BACKGROUND

- A variety of tobacco tax structures are used globally.
- Types of excise tax system:
  - Specific (e.g. per pack or by weight, a minimum tax).
  - Ad valorem (e.g. % of retail prices).
  - Mixed (specific & ad valorem).
- Tax rates can be uniform or vary across price tiers.
- Economic theory predicts that tax structures other than specific uniform are associated with greater price variability and tax avoidance opportunities.
- Recent studies (Chaloupka et al. 2014; Shang et al. 2014) present descriptive evidence that supports this theory.
- Studies that use more rigorous analytical methods and that encompass all common tax structures are needed.

OBJECTIVES

- To examine how cigarette tax structure is associated with price variability.

DESIGN/METHODS

- Data are from the ITC Project surveys across 17 countries during 2004-2013.
- Tax Structure data are from WHO reports.
- Self-reported prices were used to construct the price variability measures.
- Generalized estimating equations (GEE) was used to assess the association.

MEASURES

- Price variability
  - Prices were first ranked from the highest to the lowest.
  - Price variability was measured using the ratio of price gap between percentiles of the median price; 99%-1% 95%-5% 90%-10% and 75%-25% or Interquartile(IQR)-to-medium price ratio.

RESULTS

- Tax structure measures:
  - Dichotomous indicators for specific tiered (India, Brazil prior to 2012), ad valorem uniform (Thailand, Mexico prior to 2009), ad valorem tiered (Bangladesh), mixed uniform (EU, Malaysia, Mexico 2009-), and mixed tiered tax structure (China, Brazil 2012-), with the specific uniform structure (US, Australia, Canada, Uruguay, Mauritius, and Republic of Korea) being the omitted category.
  - Percentage of specific component among total excise taxes and a dichotomous indicator for a tiered structure.
  - Controlled for a EU dummy (tax structure is subject to same criteria), a dummy for sub-national taxes (Canada, US, India), with year as a fixed effect.
  - On average, the share of specific component among total excise taxes is 63.48 (thus ad valorem share is 36.52) percentage points.
  - 19.9% of the sample has a tiered tax structure.
  - Results, dichotomous measure for each type of tax structure:

<table>
<thead>
<tr>
<th>Price Variability</th>
<th>%75-25%</th>
<th>%90-10%</th>
<th>%95-5%</th>
<th>%99-1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Uniform-Omitted, (N=78)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiered</td>
<td>0.19***</td>
<td>0.60**</td>
<td>1.03***</td>
<td>1.37***</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.30)</td>
<td>(0.38)</td>
<td>(0.45)</td>
</tr>
<tr>
<td></td>
<td>[0.85]</td>
<td>[1.01]</td>
<td>[1.28]</td>
<td>[1.01]</td>
</tr>
<tr>
<td>Ad Valorem Uniform</td>
<td>0.03</td>
<td>0.01</td>
<td>0.28</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.15)</td>
<td>(0.23)</td>
<td>(0.41)</td>
</tr>
<tr>
<td></td>
<td>[0.12]</td>
<td>[0.01]</td>
<td>[0.35]</td>
<td>[0.26]</td>
</tr>
<tr>
<td>Ad Valorem Tiered</td>
<td>0.69***</td>
<td>0.67**</td>
<td>1.49***</td>
<td>1.45***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.11)</td>
<td>(0.15)</td>
<td>(0.18)</td>
</tr>
<tr>
<td></td>
<td>[2.89]</td>
<td>[1.13]</td>
<td>[1.86]</td>
<td>[1.06]</td>
</tr>
<tr>
<td>Mixed Uniform</td>
<td>0.09***</td>
<td>0.45**</td>
<td>0.36*</td>
<td>0.60**</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.20)</td>
<td>(0.19)</td>
<td>(0.29)</td>
</tr>
<tr>
<td></td>
<td>[0.40]</td>
<td>[0.75]</td>
<td>[0.45]</td>
<td>[0.44]</td>
</tr>
<tr>
<td>Mixed Tiered</td>
<td>0.39**</td>
<td>0.38</td>
<td>0.85</td>
<td>3.43</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.48)</td>
<td>(0.66)</td>
<td>(1.00)</td>
</tr>
<tr>
<td></td>
<td>[1.71]</td>
<td>[0.64]</td>
<td>[1.06]</td>
<td>[2.51]</td>
</tr>
</tbody>
</table>

* p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01. Marginal effects or coefficients are reported. Standard errors clustered at the country level are reported in parentheses and corresponding elasticity estimates are reported in square brackets.

- A 10% increase in the share of specific taxes among total excises is associated with a 4.3% decrease in the IQR-to-median ratio (p≤0.1).
- A 10% increase in the share of specific components in total excises is associated with a 2.8-4.3% lower price variability.
- A tiered tax structure is associated with a 147% increase in the IQR-to-median ratio (p≤0.01).
- A tiered structure is associated with a 61-147% higher price variability.

RESULTS (CONTINUED)

- A mixed uniform structure is associated with 40-75% greater price variability.
- A specific tiered structure is associated with 85-128% greater price variability.
- An ad valorem tiered structure is associated with 106-289% greater price variability.
- A mixed tiered structure is associated with 171-250% greater price variability.
- Results, percentage of specific component among total excise taxes and a dichotomous measure for tiered structure (mixed/ad valorem/specific):

<table>
<thead>
<tr>
<th>Price Variability</th>
<th>%75-25%</th>
<th>%90-10%</th>
<th>%95-5%</th>
<th>%99-1%</th>
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<tbody>
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<td>Specific Uniform-Omitted, (N=78)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiered</td>
<td>-0.01***</td>
<td>-0.02***</td>
<td>-0.004***</td>
<td>-0.006*</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.004)</td>
</tr>
<tr>
<td></td>
<td>[-0.43]</td>
<td>[-0.28]</td>
<td>[-0.36]</td>
<td>[-0.33]</td>
</tr>
<tr>
<td></td>
<td>0.33***</td>
<td>0.37**</td>
<td>0.83***</td>
<td>1.88**</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.18)</td>
<td>(0.24)</td>
<td>(0.78)</td>
</tr>
<tr>
<td></td>
<td>[1.47]</td>
<td>[0.61]</td>
<td>[1.04]</td>
<td>[1.39]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% of specific</th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Sub-national</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tiered</td>
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</tbody>
</table>

- Compared with a specific uniform structure, tiered (specific, mixed and ad valorem) and mixed uniform structures are positively associated with price variability.

CONCLUSIONS

- Complicated tax structures that depart from a specific uniform structure are associated with greater price variability of cigarettes.
- Countries that impose a specific uniform tax structure, that increase their reliance on specific excise taxes, and/or switch from tiered to uniform tax rates, will reduce price variability.
- These results support the proposition that specific uniform tax structure is the most effective tax structure for reducing tobacco consumption and prevalence.