THE ELASTICITY OF TAXABLE INCOME IN NEW ZEALAND:
EVIDENCE FOR PERSONAL TAXPAYERS FROM UNIT RECORD DATA

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Project Objective:

- Assist tax reform design by analysing how taxable incomes have responded to previous N.Z. tax reforms?

Key Points:

- ETI estimates: ‘standard instrument’ (Auten-Carroll-Gruber-Saez) is weak in presence of volatile income dynamics
  ⇒ What to do when standard instrument in IV approach fails?
- Using 2 new instruments based on modelling ‘no reform’ income dynamics produces sensible ETI results.
- *Type* of income and taxpayer is important for ETI estimates.
Research approach

• How does taxable income respond to tax reforms?
• Use Feldstein (1995) elasticity of taxable income, ETI:

  \% \text{response of taxable income to} \ 1\% \ \text{change in the ‘net-of-tax’ rate} \ (1 − \tau)

• Captures combined effect of variety of responses (labour supply, wage/salary setting, tax avoidance/evasion) and
  • Easily related to revenue outcomes (Creedy & Gemmell, 2012)
  • Direct welfare measurement is possible, under specific assumptions
• Many empirical estimates from variety of methodologies: mainly US, Europe
• Saez et al (2012) range of values: 0.12 – 0.4 (US); but Weber (2014) ~ 0.9 (US)
ETI: Approaches to testing

- Saez, Slemrod, Giertz (2012, p.18):
  
  “to isolate the effects of the net-of-tax rate, one would want to compare observed reported incomes after the tax rate change to the incomes that would have been reported had the tax change not taken place. Obviously, the latter are not observed and must be estimated.”

- Various approaches ... Income shares (e.g. top 1%); bunching at thresholds; diff-in-diffs for ‘treated’ (affected) and ‘control’ (unaffected) taxpayers.

- IV Regressions of pre- & post- tax reform incomes ...
ETI: regression approach

Typical ETI regression:

\[ q_i = \alpha + \eta z_i + N_i + u_i \]

where:
- \( q_i = \) change in log taxable income
- \( z_i = \) change in log net of tax rate
- \( \eta = \) ETI measure
- \( N_i = \) other controls (e.g. age, past income)

Endogeneity problems \( \Rightarrow \) need instrument for \( z_i \) that is not affected by \( q_i \).

\( \Rightarrow \) ‘standard instrument’ (Auten-Carroll, 1999; Gruber-Saez, 2002):
- tax rate that would have been faced after reform, with unchanged income
Standard instrument: recent challenges

- Standard instrument may not deal with inconsistency (bias) of OLS (Weber, 2014)
  - Instrument is *inconsistent* with plausible assumptions about income generating process
  - So-called ‘treated’ and ‘untreated’ may not only differ in exposure to tax reform? (e.g. non-random selection for treatment)

- **Weak** instrument with exogenous volatile income dynamics
- Largely ignored till now, *but* important in N.Z. data
## The 2001 NZ personal tax reforms

<table>
<thead>
<tr>
<th>Income bands</th>
<th>1999 Rates</th>
<th>2002 Rates</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 - $9,500</td>
<td>15%</td>
<td>15%</td>
<td>-</td>
</tr>
<tr>
<td>$9,500 - $34,200</td>
<td>21.75%</td>
<td>21%</td>
<td>-0.75%</td>
</tr>
<tr>
<td>$34,200 - $38,000</td>
<td>24%</td>
<td>21%</td>
<td>-3%</td>
</tr>
<tr>
<td>$38,000 - $60,000</td>
<td>33%</td>
<td>33%</td>
<td>-</td>
</tr>
<tr>
<td>&gt; $60,000</td>
<td>33%</td>
<td>39%</td>
<td>+6%</td>
</tr>
</tbody>
</table>
Emergence of spikes in the income distribution ...
An alternative IV approach

• Estimate **income dynamics** from period of *no tax reform*
• Use to construct ‘expected’ income – and associated ‘expected’ marginal tax rate – if no reform.

**Approach:**

Take period without any tax changes, and run autoregressive process:

\[
\log y_{i,j} - \mu_j = \alpha_1 (\log y_{i,j-1} - \mu_{j-1}) + \alpha_2 (\log y_{i,j-2} - \mu_{j-2}) + u_i
\]

Incorporates:
- *regression towards the mean*
- *serial correlation* in relative income changes.

⇒ Parameters $\alpha_1$, $\alpha_2$ used to project *counterfactual* incomes after reform year
Tax reform

Pre-reform measured income dynamics

Apply income dynamics

Post-reform measured income dynamics

counterfactual

observed

Pre-reform

Tax reform

Measure reform effect

No reform effect
Alternative instruments

1. Tax rate at **expected income**, with no reform (0.15, 0.21, 0.33 or 0.39)
2. Expected tax rate - weighted average using mean & variance from income dynamics.

Basic example:

\[
E(\tau) = (0.15 \times 0.01) + (0.21 \times 0.50) + (0.33 \times 0.40) + (0.39 \times 0.09) = 0.27
\]
The Data

NZ Inland Revenue data on individual (personal) taxpayers 1994-2009

Random sample of approx. 139,000 taxpayers, weighted up to represent NZ taxpayer population of approx. 2.9 million.

Our sub-sample:

Panel of taxpayers aged 25-64 and income between $16k and $1 million

Taxpayers with available data in all relevant years, 1998 to 2005: ~39,000 taxpayers weighted up to 804,000.
How do the instruments compare?
**ETI Results:**

\[ q_i = \alpha + \eta \hat{z}_i + N_i + u_i \]

\( N_i \) includes: age; age\(^2\); lagged incomes; dummy for ‘other income’ (non-wage & salary)

<table>
<thead>
<tr>
<th></th>
<th>Standard Instrument</th>
<th>Expected Income Instrument</th>
<th>Expected Tax Rate Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ETI coefficient</strong></td>
<td>-175.027</td>
<td>0.575</td>
<td>0.676</td>
</tr>
<tr>
<td><strong>t-statistic</strong></td>
<td>-0.11</td>
<td>1.99</td>
<td>5.39</td>
</tr>
<tr>
<td>‘Other income’</td>
<td>-0.11</td>
<td>5.71</td>
<td>6.52</td>
</tr>
<tr>
<td><strong>t-statistic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ETI = 0.67 implies: \( \Delta \tau \approx +18\% \ (33\% \rightarrow 39\%); \ \Delta(1-\tau) \approx -9\% \ (67\% \rightarrow 61\%) \)

\( \Delta y \) response \( \approx -6\% \)
## ETI coefficients by income & taxpayer

<table>
<thead>
<tr>
<th>By income type</th>
<th>wage/salary income</th>
<th>Coefficient</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>other income (additional)</td>
<td>0.414</td>
<td>0.495</td>
<td>2.39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>By taxpayer type</th>
<th>with other income</th>
<th>Coefficient</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>without other income</td>
<td>0.514</td>
<td>0.190</td>
<td>3.65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Taxpayers with other income</th>
<th>all income</th>
<th>Coefficient</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>other income</td>
<td>0.220</td>
<td>2.484</td>
<td>1.53</td>
</tr>
</tbody>
</table>
Other income responses

Graph showing % of total other income versus taxable income for 1999 and 2002.
Who responded to the 2001 reforms?

- All taxpayers experience combinations of:
  - Income increase or decrease (before/after reform)
  - Actual net-of-tax rate increase, unchanged or decrease
  - Counterfactual net-of-tax rate (instrument) increase, unchanged or decrease

- >83% of taxpayers are in 5 categories (combinations) of income and net-of-tax rate change
  - associated with different parts of the tax schedule (A-E)
Can identify who/how responded to 2001 reforms:

- Unit record data allows detailed interrogation of specific taxpayer responses.
- Reform-induced movements ... did they involve family income sharing?
Conclusions

ETI regressions provide strong evidence of taxable income responses in N.Z. but only when appropriate ‘instruments’ are used.

Important insights for tax compliance analysis – who responds and how?

Areas for data/analysis improvement?

1. Allow for coordination of intra-household (couples) tax behaviours.

2. Allow for income effects via (adjusted) *average* net-of-tax rate and virtual income.
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