

# **THE ANATOMY OF DOUBLE TAX TREATIES: COMPLEXITY, GENEROSITY, INFORMATION EXCHANGE AND THEIR EFFECTS**

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# Motivation

“The principal function of income tax treaties is to facilitate international trade and investment by removing – or preventing the erection of – tax barriers to the free international exchange of goods and services and the free international movement of capital and persons.”  
(Hugh and Tillinghast, 1992, p.1)

“The purpose of double taxation conventions is to promote, by eliminating international double taxation, exchanges of goods and services, and the movement of capital and persons.”  
(OECD, 2000, p.50)

“Treaties can offer some benefits for some countries while entailing substantial costs for others.” (Dagan, 2000, p.947)

# Motivation

- **WTO-consistent preferentialism has grown in terms of**
  - Trade agreements (TAs),
  - Investment agreements (IAs)
  - and Tax treaties (TTs).
- **Number of DTTs over time**
  - 1970: 324 (for comparison: 85 BITs; 84 PTAs);
  - 1990: 1,180 (for comparison: 502 BITs; 916 PTAs);
  - 2010: 2,597 (for comparison: 4,112 BITs; 2,855 PTAs).

# Motivation

- **Optimistic view on preferentialism:** benefits to member countries of agreements which ultimately stimulate business activity.
  - DTTs: avoiding double taxation of foreign-earned income and offering better tax provisions than unilateral tax law would.
  - TAs and IAs: reduction of tariffs on imported goods and the increase in transparency about consequences of a violation of property rights to foreign investors.
- **Pessimistic views on preferentialism:**
  - Preferentialism is almost **superfluous** with extensive unilateralism.
  - Preferentialism may **distort** the business activity between members and nonmembers.
  - Bargaining power is not symmetric between signatories so that the benefits are **asymmetric**.
  - Preferentialism may be a **stepping stone** to less distorting multilateral agreements.

# Motivation

- Some – but not all – countries offer unilateral exemption of foreign-earned income from domestic taxation which makes the DT-relief component in DTTs superfluous (but not for all economies).
- DTTs may generate some degree of trade or investment diversion as is commonly mainly discussed in the context of TAs.
- Hard to achieve multilateral tax agreements with bite, and the large number of DTTs might be a stepping stone to the latter.
- The benefits and costs associated mostly with trade preferentialism naturally extend to the world of double taxation and its avoidance policies.

# Motivation

- Much research on
  - content and scope of TAs (see Pelc, 2009; Baccini et al., 2011a,b; Dür et al., 2013) and its effects (see Egger and Nigai, 2014; Egger et al., 2014);
  - content and scope of BITs (see, Adlung and Molinuevo, 2008) and its effects (see Berger et al., 2011).
- This unveiled important features and heterogeneity of bilateralism in these dimensions.
- An analysis of DTTs of a similar depth is not available so far.  
[Earlier work focused on whether they were in place at all or not (see, e.g., Blonigen and Davies, 2002, 2004; Millimet and Kumas (2008); Barthel et al., 2010). Much fewer studies were concerned with the type of relief system DTTs adopted (credit, deduction, or exemption; see Slemrod, 1990; Egger et al., 2006; Huizinga et al., 2012), and whether they contained information exchange clauses or not (see, Elsayyad, 2012).]
- Earlier work on DTTs has typically not covered their content in much detail, and it did not cover a large number of DTTs when doing so.

# This Paper

- In-depth analysis of more than 3,300 DTTs that had been concluded between 187 signatory countries between 1900 and 2013 as well as of 11 OECD model tax treaties (MTTs) that had been formulated between 1963 and 2010.

[Cover all existing and ever-concluded DTTs that had been originally signed in or translated into English language. Of the 11 OECD MTTs, the six of OECD (1998, 2000, 2003, 2005, 2008, 2010a) are available electronically on the OECD's webpage, while the other ones are available in hard copy from the OECD's library.

Primary aim of the OECD Model Tax Convention on Income and Capital is to settle the most frequent problems related to double taxation by means of a common basis (see OECD, 2010b). When in 1963 the OECD published its first version of a model tax convention, about 200 DTTs had been signed between countries. In 2013, after 10 revisions of the OECD MTT and 50 years later, there were about 3,000 mostly bilateral DTTs in place. Amongst the most important revisions of the MTT are the decision on periodic updates in 1990 and the taking into account of non-OECD member countries' positions since 1997. The vast majority of those DTTs departed from the OECD MTT. The OECD estimates the number of DTTs influenced by its MTT to be about 3,000 (see the OECD Observer, available under:

[http://www.oecdobserver.org/news/archivestory.php/aid/2756/OECD\\\_Model\\\_Tax\\\_Convention.html](http://www.oecdobserver.org/news/archivestory.php/aid/2756/OECD\_Model\_Tax\_Convention.html) accessed on October 13, 2015). In 1990, the United Nations published an MTT of their own. However, unlike the OECD's this convention, which is very similar to the OECD MTT, never gained importance as a blueprint for the conclusion of actual bilateral DTTs.]

# This Paper

- Detailed assessment of DTT content through text analysis.  
[Status of DTTs, their length, the number of articles covered, the measurable content (e.g., withholding tax rates specified therein; the specification of information exchange; the specification of the form of double-taxation relief such as credit, deduction, and exemption, etc.), and their similarity to (or deviation from) the prevailing OECD MTT norm.]
- Study cultural, economic, geographical, historical, institutional, and political drivers of DTT complexity including deviations from OECD MTTs, preference margins extended in DTTs (treaty generosity), and the presence and nature of information-exchange provisions in DTTs.



# This Paper

- Analyze how number of affiliates held by headquarters bilaterally as one measure of MNE activity responds to DTT characteristics – again focusing on complexity, generosity, and the presence and nature of information-exchange provisions.
- Document large degree of heterogeneity in existing DTTs, and demonstrate that, on average, number of foreign affiliates held by headquarters at a bilateral level is reduced by an increase in DTT complexity while it is raised by DTT generosity and even, to a lesser extent, by deeper information-exchange provisions, all else equal. This heterogeneity is about effects of DTTs on actual signatory countries. [Evidence of the heterogeneity of effects of the DTT-treatment effect on DTT-treated country-pairs, where this heterogeneity flows from observable features of DTTs.]

# Three Relevant DTT Features

- DTT complexity  
[length, clarity, and similarity to model tax treaties]
- DTT generosity  
[extent of preference margins granted within treaties, i.e., the degree of double-taxation relief]
- Information exchange in DTTs  
[the existence and extent of it in a DTT]
- Each of these dimensions is reflected in several measures which are correlated to a nontrivial degree with each other.
- To reduce dimensionality and facilitate identifiability of effects, distill most important common feature (the **first principal component:  $P_c, P_g, P_e$** ) for each – complexity, generosity, and information exchange – based on numerous ingredients.

# Approach

- **Step 1** – Measure DTT characteristics by matrices  $\mathbf{M}_c, \mathbf{M}_g, \mathbf{M}_e$  and distill respective principal components  $\mathbf{P}_c, \mathbf{P}_g, \mathbf{P}_e$ .
- **Step 2** – Explain principal components  $\mathbf{P}_c, \mathbf{P}_g, \mathbf{P}_e$  by suspect characteristics (“instruments”) of countries/country pairs (including linguistic complexity).
- **Step 3** – Explain affiliates per headquarters in end-of-period cross section,  $\text{affphq}_{ij}$ , by instrumented  $P_{cij}, P_{gij}, P_{eij}$  and other characteristics  $\mathbf{X}_{ij}$  in an exponential-family regression model.

# Data – Basics

- All DTTs in English language contained in the International Bureau of Fiscal Documentation's (IBFD's) Tax Treaties Database that had been concluded up until 2013.
- Of all DTTs enforced until the end of 2013,
  - Text not available for 154 from IBFD.
  - Text only exists in another language than English for 331 (Arabic, French, Russian, and Spanish DTTs).
- General structure of those DTTs is similar. Information about conclusion date, the date of entry into force, the date from which onwards the DTT effectively applies, and the termination date in case the DTT expired or was replaced by another one at the beginning.
- Regarding dates, focus on the year a DTT effectively entered in force.

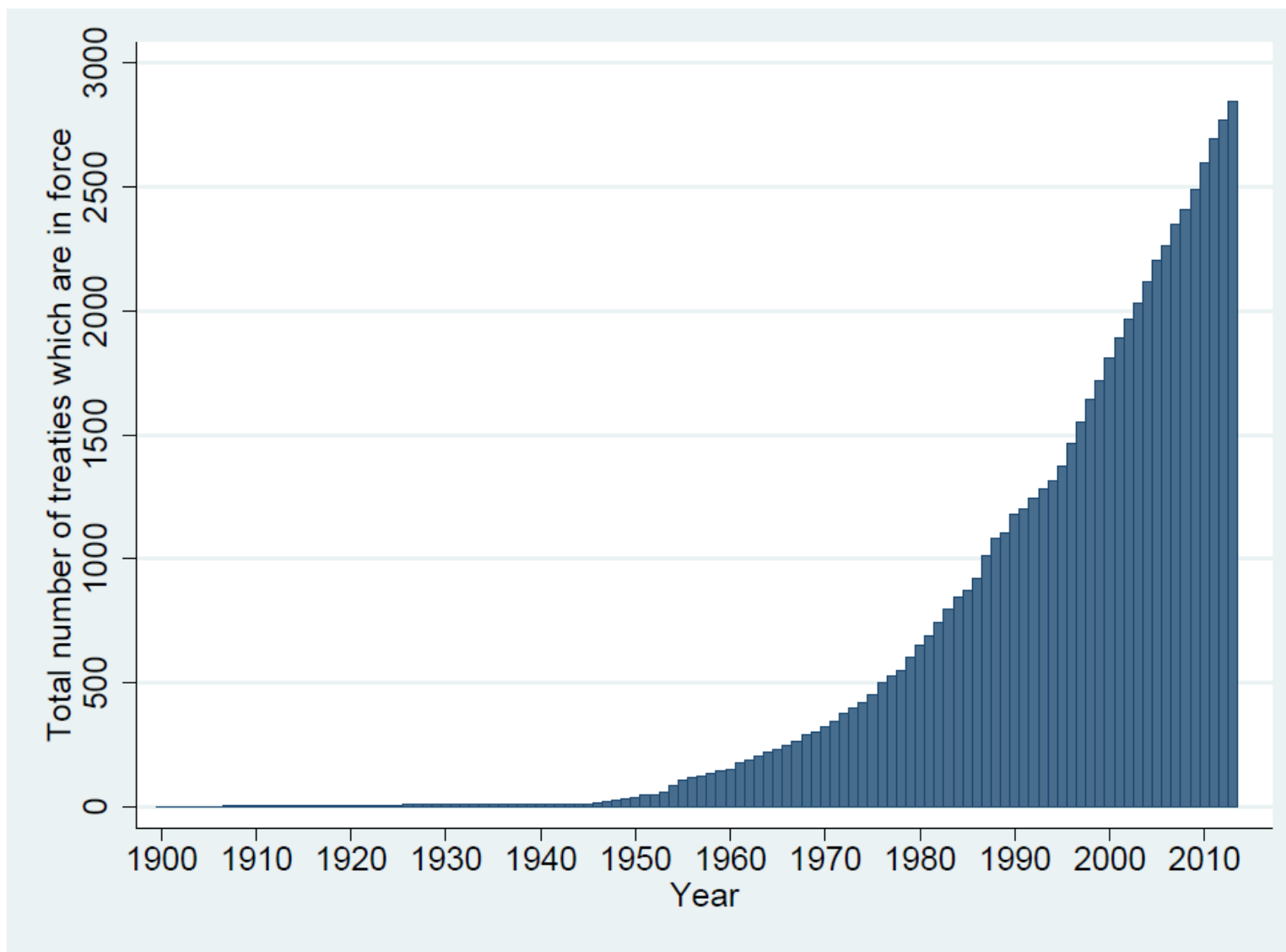
# Data – Information Extraction

- **Treaty complexity:**  
length of a treaty, the number of articles contained, and other characteristics.
- **Treaty generosity:**  
aspects of mode (deduction, credit, exemption) and extent of double-taxation relief (covering withholding tax rates on various tax bases including royalty, dividend, and interest payments). Information about mode of DT relief is contained in Article 23 of DTTs formulated in English language. Information on DTT generosity regarding dividend, interest, and royalty payments is contained in Articles 10-12 of the covered treaties.
- **Information exchange:**  
extent, scope, and automatism at which information about relevant parties is shared among involved governments. Rules agreed on the exchange of information are contained in Article 26 of the covered treaties.

# Data – Descriptive Features

- Top-three users of the DTT instrument are European countries, namely the United Kingdom (123), France (122), and Switzerland (105).
- Shift in the geography of DTTs in force:
  - most DTTs up until the 1990s had been concluded among European countries;
  - much of the activity has been shifted towards DTTs where one party is Asian and the other one is European by 2010:
    - political disintegration (through the break-up of the Soviet Union) and the economic rise of Asia is now also reflected in the size of its DTT network with the rest of the world
    - Asian economies together had only three DTTs in force in the 1950s, while there were 1,276 DTTs in force involving Asian countries by the end of 2010.
- While in the 1950s and 1970s Europe and America exhausted their relative DTT-network potential the best, the many DTTs enforced within Asia and between Asia and Europe in the 1990s and in 2010 led to a lead of these continents in the exhaustion of the DTT-network potential.

Figure 1: The evolution of DTTs in 1900-2013



In 1900, 1 DTT in English language was in force, while in 2013, 2,845 such DTTs were in force.

Source: International Bureau of Fiscal Documentation (IBFD).

Table 6: Number of DTTs as concluded by continent

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa	0					
1950	America	0	1				
1950	Asia	0	0	0			
1950	Europe	3	11	3	12		
1950	Pacific	0	0	0	5	0	
1950	World	3	12	3	34	5	35
1970	Africa	14					
1970	America	2	4				
1970	Asia	5	5	8			
1970	Europe	58	67	52	89		
1970	Pacific	0	3	4	12	1	
1970	World	79	81	74	278	20	324
1990	Africa	24					
1990	America	12	20				
1990	Asia	17	40	81			
1990	Europe	124	105	329	370		
1990	Pacific	0	5	15	35	3	
1990	World	177	182	482	963	58	1180
2010	Africa	54					
2010	America	22	36				
2010	Asia	125	80	318			
2010	Europe	233	223	720	693		
2010	Pacific	2	9	33	43	6	
2010	World	436	370	1276	1912	93	2597

Notes: The table shows the number of treaties concluded within or between continents in four different years.



Table 7: Number of normalized DTTs as concluded by continent

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa	0.00000					
1950	America	0.00000	0.00111				
1950	Asia	0.00000	0.00000	0.00000			
1950	Europe	0.01579	0.00965	0.00329	0.00831		
1950	Pacific	0.00000	0.00000	0.00000	0.06579	0.00000	
1950	World	0.00031	0.00122	0.00031	0.00178	0.00001	0.00357
1970	Africa	0.00723					
1970	America	0.00134	0.00346				
1970	Asia	0.00367	0.00474	0.00832			
1970	Europe	0.03380	0.05053	0.04301	0.05851		
1970	Pacific	0.00000	0.01471	0.02151	0.05128	0.02778	
1970	World	0.00333	0.00342	0.00291	0.00428	0.00004	0.01366
1990	Africa	0.00854					
1990	America	0.00527	0.01082				
1990	Asia	0.00844	0.02448	0.05609			
1990	Europe	0.05999	0.06261	0.22200	0.24326		
1990	Pacific	0.00000	0.00894	0.03036	0.06903	0.01775	
1990	World	0.00512	0.00526	0.01278	0.01172	0.00009	0.03411
2010	Africa	0.01852					
2010	America	0.00947	0.01947				
2010	Asia	0.04724	0.03797	0.13244			
2010	Europe	0.08806	0.10584	0.29988	0.28863		
2010	Pacific	0.00247	0.01395	0.04490	0.05850	0.02667	
2010	World	0.00989	0.00839	0.02712	0.01670	0.00014	0.05889

Notes: The table shows the normalized number of treaties concluded within or between continents in four different years. The entries in the table reflect the number of treaties existing within or between continents over (or normalized by) the number of possible treaties that could have been concluded within or between continents.

# Data – Generic Features

- In principal, effects of DTTs and their characteristics could be thought of as to be identified by four indices:
  - two pertaining to the two signatories,
  - one pertaining to the year of entry into force (or signing),
  - and one pertaining to the year their effects are measured in.
- Hence, in a cross section of outcomes (e.g., MNE activity), DTTs and their effects still vary in three dimensions: two signatory countries and year of entry into force.

# Measuring Treaty Complexity

## Features:

- **length** (number of words contained; a count variable);
- **structure** (number of articles contained; a count variable);
- **protocol** (whether a protocol to a given DTT exist; a binary indicator variable);
- **similarity** to the prevailing OECD MTT at the time the DTT was formulated/signed (a fractional variable);
- **renewal** (a count number for times a country pair had had other DTTs or other versions of a given DTT enacted since 1901 up to a given year).

Table 8: Treaty length

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America		10123				
1950	Asia						
1950	Europe	4129	5270	3577	2811		
1950	Pacific				5053		
1950	World	4129	5674	3577	4120	5053	4292
1970	Africa	4500					
1970	America	4687	8933				
1970	Asia	6324	6163	6911			
1970	Europe	6801	6339	6929	7693		
1970	Pacific		4522	7304	6289	4217	
1970	World	6297	6349	6853	6968	6123	6817
1990	Africa	7013					
1990	America	8937	8287				
1990	Asia	7322	7313	8104			
1990	Europe	7843	8140	7241	8219		
1990	Pacific		9632	8985	8433	8632	
1990	World	7759	8068	7451	7836	8689	7857
2010	Africa	13706					
2010	America	9299	12852				
2010	Asia	13136	11410	8777			
2010	Europe	9815	10502	8702	8897		
2010	Pacific	9315	9972	9466	8914	9520	
2010	World	11089	10843	9296	9127	9260	9477

Notes: The table shows for four different years the average treaty length in words, concluded within or between continents.

Table 9: Average frequency of treaty renewal

continent	Africa	America	Asia	Europe	Pacific	World
Africa	0.12					
America	0.00	0.06				
Asia	0.01	0.13	0.08			
Europe	0.08	0.16	0.15	0.24		
Pacific	0.00	0.15	0.06	0.12	0.27	
World	0.06	0.13	0.11	0.17	0.12	0.15

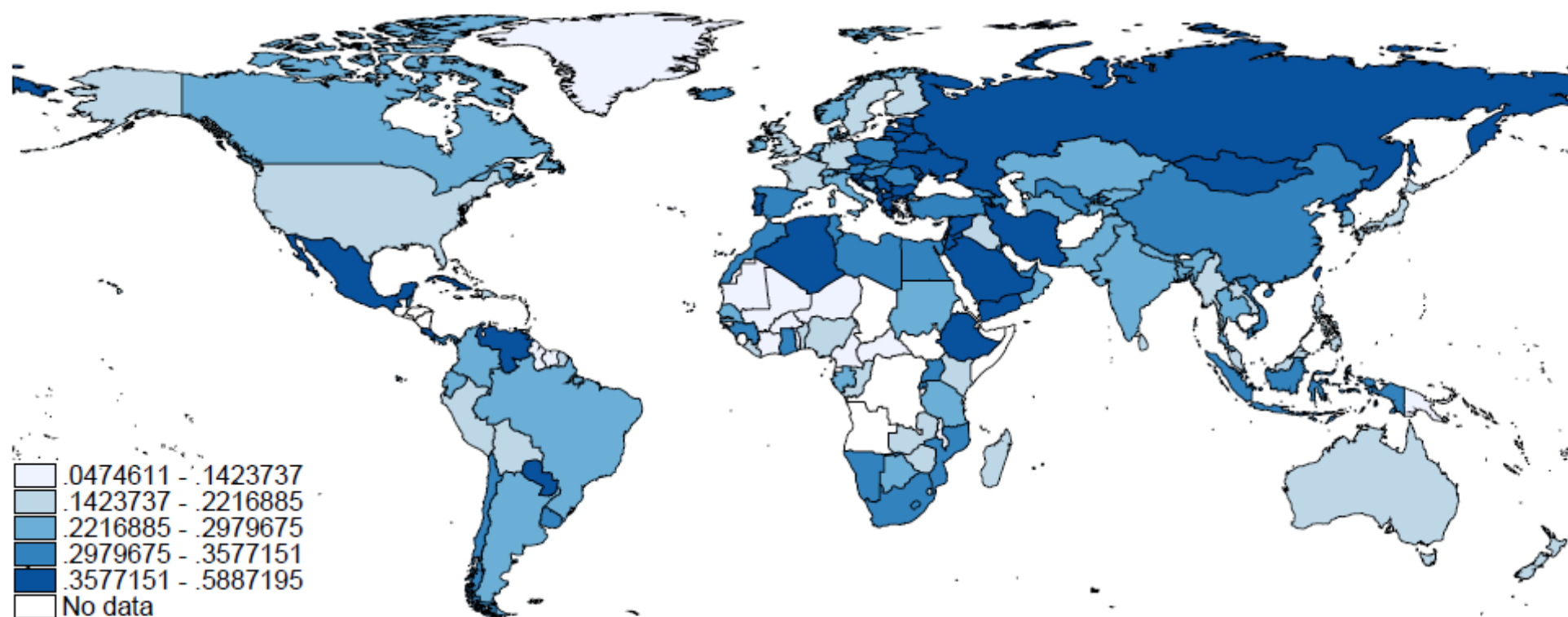
Notes: The table shows for all years (1900-2013) the average frequency of treaty renewal of treaties concluded within or between continents. On average all treaties that ever existed and still exist today were 0.15 times renewed.

Table 10: Similarity to model tax treaties

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America						
1950	Asia						
1950	Europe						
1950	Pacific						
1950	World						
1970	Africa	0.05					
1970	America		0.06				
1970	Asia	0.14	0.14	0.07			
1970	Europe	0.14	0.11	0.16	0.18		
1970	Pacific			0.10	0.07		
1970	World	0.13	0.11	0.14	0.16	0.09	0.15
1990	Africa	0.11					
1990	America	0.17	0.11				
1990	Asia	0.17	0.15	0.15			
1990	Europe	0.17	0.16	0.18	0.20		
1990	Pacific		0.12	0.12	0.13	0.06	
1990	World	0.16	0.15	0.17	0.18	0.12	0.18
2010	Africa	0.23					
2010	America	0.23	0.28				
2010	Asia	0.32	0.26	0.30			
2010	Europe	0.28	0.27	0.31	0.32		
2010	Pacific	0.22	0.19	0.16	0.18	0.10	
2010	World	0.28	0.27	0.30	0.30	0.17	0.30

Notes: The table shows for four different years the similarity of treaties concluded within or between continents to the OECD model tax treaties applicable at the time of conclusion, with 0 indicating no similarity at all and 1 indicating complete similarity. Overall there are 9 model tax treaties covering the periods 1963-1977, 1977-1995, 1995-1998, 1998-2000, 2000-2003, 2003-2005, 2005-2008 and 2008-2010.

Figure 2: Average similarity to relevant model tax treaties by country for all DTTs in the database 1963-2013



For 187 countries from 1963-2013. Relevant model tax treaties are the latest version available on the date of treaty conclusion.

# Measuring Treaty Generosity

## Features:

- **dividend-tax margin** relative to the statutory, unilateral dividend-tax rate for each country in a pair and bracket of dividend holdings (up to 10%, 10-25%, above 25%; number of words contained; six fractional variables);
- **interest-tax margin** relative to the statutory, unilateral tax rate on interest paid for each country and interest recipient (institutions vs. others; four fractional variables);
- **royalty-tax margin** relative to the statutory, unilateral royalty-tax rate for each country in a pair and type of royalty source (patents, scientific work, and industrial work vs. others; four fractional variables);
- **exemption** to foreign income (how many countries in a pair apply it; {0,1,2});
- **credit** to foreign income (how many countries in a pair apply it; {0,1,2});
- **deduction** to foreign income (how many countries in a pair apply it; {0,1,2}).



# Preference Margins on Dividends

year	continent	Dividends					
		Africa	America	Asia	Europe	Pacific	World
2000	Africa	2.75					
2000	America	5.67	4.36				
2000	Asia	2.34	7.28	4.16			
2000	Europe	5.21	8.05	6.54	7.57		
2000	Pacific	7.50	14.50	9.98	10.89	12.50	
2000	World	4.41	7.46	5.95	7.08	10.84	6.63
2010	Africa	2.41					
2010	America	4.66	5.76				
2010	Asia	1.65	6.40	2.43			
2010	Europe	4.00	7.49	4.51	4.42		
2010	Pacific	7.50	11.59	8.12	10.11	9.20	
2010	World	3.20	7.01	3.97	4.90	9.40	4.56

# Preference Margins on Interest

year	continent	Interest					
		Africa	America	Asia	Europe	Pacific	World
2000	Africa	11.46					
2000	America	11.45	17.56				
2000	Asia	10.71	11.71	7.89			
2000	Europe	8.91	13.49	9.73	10.76		
2000	Pacific	5.00	9.50	4.58	7.19	1.67	
2000	World	9.69	13.41	9.38	10.41	6.12	10.29
2010	Africa	6.96					
2010	America	9.49	14.56				
2010	Asia	5.97	11.28	6.45			
2010	Europe	7.41	12.47	7.79	8.59		
2010	Pacific	6.25	10.00	4.17	7.01	2.00	
2010	World	7.06	12.17	7.40	8.57	5.94	8.28

# Preference Margins on Royalties

year	continent	Royalties					World
		Africa	America	Asia	Europe	Pacific	
2000	Africa	12.12					
2000	America	8.30	18.15				
2000	Asia	9.64	12.10	6.93			
2000	Europe	10.00	14.21	10.20	12.57		
2000	Pacific	11.00	16.15	7.68	13.56	6.67	
2000	World	10.05	13.94	9.55	11.68	11.25	11.26
2010	Africa	7.62					
2010	America	7.20	11.79				
2010	Asia	5.01	10.54	4.85			
2010	Europe	8.38	12.57	8.05	10.21		
2010	Pacific	7.25	15.08	7.91	12.55	9.50	
2010	World	7.27	11.78	7.14	9.53	10.75	8.78

# Measuring Information Exchange

## Features:

- DTT contains an OECD-MTT-type **Article 26** addressing information exchange (a binary indicator variable);
- mode of information exchanges (a multinomial, ordered variable):
  - if information is available to the tax authority and can possibly be shared and used (1);
  - if information is necessary (2);
  - if information is foreseeably relevant (3);
  - if information is actually relevant (4);
  - if information must always be provided on request (5);
  - if information is always spontaneously shared (6).
- whether **secrecy** is applied to exchanged information or not (a binary indicator variable);
- whether extent of information shared goes **beyond national routine** or not (a binary indicator variable);
- whether information is exchanged **in spite of bank secrecy** applying in one country or not (a binary indicator variable);
- whether one of the two or both countries did not impose any **limitation** on the type of information exchanged (a binary indicator variable).

Table 13: Percentage of DTTs containing Article 26 across continents

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America		0.00				
1950	Asia						
1950	Europe	1.00	0.82	0.67	0.25		
1950	Pacific				1.00		
1950	World	1.00	0.75	0.67	0.65	1.00	0.63
1970	Africa	1.00					
1970	America	1.00	0.75				
1970	Asia	0.80	1.00	1.00			
1970	Europe	0.95	0.97	0.92	0.75		
1970	Pacific		1.00	1.00	1.00	1.00	
1970	World	0.95	0.96	0.93	0.89	1.00	0.90
1990	Africa	0.92					
1990	America	1.00	1.00				
1990	Asia	0.88	0.77	1.00			
1990	Europe	0.95	0.93	0.94	0.89		
1990	Pacific		1.00	1.00	1.00	1.00	
1990	World	0.94	0.91	0.93	0.92	1.00	0.93
2010	Africa	0.76					
2010	America	1.00	0.94				
2010	Asia	0.68	0.85	0.86			
2010	Europe	0.92	0.87	0.93	0.93		
2010	Pacific	1.00	1.00	1.00	1.00	1.00	
2010	World	0.84	0.88	0.88	0.92	1.00	0.90

Notes: The table shows for four years the percentage of treaties concluded within or between continents that included Article 26 on the exchange of information.

Table 14: Scope of information exchange

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America						
1950	Asia						
1950	Europe						
1950	Pacific						
1950	World						
1970	Africa						
1970	America						
1970	Asia	0.00	0.00				
1970	Europe	0.00	0.00	0.00	0.16		
1970	Pacific			0.00	0.00		
1970	World	0.00	0.00	0.00	0.08	0.00	0.07
1990	Africa	0.00					
1990	America	0.44	0.20				
1990	Asia	0.18	0.38	0.19			
1990	Europe	0.30	0.32	0.28	0.21		
1990	Pacific		1.00	0.67	0.80	0.33	
1990	World	0.28	0.35	0.28	0.27	0.74	0.28
2010	Africa	1.03					
2010	America	0.79	0.74				
2010	Asia	0.65	0.74	0.62			
2010	Europe	0.72	0.75	0.69	0.79		
2010	Pacific	1.50	1.14	0.79	0.97	0.80	
2010	World	0.74	0.76	0.68	0.75	0.92	0.73

Notes: The table shows a measure for the scope of information to be exchanged in tax treaties under Article 26, concluded within or between continents in four different years. The values are an average composed of three different measures, where 0 indicates that the information to be exchanged does not go beyond the coverage of the treaty, 1 indicating that the information to be exchanged is not limited by Article 1 of the treaty, stating the treaty parties and 2, indicating that the information to be exchanged is not limited by Article 1 and 2 of the convention, where Article 2 states the taxes covered in the convention. Therefore a higher value in the table indicates a wider scope of information exchange.

Table 15: Information provided is treated as secret

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America						
1950	Asia						
1950	Europe	1.00	1.00	1.00	0.67		
1950	Pacific				1.00		
1950	World	1.00	1.00	1.00	0.95	1.00	0.95
1970	Africa	1.00					
1970	America	1.00	1.00				
1970	Asia	1.00	1.00	1.00			
1970	Europe	0.98	1.00	1.00	0.97		
1970	Pacific		1.00	1.00	1.00	1.00	
1970	World	0.99	1.00	1.00	0.99	1.00	0.99
1990	Africa	1.00					
1990	America	1.00	0.65				
1990	Asia	1.00	1.00	1.00			
1990	Europe	0.99	1.00	0.80	0.93		
1990	Pacific		1.00	1.00	1.00	1.00	
1990	World	0.99	0.96	0.86	0.90	1.00	0.91
2010	Africa	1.00					
2010	America	1.00	0.97				
2010	Asia	1.00	0.99	1.00			
2010	Europe	1.00	1.00	0.95	0.98		
2010	Pacific	1.00	1.00	1.00	1.00	1.00	
2010	World	1.00	0.99	0.97	0.98	1.00	0.98

Notes: The table shows for four different years the percentage of treaties concluded within or between continents that agree to treat the information provided under Article 26 as secret.

Table 16: Limitation imposed on the information exchanged

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America						
1950	Asia						
1950	Europe	0.00	0.00	0.00	0.33		
1950	Pacific				0.00		
1950	World	0.00	0.00	0.00	0.05	0.00	0.05
1970	Africa	0.00					
1970	America	0.00	0.33				
1970	Asia	0.75	0.40	0.63			
1970	Europe	0.25	0.34	0.52	0.58		
1970	Pacific		0.00	0.00	0.08	0.00	
1970	World	0.23	0.32	0.51	0.41	0.05	0.38
1990	Africa	0.27					
1990	America	0.75	0.55				
1990	Asia	0.93	0.87	0.94			
1990	Europe	0.55	0.72	0.69	0.85		
1990	Pacific		0.80	0.60	0.77	0.33	
1990	World	0.56	0.73	0.76	0.74	0.71	0.75
2010	Africa	0.76					
2010	America	0.86	0.94				
2010	Asia	0.99	0.96	0.99			
2010	Europe	0.85	0.93	0.92	0.94		
2010	Pacific	1.00	0.89	0.85	0.91	0.83	
2010	World	0.87	0.93	0.94	0.92	0.88	0.93

Notes: The table shows for four different years the percentage of treaties concluded within or between continents that agree to impose limitations on the information provided under Article 26. Such limitations concern mostly a non violation of the national law when providing information and that information is not exchanged where it would lead to the disclosure of trade or business activities.



Table 17: Information exchange beyond national practice

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America						
1950	Asia						
1950	Europe	0.00	0.00	0.00	0.00		
1950	Pacific				0.00		
1950	World	0.00	0.00	0.00	0.00	0.00	0.00
1970	Africa	0.00					
1970	America	0.00	0.00				
1970	Asia	0.00	0.00	0.00			
1970	Europe	0.00	0.00	0.00	0.06		
1970	Pacific		0.00	0.00	0.00	0.00	
1970	World	0.00	0.00	0.00	0.02	0.00	0.01
1990	Africa	0.00					
1990	America	0.00	0.00				
1990	Asia	0.00	0.03	0.00			
1990	Europe	0.02	0.00	0.01	0.03		
1990	Pacific		0.00	0.00	0.00	0.00	
1990	World	0.01	0.01	0.01	0.02	0.00	0.01
2010	Africa	0.00					
2010	America	0.00	0.09				
2010	Asia	0.01	0.04	0.04			
2010	Europe	0.03	0.05	0.04	0.06		
2010	Pacific	0.00	0.11	0.03	0.12	0.00	
2010	World	0.02	0.05	0.04	0.05	0.08	0.05

Notes: The table shows for four different years the percentage of treaties concluded within or between continents that agree to exchange information under Article 26, that would go beyond the national practice of collecting such information. By including this paragraph into the treaty the treaty parties assure to undertake efforts for the provision of information under Article 26, that would go beyond the routinely collected information for their own tax purposes.

Table 18: Information exchange despite bank secrecy

year	continent	Africa	America	Asia	Europe	Pacific	World
1950	Africa						
1950	America						
1950	Asia						
1950	Europe	0.00	0.00	0.00	0.00		
1950	Pacific				0.00		
1950	World	0.00	0.00	0.00	0.00	0.00	0.00
1970	Africa	0.00					
1970	America	0.00	0.00				
1970	Asia	0.00	0.00	0.00			
1970	Europe	0.00	0.00	0.00	0.06		
1970	Pacific		0.00	0.00	0.00	0.00	
1970	World	0.00	0.00	0.00	0.02	0.00	0.01
1990	Africa	0.00					
1990	America	0.00	0.00				
1990	Asia	0.00	0.03	0.00			
1990	Europe	0.02	0.00	0.01	0.03		
1990	Pacific		0.00	0.00	0.00	0.00	
1990	World	0.01	0.01	0.01	0.02	0.00	0.01
2010	Africa	0.00					
2010	America	0.00	0.12				
2010	Asia	0.01	0.06	0.03			
2010	Europe	0.03	0.08	0.04	0.06		
2010	Pacific	0.00	0.11	0.03	0.09	0.00	
2010	World	0.02	0.07	0.04	0.05	0.06	0.05

Notes: The table shows for four different years the percentage of treaties concluded within or between continents that agree to exchange information under Article 26, despite bank secrecy. By including this paragraph into the treaty the treaty parties assure to reject a request for exchange of information under Article 26 because the information requested is held by a bank or financial institution.

# Principal Components of DTT Features

## Goal:

- Extract the most relevant information from all the variables reflecting DTT complexity, generosity, and information exchange, separately.
- Explain (instrument) this information by variables:
  - economic;
  - political;
  - cultural;
  - legal.

## Finding:

- Complexity of two signatories' languages, legal proximity, and economic factors are most important (apart from country fixed effects).

Table 19: Overall  $R^2$  and percentage of empirical model contributed by group to explaining the first principal components of DTT complexity, generosity, and information exchange

	Complexity	Generosity	Information exch.
Model $R^2$	35.41	75.49	12.75
Characteristics	Percentage contributed to model sum of squares		
Economy	3.13	3.15	3.96
Geography	0.42	0.14	0.91
Culture/history	1.74	0.18	1.89
Law/politics	2.29	2.43	16.29
Language complexity	15.18	10.86	19.28
Redistribution preferences	1.07	1.18	5.17
Corruption/policing	0.84	1.57	2.20
Fixed country effects	33.21	19.38	32.93
Fixed time effects	0.02	0.69	0.99

# DTT Features As Determinants of Affiliates of Headquarters

## Goal:

- Use an exponential-family model to explain the number of affiliates held in by headquarters from two countries in 2013.
- Identify conditional effect of 3 DTT features.

## Finding:

- Complexity causes reduction in affiliate holdings.
- Generosity causes increase in affiliate holdings.
- Information exchange is beneficial or insignificant on net.

Table 20: Poisson regression output for affiliates of headquarters by country-pair on treaty and country determinants

	Exogenous features		Endogenous features (IV)	
Variables	(1)	(2)	(3)	(4)
DTT features				
$pcompl_{ij}$	0.129*** (0.021)	0.235*** (0.028)	-0.529*** (0.156)	-0.581*** (0.176)
$pmarg_{ij}$	0.170*** (0.013)	0.239*** (0.028)	0.300*** (0.069)	0.131** (0.062)
$pexch_{ij}$	-0.108*** (0.012)	-0.0971*** (0.019)	0.349** (0.151)	0.0387 (0.089)
Control variables				
$\log(GDPSum_{ij})$	0.135*** (0.031)	0.101 (0.061)	0.317*** (0.069)	0.359*** (0.069)
$\log(GDPDiff_{ij})$	0.119*** (0.027)	-0.0656 (0.044)	-0.226*** (0.047)	-0.211*** (0.041)
$\log(GDPpc_{ij})$	-0.668*** (0.041)	-0.766*** (0.089)	-0.803*** (0.107)	-0.687*** (0.101)
$\log(GDPpcDiff_{ij})$	-0.815*** (0.034)	-0.862*** (0.089)	-0.806*** (0.087)	-0.848*** (0.092)
$\log(dist_{ij})$	0.275*** (0.032)	0.212*** (0.056)	0.248*** (0.060)	0.273*** (0.060)
$contig_{ij}$	1.630*** (0.117)	1.652*** (0.190)	1.758*** (0.177)	1.729*** (0.190)
$comlang_{ij}$	1.240*** (0.173)	0.556*** (0.146)	0.561*** (0.167)	0.522*** (0.146)
$colony_{ij}$	-0.882*** (0.163)	-0.463*** (0.179)	-0.011 (0.211)	-0.0493 (0.210)
$comcol_{ij}$	-0.523*** (0.160)	-0.983*** (0.283)	-0.405 (0.276)	-0.804*** (0.296)
$col45_{ij}$	0.911*** (0.097)	1.395*** (0.191)	1.472*** (0.199)	0.841*** (0.202)
$smctry_{ij}$	-1.878*** (0.278)	-3.423*** (0.293)	-3.313*** (0.261)	-3.521*** (0.299)
Constant	2.348** (0.937)	5.103*** (1.945)	-0.95 (2.098)	-3.353 (2.173)
Observations	10372	2351	2351	2351
p-value of control function			0.000	0.000
Correlation of data & prediction	0.812	0.720	0.919	0.909

# Conclusions

- Extremely rich data-set on **DTT content** established by text analysis.
- Novel features of DTTs of **qualitative and quantitative** nature.

## Findings about DTT features:

- Signatories whose language backgrounds are complex tend to formulate complex treaty texts and this has negative causal effects on MNE activity.
- Countries with high potential of MNE activity (for cultural, legal, or economic reasons) tend to be more generous in granting tax relief.
- Countries with more similar legal system (and more policing/less corruption) tend to grant more extensive information exchange.

# Conclusions

## Findings about DTT effects:

- Going beyond the role of mere existence of DTTs is apparently important.
- Neglecting DTT heterogeneity is costly:
  - All the effects identified here are among signatories.
  - Conventionally, we assume DTT effects to be similar/identical for signing/enforcing countries.
  - This is apparently wrong.
  - Heterogeneous DTT effects – especially those of complexity and generosity – are relevant.



# Conclusions

## Future research

- More extensive data:
  - Non-English DTTs.
  - More margins of MNE activity.
  - Quantifying effects in structural models (with care here: structural models tell us much more about theory than the data; but quantification about full economic benefit/cost of certain treaty features not possible w/o structure).
- Other research questions:
  - Zooming in on DTT network formation (less limitation on time horizon than with MNEs).
  - Relationships with BIT and PTA network.