The Making of International Tax Law: Empirical Evidence from Natural Language Processing

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Abstract

Legal scholars debate at length whether an international legal tax regime exists. We offer the first attempt at empirically testing the level of transnational consensus on the legal language controlling international tax matters. We also investigate the institutional framework of such consensus-building. We build a dataset of 4,052 bilateral income tax treaties, as well as 16 model tax treaties published by the United Nations (UN), Organisation for Economic Co-operation and Development (OECD) and the United States. We use natural language processing to perform pair-wise comparison of all treaties in effect at any given year. We identify clear trends of convergence of legal language in bilateral tax treaties since the 1960s, particularly on the taxation of cross-border business income. To explore the institutional source of such consensus, we compare all treaties in effect at any given year to the model treaties in effect during that year. We also explore whether newly concluded treaties converge towards legal language in newly introduced models. We find the OECD Model Tax Convention (OECD Model) to have a significant influence. In the years following the adoption of a new OECD Model there is a clear trend of convergence in newly adopted bilateral tax treaties towards the language of the new OECD Model. We also find that model treaties published by the UN (UN Model) have little immediate observable effect, though UN treaty policies seem to have a delayed, yet lasting effect. We conclude that such findings support the argument that a trend towards international legal consensus exists, at least on certain important matters, and that the OECD is the institutional source of the consensus building process.

I. Introduction

The academic field of international tax law is defined by the basic question of whether a binding international legal tax regime exists. The answer to this question has important practical implications. To the extent that there is transnational tax law, nation-states "are not free to adopt any international tax rules they please, but rather operate within the context of the regime" (Avi-Yonah, 2007). There are, of course, certain formal, binding multilateral tax laws, such as in the European Union (EU), as well as certain multilateral tax treaties. But the taxation of most cross border transactions is not subject to any formal transnational legal framework. Rather, most international transactions are taxed according to the laws of the jurisdictions involved, as well as any relevant treaties that such jurisdictions may be parties to.

Thus, whether an informal international tax regime exists is a question that legal scholars debate at length. Many have suggested that there is a coherent international tax regime (Avi-Yonah, 2004; Avi-Yonah, 2007; Brauner, 2003), but opinions differ as to the binding nature of this regime. Pointing to (qualitative) evidence of convergence in domestic tax laws and bilateral tax treaties, some commentators assert that there are identifiable customary norms that provide the basis for a *binding* transnational framework on tax matters (Avi-Yonah, 2004; Kaufman, 1998). Others suggest that the observed convergence in tax standards represents nations' adherence to "soft law" (Brauner, 2016; Christians, 2007; Vega, 2012) or transitional legal orders (Genschel & Rixen, 2015) that are not formally binding, yet create a sense of legal obligation.

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National and international governmental bodies also tend to suggest that an international tax regime exists. For example, in response to rampant tax avoidance by multinational corporations and the popular outcry that resulted, the Organisation for Economic Cooperation and Development (OECD) launched the anti Base Erosion and Profits Shifting (BEPS) project in 2013. In part, this project's aim is to revisit "international tax standards" as well as the "international tax framework, which was designed more than a century ago" (Organisation for Economic Cooperation and Development, 2015). Similarly, the U.S. government, in a recent official white paper, referred to an "international tax system" consisting of certain "international consensus" and "norms" on tax matters (United States Department of Treasury, 2016). The white paper was written in response to several decisions by the European Commission. The commission accused certain EU member states of cutting "sweetheart" tax deals with U.S. corporations. Such deals, according to the commission, amount to illegal state-aid under EU law. In a rebuttal attempt, the U.S. Department of Treasury suggested that the European Commission's decisions violate international consensus on certain tax matters.

Other commentators are more skeptical, suggesting that there are no enforceable international tax norms, or in fact, any identifiable "international tax regime" (Rosenbloom, 2000; Roin, 2002). Under such views nations are free to adopt whatever international tax rules they like. According to the skeptical view, international tax law as a field of research deals with the interaction of different *national* tax laws as applied in the cross border context (Kane, 2004; Rosenbloom, 2000). Specifically, taxpayers engage in cross-border intercompany transactions to reduce their worldwide tax bills. Taxpayers are deliberately taking advantage of differences between *domestic* tax laws across countries in their tax planning (this is known as "international tax arbitrage"). Countries, on their part, engage in tax competition through their tax laws in order to attract foreign direct investment. Under the skeptical view, the focus of the academic field of international tax law concerns the policy implications of such behaviors as well as potential responses (if any), whether unilateral or coordinated.

An important factor contributing to the intractability of this debate is the institutional exceptionalism of international taxation. While the bulk of cross border economic activity is subject to binding multilateral frameworks enforced by centralized inter-governmental-organizations (IGOs) such as the World Trade Organization (WTO), there is no formal "world tax organization", nor there has ever been one (Tanzi, 1999). Thus, it is difficult to clearly point to a source of international tax law making, as well as to mechanisms of enforcement (Brauner, 2005).

Instead, taxation of cross-border activity is mostly controlled by a network of thousands of *bilateral* tax treaties. These bilateral legal instruments allocate the taxing rights between the two member states of each treaty. It is estimated that there are about 3,000 such treaties currently in force (Brauner, 2016). In spite of their bilateral nature, tax treaties seem to be remarkably similar to one another. Professor Reuven Avi-Yonah estimated that as much as "75% of the actual words of any given [bilateral tax treaty] are identical with the words of any other [bilateral tax treaty]" (Avi-Yonah, 2009). Since these similar bilateral treaties control the tax treatment of the vast majority of cross border activity, they arguably constitute an identifiable international tax regime (Brauner, 2016; Avi-Yonah, 2000).

Even if such consensus exists (which many dispute) what might be its source? Is it simply a natural occurrence? Or are there international actors that play a role in the consensus-building process?

The UN and the OECD (as well as other IGOs) publish and update "model" tax treaties from time to time. Such models do not have binding legal force. Rather, they serve as proposed policies by the organizations that issue them. It has been suggested, however, that these model treaties have had an identifiable effect on the drafting of bilateral tax treaties (United Nations, 2011). For example, it is frequently argued that the

OECD treaty model has had a considerable effect on legal standards adopted by OECD members and non-members alike (Ault, 2009; Ring, 2010). Since the 1950s the OECD has emerged as a "solid institutional center" for transnational legal order on tax matters (Genschel & Rixen, 2015). It has even been argued that the OECD influence on national tax policies is so profound, that the OECD functions as a de-facto "world tax organization" (Cockfield, 2006).

In spite of the significance of these issues, no attempt has been made to date – to the best of our knowledge – to provide systematic empirical evidence of the level of consensus in bilateral tax treaties' language over time and the effect of model treaties. While scholars have considered international tax practices from comparative perspectives, past studies have mainly been limited to measurable fiscal outcomes such as tax rates (Slemrod, 2004), revenue compositions (cite), the distribution of tax burdens (Swank & Steinmo, 2002), and qualitative assessments of states' tax policy practices (Tanzi, 1995; Steinmo, 2003). Some have also tried to assess the institutional influence of international organizations (Ring, 2010; Rixen, 2008; Lang, et al., 2012). However, no study has empirically investigated the written language of the legal instruments that control international tax matters – meaning, bilateral tax treaties. There has also not been an attempt, to the best of our knowledge, to empirically assess the institutional influence of the OECD, the UN, or other international actors on the drafting of bilateral tax treaties.

In this article we make a first attempt to fill this gap in the literature. Using a unique dataset of 4,052 bilateral income tax treaties and 16 model treaties, we seek to empirically answer three questions: First, we try to identify whether international legal consensus on the taxation of cross-border transactions exists, and whether there are observable changes in the level of such consensus overtime. We do so by measuring the level of pair-wise language similarity of each pair of treaties in effect at any given year. We find clear trends towards convergence in legal language in treaties, particularly since the early 1960s – when the OECD first introduced its model tax treaty.

Second, we take advantage of the fact that most bilateral tax treaties are neatly organized into tax topics in order to try and identify whether some areas of international taxation present a higher level of consensus than others. To date, the academic debate on the existence of an international tax regime has run a primarily binary course, with each side of the debate presenting facts supporting its own argument. There was little attempt, however, to empirically identify particular areas of consensus or disagreement. We find that convergence in legal language is most clearly observed in the context of intercompany pricing, taxation of cross border business income, and in the context of mutual agreement procedures. The lowest levels of convergence are observed in connection with certain definitional issues (such as the taxes and the geographical extent to which treaties apply), on the question on how to relieve double taxation, as well as in the context of assistance in collection of taxes.

Lastly, and perhaps most importantly, we investigate the institutional influence of the drafting of tax treaties. That is, to the extent that there is an international tax consensus embodied in tax treaties, what is its source? As discussed, the OECD, the UN, and several other international actors issue non-binding model treaties that seem to have a dramatic effect on actual tax treaties. Commentators point to the fact that actual treaties seem to closely follow the models, particularly the OECD one. We take advantage of the fact the model treaties are occasionally updated, and measure the level of similarity against each model over time. We try to identify whether actual treaties converge in language towards newly published UN or OECD models, or whether such models simply incorporate existing tax treaty practices. We also investigate the model published by the United States. It has been suggested the United States plays a significant role in affecting international tax policies (Steinmo, 2003; Tanzi, 1995), and we therefore consider the investigation of such a model worthwhile. We find evidence that the OECD Model Tax Convention is most influential. In the years following the adoption of a new OECD Model there is a clear trend of convergence in newly adopted bilateral tax treaties towards the language of the new OECD model. We find that model treaties published by the UN have little immediate observable effect, but that overall the UN model treaties seem to be similar to existing long term tax-treaties practices. The models published by the United States tend to innovate away from existing practices.

While we stop short of concluding that a binding international tax regime exists, we believe our findings lend support to such argument. Trends towards international legal language convergence are clearly observable, at least on certain matters, and IGOs, in particular the OECD, seem to function as institutional sources of consensus building.

The rest of the article is structured as follows: Part II provides the necessary background on two matters. First, it discusses the international tax framework and the role of bilateral treaties in it. We discuss some of the historical background of tax treaties, the rise of model treaties and the institutional framework in which models are concluded. Second, we describe past research on convergence in international tax law. In part III we discuss the building of the dataset as well as the language processing procedures we use to test legal language convergence. Part IV presents the findings. Part V concludes with a discussion of the implications of our empirical findings.

II. Tax Treaties and the "International Tax System"

a. Tax Treaties and Model Treaties: Historical Institutional Background

Tax treaties were born out of the concern over double taxation as early as the late 19th century (Genschel & Rixen, 2015). At the time, growth in international trade introduced the potential of competing tax claims by multiple jurisdictions over the same streams of income. Seligman identified three early policy trends aimed at relieving double taxation (Seligman, 1928). First, states attempted to eliminate double taxation between their municipalities through the passing of state laws. For example, in 1909 Germany replaced its 1870 laws allocating taxing rights between municipalities by the Double Taxation Act of 1909 (Kobetsky, 2011). Second, States signed bilateral agreements preventing the double taxation of cross-border income. The first of these treaties was the 1899 bilateral tax treaty between the Austro-Hungarian Empire and Prussia [cite]. Lastly, and most importantly for purposes our research, international bodies formed model treaties on the prevention of double taxation.

The institutional beginning of a coordinated international policy making on tax matters is commonly attributed to the International Chambers of Commerce (ICOC) (Graetz & O'Hear, 1997; Rixen, 2008). The ICOC banded together to represent international business interests following the First World War. During the early 1920s the ICOC urged the League of Nations to take measures to prevent double-taxation, which was seen as an impediment on reconstruction following the war. In response to ICOC's pressure, the League of Nations appointed a Committee of Experts to develop principles for the prevention of double taxation. The most influential work of Committee of Experts was a 1923 report drafted by the four economists of the Committee: Edwin Seligman of the United States, Professor Luigi Einaudi of Italy, Professor G. W. J. Bruins of the Netherlands, and Sir Josiah Stamp of Great Britain (League of Nations, 1923).

Out of the 1923 report emerged "three great principles" of international taxation (Graetz & O'Hear, 1997): First, that "the classification and assignment of specific categories of income to source or residence should be determined by an objective test, 'economic allegiance'." Second, that "tax practices across the globe tended to underestimate the contribution of residence and to reflect a misguided belief in the naturalness and rightness of source-based taxation". Third, that progressivity in income taxes should be the prerogative of the residence jurisdiction. Some commentators suggested that the principles proposed by the 1923 report provide, to this day, the foundational features for the taxation of cross border transactions (Ault, 1992; Avi-

Yonah, 1996). Others dispute such a characterization (Graetz & O'Hear, 1997). The report clearly favored residence taxation (that is, the allocation of taxing rights to the country of residence of the investor), over source taxation (meaning, the allocation of taxing rights to the country in which the investment is located).

The 1923 report outlined economic principles, not legal language to implement them. The legal drafting task was assigned by the League of Nations to a committee of "Technical Experts" who produced a new report in 1925. "The 1925 Report was an effort to transform the pro-residence 1923 Report into a more balanced product" (Id.). The Technical Experts were then tasked with drafting model bilateral tax conventions. The purpose of drafting the model conventions was to achieve "a degree of uniformity between tax treaties by implementing bilateral tax treaties based on the Committee's draft convention." (Kobetsky, 2011). The Technical Experts drafted several model treaties, each on a discrete topic in taxation. Several such models were drafted between 1925 and 1928. In 1928 the League of Nations held a general meeting to review, amend, and subsequently approve the conventions (League of Nations, 1928). The 1928 treaties eventually became the "definitive League model" (Graetz & O'Hear, 1997), and served as the basis of all subsequent models put forth by the League of Nations.

The 1928 meeting established a permanent Fiscal Committee in charge of the development of the League of Nations' Models and to consider the allocation of international income between associate enterprises. Most importantly, the Fiscal Committee considered a 1933 report by Mitchell B. Carroll's (Carroll, 1933). Carroll's report surveyed the methods of apportionment used by countries in an attempt to distill general rules of profits allocation within a multinational enterprise. The most influential aspect of the Carroll report was the introduction of the arm's length principle in a newly published League of Nations model of 1935. Under the arm's length principle affiliated companies must deal with each other at arm's length prices. The arm's length standard is considered the golden standard of intercompany pricing to these days (Picciotto, 2016). The 1935 model also highlighted, for the first time, "U.S. leadership in international tax issues", as the 1935 model convention effectively adopted the U.S. transfer pricing rules then in place (Rixen, 2008).

Following the approval of the 1935 model, the League of Nations attempted to update the model on an annual basis until the beginning of World War II. With the war in Europe escalating, the League of Nations scaled down its affairs. However, before the League of Nations' break in activity (and ultimate demise and replacement by the United Nations), the Fiscal Committee suggested the model treaty be redrafted, leading to a meeting at The Hague in 1940 to begin the process (League of Nations, 1946). Further meetings were held in Mexico City and in London, resulting in two new models in 1943 (The "Mexico Model") and in 1946 (the "London Model"). Probably due to constraints on travel during the Second World War, the attendees in both drafting meeting varied significantly (Kobetsky, 2011). The 1943 Mexico meeting was attended mostly by Latin American participants, all capital-importing countries, who favored source-based taxation. The 1946 meeting had a robust attendance by capital export countries, who favored residence-based taxation. This resulted in significantly different Models, with the Mexico Model leaning towards source taxation, while the London Model towards residence taxation. Many of the provisions and principles included in both the London and Mexico Drafts can be found within the model treaties of the UN and the OECD today. The UN Model is a seen as a successor to the Mexico Draft, while the OECD Model is a successor to the London Draft (Lennard, 2008). The two Models represent clear historical institutional divergence in treaty development, marking a different tax policy path to capital exporting versus capital importing countries. Given the historical importance of the London and Mexico Models, we also explore their influence on tax treaty practices.

The United Nations did not seriously engage in model drafting again until the 1970s. The years following the Second World War saw increased economic interdependence, particularly between countries of the Organisation for European Economic Co-operation (OEEC, the predecessor of the OECD). Responding again to pressure from the ICOC and from several member states, the OEEC established a Fiscal Committee that sought to draft a model convention in order to "effectively resolve the double taxation problems existing between OECD member countries" (Vogel, et al., 2014). The Fiscal Committee based its work on the London and Mexico models. Both models were understood to have significant influence on bilateral tax treaties adopted during the late 1940s and early 1950s, but none was viewed as a basis for a broad consensus. (Id.). The first OECD Model was published in 1963. The 1963 Model seems to have aligned with the London Model, adopting a pro-residence stance favored by capital exporting countries. In the years following the adoption of the OECD Model, the OECD became "the main multilateral forum for international tax policy" (Rixen, 2008). In addition, new countries joining the OECD, particularly the United States, became influential. U.S. positions were fully incorporated into the drafting and revisions of the work of the OECD (Id.). The OECD since then updated its model regularly. Two new complete models were published in 1977 and in 1992. In 1991, however, the OECD recognized that the "revision of the Model Convention and the Commentaries had become an ongoing process" (OECD, 2014), and adopted a process under which the revisions to the Model are published every two or three years.

While the OECD Model is not a binding document, it is generally accepted that the OECD Model "has had wide repercussions on the negotiation, application, and interpretation of tax conventions", even outside the OECD (Vogel, et al., 2014; OECD, 2014). A summary report of a recent influential survey of the tax treaty practices in 37 countries, from both within and without the OECD (Lang, et al., 2012), concludes that "the influence the [OECD Model] on the general structure and clauses of bilateral tax treaties has gradually gained in importance so that it now affects those concluded with or even between non-OECD Member countries" (Pistone, 2012).

As the OECD was gaining prominence as the main institutional source for international tax policy, developing countries were dismayed by the emphasis on residence taxation. In response, several attempts were made at drafting model conventions that shifted the focus to source taxation. The earliest attempt was probably the ANDEAN model adopted by several Latin American countries in 1971 (Andean Community, 1971). But this model is understood to have had relatively little influence (Rixen, 2008). The UN itself established a Committee of Experts on International Cooperation in Tax Matters in 1967. The work of this group of experts eventually led to the publication of the first UN model in 1980. Unlike the OECD model, the UN model emphasized source taxation and the interests of developing countries. The UN Model is not regularly updated, though two major revisions have been published, one in 2001, and another in 2011 (United Nations, 2011). The United Nations asserts in the preamble to the UN Model that both the OECD Model as well as the UN Model "have had a profound influence on international treaty practice" (Id.). Others dispute the characterization of the UN Model as influential, and argue that the UN Model's main influence is in negotiations between developed and developing countries, and that in any case such influence has gradually decreased over the course of the 20th century (Rixen, 2008; Pistone, 2012).

b. Tax Law Convergence and the "International Tax System"

The previous part reviewed the institutional beginning of the consensus-building process on international tax matters. This part summarizes past research on the substantive content of such consensus. Broadly speaking, it is possible to divide the discourse in comparative tax law along two spectrums. One is the spectrum between convergence and divergence, and the other is the spectrum of cooperation versus competition on international tax matters.[4]

[4] Literature review on tax convergence to be completed.

III. Data and Methods

This section describes the methods for constructing statistical data from the text of international tax treaties.

a. Treaty Data

The corpus of treaties was downloaded from the online database maintained by the International Bureau of Fiscal Documentation (IBFD). The IBFD maintains the most expansive database of treaties on tax matters. We first download all tax treaties drafted in English as well as treaties for which an English language translation is available. We then exclude non-income tax treaties, multilateral treaties, and treaties that have never entered into effect. Since only U.S., OECD and UN models are argued to have an influence on treaty drafting we exclude seven models published by institutions other than the OECD, UN or the United States. The resulting dataset is comprised of 4,502 bilateral treaties that at some point were in effect, and 16 model treaties. The earliest bilateral treaty in our dataset entered into force in 1942, and the latest is in 2015. There are 205 party-countries represented. We also separately add to our dataset the Mexico Model and the London Model, which we obtained from the UN website.

Each treaty has information on the parties, current status, conclusion date, effective date, and entry-into-force date. Figure 1 presents the number of bilateral tax treaties concluded by year. Figure 2 aggregates the total number treaties in effect at any given year.

Figure 1- Number of Treaties Concluded by Year

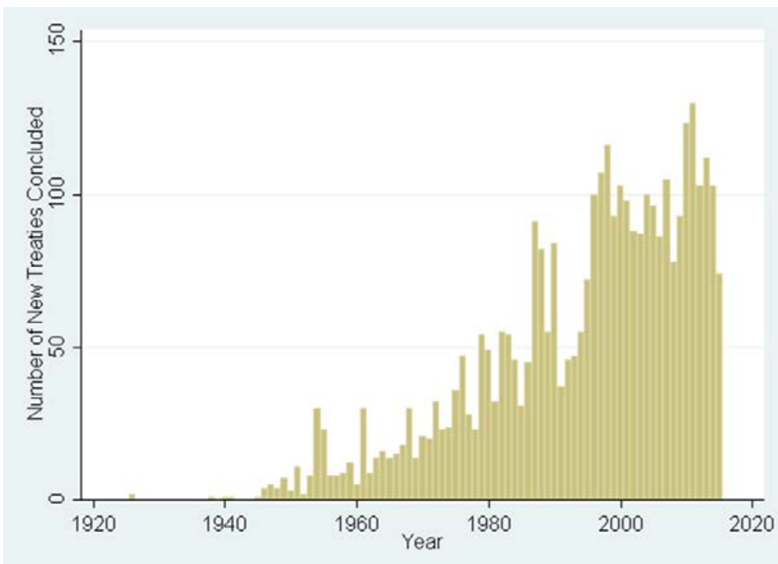


Figure 2 - Number of Treaties in Force By Year

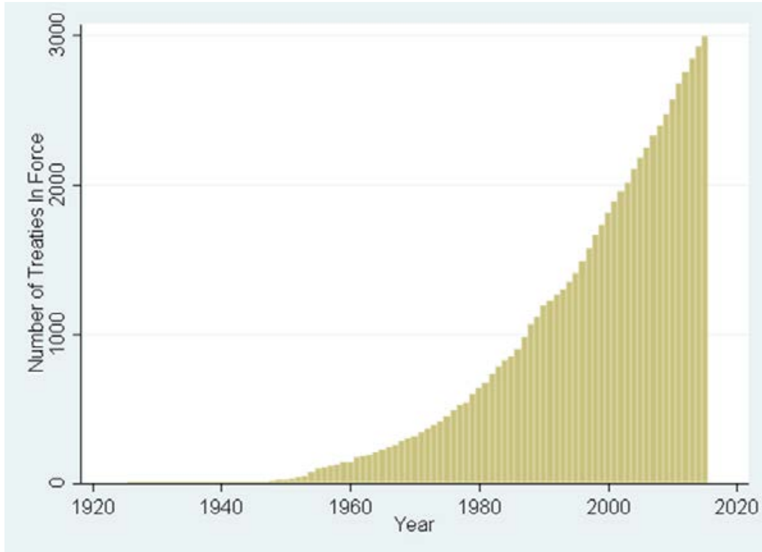


Figure 1 and 2 demonstrate the increasing importance of bilateral tax treaties in international trade over time.[5]

Finally, in order to assess whether legal language convergence is more apparent in certain areas than others, we take advantage of the fact that the IBFD database divides the text of the treaties into 32 categories. The text of the treaties is thus split into sections, which allows for a section-by-section comparison. We manually divide the Mexico and London Models into categories that best match the categories in the IBFD database. The particular categories are outlined in the Online Appendix.

b. Constructing Text Features

We follow standard methods in the use of natural language processing in social science (e.g. Ash, 2016). A series of scripts reads through the text of the clauses and processes them as follows. First a clause is split into sentences. These sentences are then split into words, excluding numbers. The vocabulary is then filtered such that any words not appearing in at least 10 clauses are excluded – these include some foreign-language terms, misspelled words, or place names, for example.

Next, the sentences are used to produce n-grams (phrases) up to a length of four words. These n-grams are filtered based on their parts of speech in order to obtain informative noun and verb phrases. The set of parts-of-speech sequences are based on Denny et al. (2015) and Ash (2016). The resulting text features include technical key phrases from international tax law such as "income from immovable property," "income from

5 In order to assess the magnitude of worldwide income taxed under the rules prescribed by treaties in our dataset, we measure the percentage of international capital flows for any given year covered by our dataset. We draw data on international trade flows from the United Nations COMTRADE dataset. We then aggregate the amount of capital flows between all country pairs subject to a bilateral tax treaty then in effect, and divide the aggregated amount by total worldwide capital flows. Appendix Figure 1 presents the aggregate percentage of capital flows covered by treaties in our dataset over time. Unsurprisingly, treaties cover an increasing percentage of international capital flows over time. Importantly for our purposes, treaties in our dataset cover a significant part of world trade, at least since 1970. Thus, any consensus identified in our research can be said to be relevant to the bulk of world trade.

government securities," "preparatory or auxiliary character," "has an habitual abode," "through a permanent establishment," "fixed place of business," and "is the beneficial owner." These phrases provide much more legal information than single words, or n-grams regardless of the parts-of-speech. Moreover, this method captures the highly context-dependent meanings of individual words, such as "income" (e.g., "income from immovable property" versus "income from government securities").

In the final vocabulary of text features, words and phrases must occur in at least 10 clauses to be included. Single words are included if they are nouns, verbs, adjectives, or adverbs. In addition, party names and non-party countries are tagged with special tokens. The final vocabulary has 45,259 features. This includes 4,051 words, 13,469 bigrams, 18,447 trigrams, and 9,292 quadgrams. Using this vocabulary of features (words and phrases), we construct frequency distributions over features for each treaty in the corpus. The informative phrases are treated as single tokens and linked together, so if the word "course" appears as part of the phrase "in the normal course," it will not be included in the frequency distribution by itself. The outcome of this procedure is that each treaty is represented as a sparse vector of phrase frequencies. These vectors are used in the analysis. We explain the vector representation of words and documents at length in Online Appendix 2.

c. Computing Treaty Similarity

The treaty frequency vectors are then stacked into an *NxP* sparse matrix, where *N=4,052* treaties and *P=45,259* text features. We then compute the cosine similarity between each treaty vector. This vector of similarities, of length *N(N-1)=19,092,530* treaty pairs, gives the pair-wise similarity for each row in the matrix. The pair-wise similarities between treaties are used in the empirical analysis.

IV. Results

a. Convergence in General

This section provides evidence on whether tax treaties are converging in the similarity of their language. To assess overall similarity in tax treaty language over time we measure the pair-wise similarity of each possible pair of treaties in force at any given year, and calculate the mean similarity in each year. Figure 3 presents these statistics. The dashed error spikes provide the 25th and 75th quantiles of these measures by year.

Figure 3 – Pair-wise Text Similarity of Active Treaties By Year

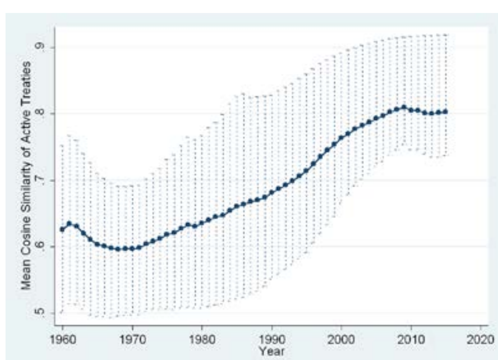


Figure 3 shows a clear increase in similarity between around 1970 to around 2010. The trend holds when we exclude treaties to which at least one country member is an OECD member.

The trend towards convergence becomes clear in the 1970s, in the time when the OECD was the only international institution actively engaged in tax treaty policy. The UN did not publish a model treaty until 1980, and the United States published its first model in 1976. The fact that the OECD dominance on international tax matters was not challenged may have been a contribution factor to prolonged OECD influence (this is further discussed below).

We next turn to measure the pair-wise similarity among each category, applying the same method we use to assess overall convergence. Table 1 shows absolute level of legal language similarity for each of the 32 categories. Absolute similarity is shown for both 1965 and 2015. We also present the change in similarity over such period to show convergence (divergence) within each category, both in absolute and proportional terms. The table is ordered from to most to least similar categories per our 2015 measurements.

Table 1 – Pairwise Similarity of Specific Categories in Active Treaties

Category	1965 sim	2015 sim	change	prop change
Associated Enterprises	0.7937064	0.85899	0.0652	0.0822
Permanent Establishment	0.5521720	0.82869	0.2765	0.5007
Director Fees and Remuneration of Top Officials	0.3295646	0.775551	0.44594	1.35324
Business Profits	0.5617774	0.764777	0.20293	0.36137
Income from Employment	0.4327786	0.749682	0.31696	0.73222
Mutual Agreement Procedure	0.2610742	0.743722	0.482	1.848
Capital	0.2498531	0.733148	0.48328	1.93425
Dividends	0.3504622	0.720334	0.36986	1.05534
Non-Discrimination	0.5509883	0.719448	0.16845	0.30574
Residence	0.3643702	0.718982	0.35461	0.9732
Income from Royalties	0.2418383	0.713655	0.47181	1.95097
Income from Immovable Property	0.1888808	0.695406	0.506520	2.6816
Persons Covered	0.3217583	0.6766	0.354937	1.10311
Exchange of Information	0.4962851	0.665873	0.169587	0.34171
Interest	0.2514439	0.664631	0.413196	1.64329
Capital Gains	0.2660178	0.644644	0.378627	1.42331
Independent Personal Services	0.3297072	0.642245	0.312541	0.94797
Government Service	0.3019349	0.625434	0.323501	1.07148
Entertainers and Sportspersons	0.4636967	0.61213	0.148441	0.32019
Other Income	0.301073	0.607725	0.306647	1.01851
Members of Diplomatic Missions	0.221538	0.554435	0.332897	1.50264
General Definitions	0.517534	0.514908	-0.002629	-0.00507
Territorial Extension	0.585339	0.458559	-0.126781	-0.21653
Pensions	0.386216	0.445803	0.05959	0.15421
Taxes Covered	0.308500	0.435393	0.12689	0.41133
Double Taxation (Exemption Method)	0.229873	0.40091	0.17104	0.74409
Shipping, Waterways Transport, and Air Transport	0.280105	0.38666	0.106554	0.38048
Students	0.450452	0.38117	-0.06927	-0.15378
Termination	0.382656	0.33945	-0.04320	-0.11285
Assistance in the Collection of Taxes	0.1766613	0.28777	0.11111	0.627
Double Taxation (Credit Method)	0.15198	0.27544	0.12345	0.812
Entry Into Force and Implementation	0.34527	0.25986	-0.08541	-0.2477

V. Which Model Treaties are the Most Influential?

This section provides evidence on which model treaties have the largest impact (in terms of text content) on bilateral treaties.

Figure 5 – Average Similarity of Treaties in Force to Model Treaties

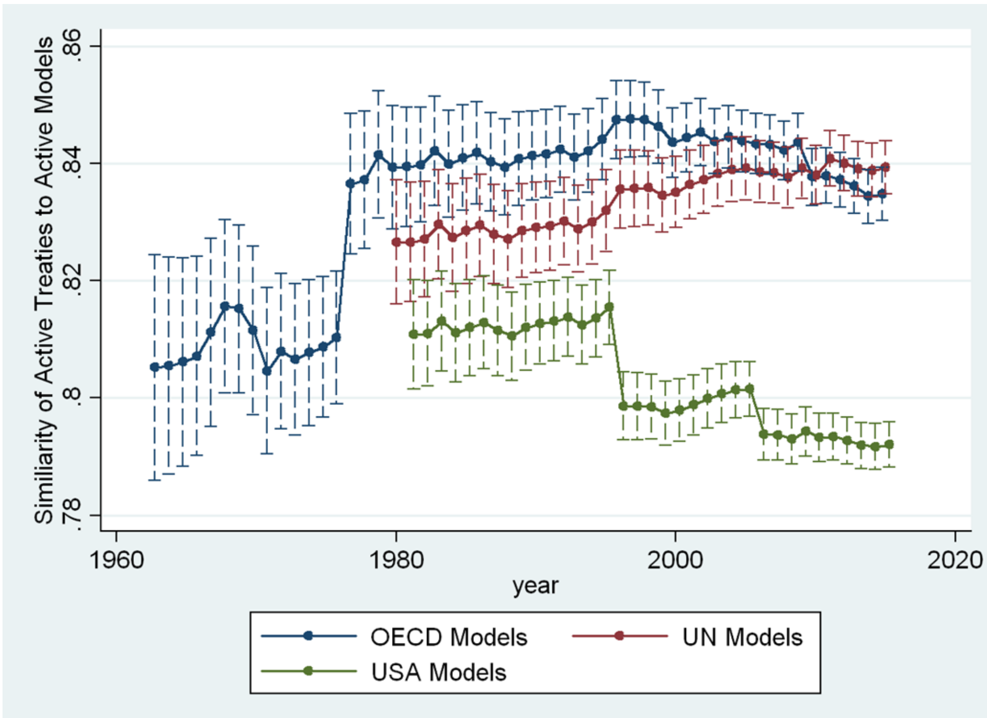
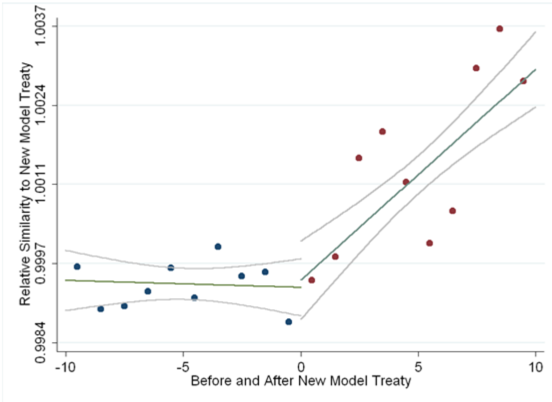


Figure 5 shows the trends in similarity of active treaties to the three models, OECD, United Nations, and United States. It is possible to identify discrete jumps when the various actors introduce new models. A discrete jump upwards means that the new model is more similar to the existing stock of treaties. A discrete jump downwards means that the new model is less similar to the existing stock of treaties. On average, recent active treaties are most similar to OECD and United Nations Treaties. Interestingly, in recent years active treaties seem to be slightly more similar to the latest UN Model (though the difference of similarity to the OECD Model is negligible). As we discuss further below, the introduction of new UN Models seem to have little short term effect on treaties adopted following the introduction of the model. On the other hand, it seems that existing treaty practices, as well as the OECD Model, very slowly converge towards UN legal language. This possibly suggests a very slow process of abandoning favoritism for residence based taxation, in favor of source based taxation, even among OECD countries.

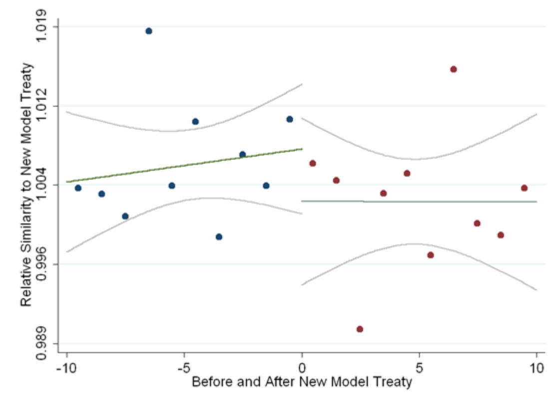
We next turn to question whether the introduction of a new model treaty has an observable effect on actual treaty drafting in the short-to-medium term.

Figure 6 - Relative Similarity to New Models Relative to Old Models, By Conclusion Year

6a. New OECD Models



6b. New UN Models



6c. New U.S. Models

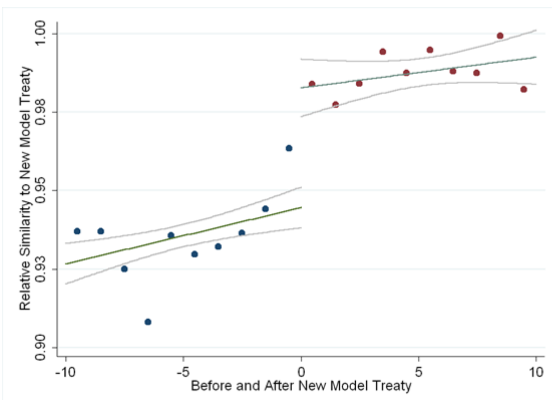


Figure 6 plots the relative similarity of newly concluded treaties to the newest model, relative to the previous model. Formally, this is the average cosine similarity of treaties concluded in a year to the new model, divided by the average cosine similarity of those treaties to the old model. The figure plots the average of this measure in ten years before and after a new model is introduced, separately for OECD, United Nations, and United States models. An increase in the measure after the treaty means that new treaties are following the new model, in the sense that they are more similar to the new model. An upward-sloping pre-trend would mean that the new model is responding to pre-existing trends in tax treaty language.

In the context of new OECD Models, the response is a sloped upwards, post-model introduction. This suggests an over-time convergence of newly concluded treaties towards new OECD Models. It is therefore reasonable to conclude that the introduction of OECD Models have an effect on new treaty drafting.

In contrast, we see no significant trend before or after new models for the UN models.

In the context of new US Models, the first thing one notices is an upward-sloping pre-trend. This suggests that the new model is responding to pre-existing trends in treaty changes. In addition, there is an immediate response of new treaties, which are significantly more similar to the USA models than treaties right before. There are two ways to interpret this outcome: First, the U.S. Model is extremely influential, and new treaties concluded after the introduction of a new U.S. Model immediately adopt the language in that model. A second possible interpretation, is that in the years prior to the introduction of a new U.S. Model, actual treaty practice slowly diverged from the previous model. The new U.S. Model simply adopts new existing practices. Therefore, immediate similarity to the new model is observed. Stated differently, under the second interpretation, a new U.S. Model tends to adopt existing treaty practices and not the other way around.[6]

VI. Conclusion

Our empirical investigation has important implications to the international tax regime debate. Specifically, if countries are free to adopt whatever tax rules they wish, a high level of variance in tax treaty language is expected. The reason is that in tax treaty negotiations, countries will try adopt the position the best serve their national interest (Dagan, 2000). Each pair of countries presents a different set of negotiating circumstances. For example, one country may be a net capital exporter in relation to one treaty partner, but a capital importer in relation to another. A country may hold a strong negotiating position vis-a-vis one treaty partner (for example, due to economic size), but a weak stance against another. Different pairs of countries may present varying levels of kinship or animosity, whether diplomatic or cultural. Given the varied sets of circumstances applicable to each particular treaty, it is reasonable to expect a high level a variance among treaties. Our findings, however, point to convergence in legal language, which may suggest that countries are guided by transnational legal considerations.

We find that convergence in legal language is most clearly observed in the context of intercompany pricing, taxation of cross border business income, and in the context of mutual agreement procedures. The lowest levels of convergence are observed in connection with certain definitional issues (such as the taxes and the geographical extent to which treaties apply), on the question on how to relieve double taxation, as well as in the context of assistance in collection of taxes.

We also explore the institutional aspect of consensus building in tax treaties. We find the OECD Model to be the most influential model. In the years following the adoption of a new OECD Model there is a clear

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[6] To be added: an analysis controlling for country characteristics. We code each member country to a treaty for whether it is or it is not and OECD/OEEC member. This creates on three categories of treaties: jurisdictions are OECD/OEEC members; Both jurisdictions are *not* OECD/OEEC members; One jurisdiction is an OECD/OEEC member, and the other is not. We also plan to add an analysis of the historical influence of the London and Mexico Models.

trend of convergence in newly adopted bilateral tax treaties towards the language of the new OECD model. This suggests that the OECD plays an important role in facilitating international legal consensus on tax matters through the publication of its model treaty.

We also find that model treaties published by the UN have little observable effect in the shot-to-medium term. However, current treaty practices seem to align themselves with the UN Model of 2011 more than with the OECD Model. It is therefore reasonable to accept an argument according to which the UN tax policies may have a long term effect, representing a slow shift from residence to source-based taxation, even among developed countries.

Overall, we believe our findings support the argument that a trend towards international legal consensus exists, at least on certain matters, and that the OECD is the institutional source of the consensus building process. The OECD seems to play an effective role as a quasi-formal international tax organization on tax treaty matters. We stop short of concluding that a customary international law of taxation exists, though we believe our findings lend some support to such arguments.

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