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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"*

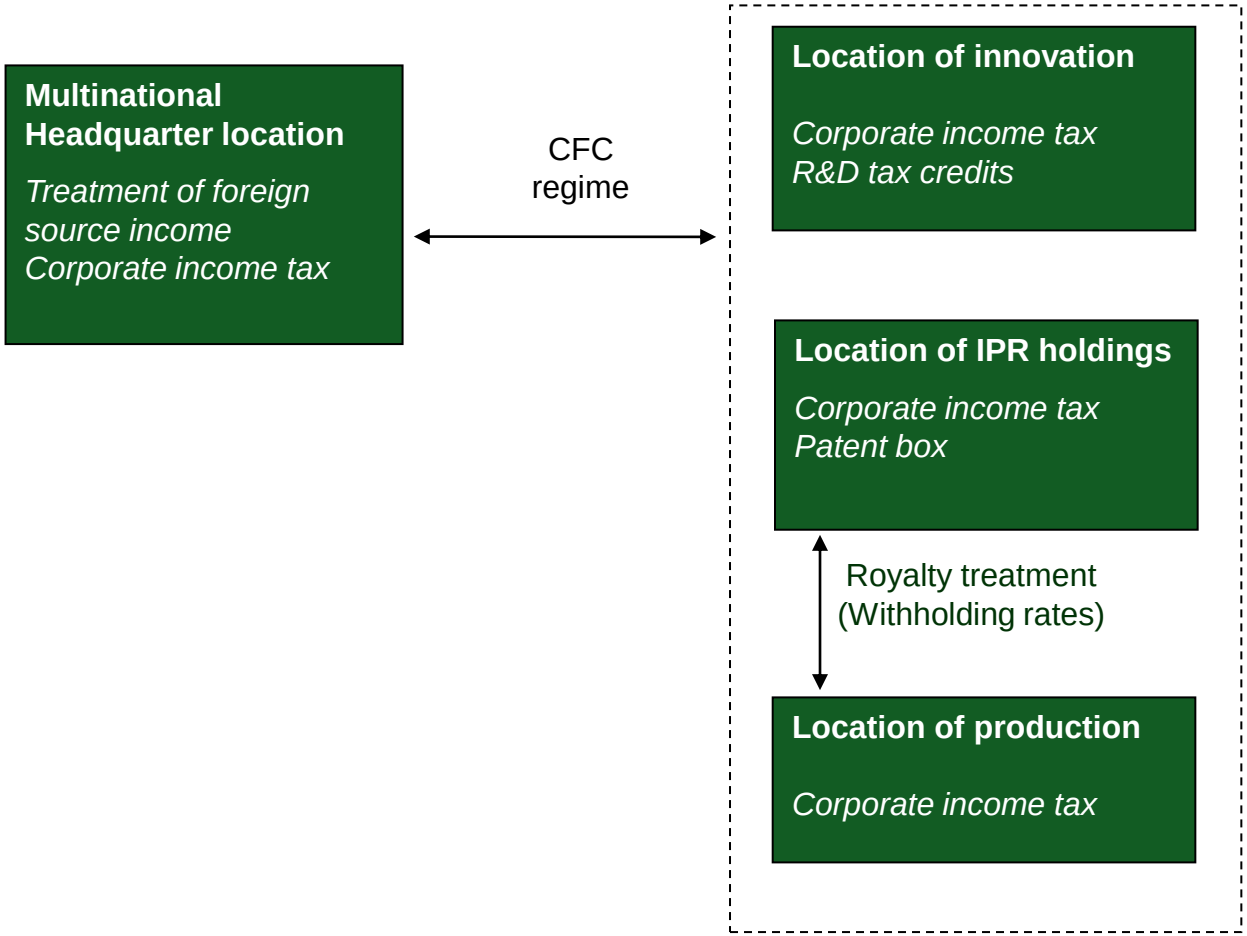
The location of IP and government tax setting

- 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



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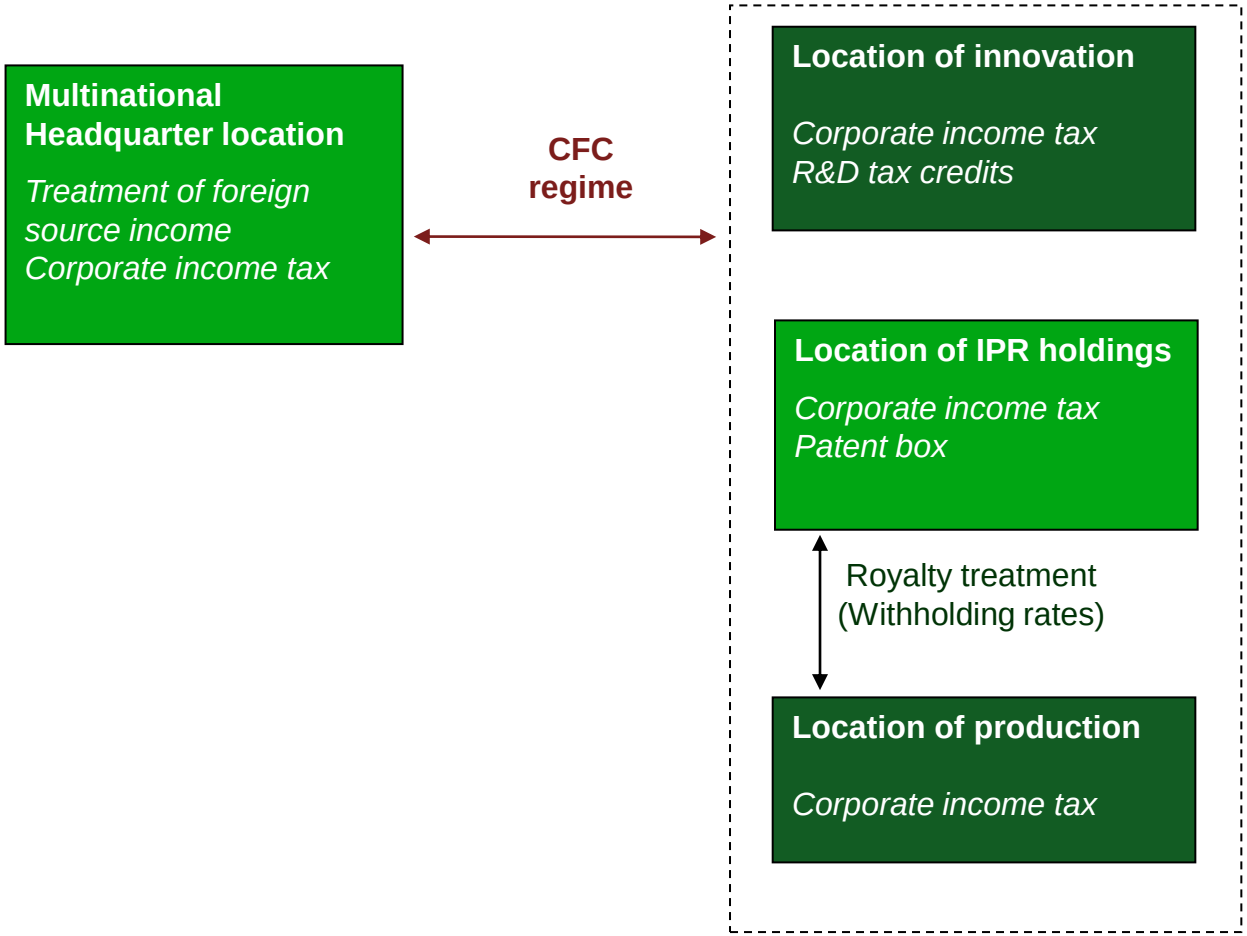

Firm behaviour - location and taxes

- 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 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

	Country changing tax rate														
Location country	Belgium	Denmark	Finland	France	Germany	Ireland	Italy	Luxembourg	Netherlands	Norway	Spain	Sweden	Switzerland	UK	US
Belgium	**-1.006**	0.031	0.051	0.171	0.026	0.001	0.042	0.006	0.168	0.006	0.004	0.080	0.111	0.143	-0.012
Denmark	0.064	**-1.375**	0.056	0.261	0.076	0.001	0.089	0.011	0.228	0.011	0.007	0.109	0.193	0.257	0.038
Finland	0.055	0.030	**-1.568**	0.471	0.112	0.001	0.062	0.005	0.486	0.006	0.004	0.193	0.147	0.202	0.054
France	0.030	0.023	0.077	**-0.917**	0.035	0.000	0.031	0.003	0.232	0.004	0.002	0.097	0.095	0.124	0.000
Germany	0.011	0.016	0.046	0.087	**-0.642**	0.000	0.016	0.003	0.109	0.004	0.002	0.060	0.069	0.080	-0.053
Ireland	0.082	0.081	0.083	0.311	0.094	**-0.768**	0.129	0.017	0.252	0.016	0.014	0.136	0.461	0.318	0.053
Italy	0.028	0.029	0.038	0.117	0.025	0.001	**-0.842**	0.008	0.089	0.008	0.005	0.064	0.091	0.132	-0.014
Luxembourg	0.058	0.056	0.045	0.194	0.074	0.001	0.124	**-1.299**	0.129	0.013	0.010	0.089	0.160	0.242	0.028
Netherlands	0.038	0.025	0.103	0.301	0.056	0.000	0.030	0.003	**-1.067**	0.004	0.002	0.124	0.116	0.148	0.018
Norway	0.061	0.055	0.056	0.249	0.085	0.001	0.115	0.013	0.183	**-1.340**	0.008	0.105	0.168	0.242	0.039
Spain	0.043	0.041	0.040	0.148	0.052	0.001	0.097	0.012	0.090	0.010	**-1.081**	0.068	0.099	0.171	0.018
Sweden	0.052	0.035	0.119	0.365	0.090	0.001	0.063	0.006	0.359	0.007	0.004	**-1.405**	0.146	0.196	0.043
Switzerland	0.069	0.061	0.085	0.336	0.094	0.002	0.087	0.010	0.316	0.011	0.005	0.140	**-0.857**	0.276	0.052
UK	0.052	0.046	0.069	0.258	0.067	0.001	0.073	0.008	0.239	0.009	0.005	0.109	0.160	**-1.181**	0.026
US	-0.007	0.012	0.031	-0.001	-0.075	0.000	-0.013	0.002	0.048	0.002	0.001	0.040	0.058	0.044	**-0.266**

Market elasticities (subset of countries)

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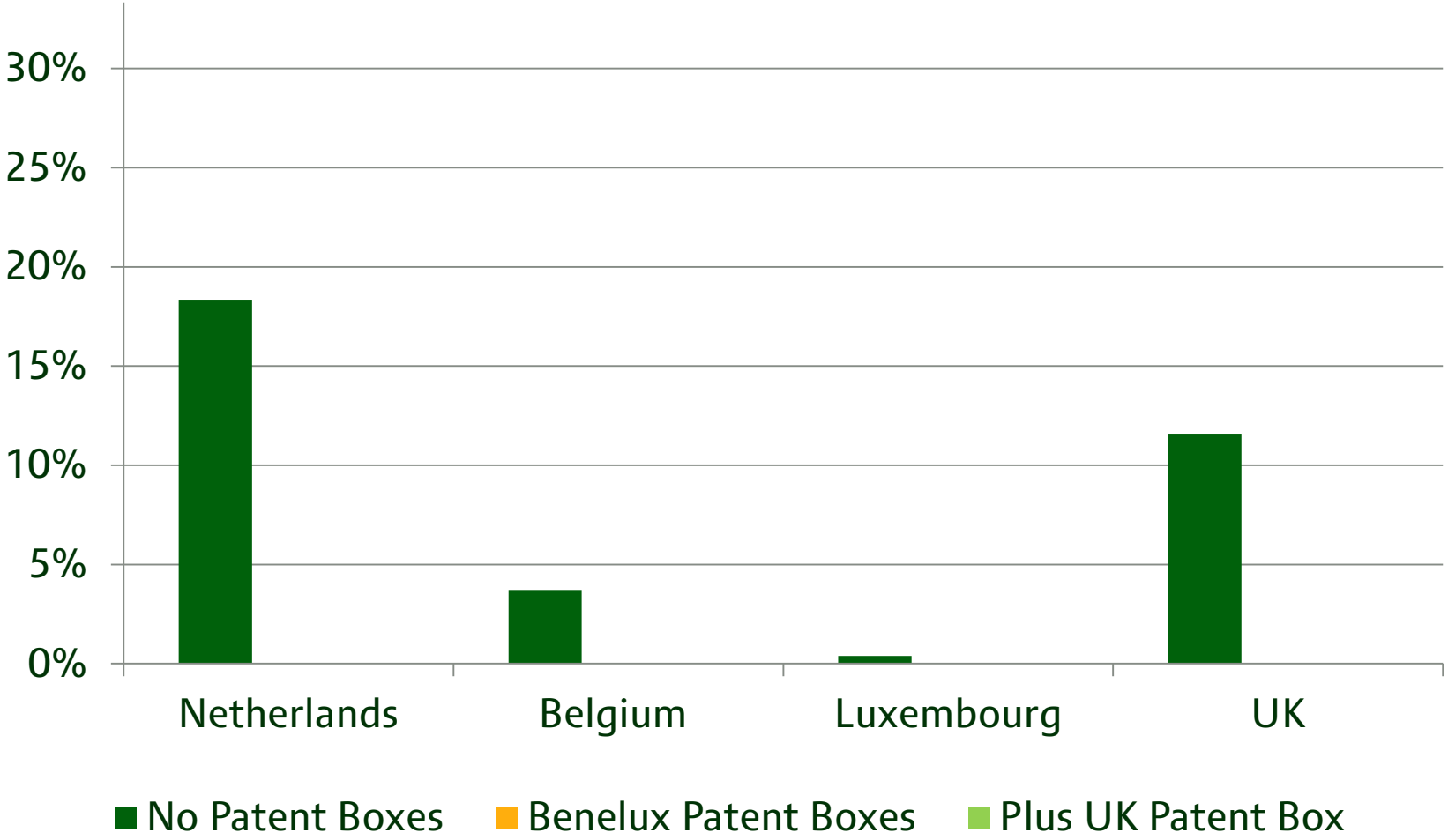
Effect of Patent Boxes: share of new patent applications



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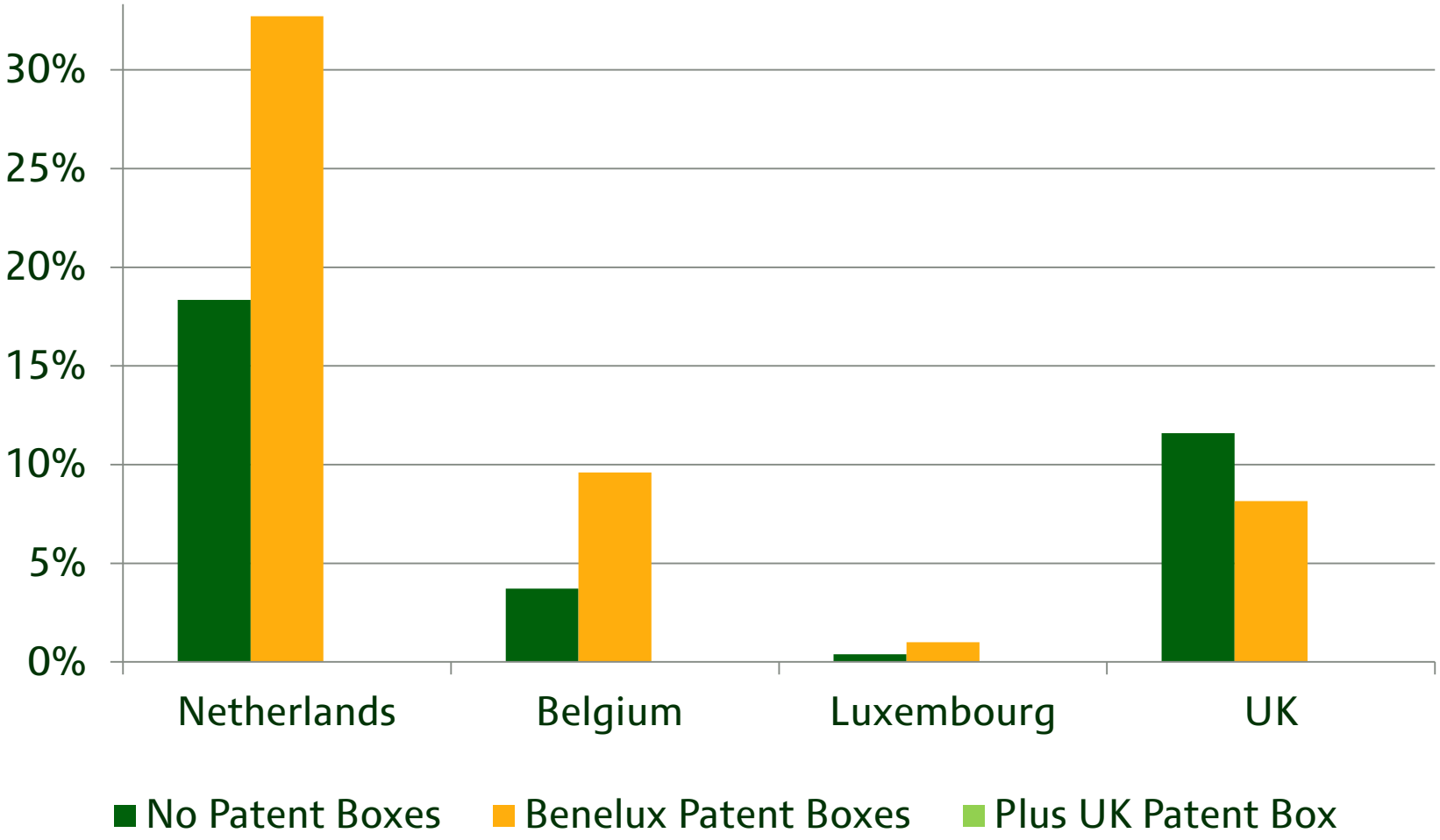

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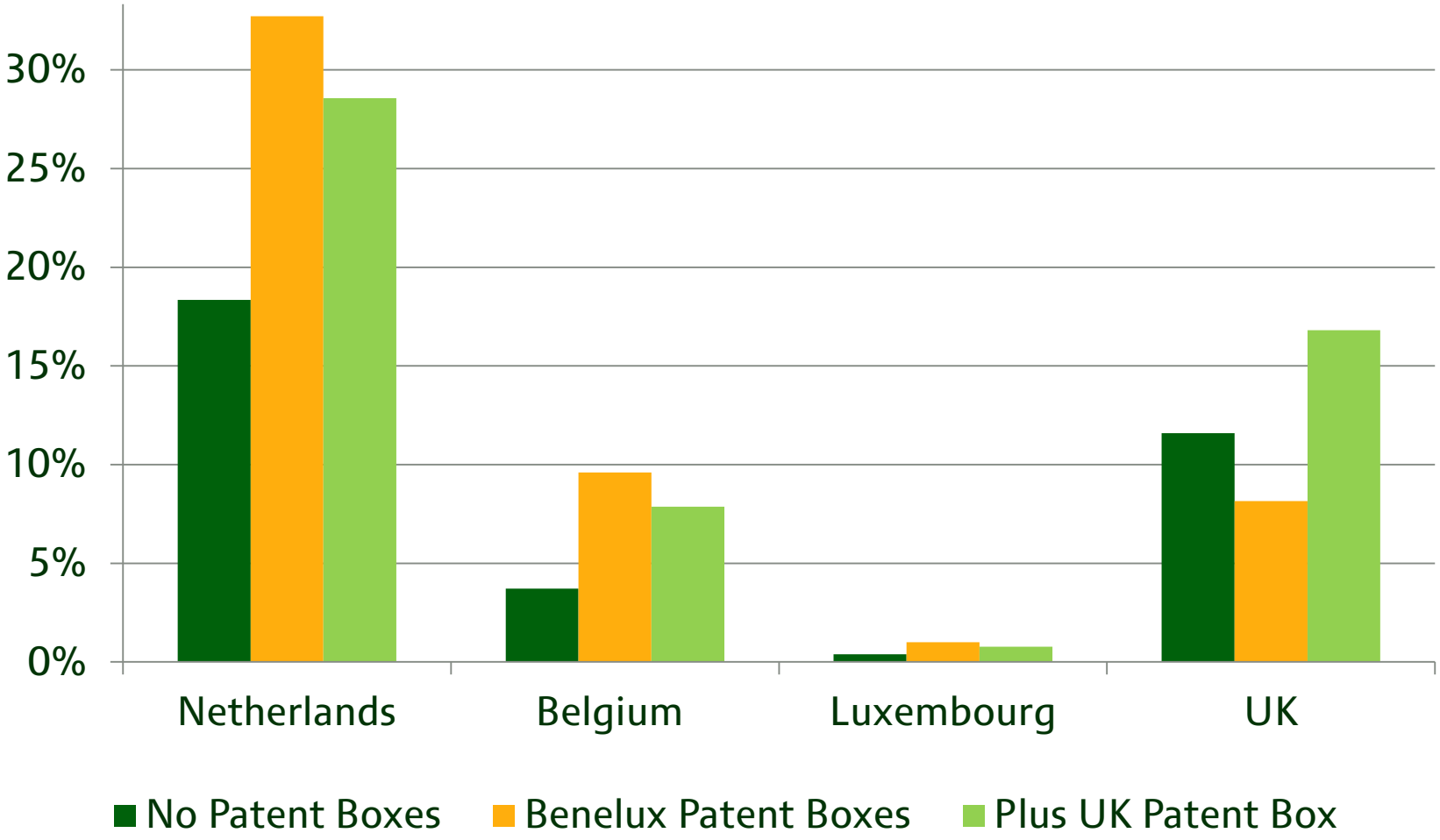

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Revenue maximizing governments

- 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:

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

  - τ_{jt} : tax rate on the income from intellectual property
  - λ_{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

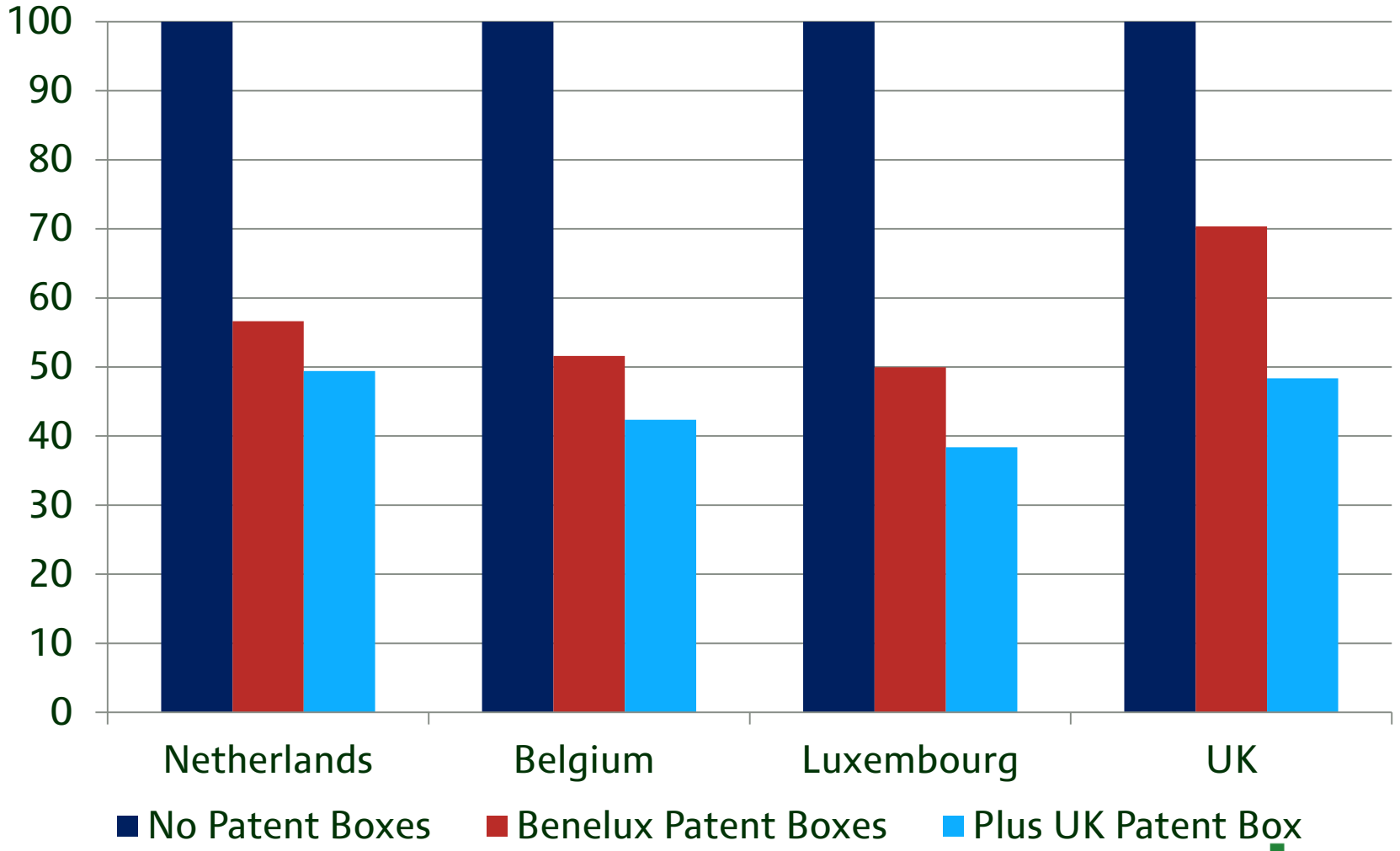
- Revenue maximising tax rates are such that:

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

- 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)



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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?

Five largest filers	*# EPO patent applications by UK applicants* (1)	*% of all EPO patent applications by UK applicants* (2)
Unilever plc	1,120	7.80%
GlaxoSmithKline	713	5.00%
BT Group plc	385	2.70%
Rolls-Royce plc	349	2.40%
QinetiQ Limited	271	1.90%
Total of top five	2,838	19.80%

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