

Patent boxes and patent transfers

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Patent boxes and patent transfers

- tax policy that provides a lower tax rate on income related to intellectual property
- initiated in several European countries, starting in early 1970s and again after 2005; also in China
- discussion in the USA: draft for “innovation box” by Reprs. Charles Boustany (R-LA) and Richard Neal (D-MA)
- skepticism from OECD (Pascal Saint-Amans, Centre for Tax Policy): “a policy that may not be smart” – focal theme in BEPS discussions
- skepticism from CEA (Jason Furman): R&D tax credit preferred over a patent box



Belgium	Malta
Cyprus	Netherlands
France	Portugal
Hungary	Spain
Ireland	Switzerland
Liechtenstein	UK
Luxembourg	© Google Maps



Patent box as innovation policy

Pros and (mostly) cons

- Patent box (or IP box) intended to encourage innovation more broadly than R&D instruments
 - May be especially welcome in the service sector, where there is more innovation without R&D
- Compared to R&D tax credit – output rather than input measure
 - Only for successful investment
 - Does not target a choice variable of the firm
 - Distorts investment even further toward “appropriable” directions (incremental, patentable)
 - Difficulties in allocating income and expenses to innovations covered by patents
 - Rewards “zombie” patents – those that should not have been issued, but will not be asserted (tested) if they are used to obtain reduced taxes



Our paper

Three questions

- Do patent boxes induce transfers of patent ownership to lower tax countries?
 - How is this affected by features of the patent box and other tax regulations?
- Do patent boxes affect the choice of priority country for patent filings?
- Do patent boxes increase patentable invention in a country?



Recent studies on patent boxes

Most studies on applications, two studies on transfers, none on priority filings or subsequent invention

Authors	Year	Version	Level of observation	Dependent variable
Alstadsaeter et al.	2015	WP	firm	Number of EP patent filings by applicant country-tech field
Boehm et al.	2015	WP	Patent	EP applicant/inventor country divergence
Bösenberg & Egger	2015	WP	Country-technology	Number of EP applications and pre-grant transfers by applicant country-tech field
Dudar et al.	2015	WP	Country pairs	Size of royalty streams
Griffith et al.	2014	JPubE	Patent	EP applications by applicant country
Karkinsky & Riedel	2012	JIntE	MNC affiliate	EP applications by applicant country
Koethenbuerger et al.	2016	WP	MNC affiliate	Stated profit before tax by subsidiary
Ciaramella	2017	WP	firm	Granted patent transfers



Basic patent box features

<i>Country</i>	<i>Years with IP box</i>	<i>R&E tax credit@</i>	<i>Includes existing patents</i>	<i>Includes acquired patents</i>	<i>Corp tax rate (statutory)</i>	<i>IP box rate (statutory)</i>
Belgium	2007-	x	yes%	yes%	34	6.8
Cyprus	2012-		yes	yes	10	2.5
France	1971-	x	yes	yes#	34	16
Hungary	2003-	x	yes	yes	20	10
Ireland	1973-2010	x	yes	no	12.5	0
Liechtenstein	2011-		yes	yes	12.5	2.5
Luxembourg	2008-		no	yes	29	5.84
Malta	2010-		yes	yes	35	0
Netherlands	2007-	x	yes%	yes%	25.5	5
Portugal	2014-	x	no	no	31.5	15
Spain	2008-	x	yes	no	30	12
Switzerland	2011-		yes	yes	21	8.8
UK	2013-	x	yes	yes%	22	10

if held for at least 2 years. % if further developed.

@Some kind of R&D tax credit (beyond expensing) available during the period.



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Patent Transfers – Transfer Example

Internationaal Octrooibureau B.V. - P.O. Box 220 - 5600 AE Eindhoven - The Netherlands

European Patent Office
Erhardtstrasse 27
80331 MÜNCHEN
Germany


onderw. re. conc. betr.	doorkiesnummer accès intern dir.	in-dialling Durchwahl	datum, date
PHA 23486 EP EE.	+31 40 27 43505		2003-01-10

REQUEST FOR REGISTRATION OF A TRANSFER (Rule 20(1), EPC)

Re: European Patent Application No. 99202415.8
Applicant: Koninklijke Philips Electronics N.V.
Assignment to BROADBAND ROYALTY CORPORATION

I, the undersigned, hereby request the registration of the transfer of the above-identified European Patent Application to BROADBAND ROYALTY CORPORATION on the basis of the enclosed instrument of assignment.

The Professional Representative



J.L. van der Veer



Further details on the patent box

- Variations in IP covered (sometimes even informal IP)
- Variations in treatment of income and expense
 - Gross income in some countries, rather than net
 - Recapture of past R&D expense deductions in some cases
- Ability of an MNC to use this feature may be affected by CFC rules (home country taxes income received in low tax country at domestic rate)
 - However, much of the transfer is among EU/EEA countries and the ECJ has limited the application of CFC rules within the EEA area.
- In practice, variation in patent box features
 - makes estimation using a patent box as a “natural experiment” somewhat imprecise
 - accounting for the features leaves little variation for identification
- NB: can already transfer patent income to low tax jurisdiction even without a patent box (subject to CFC rules)



Model for aggregate patent transfers

patents transferred from “seller” country S to “buyer” country B

$$E(\#transfers_{S \rightarrow B} | S, B, t, tax) = \alpha_S + \beta_B + \lambda_t + f(tax_{S_t}, tax_{B_t})$$

where t = calendar time.

- Tax variables:
 - Statutory corporate tax rates in B and S
 - Dummies for patent box or difference between corp tax rate and patent box rate in each country
 - Alternatively: difference in corp tax rates and difference in patent box wedge between countries B and S .
- Unit of observation: country pairs at time t
- 37 countries: EU24, NO, IS, CH, US, JP, KR, CA, AU, NZ, CL, MX, TR, IL
- Method of estimation is Poisson with robust standard errors

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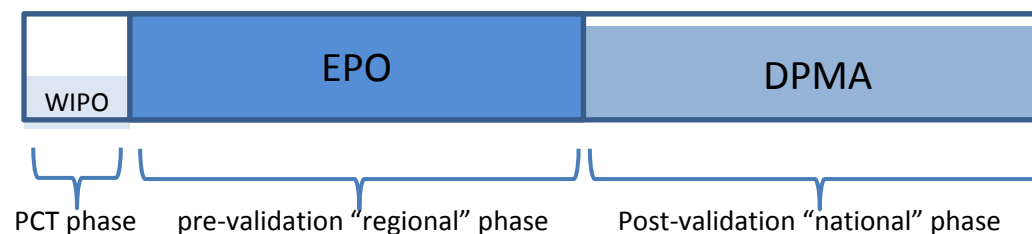
Patent Transfers Data 2016



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Dataset Covers Transfers of European Bundle Patents (EP) 1981-2014

- 1.2 million registered patent ownership transfers
- Patents with „change in ownership information“ in (WIPO), DPMA and EPO data
- Sector allocation: corporations, individuals, universities, non-profit, etc.
- Distinction between market, M&A and intra-group patent transfers
- About 12% of these transfer are cross-country
- For further info, see Gaessler and Harhoff (2016)



Notes: DPMA: German Patent and Trademark Office. EPO: European Patent Office. WIPO: International Bureau of the World Intellectual Property Organization. Only a subset of EP patents experiences a prior PCT phase and not all EP patents are validated in Germany



Patent boxes and patent transfers

Patent Transfer Flows – Europe (2000-2014)

Code	Country	Year patent box introduced	Patents transferred out	Patents transferred in	Difference in patents transfers
AT	Austria		1313	1041	-272
BE	Belgium	2007	1073	1540	467
CH	Switzerland	2011	6049	9354	3305
CY	Cyprus	2012	158	219	61
DE	Germany		12266	9449	-2817
DK	Denmark		1078	861	-217
ES	Spain	2008	398	322	-76
FI	Finland		1611	1838	227
FR	France	1971	4730	4282	-447
GB	UK	2013	8949	4084	-4865
HU	Hungary	2003	127	241	115
IE	Ireland	1973	473	1906	1433
IS	Iceland		28	90	62
IT	Italy		1784	1316	-469
LI	Liechtenstein	2011	306	271	-35
LU	Luxembourg	2008	724	2607	1883
MT	Malta	2010	36	77	42
NL	Netherlands	2007	6068	8023	1955
NO	Norway		452	503	51
PT	Portugal	2014	105	165	60
SE	Sweden		2672	3514	841

- generally positive balance for countries with patent boxes
- exceptions: France, UK



Patent boxes and patent transfers

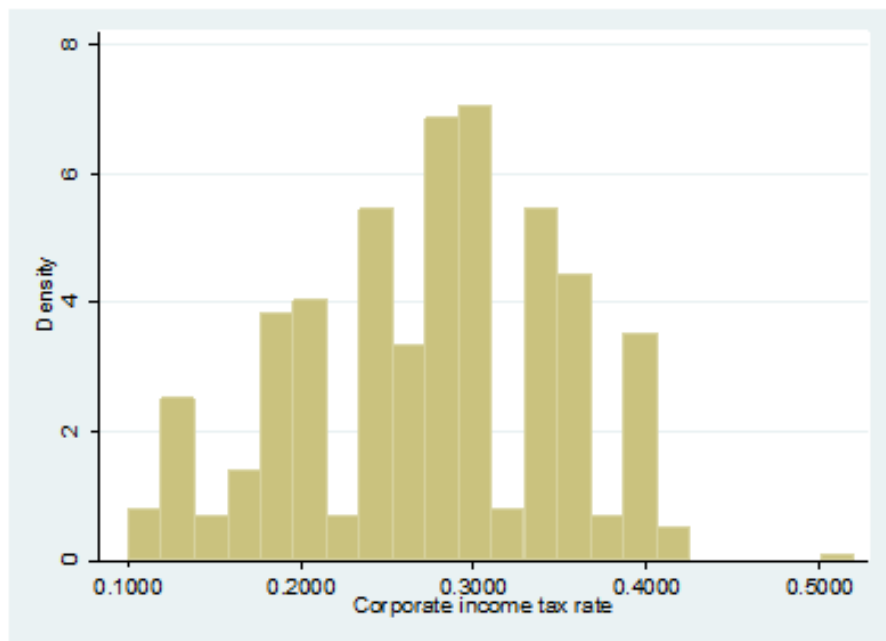
Patent Transfer in and out Flows – Rest of the World and Tax Havens (2000-2014)

Code	Country	Tax haven	Patents transferred out	Patents transferred in	Difference in patents transfers
AU	Australia		1088	503	-586
BB	Barbados	yes	569	1710	1141
BM	Bermuda	yes	205	809	604
BS	Bahamas	yes	44	129	85
CA	Canada		3214	1846	-1368
CW	Curacao	yes	478	527	49
GG	Guernsey	yes	211	269	58
GI	Gibraltar	yes	28	86	58
HK	Hong Kong	yes	145	611	467
IL	Israel		872	643	-228
IM	Isle of Man	yes	105	141	36
JE	Jersey	yes	67	132	66
JP	Japan		4205	2579	-1627
KR	South Korea		528	809	281
KY	Cayman Islands	yes	500	1507	1007
MC	Monaco	yes	70	38	-33
MX	Mexico		62	176	115
NZ	New Zealand		161	78	-83
SG	Singapore	yes	236	1354	1118
US	US		23520	20293	-3227

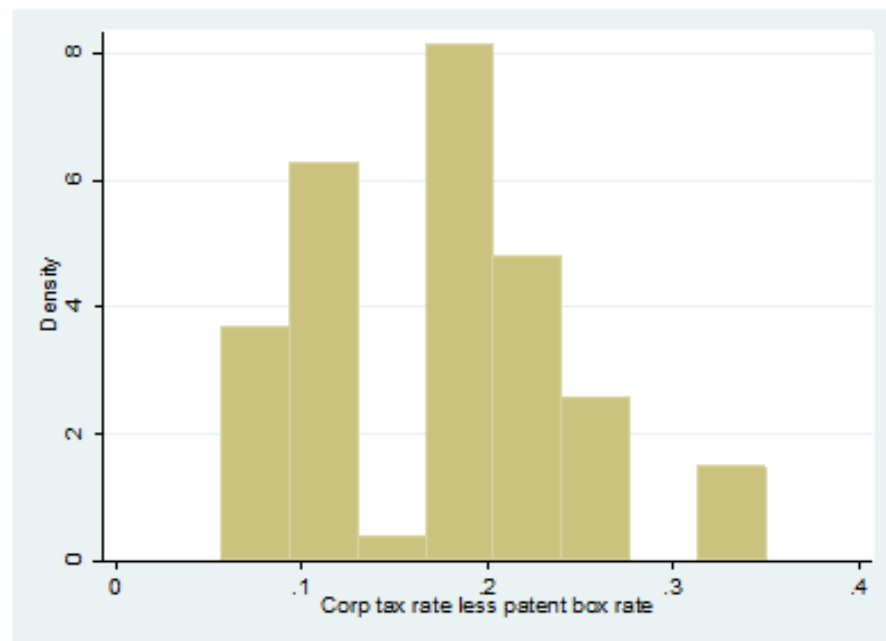
- generally negative balance for large countries (US, JP, CA, AU)
- generally positive balance for tax havens



Tax variables



Statutory corporate tax rate



Corporate tax rate less patent box rate



Aggregate results – patent transfers

Dependent variable: # patents transferred from seller to buyer country during the year

Buyer corp tax rate	1.34 (1.38)	1.54 (1.38)	
D (buyer patent box)	-0.12 (0.15)		
Buyer patent tax wedge		-0.22 (0.84)	
Seller-buyer corp tax		0.83 (0.97)	1.17 (1.06)
Buyer-seller pat tax wedge		0.27 (0.57)	-0.59 (0.59)
D (exist/acq IP included)			-0.00 (0.24)
D (exist/acq)*patbox wedge			3.86*** (1.32)
Seller corp tax rate	2.86** (1.17)	3.00*** (1.16)	
D (seller patent box)	-0.27* (0.16)		
Seller patent tax wedge		-0.98 (0.77)	

19,980 observations on 1,332 country pairs; robust s.e.s clustered on pairs.

All regressions include dummies for buyer and seller countries, and years 2000-2014



Summary of aggregate results

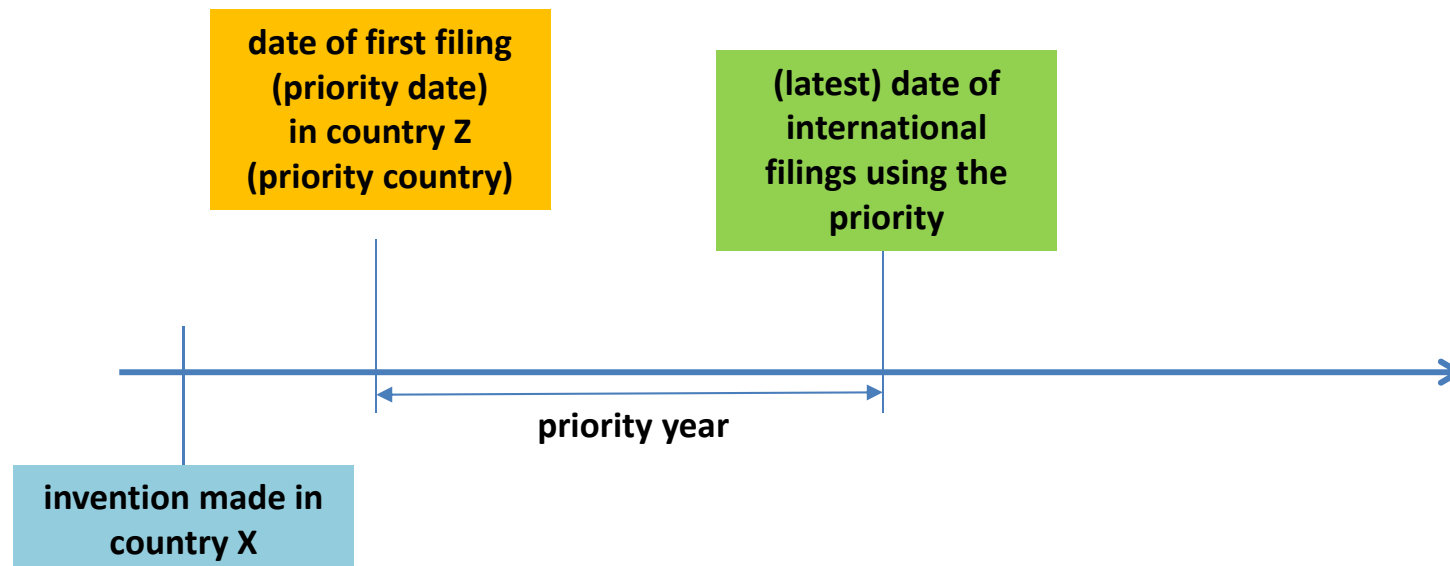
- Seller corporate tax rate remains a strong influence on patent transfer, regardless of the presence of a patent box
- Patent boxes do not seem to encourage transfer to a country unless existing and/or acquired patents are included
 - A 10 per cent increase in patent tax advantage associated with 33 per cent increase in transfers in this case
 - Intra-group transfers show an even stronger effect but are less precise



Patent boxes and patent ownership location

A Different Variable: Inventor/Applicant Country – Priority Country Pairs

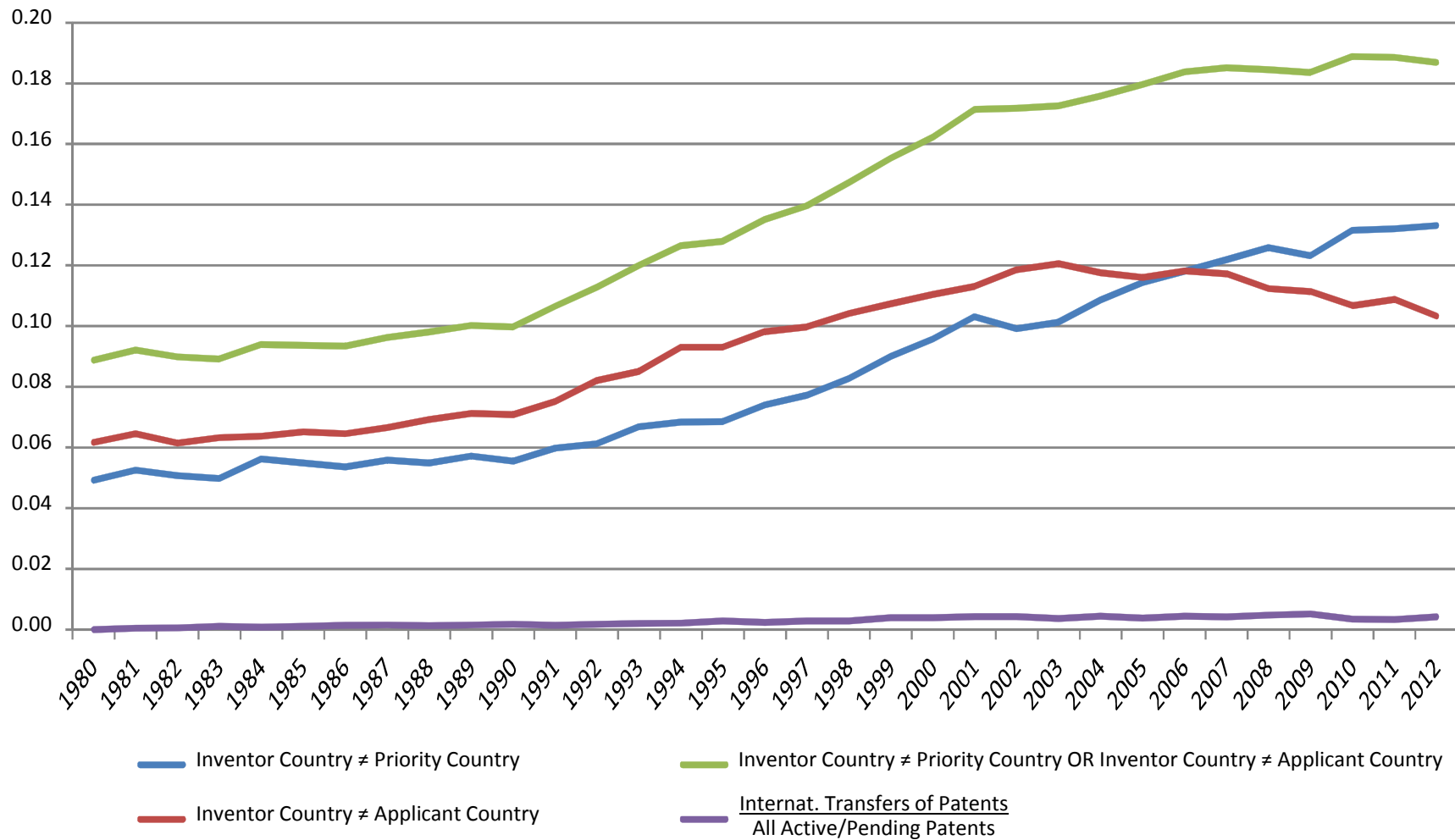
- Applicant (usually a firm or other organization) location can differ from inventor location
- Priority patent office can differ from office of inventor location
- Are these choices affected by tax considerations?



Time Trend: Transfers and Filing Pattern



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Patent boxes and patent location

Inventor Country to Priority / Applicant Country Patent Flows

Dependent variable: Number of patents with inventor country different from priority filing / applicant country (“destination”)

Variable	Priority country	Applicant country
Difference: inventor-destination corp tax	0.04 (0.56)	0.32 (0.27)
Difference: destination-inventor pat tax wedge	0.80*** (.25)	-0.19 (0.21)
Log (patents in inventor country)	1.11*** (0.16)	0.78*** (0.10)
Log (patents in destination country)	1.50*** (0.17)	0.86*** (0.11)
Observations	16,302	19,266
Country pairs	1,254	1,482

All regressions include population, GDP per capita, R&D researchers per pop, and complete sets of dummies for the 37 inventor and destination countries, and years 2000-2013.

Standard errors are clustered on buyer-seller country pairs. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.



Patent boxes and patent location

Summary

- Conditional on priority filing in a country different from inventor country
 - Corporate tax differences do not affect choice
 - Patent boxes affect choice fairly strongly – 10% difference in rate associated with 8% increase in priority filings
- Conditional on applicant location different from inventor location
 - Taxes do not seem to affect choice of applicant location



Patent boxes and invention

- Does the presence of a patent box increase patentable invention in a country?
 - Difficult to see because all countries have a strong upward trend in patents
 - We estimate regressions for the log (EP filings in a country-year) on the patent box, corporate tax rates, log population, log GDP per capita, country and year dummies.
 - We find no impact of the patent box (but the amount of post-box data is limited).



Patent boxes and invention

Dependent variable: Log (EP filings by inventor country and year)		
D (patent box)	0.02 (0.12)	
Patent box tax wedge		0.41 (0.49)
Corporate tax rate	-2.26* (1.30)	-2.39* (1.29)
Log population	-0.51 (1.54)	-0.47 (1.52)
Log GDP per capita	1.94*** (0.51)	1.97*** (0.50)
Standard error	0.338	0.338

588 observations on 32 countries, 1996-2014

All regressions include a complete set of country and year dummies

Standard errors are robust and clustered on country.



Patent level analysis

- Sample: ~700,000 EP granted patents filed 2000-2012, granted by 2014
- Look at first transfer only
- Hazard rate model of probability of an international transfer as a function of
 - Patent characteristics – family size, claims, forward citations, number of inventors
 - Applicant characteristics – patent portfolio size, D (research active in more than one country), D (corporation, not research active MNC)
 - Dummies for applicant country, technology area (34), application year
- 5,422,310 observations at risk, with 34,473 transfers



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Patent level analysis (preliminary)

Dependent variable: time until first international transfer of patent

	All	Intra-group only
Patent family size (docdb)	0.097*** (0.010)	0.161*** (0.013)
Claims	0.017* (0.009)	0.019 (0.012)
Forward citations	0.022*** (0.007)	0.009 (0.010)
Inventors	0.045*** (0.013)	0.166*** (0.017)
Patent portfolio size	-0.097*** (0.003)	-0.071*** (0.004)
MNC research active	0.500*** (0.017)	0.778*** (0.023)
Corp, not MNC	0.210*** (0.021)	0.157*** (0.031)

A complete set of country, technology area, and application year dummies included in all regressions. Left-out category is individuals and non-profits.

Standard errors are clustered by patent.



Summary

- Do patent boxes induce transfers of patent ownership to lower tax countries? How is transfer affected by features of the patent box and other tax regulations?
 - Transfers respond strongly to seller country corporate tax
 - Also respond to patent boxes, but only if existing/acquired patents included
 - CFC rules do not seem to affect these results (not shown)
- Do patent boxes affect the choice of priority country for patent filings?
 - Yes, fairly strongly
- Do patent boxes affect the choice of applicant country?
 - No
- Do patent boxes increase patentable invention in a country?
 - Not so far, need more data
- Are more valuable patents transferred internationally?
 - Work in progress, but looks like yes



Conclusions

- Some evidence of tax-motivated patent shifting due to patent box
- Little evidence of invention increases in response to patent box
- Effects of BEPS (base erosion and profit shifting project at OECD) and introduction of Nexus principle topics for more research in future.