‘mechanical’ revenue increase *and* a ‘behavioural’ revenue decrease.

⇒ Key questions:

• How big are behavioural effects and can policy/compliance effort change them?

• (As a benchmark) where/when does the behavioural effect outweigh the mechanical effect – the ‘wrong’ side of the Laffer Curve?
Motivation

Policy relevance?

- Different welfare/distributional objectives (& unintended consequences) of targeting particular taxpayers;
- Type and extent to behavioural responses by (groups of) individuals affect social welfare outcomes [MEB]
- Meeting revenue targets for public expenditure programmes

Compliance relevance?

- Different behavioural responses (e.g. labour supply, income shifting) have different compliance implications
- Knowing which taxpayers are expected to respond (and how) helps target compliance efforts or interpret observed non-compliance
Our paper asks:

For a multi-rate income tax:
1. When might the behavioural effect (of a tax rate increase) outweigh the mechanical effect – to generate revenue-negative effect? (the ‘wrong’ side of the Laffer curve)

2. How does the *tax structure* affect the prospects of a revenue-negative outcome?

For US personal income taxes:
3. Which individual US taxpayers might be on the ‘wrong’ side of the Laffer curve?

4. Are there particular groups of taxpayers where revenue-negative responses could be expected?
Capturing behavioural effects

- **Feldstein** elasticity of taxable income, ETI:

  \[ ETI = \text{responsiveness of taxable income to a 1\% change in the \textquote{net-of-tax\!} rate} \ (1 - \tau) \]

- Empirical estimates from variety of methodologies (mainly for US). Saez et al (2012) suggest (US) range: 0.12 – 0.4, but some larger.

  ⇒ Difficult to obtain reliable, or generalisable, estimates of ETIs


  ‘... even at the top of this range the US marginal top rate is far from the top of the Laffer curve’

  ⇒ Does this hold for multiple marginal tax rates?
Revenue-maximising tax rates and elasticities

For top tax rate:
• Saez et al show rev-maximisation across all top rate taxpayers implies:
  \[ \tau^* = \frac{1}{1 + \eta \alpha} \]
  where \( \eta \) is the ETI and \( \alpha \) is the Pareto distributional parameter.
  If \( \eta \approx 0.4 \) & \( \alpha \approx 1.5 \) \( \Rightarrow \tau^* \approx 0.62 \)
• Can transform to find rev-max. ETI as: \( \eta^* = \left(\frac{1-\tau}{\tau}\right)\left(\frac{1}{\alpha}\right) \)

What about when there are multiple rates?
• We refer to \( \eta^* \) as the revenue-maximising ETI, or ‘Laffer ETI’: \( ETI^L \)
• Consider \( ETI^L \) for individuals: \( \eta^L_{Y_i, 1-\tau_k} \)
• And \( ETI^L \) for revenue from each tax bracket or all brackets: \( \eta^L_{Y_k, 1-\tau_k} \)
The multi-step tax function

Tax function with $k = 1 \ldots K$ brackets:

$$T(y) = \tau_k(y - a_k) + \sum_{j=1}^{k-1} \tau_j(a_{j+1} - a_j)$$

or:

$$T(y) = \tau_k(y - a_k^*)$$

where:

$$a_k^* = \frac{1}{\tau_k} \sum_{j=1}^{k} a_j(\tau_j - \tau_{j-1}) \quad \text{‘effective threshold’}$$

- We are interested in: (proportional) change in total revenue, $T$, when the marginal tax rate, $\tau_k$, changes.
- When is this elasticity = 0?
- How does it relate to the ETI$^L$?
Relationships among elasticities

How does a change in $\tau_k$ affect revenues?:

$$\eta_{T_i, \tau_k} = \eta'_{T_i, \tau_k} + \eta_{T_i, y_i} \eta_{y_i, \tau_k}$$

**Mechanical effect**

**Behavioural effect**

$$\eta_{y_i, 1-\tau_k} = -\left(\frac{1-\tau_k}{\tau_k}\right) \eta_{y_i, \tau_k}$$

Feldstein ETI: w.r.t. $(1 - \tau_k)$

$$\eta_{T_i, y_i} = \frac{y_i}{y_i - \alpha_k^*} > 1$$

‘Revenue elasticity’ (fiscal drag) component of behavioural effect
Relationships among elasticities

Substitute into:

\[ \eta_{T_i, \tau_k} = \eta'_{T_i, \tau_k} + \eta_{T_i, y_i} \eta_{y_i, \tau_k} \]

To give:

\[ \eta_{T_i, \tau_k} = \eta'_{T_i, \tau_k} - \left( \frac{y_i}{y_i - a_k^*} \right) \left( \frac{\tau_k}{1 - \tau_k} \right) \eta_{y_i, 1-\tau_k} \]

Further, mechanical effect:

\[ \eta'_{T_i, \tau_k} = \frac{\tau_k (y_i - a_k)}{T(y_i)} = \frac{(y_i - a_k)}{(y_i - a_k^*)} = \frac{T_k(y_i)}{T(y_i)} \]
Revenue-maximizing (‘Laffer’) ETIs: $\text{ETI}^L$

Set $\eta_{i,\tau_k}^{L} = 0$:

$$\eta_{y_i,1-\tau_k}^{L} = \eta_{T_i,\tau_k}(\frac{y_i - a^*_k}{y_i})(\frac{1 - \tau_k}{\tau_k})$$

$$\eta_{y_i,1-\tau_k}^{L} = \left(\frac{y_i - a_k}{y_i}\right)(\frac{1 - \tau_k}{\tau_k})$$

**Interpretation:**

- If an observed/estimated ETI for taxpayer $i$ facing $\tau_k$, is greater than his/her ETI$^L$, then an *increase* in $\tau_k$ will generate *less* revenue from that taxpayer.
- But it will also raise revenue from taxpayers on higher MTRs than $\tau_k$ – i.e. those for whom $\tau_k$ is infra-marginal

$\Rightarrow$ Need suitable *aggregate* ETI$^L$s
Aggregate Laffer ETIs

- Can evaluate ETI's based on revenue from:
  - Taxpayers with marginal rate $\tau_k$
  - All taxpayers (marginal rates) combined

$$R_k^+ = \text{revenue from taxpayers in the } k^{\text{th}} \text{ bracket}$$

$$R_k^- = \text{revenue from taxpayers above the } k^{\text{th}} \text{ bracket}$$
Applying to the US income tax

**Limitations**

- Complex PIT structure ⇒ ‘Manhattan skyline’ of EMTRs;
- Illustrative individuals based on CBO examples: single-filer, no children; married joint-filer, 2 children
- Allows for responses at *intensive* margin only ⇒ likely unreliable interpretation at low income levels (< $20-30k)
- Treats benefit & deduction phase-in/phase-out rates as equally salient as statutory MTRs; i.e. use EMTRs
Effective Marginal Federal Income Tax Rates for a Single Filer in 2005

Income up to $100,000

- EITC Phase-out (7.65%)
- EITC Phase-in (-7.65%)
- EITC Phase-out and 10% Bracket (17.65%)
- 10% Bracket
- 15% Bracket
- 25% Bracket
- 28% Bracket

Effective Marginal Tax Rate
Statutory Tax Rate
Average Tax Rate
US income tax EMTRs

Source: Congressional Budget Office.

Notes: This example assumes that the taxpayer has no dependents, that all income is from wages, and that the taxpayer has itemized deductions worth 18 percent of income and claims the greater of those deductions or the standard deduction. (Forty percent of the itemized deductions are assumed to be state and local taxes, and the rest are charitable contributions and mortgage interest.)

EITC = earned income tax credit; IDP = itemized-deduction phaseout; PEP = personal-exemption phaseout; AMT = alternative minimum tax.
ETIL: single filer, no children, Fed. Taxes only

\[ \eta_{y_i,1-\tau_k} = \left( \frac{y_i - a_k}{y_i} \right) \left( \frac{1 - \tau_k}{\tau_k} \right) \]
ETI^L: married, 2 children, Fed taxes only
Adding state and payroll taxes

\[ \eta_{y_i,1-t_k}^L = \left( \frac{y_i - a_k}{y_i} \right) \left( \frac{1 - \tau_k}{\tau_k} \right) \]
ETI\(^L\)s for groups of taxpayers

\[ \eta_{Y_k,1-\tau_k}^L \bigg|_{T \text{ from } Y_k} = \left( \frac{1 - \tau_k}{\tau_k} \right) \left( \frac{\bar{y}_k - a_k}{\bar{y}_k} \right) = \sum_{i=1}^{N_k} \left( \frac{y_i}{\bar{y}_k} \right) \eta_{y_i,1-\tau_k}^L \]

But, including additional tax paid from higher tax brackets:

\[ \eta_{Y_k,1-\tau_k}^L \bigg|_{\text{Total } T} = \left( \frac{1 - \tau_k}{\tau_k} \right) \left( \frac{\bar{y}_k - a_k}{\bar{y}_k} \right) \left[ 1 + \frac{R_{(k)}^+}{R_{(k)}} \right] \]

\[ \Rightarrow \text{ where in the ETI}\(^L\) schedule do most US taxpayers lie? \]
### Income shares

#### Table 2: Income shares by Taxable Income Band

<table>
<thead>
<tr>
<th>AGI ($000s)</th>
<th>Married-Joint</th>
<th></th>
<th>Head of H’hold</th>
<th></th>
<th>Single</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% M-J</td>
<td>% all</td>
<td>Income shares</td>
<td>% HoH</td>
<td>% all</td>
<td>Income shares</td>
<td>% S</td>
</tr>
<tr>
<td>$20 - 25</td>
<td>0.1</td>
<td>0.1</td>
<td>1.0</td>
<td>0</td>
<td>0</td>
<td>4.9</td>
<td>1.2</td>
</tr>
<tr>
<td>$25 - 30</td>
<td>0.3</td>
<td>0.2</td>
<td>3.4</td>
<td>0.2</td>
<td>0.7</td>
<td>6.0</td>
<td>1.5</td>
</tr>
<tr>
<td>$30 - 40</td>
<td>1.3</td>
<td>0.9</td>
<td>14.4</td>
<td>0.7</td>
<td>0.7</td>
<td>12.5</td>
<td>3.0</td>
</tr>
<tr>
<td>$40 - 50</td>
<td>2.5</td>
<td>1.8</td>
<td>15.6</td>
<td>0.7</td>
<td>0.7</td>
<td>11.3</td>
<td>2.7</td>
</tr>
<tr>
<td>$50 - 75</td>
<td>11.9</td>
<td>8.4</td>
<td>26.3</td>
<td>1.2</td>
<td>1.2</td>
<td>18.8</td>
<td>4.6</td>
</tr>
<tr>
<td>$75 - 100</td>
<td>13.8</td>
<td>9.8</td>
<td>10.7</td>
<td>0.5</td>
<td>0.5</td>
<td>8.9</td>
<td>2.2</td>
</tr>
<tr>
<td>$100 - 200</td>
<td>25.4</td>
<td>18.1</td>
<td>11.4</td>
<td>0.5</td>
<td>0.5</td>
<td>10.9</td>
<td>2.6</td>
</tr>
<tr>
<td>$200 - 500</td>
<td>15.9</td>
<td>11.3</td>
<td>6.1</td>
<td>0.3</td>
<td>0.3</td>
<td>6.8</td>
<td>1.6</td>
</tr>
<tr>
<td>$500 - 1,000</td>
<td>7.5</td>
<td>5.4</td>
<td>3.0</td>
<td>0.1</td>
<td>0.1</td>
<td>3.2</td>
<td>0.8</td>
</tr>
<tr>
<td>&gt; $1,000</td>
<td>21.3</td>
<td>15.1</td>
<td>7.7</td>
<td>0.4</td>
<td>0.4</td>
<td>10.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

|          | 100   | 71    | 100   | 5     | 100   | 24   | 100   |     |

Note: The highlighted cells indicate significant figures or areas of focus.
ETI\(^L\)'s by income band

\[
\eta_{y_k,1-\tau_k}^L \mid T_{\text{from } Y_k} = \left( \frac{1 - \tau_k}{\tau_k} \right) \left( \frac{\bar{y}_k - a_k}{\bar{y}_k} \right)
\]

<table>
<thead>
<tr>
<th>AGI ($000s)</th>
<th>Married-Joint (M-J) ETI(^L)</th>
<th>Head of H'hold (HoH) ETI(^L)</th>
<th>Single (S) ETI(^L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20 - 25</td>
<td>2.9</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>$25 - 30</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>$30 - 40</td>
<td>0.5</td>
<td>0.2</td>
<td>0.7</td>
</tr>
<tr>
<td>$40 - 50</td>
<td>0.9</td>
<td>0.3</td>
<td>1.7</td>
</tr>
<tr>
<td>$50 - 75</td>
<td>2.2</td>
<td>0.4</td>
<td>0.9</td>
</tr>
<tr>
<td>$75 - 100</td>
<td>1.7</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>$100 - 200</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>$200 - 500</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>$500 - 1,000</td>
<td>0.1</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>&gt; $1,000</td>
<td>1.5</td>
<td>1.1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Fed. = Federal income tax only; FPS = Federal, payroll and state income taxes.
How big is adjustment for infra-marginal revenues?

\[
\eta^L_{y_k, 1-\tau_k} \left| \text{Total } T \right. = \left( \frac{1 - \tau_k}{\bar{y}_k} \right) \left( \frac{\bar{y}_k - \alpha_k}{\bar{y}_k} \right) \left[ 1 + \frac{R^+_k}{R_k} \right]
\]

Note: New Zealand tax structure & simulated income distribution.
Adjustment factor for infra-marginal revenue effects?

\[
\eta^L_{y_k, 1-\tau_k} \mid_{\text{Total } T} = \left( \frac{1 - \tau_k}{\tau_k} \right) \left( \frac{(\bar{y}_k - a_k)}{\bar{y}_k} \right) \left[ 1 + \frac{R^+_k}{R^{+}_k} \right]
\]

<table>
<thead>
<tr>
<th>Total Revenue ($bn)</th>
<th>marginal revenue, (R_{(k)})</th>
<th>Infra-marginal revenue (R^+_k)</th>
<th>Ratio: (R = \frac{R^+<em>k}{R</em>{(k)}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>972.7</td>
<td>425.4</td>
<td>547.3</td>
<td>1.3 (2.4*)</td>
</tr>
<tr>
<td><strong>Single:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>211.4</td>
<td>91.2</td>
<td>120.2</td>
<td>1.3 (1.7*)</td>
</tr>
<tr>
<td><strong>Married-Joint:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>696.9</td>
<td>301.0</td>
<td>395.9</td>
<td>1.3 (2.9*)</td>
</tr>
</tbody>
</table>

* Source: IRS 2005 data.  
* = excluding top marginal rate.
Revenue-maximising tax rates

- Can rearrange expressions for rev-max. ETI in terms of MTR to instead identify rev-max. MTR for given ETI.

- rev-max. top rate (Saez et al): \( \tau^* = \frac{1}{1+\eta \alpha} \) 
  
  \( \eta \) is the ETI and \( \alpha \) is the Pareto distributional parameter.

- Define \( R = R_+^{(k)} / R_{(k)} \), can show that multi-rate equivalent is:
  
  \[ \tau_k^* = \frac{1 + R}{1 + R + \eta \left\{ \frac{\bar{y}_k}{\bar{y}_k - a_k} \right\}} \]
  
  (holding other tax rates fixed)

  For top tax rate: \( R = 0 \), and \( \left\{ \frac{\bar{y}_k}{\bar{y}_k - a_k} \right\} \) may be captured by \( \alpha \).

- Rev-max. tax rate for each individual is: \( \tau_k^* = \frac{1}{1+\eta \left\{ \frac{y_i}{y_i-a_k} \right\}} = \frac{y_i-a_k}{y_i(1+\eta)-a_k} \)
Revenue maximising tax rates (for given ETI)

Table 5: Revenue Maximising Tax Rates by AGI Bands: Single Filer

<table>
<thead>
<tr>
<th>AGI ($000s)</th>
<th>Average TI† ($</th>
<th>Rev-Maximizing Tax Rate (%)</th>
<th>Statutory MTR</th>
<th>Single-filer EMTR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $5</td>
<td>1,025</td>
<td>83 (ETI = 0.2)</td>
<td>50 (ETI = 1.0)</td>
<td>0</td>
</tr>
<tr>
<td>$5 – 10</td>
<td>1,902</td>
<td>83</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>$10 – 15</td>
<td>4,445</td>
<td>83</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>$15 – 20</td>
<td>8,771</td>
<td>25</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>$20 – 25</td>
<td>13,356</td>
<td>37</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>$25 – 30</td>
<td>17,983</td>
<td>41</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>$30 – 40</td>
<td>24,200</td>
<td>64</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td>$40 – 50</td>
<td>32,722</td>
<td>43</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>$50 – 75</td>
<td>45,249</td>
<td>36</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>$75 – 100</td>
<td>66,236</td>
<td>66</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td>$100 – 200</td>
<td>105,313</td>
<td>39</td>
<td>11</td>
<td>28</td>
</tr>
<tr>
<td>$200 – 500</td>
<td>245,182</td>
<td>55</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td>$500 – 1,000</td>
<td>595,114</td>
<td>63</td>
<td>26</td>
<td>35</td>
</tr>
<tr>
<td>&gt; $1,000</td>
<td>3,122,202</td>
<td>81</td>
<td>47</td>
<td>35</td>
</tr>
</tbody>
</table>

† TI = taxable income; * EMTR at average TI within each AGI band.
Conclusions

Difficult to measure taxpayers’ ETIs, they are not immutable, and likely differ across individuals (e.g. wage v. non-wage income)

For a given tax system, a given *actual* ETI across taxpayers implies quite different observed revenue responses (to MTR increases).

Revenue-negative responses from some (groups of) taxpayers are to be expected, even when overall system is revenue-positive.

At lower statutory tax rates, revenue-negative responses (to an increase) by taxpayers on this rate are possible, but likely swamped by additional revenue from higher rate taxpayers.

Top US tax rate likely below rev. max. rate - but maybe not for those in ~$300k to $1m range?
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