Taxation of the income from intellectual property and government tax competition

Rachel Griffith, Helen Miller, Martin O’Connell
Motivation – UK plan for growth

• The Plan for Growth – plan to achieve strong, sustainable and balanced (long run) growth

• Key aim: ‘create the most competitive tax system in the G20’
  – introduced a relatively low statutory corporate tax rate
  – introduce a Patent Box (a reduced rate for patent income)

• Less ambitious on science spending
  – £4.6bn science budget frozen in cash terms (~10% real terms cut over 4 years)
  – stark contrast to other countries (inc Germany, France, the US, Singapore and China)
Motivation – taxation of intellectual property

• Important component of firms activity and economic growth
  – since early 1990s UK investment in intangible assets greater than in fixed capital and growing faster

• Income is highly mobile - firms can locate offshore to reduce tax
  – “...most of the assets that are going to be reallocated as part of a global repositioning are intellectual property. ...that is where most of the profit is” - tax lawyer quoted in the New York Times

• Tax can also distort the location and organisation of real activities

• Policy moves
  – modifications to CFC rules in US and UK
  – number of European countries recently introduced ‘Patent Boxes
Patent Box

• Substantially reduced rate of corporation tax for the income derived from patents

• Recently introduced by a number of European countries
  – Belgium 6.8% (full rate, 34%); Netherlands 10% (full rate, 25%); Luxembourg 5.9% (full rate, 39%) UK to introduce in 2013, 10% (full rate, 23%)
Patent Box as an innovation policy

- Original stated aim of UK policy: “strengthen the incentives to invest in innovative industries and ensure the UK remains an attractive location for innovation”

- Poorly targeted - targets income from ideas, not the activity that generates new ideas

- Research can be located separately from income
  - unclear that attracting IP will also attract innovative activities

- Implementation difficulties / significant revenue cost / large deadweight cost / benefits accrue to a small number of firms / distorts the decision to invest in patentable technologies
Patent Box as a preferential rate for mobile income

- Corporate tax changes reduce the burden on mobile firms
  - trade off in setting a single rate

- Patent Box set explicitly lower rate for important form of mobile income

- Mirrlees review: “In principle, it would be efficient to tax rents from relatively immobile activities at a higher rate than rents from more mobile activities”
The location of IP and government tax setting

- **Aim:** provide empirical evidence on how responsive the location of IP is to corporate tax and model a process of government tax setting

- **Firm behavior – Griffith, Miller and O’Connell (2011)**
  - estimate the responsiveness of the location of IP to corporate tax
  - explicitly allow for heterogeneity responsiveness to tax

- **Government tax setting – work going forward**
  - consider governments’ objectives in setting preferential rates
  - account government responses
Firm behaviour - location and taxes

Multinational Headquarters location
*Treatment of foreign source income*
*Corporate income tax*

Location of innovation
*Corporate income tax*
*R&D tax credits*

Location of IPR holdings
*Corporate income tax*
*Patent box*

Location of production
*Corporate income tax*

CFC regime

Royalty treatment (Withholding rates)
Firm behaviour - location and taxes

- **Location of production**
  - Corporate income tax

- **Location of IPR holdings**
  - Corporate income tax
  - Patent box

- **Location of innovation**
  - Corporate income tax
  - R&D tax credits

- **Multinational Headquarter location**
  - Treatment of foreign source income
  - Corporate income tax

**CFC regime**

- **Location of production**
  - Corporate income tax

**Royalty treatment (Withholding rates)**
Firm behaviour - location and taxes

• Model of firm location choice (discrete choice demand model)
• Estimate the impact of corporate taxes on innovative European multinationals’ choices over where to hold patents
• Expect considerable heterogeneity in where patents are located and how responsive such choices are to tax
  – benefits and costs of choosing a lower tax location may differ with expected value of patent
  – firms face different costs of locating patent income - organisational structure; strategies; headquarter countries; markets.
  – non-tax characteristics of countries
  – explicitly allow for unobserved heterogeneity (random coefficients)
• Allow for Controlled Foreign Company (CFC) rules
Data: Firms, patents and taxes

- Location of Intellectual Property – data on EPO patent applications
  - address of subsidiary that made application

- Multinational firm ownership structure from accounts data
  - result: European parent firms and their patent applications held in European and US subsidiaries

- Taxes
  - statutory corporate rate in source country
  - CFC regime operated in home country
    - define source countries deemed to be ‘low tax’ country
  - observed Patent Boxes rates used in simulations
Model of firm behaviour; results

- Tax does affect location of patent holding
  - important to account for interactions between tax jurisdictions (CFC)
  - significant heterogeneity in the responsiveness of patents’ location to tax (including important variation along unobserved characteristics)
  - estimate the own and cross tax elasticities
## Own and cross tax elasticities market elasticities

<table>
<thead>
<tr>
<th>Location country</th>
<th>Belgium</th>
<th>Denmark</th>
<th>Finland</th>
<th>France</th>
<th>Germany</th>
<th>Ireland</th>
<th>Italy</th>
<th>Luxembourg</th>
<th>Netherlands</th>
<th>Norway</th>
<th>Spain</th>
<th>Sweden</th>
<th>Switzerland</th>
<th>UK</th>
<th>US</th>
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</thead>
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## Market elasticities (subset of countries)

### Country changing tax rate

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Effect of Patent Boxes: share of new patent applications

- Netherlands: 25% (No Patent Boxes)
- Belgium: 5% (Benelux Patent Boxes)
- Luxembourg: 1% (Plus UK Patent Box)
- UK: 10% (No Patent Boxes)
Effect of Patent Boxes: share of new patent applications

- Netherlands
- Belgium
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Effect of Patent Boxes: share of new patent applications

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Revenue maximizing governments

- Model of strategic government tax setting

- Set a separate tax rate for the income from intellectual property to maximise income from intellectual property
  - can extend to allow for benefits in addition to revenue
  - and can relate to a more general model with two tax bases

- It will matter how firms and other governments respond
  - seen firm responses; they are a function of all governments tax rates
  - different possible assumptions about the form of strategic interactions between governments
Model of government tax setting

- Government objective function:

\[
\max_{\tau_{jt}} R_{jt} = (\tau_{jt} + \lambda_{jt}) s_{jt}(\tau_{jt}, \tau_{-jt}) M_t
\]

- \(\tau_{jt}\) : tax rate on the income from intellectual property
- \(\lambda_{jt}\) : (non-tax) marginal benefits, in revenue equivalent terms
- \(s_{jt}(\tau_{jt}, \tau_{-jt}) M_t\) : tax base - share of total (European) income from intellectual property located in country

- First order condition

\[
\frac{dR_{jt}}{d\tau_{jt}} = (\tau_{jt} + \lambda_{jt}) \frac{\delta s_{jt}(\tau_{jt}, \tau_{-jt})}{\delta \tau_{jt}} + s_{jt}(\tau_{jt}, \tau_{-jt}) = 0
\]
Revenue maximizing governments

• Revenue maximising tax rates are such that:

\[
- \frac{\tau_{jt}^*}{s_{jt}(\tau_{jt}^*, \tau_{-jt})} \frac{\delta s_{jt}(\tau_{jt}^*, \tau_{-jt})}{\delta \tau_{jt}^*} = \varepsilon_{jt} = 1
\]

• Own tax elasticities range from –1.5 to –0.6; –1.18 for UK
  – close to one for most countries suggests that observed statutory tax rates are relatively close to revenue maximising

• Implies that introducing patent boxes will result in a revenue loss
  – UK treasury estimates revenue cost of £1.1 billion p.a.
  – our estimates also suggest a substantial revenue loss from initial Patent Box introductions
Tax revenue (indexed to 100 before Patent Boxes)
Revenue maximizing governments

• Implies that introducing patent boxes will result in a revenue loss
  – UK treasury estimates revenue cost of £1.1 billion p.a.
  – our estimates also suggest a substantial revenue loss
  – would increase if, in equilibrium, other governments also introduced Patent Boxes

• Is income more mobile than we estimate?
  – income may have become more mobile (esp in small open economies)
  – would need large (differential) increases to justify Patent Boxes as revenue maximising
Where are the benefits?

- Government objective function accounting for other benefits aside from revenue

- Benefits from the location of real activities
  - importance of benefits depends on the interpretation of the tax base
  - possible spillovers between innovative activities

- Benefits from revenues of the other tax base
  - revenues from real activities in general CT receipts
  - a separate rate for mobile income to preserve revenues from less mobile activity?
An efficient way to raise revenues?

• A single statutory tax rate for all income implies a trade-off

• Theoretical results on desirability of preferential rates depend on assumptions: can be shown lead to higher or lower overall revenues

• In practice
  – mobile income subject to lower effective rates
  – but explicit differentiation difficult to implement (requires that mobile base can be accurately identified and profits not artificially shifted into it)
  – discouraged by international agreements – concerns over tax competition
Where are the benefits?

• reduced corporate tax revenue for the government represents a reduced tax burden for the firms that hold patents
• some large firms that stand to receive large gains
  – patenting is highly skewed - a relatively small number of firms hold a disproportionate share of patents
Where are the benefits?

<table>
<thead>
<tr>
<th>Five largest filers</th>
<th># EPO patent applications by UK applicants</th>
<th>% of all EPO patent applications by UK applicants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilever plc</td>
<td>1,120</td>
<td>7.80%</td>
</tr>
<tr>
<td>GlaxoSmithKline</td>
<td>713</td>
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<tr>
<td>BT Group plc</td>
<td>385</td>
<td>2.70%</td>
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<tr>
<td>Rolls-Royce plc</td>
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<tr>
<td>QinetiQ Limited</td>
<td>271</td>
<td>1.90%</td>
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<tr>
<td><strong>Total of top five</strong></td>
<td><strong>2,838</strong></td>
<td><strong>19.80%</strong></td>
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</tbody>
</table>
Conclusions

• Evidence that the location of firms intellectual property responds to tax
  – accounting for heterogeneity is important

• Patent Boxes are not maximising the revenue that governments raise from intellectual property
  – possible that there other benefits from the co-location of real activities
  – unclear whether the Patent Box will be an efficient way to tax a mobile form of income or a road to tax competition
  – some firms will have large gains