Canadian Income Taxation:
Statistical Analysis and Parametric Estimates

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What We Do

- Compare Canadian income and taxation statistics with those of the U.S.

- Provide estimates of parametric tax specifications which are readily to use
During the tax season, individuals and businesses must navigate a complex system of income taxation. This complexity arises from various factors including tax units, the number of tax brackets, family size dependent tax benefits, and various tax credits. Due to the intricate nature of these factors, it is often challenging to include all aspects in quantitative analysis.

The academic literature has developed parametric functions, or specifications, to represent the entire income tax system and estimated these functions using survey data. These specifications allow for a detailed understanding of how income taxation operates.

This paper contributes by providing estimates of existing tax specifications for a diverse set of Canadian households, using administrative data. This approach offers a comprehensive view of the tax system's impact on various household types, enhancing our understanding of income taxation's far-reaching effects.
Guner et al. (2014) provides income and tax statistic and estimates of four common parametric specifications using the administrative dataset in U.S.

We compare Canadian and US income and taxation facts using Guner et al. (2014)

How we differ?

- Introduce a better tax specification
- Include provincial taxes
- Estimate benefit function with refundable tax credits and other benefits
Data and Sample Selections

- Longitudinal Administrative Databank (LAD) (year 2000)

- Sample unit is at household level instead of individual level, because
  - a common ground to compare to Guner et al. (2014)
  - spousal income and tax liabilities directly impact the intra-household decisions
  - include additional estimations using individual level

- As in Guner et al. (2014), we have similar key sample restrictions:
  - have strictly positive income
  - average tax rates are less than the highest statutory marginal tax rate
**Income Definition**

- Our benchmark income notion is *household* income and consist of the following three components:

  **Table: Before Tax Income (BTI) Breakdown**

<table>
<thead>
<tr>
<th>Labour Income</th>
<th>Capital Income</th>
<th>Transfer Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings from T4 slips</td>
<td>Capital gains or losses, net</td>
<td>CPP/QPP benefits</td>
</tr>
<tr>
<td>Indian exemption for employment income</td>
<td>Limited partnership income, net</td>
<td>Employment insurance benefits</td>
</tr>
<tr>
<td>Other employment income</td>
<td>Dividends</td>
<td>Old Age Security pension</td>
</tr>
<tr>
<td>Alimony or support income</td>
<td>Interest and investment income</td>
<td></td>
</tr>
<tr>
<td>Other income</td>
<td>Rental income, net</td>
<td></td>
</tr>
<tr>
<td>2 Self-employment, net income</td>
<td>1 Self-employment, net income</td>
<td></td>
</tr>
<tr>
<td>Pension and superannuation</td>
<td></td>
<td></td>
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<tr>
<td>RRSP income</td>
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</tr>
</tbody>
</table>

- Family Benefit, Provincial refundable tax credit, Child Tax benefit, GST and FST credits are left out from this definition
• Lower income household has higher after tax income (ATI) share than their BTI share
• Top 10% contribute over 30% of the total income
• Gini for BTI (ATI) in Canada is 0.48(0.44) and in the US is 0.59(0.56)
Capital share increase with income in both countries and the share of top incomes are higher in the U.S.

Much larger transfer share in Canada than in the U.S.
Overall, high income households have a larger share of tax liability in the US than in Canada.

Potential reasons: (i) higher income in the US at the top; (ii) higher tax rate in the US.
Parametric Tax Functions

- Parametric tax functions should be easy to analyze and a good fit of the data.

- Four tax specifications + one new specification:
  
  - **Log**: \( t(\tilde{y}) = \alpha + \beta \log(\tilde{y}) \)
  
  - **HSV**: \( t(\tilde{y}) = 1 - \lambda \tilde{y}^{-\tau} \)
  
  - **Power**: \( t(\tilde{y}) = \delta + \gamma \tilde{y}^\epsilon \)
  
  - **GS**: \( t(\hat{y}) = b \left[ 1 - (s\hat{y}^p + 1)^{-1/p} \right] \)
  
  - **Atan**: \( t(\tilde{y}) = \nu + \mu \arctan(\tilde{y}) \)

  where \( t(\cdot) \) is the average tax rate, \( \tilde{y} \) is multiple of mean (before-tax) income, and \( \hat{y} \) is income/1,000.

- We introduce *Atan* form because it can capture bottom and top income tax rate better.

- Beside *Log* and *Atan*, all the other form are estimated using non-linear least squares.
GS fits well except the top 10% group; while atan fits well at the top with small residuals in the middle
Credit and Benefit Tax Rate

- Researchers may want to incorporate also refundable tax credit into the function

- However, above specifications cannot capture the net credit tax rates \( \frac{\text{tax} - \text{benefit}}{\text{Income}} \)

- One solution is combine tax function with benefit function

\[
b(\tilde{y}) = \theta_0 + \exp(\theta_1)\exp(\theta_2\tilde{y})\tilde{y}^{\theta_3}
\]

where \( b(\tilde{y}) \) is the average benefit rate

- Benefit include both refundable tax credit (e.g., Child Tax benefit, GST credit, etc) and other benefit (e.g., GIS, Workers’ compensation payments, Social assistance income)
The function match well at the bottom
Conclusion

- Provide comparison of income and tax statistics for the U.S. and Canada

- Estimate four common parametric tax functions and introduce a new functional form for Canadian tax system

- The new function can match tax rate at both top and bottom income quantiles well, which can be very important in the quantitative analysis of many research

- Further Income and tax statistics and tax function estimates by different family types are provided in the paper
Thank You
Child related deduction and credit reduce tax rate in both countries except for the top.

Reduction in tax rate diminish at lower income in Canada than in the U.S., as household switch to single earner.
Importance of Capturing Top Rates

- Consider an error of +5% in the average tax rates for top 0.1% (∼ $2 Million)

- If labor supply is inelastic, per-capita taxes would ↑ by $943 (∼↑10% original value)

- If labor supply is elastic, total income (GDP) would be reduced by 0.34% by assuming elasticity to be one for high-income earners (see Sillamaa and Veall (2001))

- More calculations can be found in the paper

- These are huge differences which may mislead researchers on quantitative analysis

- Therefore, we believe Atan specification is an important contribution to the literature