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Abstract

Transfer pricing (TP) regulations have been introduced in the domestic tax laws of 177 countries by the year 2019. This paper provides a survey on TP regulations worldwide for the years 2001 to 2019. First, the paper provides a descriptive overview on the dataset, which includes variables on the years of introduction of TP regulations as well as 40 variables on different provisions in TP regulations. We then perform a pooled cluster analysis on our TP panel dataset to find out how TP regulations have evolved across countries and over time. Finally, we analyze the determinants of bilateral dissimilarity in TP regulations across countries and over time in a regression framework. We find that bilateral trade and income levels are explain similarity in TP regimes across countries. Other geographic and cultural proximity indicators also play a significant role.

JEL codes: H25, K34.

Keywords: Transfer pricing regulations, corporate taxation, cluster analysis, dissimilarity matrix.

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1 Introduction

Recent studies have shown that MNEs exploit loopholes in the international tax system to avoid large amounts of tax (see e.g. Heckemeyer and Overesch, 2017; Riedel, 2018; Wier and Zucman, 2022; and Merlo and Wamser, 2023, for surveys). One of the most prominent channels of tax avoidance is the manipulation of the transfer price of cross-border transactions within the firm (see, e.g., Clausing, 2003; Davies et al., 2018; Liu et al., 2020; Beer et al., 2020).[1] Transfer prices are the prices set for goods or services traded between different divisions or entities within the same firm. In effect, transfer pricing determines how profits are allocated within an MNE group and how much tax is paid on those profits in different jurisdictions. To minimize the overall tax burden, an affiliate in a high-tax country pays an inflated (i.e. above the market price) transfer price for an input or service provided by an affiliate in a low-tax country. This behavior shifts profits from the high-tax affiliate to the low-tax affiliate, where profits are subject to zero or low taxes.

To limit harmful profit shifting and tax avoidance, governments worldwide have introduced anti-tax avoidance rules into their domestic tax codes. Transfer pricing (TP) legislation aims to limit profit shifting and harmful tax avoidance by regulating the setting of transfer prices by MNEs.[2] The core of TP legislation is the arm's length principle, which states that transactions between related parties should be set as between two unrelated parties, i.e. at arm's length. To regulate the arm's length standard, most TP rules prescribe allowable methods and comparables that can be used to calculate valid transfer prices. Many jurisdictions also require the taxpayer to provide detailed information on the calculation of transfer prices on a regular basis. While the first domestic TP laws date back to the 1920s, transfer pricing was also part of the OECD/G20 Base Erosion and Profit Shifting (BEPS) Action Plan launched in 2015 (OECD, 2015). Actions 8 to 10 of the BEPS reform package provided new guidance on the implementation of the arm's

[1] Other important channels of tax avoidance and profit shifting include debt shifting (see, e.g., Buettner and Wamser, 2013) and treaty shopping (see, e.g., Mintz and Weichenrieder, 2010 and van 't Riet and Lejour, 2018), among others. For a recent overview see Merlo and Wamser (2023)

[2] Other anti-tax avoidance rules include general anti-avoidance rules (GAAR), controlled foreign company (CFC) rules, and thin capitalization or earnings stripping rules.

length principle, particularly for hard-to-value intangibles and financial transactions. Despite these international coordination efforts, the content and detail of TP rules varies considerably from country to country, leaving loopholes in the international tax system.[3]. Illustrating and understanding the differences in TP regimes across countries is the main objective of this paper.

This study provides a comprehensive overview on TP regulations worldwide. We have collected the novel *Transfer Pricing Regulations Dataset*, which is part of the *International Tax Institutions (ITI)* database of the Research School of International Taxation (Wamser et al., 2024). It is the most comprehensive dataset on TP regulations worldwide, covering 219 countries and 19 years (2001-2019) and more than 40 variables on their content[4]. The dataset consists of two parts: the first part contains data on the years of introduction of TP legislation, TP documentation requirements, GAARs and Advanced Pricing Agreements (APAs); the second part contains more detailed provisions of domestic TP regulations such as TP methods, comparables, penalties and enforcement indicators. It thus fills an important data gap. Other datasets on TP regulations include Mescall and Klassen (2018), Zinn et al. (2014), Rathke et al. (2020), but their coverage is well below the dataset presented in this study in terms of time, countries and TP provisions.[5]

First, we provide a detailed descriptive analysis of our newly collected dataset. While only eight countries had TP legislation in 1960, 177 countries had TP legislation in 2019. The introduction of TP documentation requirements began later in the 1990s, and as of 2019, 115 countries have these rules in place. Many countries (77) also introduced APA legislation during our sample period, which are agreements between tax administrations and MNEs that pre-determine intra-firm prices for certain transactions. We find differ-

[3]When the BEPS project expanded in 2016 into the Inclusive Framework on BEPS – with more than 140 members today – the actions on transfer pricing were not made a minimum standard for countries to join the platform. Nevertheless, the OECD TP Guidelines are implicitly or explicitly followed by many OECD and non-OECD countries (Calderon, 2007).

[4]Note that the ITI database will be updated and revised on a regular basis to include information on more recent years and additional variables (see https://www.rsit-uni-tuebingen.de/data/).

[5]For example, Mescall and Klassen (2018) estimate a TP risk index for 33 countries and the period 2000 to 2012. Zinn et al. (2014) collect information on key aspects of TP regulations (e.g., year of introduction of TP legislation, TP documentation requirements, methods, penalties, and APAs) for 44 countries and the period 2001 to 2009. Rathke et al. (2020) compile a panel dataset on 57 TP characteristics, covering 44 countries and the period from 2010 to 2016.

ences in the TP rules between OECD and non-OECD countries and between tax havens and non-havens. For example, on average, OECD countries have the highest number of TP provisions, with about 80% of OECD countries having TP documentation requirements in laws and APAs. Furthermore, we find that the TP rules are much more detailed in non-haven jurisdictions than in tax havens, with the exception of the GAAR, which is the most basic of the TP rules and is available in tax havens and in non-haven jurisdictions to the same extent. However, in OECD countries and most non-haven jurisdictions, the basic TP rules are supplemented by provisions on documentation requirements, methods, comparables and penalties.

To provide a more systematic analysis of TP regimes, we perform a pooled cluster analysis on our unbalanced TP panel data from 2001 to 2019, which includes 66 countries with TP legislation in 2001 and 177 countries in 2019. Using the k-modes clustering algorithm, we find three distinct clusters with different levels of detail in their TP regulations. The first cluster includes country-year observations with no detailed TP rules; the second cluster consists of country-year observations with more detailed TP rules that differ from the OECD standards; and the last cluster includes country-year observations with very detailed TP rules based on the OECD TP guidelines. The two clusters with more detailed TP rules differ mainly in their provisions on APAs and penalties. Furthermore, we exploit the time dimension of our TP panel dataset and follow countries that move between the clusters over time. We find that most countries did not have very detailed TP regulations to begin with. However, we do not find a clear pattern of countries that introduced TP regulations earlier having more detailed regulations in 2019, or vice versa. In addition, we find that 11 of the 110 countries that joined the Inclusive Framework on BEPS between 2016 and 2017 changed their TP regulations and moved to Cluster 1 with detailed TP regulations in 2017. Finally, we find that countries with, on average, higher income levels, higher export shares, and higher levels of government spending have more detailed TP regulations. We find no evidence that the clusters are correlated with the statutory corporate income tax rate. This may be due to the fact that the cluster with less detailed TP rules includes both high-tax developing countries and low-tax small island states.

In a second application, we investigate which country-level characteristics are corre-

lated with (dis)similar TP regulations. We construct a bilateral distance measure that indicates by how much the provisions of TP regulations differ between two countries. We regress TP distance on several bilateral socio-economic variables, such as the size of bilateral trade, the tax rate differential, and geographic, cultural, and economic proximity. While our estimation results only indicate correlations, they provide a first insight into important determinants of similarity between TP regimes. The results suggest that bilateral trade volume and fixed effects (i.e. unobserved time-invariant country characteristics) alone explain about half of the variation in bilateral distance between TP regimes. Country pairs that trade a lot, share a common official language, and have a colonial history are likely to have more similar TP regulations. In addition, countries with similar tax rates and greater geographic and economic proximity also have more similar TP regimes.

We contribute to a small literature on TP regimes and their potential drivers (Mescall and Klassen, 2018; Zinn et al., 2014). The work most closely related to ours is that of Rathke et al. (2020). They also perform a (hierarchical) cluster analysis and find four clusters among the 44 countries with similar TP regulatory systems in 2016. Our cluster results are consistent with their findings, except for their very small fourth cluster (only two countries), which is grouped into one of the other three clusters in our analysis. We add to this literature by conducting a pooled cluster analysis, which also allows us to easily track when countries change clusters over time, and thus, identify when and where major TP reforms took place. This gives us a more dynamic perspective on how the three clusters of TP regulatory systems evolve over time. In addition, we are the first to assess the socio-economic determinants of the adoption of similar TP regulations.

The rest of the paper is structured as follows: in Section 2, we present the TP regulations dataset in more detail and compute a bilateral distance matrix of the data. Section 3 presents the results of a pooled cluster analysis and shows which countries have similar TP regulations. In Section 4, we apply a linear regression model to assess the determinants of similar TP regulations. Finally, Section 5 concludes.

2 Data

We have compiled a new comprehensive dataset on TP regulations for 219 countries for the time period from 2001 to 2019 (RSIT, 2022). The dataset includes information on the years of introduction of TP regulations, as well as 40 indicators on detailed characteristics of TP regulations. This section provides some initial descriptive statistics on the novel dataset and computes a bilateral dissimilarity matrix for TP regulations between all country pairs. Appendix A provides all information about the data collection process and the data sources used.

2.1 Descriptive Statistics

Figure 1 shows the introduction TP legislation and TP documentation requirements over time. In 1960, only eight countries had TP legislation in force. The first countries to adopt basic TP legislation based on the arm's length principle were the United States (1921), Sweden (1928) and France (1933). By 1990, 25 countries had basic TP legislation. From the 1990s onwards, many countries started to introduce TP legislation, so that in 2019, 177 countries have TP legislation in force. The introduction of TP documentation requirements only started in 1996 and took off after 2000. By 2019, 115 countries had introduced TP documentation requirements in their domestic tax legislation. Many countries introduced TP legislation and documentation requirements between 2001 and 2019. Therefore, we collect more detailed information on TP rules in each country for this specific time period.

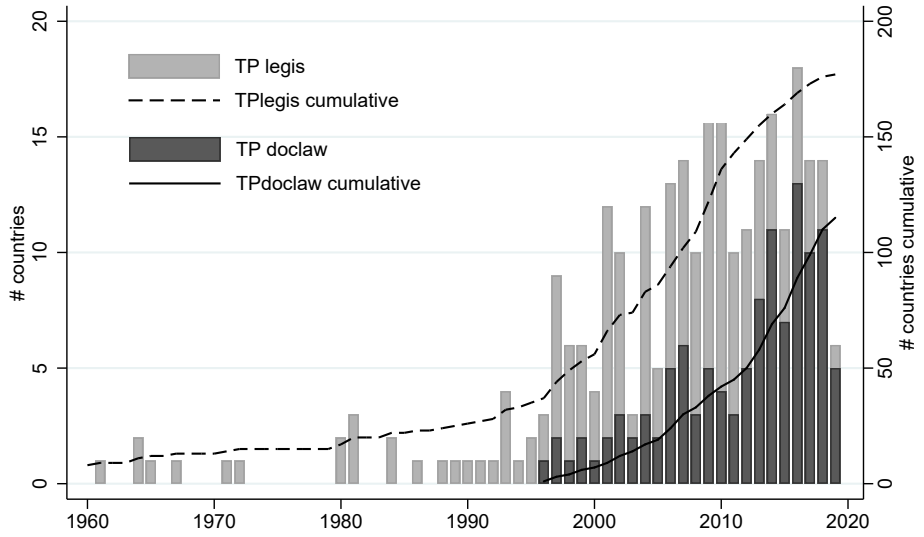
Table 1 provides an overview of the coverage of all variables from our TP regulations dataset for the years 2001 and 2019, as well as the total number of non-missing observations. We include countries with and without TP regulations. The dataset is divided into two parts. First, we collected information on the years of introduction of eight key provisions in TP laws (GAAR, TP legislation, TP documentation requirements, and various types of APAs). Similar to TP legislation and documentation requirements, GAARs have gained popularity. While we observed 44 countries with a GAAR in 2001, there are

Table 1: List of Variables and Coverage

Variable	2001	2019	N
Part I: Introduction of TP regulations			
GAAR	44 (130)	133 (188)	3,349
TP legislation	64 (222)	177 (222)	4,227
TP documentation	17 (180)	138 (180)	3,420
TP documentation in law	9 (185)	115 (185)	3,515
APA legislation	15 (154)	77 (153)	2,908
APA unilateral	16 (144)	72 (144)	2,736
APA bilateral	12 (142)	65 (142)	2,698
APA multilateral	8 (138)	52 (138)	2,622
Part II: Detailed characteristics of TP regulations			
Arm's length principle	34 (35)	147 (149)	1,982
Adoption of OECD TP guidelines	6 (6)	105 (128)	1,252
Documentation:			
Disclosure of related party transactions	- (-)	76 (109)	3,091
Contemporaneous documentation requirements	11 (39)	66 (99)	3,058
Materiality limit and threshold	1 (1)	63 (115)	2,424
Statute of limitations on TP assessments	- (-)	108 (111)	3,101
Methods:			
Comparable uncontrolled price method	14 (14)	111 (111)	3,213
Resale price method	12 (12)	107 (108)	3,143
Cost-plus method	12 (12)	108 (108)	3,163
Transactional net margin method	3 (4)	97 (100)	2,940
Profit split method	7 (7)	99 (102)	2,999
Other methods	5 (5)	47 (86)	2,734
Comparables:			
Availability of benchmarking/comparable data	28 (36)	4 (19)	2,722
Foreign comparables	40 (41)	72 (77)	2,923
Secret comparables	10 (36)	3 (3)	2,648
Additional arrangements:			
Allowance of commissionaire arrangements	35 (40)	8 (8)	2,724
Allowance of cost contribution or costsharing arrangements	32 (37)	10 (10)	2,705
Taxpayer setoffs for other related-party transactions	- (-)	1 (1)	2,178
Penalties:			
Penalties on TP adjustments	- (-)	108 (124)	3,125
Fines for not complying with TP documentation requirements	- (-)	98 (124)	2,851
Fine for not complying with the CbC report requirements	- (-)	28 (124)	2,816
Other fines and penalties	- (-)	67 (127)	2,812
Imprisonment	- (-)	8 (124)	2,827
Temporary disclosure/Obstacles to business activity	- (-)	7 (124)	2,826
Reputational damage	- (-)	7 (124)	2,828
Penalty relief	- (-)	79 (124)	3,064
Enforcement:			
Requency/likelihood of tax audit	- (-)	44 (45)	2,325
TP audit	- (-)	107 (110)	2,874
TP scrutiny	24 (27)	96 (96)	2,886
Challenging of methodology	- (-)	94 (94)	2,388

Notes: The numbers in columns 2 and 3 indicate how many countries have a specific regulation in force in 2001 and 2019, respectively. The numbers in parentheses indicate the number of countries for which the variable is observed in that year (including zeros). The last column reports the number of non-missing observations per variable for the full panel (2001-2019).

Figure 1: TP Legislation and Documentation Requirements, 1960 to 2020



Notes: The light grey bars show the number of countries with new TP legislation by year. The dark grey bars show the number of countries that introduced TP documentation requirements in law in a certain year. The line graphs give the cumulative number of countries with TP legislation and TP documentation requirements. Data comes from the ITI Database (RSIT, 2022).

133 countries with a GAAR in 2019. The rule can be seen as a very basic form of, or complement to, TP legislation that does not explicitly refer to the arm's length principle, but allows tax administrations to challenge transfer prices if they infer tax avoidance.

Similarly, the number of countries with APA legislation has increased from 15 in 2001 to 77 in 2019. APAs allow the taxpayer to negotiate a pre-determined transfer price with the participating tax administrations before the intra-firm transaction takes place.[6]

The second part of the dataset provides more detailed characteristics on different areas of TP regulation (see Table 1). As mentioned above, an important area of TP regulations is documentation requirements. TP documentation rules require corporate taxpayers to provide the tax authority with detailed documentation on the calculation of their transfer prices on an annual basis or upon request. In 2019, 63 countries have a materiality threshold for TP documentation requirements, meaning that MNEs below a certain size are exempt from documentation requirements. In France, for example, only

[6]There are different types of APAs depending on the number of tax administrations involved. Unilateral APAs involve only the taxpayer and the tax administration of one country. A bilateral APA is negotiated between two related taxpayers (two affiliates of an MNE) and the tax administrations of the two relevant countries. Multilateral APAs involve three or more related taxpayers and tax the authorities in each of their countries.

MNEs with unconsolidated turnover or gross assets above EUR 400 million are required to file documentation.[7] Our dataset includes information on the size and basis of these TP documentation thresholds.

Another key area of TP regulation is the methods accepted for calculating valid arm's length transfer prices. The comparable uncontrolled price (CUP) method is the most widely accepted of the five main TP methods and is explicitly allowed in 111 countries in 2019. The CUP method is used to ensure that prices of controlled intra-firm transactions are comparable to uncontrolled transactions between two unrelated parties. However, most TP regimes that specify TP methods allow all five standard methods, which consist of three traditional transaction methods (the CUP method, the resale price method, and the cost-plus method) and two transactional profit methods (the transactional net margin method and the profit split method).

In addition to the TP methods, the type of comparable data allowed is relevant to the calculation of valid transfer prices. Transaction data from a similar unrelated-party transaction of goods or services traded in the same industry and country as the assessed related-party transaction is preferred. However, the goods and services traded within MNEs are often highly firm-specific and perfect comparables do not exist. Therefore, 72 countries explicitly allow the use of foreign comparables in their TP rules in 2019.

To ensure the enforcement of valid arm's length transfer prices, many countries include penalties in their TP regulations. For example, in 2019, 108 countries include penalties for TP adjustments in their tax laws, i.e., a penalty applies if the tax administration has to adjust the transfer price used by the MNE taxpayer because the transfer price was not at arm's length. However, 79 countries also provide for penalty relief under certain circumstances, for example, if the MNE corrects the transfer price in a timely manner. Another enforcement mechanism is tax audits, with 107 countries allowing separate TP audits in 2019. Separate TP audits can make transfer pricing enforcement more efficient by allowing auditors to focus on fraudulent transactions to identify potential mispricing

[7] This materialty threshold was introduced into the French tax code in 2010. Since 2017, smaller French firms with turnover or assets above EUR 50 million also have to file simplified TP documentation, and large MNEs with consolidated turnover of EUR 750 million or more have to provide country-by-country reporting files.

and tax avoidance.

To get a first insight into the worldwide differences in TP rules, Table 2 shows selected descriptive statistics by different groups of countries. More specifically, we divide countries by their OECD membership status (columns 1 and 2), whether they are classified as tax havens (columns 3 and 4, as defined in Dharmapala and Hines, 2009), whether they have low tax rates (columns 5 and 6, as defined by having corporate income tax rates below or above 15%), and whether they are defined by the World Bank as being low-/middle- or high-income countries (columns 7 and 8). The group of OECD countries with TP legislation shows the highest percentage of enactment of most TP provisions. For example, more than 90% of OECD countries have a GAAR, explicitly allow the CUP method, have penalties for TP adjustments, and conduct separate TP audits, while only about half of the non-OECD countries have these TP provisions. We also find differences in the TP rules adopted by tax havens and non-haven countries: while the GAAR is adopted by the same proportion of tax havens and non-haven countries, all the other TP provisions listed in Table 2 are allowed in more non-haven countries than in tax havens. This finding is confirmed when we divide countries with TP legislation into low-tax and high-tax countries, that is, countries with corporate income tax rates below or above 15%. Finally, we find that some TP provisions are allowed to a similar extent in the TP laws of high-income countries and low- and middle-income countries (e.g. TP documentation law or the CUP method). The use of APAs and foreign comparables is allowed to a much lesser extent in low-income countries than in high-income countries.

2.2 Dissimilarity Matrix

To systematically assess how similar or different TP regulations are across countries, we compute bilateral distances between the TP regulations of each country pair. Using the 36 binary TP measures, we compute the Jaccard distance for each country pair in each year. The Jaccard distance d is a simple unweighted count of the mismatches between

Table 2: Overview of Selected TP Regulations and Country Groupings (2019)

Variable	OECD	Non-OECD	Tax haven	Non-haven	Low-tax	High-tax	HIC	LMIC
	N=38	N=139	N=27	N=150	N=17	N=158	N=64	N=107
GAAR	92%	60%	67%	67%	41%	69%	73%	62%
TP documentation law	79%	60%	44%	67%	29%	67%	66%	64%
Materiality limit	63%	27%	15%	39%	29%	35%	42%	31%
APA legislation	84%	32%	33%	45%	24%	45%	59%	33%
CUP method	92%	55%	22%	70%	47%	65%	66%	63%
Foreign comparables	79%	30%	19%	45%	29%	42%	50%	36%
Penalties on TP adj.	92%	51%	30%	65%	53%	61%	66%	59%
Penalty relief	79%	35%	19%	49%	29%	47%	52%	43%
TP audit	97%	50%	26%	67%	53%	62%	67%	59%

Notes: The numbers show the shares of countries with a specific TP regulation in place in 2019. The share is relative to the total number of countries with TP legislation in 2019, indicated by N for each column. Tax haven countries are based on the list provided by Dharmapala and Hines (2009). Low- and high-tax countries are identified by statutory corporate income tax rates below or above 15% in 2019. High-income countries (HIC) and low- and middle-income countries (LMIC) are based on the World Bank's classification of country income groups.

country pairs (X,Y) in the binary TP regulation variables j $\in$ [1, 36]

$$d(X,Y) = \sum_{j=1}^{36} \delta(x_j, y_j) \tag{1}$$

where

$$\delta(x_j, y_j) = \begin{pmatrix} 0 & (x_j = y_j) \\ 1 & (x_j \neq y_j) \end{pmatrix} \tag{2}$$

Thus, the resulting dissimilarity matrices for each year consist of N $\times$ N elements, where N is the number of countries with TP legislation in that year. Each element of the symmetric dissimilarity matrix describes the bilateral distance between the TP regulations of a pair of countries.

By averaging over the bilateral distances for each year, we assess how the overall distance in TP regulations evolves over time. Figure 2 shows that the bilateral distance between TP regulations decreases over time, indicating that TP regulations are becoming more similar across countries. We find a sharp decrease from 0.8 to 0.5 in the average bilateral TP distance from 2001 to 2019, which is based on the bilateral distances in TP

regulations of the 66 countries that had TP legislation in place in 2001 (dashed line). If we also consider the bilateral TP distances of the new country pairs that are added each year as more countries adopt TP rules, we find that the average TP distance decreases, but to a lesser extent, from 0.8 to 0.67 (solid line). The most pronounced decrease in bilateral TP distance is observed for country pairs where both countries are OECD members (dash-dotted line). The OECD has made immense efforts to harmonize TP rules across its member countries, for example by regularly updating and expanding its TP Guidelines (OECD, 2010). Member states – as well as many non-OECD members – have incorporated the TP Guidelines into their domestic tax laws. The goal of more harmonized TP rules across countries is to reduce the scope for transfer price discretion and loopholes for MNEs to avoid tax.

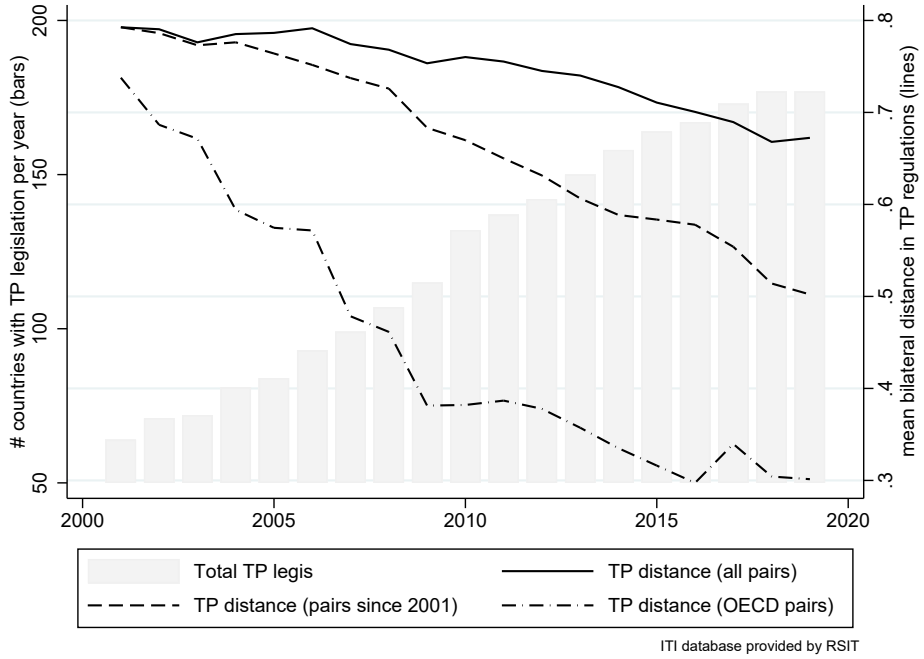
In summary, international efforts to harmonize TP regulations seem to be having some effect, but many differences in TP regulations across countries persist. This encourages us to further investigate differences and similarities in TP regulations across countries and to explore their possible determinants in the following sections.

3 Cluster Analysis

In this section, we present the results of a k-modes pooled cluster analysis on binary TP regulations data for the years 2001 to 2019. Our cluster analysis groups country-year observations with similar TP regulations into clusters and explores their similarities.[8] Understanding differences and similarities in TP regulations across countries and over time is important because they may explain heterogeneous effects of TP regulations. We find three clusters in our sample whose objects have different levels of detail in their TP regulations. Figure 3 shows the countries in the three clusters on a world map for the year 2019. In addition, we discuss how the clusters evolve over time and examine the types of TP legislation that countries typically introduce in the first place. Finally, we examine the economic factors associated with countries in the same cluster and assess the

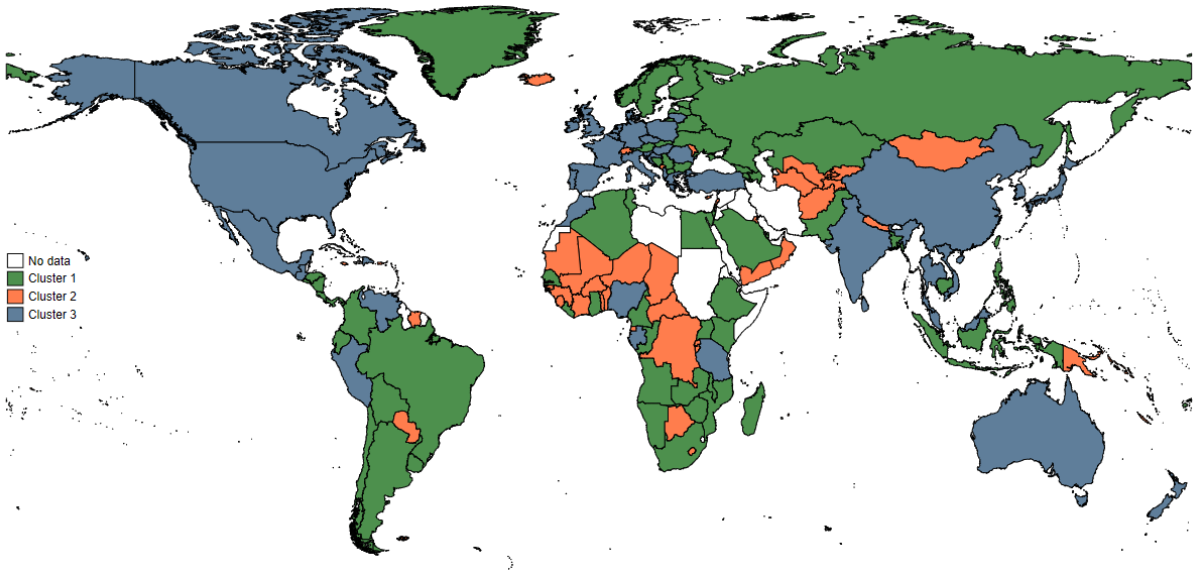
[8]Cluster analysis uses unsupervised machine learning algorithms to find interesting patterns in the data and group objects together into clusters when they share similar characteristics of the data.

Figure 2: Average Bilateral Distance in TP Regulations Over Time



Notes: The line graphs (right axis) show the average bilateral Jaccard distance in TP regulations per year (only binary TP characteristics considered). For the three line graphs, different sets of country pairs are used: all country pairs (solid line), country pairs where both have TP legislation in 2001 (dashed line), and OECD country pairs (dash-dotted line). The bars (left axis) represent the number of countries with TP legislation in the respective year.

Figure 3: Clusters in 2019



Notes: The map shows the results of the kmodes pooled cluster analysis for the year 2019. Cluster 1 includes 65 countries, Cluster 2 includes 69 countries, and Cluster 3 includes 43 countries. A list of the respective countries is included in Appendix B.

non-tax-related characteristics that these countries share.

3.1 Clustering Methodology

In the following, we describe the cluster analysis in detail and outline the three steps involved. First, we create a balanced dataset to perform the clustering process by restricting our data sample to countries with TP legislation in place for the years 2001 to 2019, respectively. Since fewer countries have TP legislation in earlier years, our data sample has 66 country observations in 2001 and 177 country observations in 2019. Furthermore, we restrict the sample to either binary variables or variables converted to binary.[9] This

[9]Variables coded as "yes/no with exceptions" are converted to binary variables by replacing them with "yes/no". The TP method variables are converted to binary variables and a new dummy variable is added to indicate whether there is a hierarchy in the TP methods. The statute of limitations variable is transformed into a binary variable being equal to one if the original variable is greater than zero. The Likert-scale enforcement variables are dropped from the cluster analysis to focus only on the legislative characteristics of TP regulations. The variables "set-offs" and "comparative data available" are dropped due to missing variation. We include four variables on penalties, i.e., penalties for TP adjustments, fines for failure to comply with TP documentation requirements, other fines, and penalty relief.

step is necessary to have a purely binary dataset and do not have to rescale the data.[10] Missing and not applicable values are replaced by zeros because clustering requires a fully balanced dataset. We assume that the absence of information on certain characteristics of TP regulations in most cases indicates the absence of these regulations. Our balanced and binary TP regulation dataset consists of 2,354 country-year observations and 29 binary variables on TP legislative characteristics.

In a second step, we evaluate the clustering tendency of this sample and check for the optimal number of clusters. We compute a Hopkins statistic of 0.313, which is less than 0.5 and indicates that the data is clusterable. The elbow plot suggests an optimal number of three clusters (see Figure B1 in Appendix B).

As a third step, we perform the clustering, for which we use k-modes clustering for our binary TP regulations data, based on the algorithm described in Huang (1997). As a distance measure, we use the Jaccard distance (see Section 2) and the resulting dissimilarity matrices for the years 2001 to 2019, which indicate the bilateral distance in TP regulations for all country pairs. The k-modes algorithm runs over the dissimilarity matrix by randomly assigning three initial modes. Then, the clustering technique divides the countries into three groups by minimizing the distance of the countries to the assigned cluster modes. We iterate the clustering algorithm ten times, choosing different initial modes after setting a seed.[11]

We find three clusters of countries with similar TP regulations over the period 2001 to 2019. Cluster 2 is the largest cluster with 1,226 country-year observations, followed by Cluster 3 with 584 country-year observations and Cluster 1 with 543 country-year observations. A list of countries for each cluster in 2019 can be found in Appendix B. In addition, Figure B2 in Appendix B shows the kmodes clustering results for three initially selected modes. The three clusters are plotted in a two-dimensional space with the first two principal components of the data on the axes, which explain more than 50% of the variation in the data. We also confirm the validity of the clusters by looking at the silhou-

[10]Other clustering techniques, such as k-means, require a rescaling of the original data to obtain continuous variables. This approach is not appropriate for our TP regulation data, which consists mostly of binary variables.

[11]We also tried 25 iterations and the clusters remain stable.

ette widths, which indicate the distance of countries to neighboring clusters.[12] Overall, Cluster 2 is compact and well separated from the other two clusters, while Clusters 1 and 3 are less compact but separated.

3.2 TP Characteristics of the Clusters

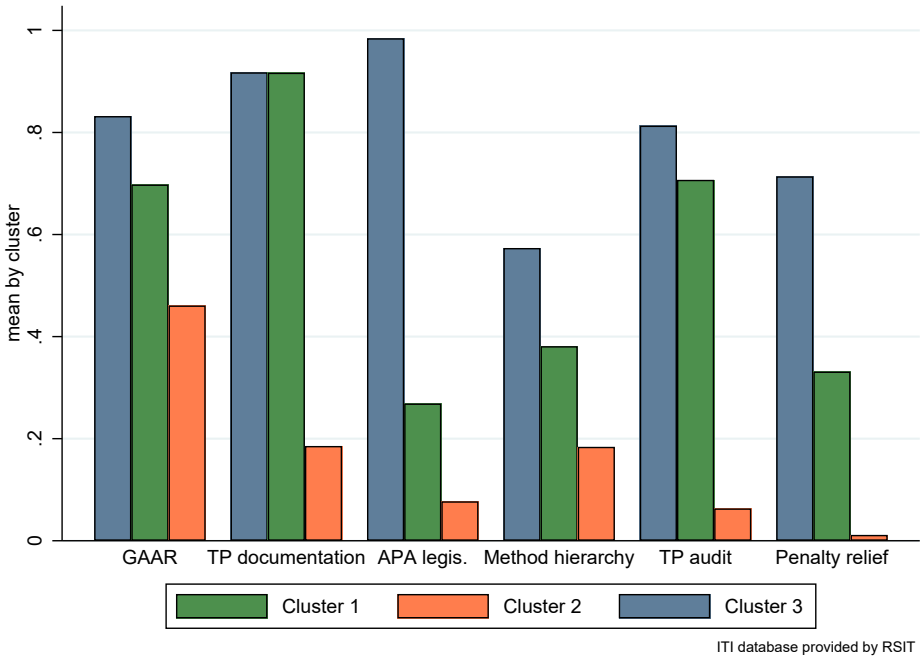
We also examine the characteristics of the TP laws that drive the clustering results. Looking at the loadings of the first two principal components, we find that TP methods, TP audits, penalty relief and APAs account for the highest proportion of variation in our TP data. Figure 4 plots some of these variables in a bar chart (see also Table B1 in Appendix B for the exact numbers). Cluster 2 has the least detailed TP regulations: while almost half of the observations in Cluster 2 have a GAAR in force, less than 20% have TP documentation requirements and less than 10% have APA legislation in force. Clusters 1 and 3 both have high availability of GAARs and TP documentation requirements in their TP regulations, but differ in the availability of APA legislation. In Cluster 3, almost all observations have APA legislation, whereas in Cluster 1, less than 30% of the cluster observations provide APA legislation. Regarding the hierarchy of TP methods (e.g., traditional transaction methods are preferred to transactional profit methods), we find that more than half of the countries in Cluster 3 have a hierarchy in their methods, while fewer countries in Clusters 1 and 2 have a hierarchy in their TP methods.[13] A separate TP audit, apart from a regular tax audit, is a common practice in countries belonging to Clusters 1 and 3, while it is less common in countries belonging to Cluster 2. Finally, Cluster 2 mostly lacks provisions for penalty relief, while Cluster 1 offers penalty relief in one third of the countries and Cluster 3 in about two thirds of the countries.

The summary statistics presented for the TP regulation variables across the three clusters provide a first insight into the differences in TP regulations between them. We have

[12]Our average silhouette width is close to zero, indicating acceptable but not perfect clustering. Some country-year observations in our sample have negative silhouette widths because they are close to other clusters.

[13]Note that the revision of the OECD (2010) TP Guidelines has removed the recommendation for a hierarchy of methods, relying instead on the selection of the most appropriate method. As a result, many countries have removed the hierarchy of methods from their national TP regulations.

Figure 4: TP Characteristics by Cluster



Notes: Bars indicate the share of country-year observations in the respective cluster that have a certain TP rules characteristic in force.

identified three distinct clusters that have different levels of detail in their TP regulations. Cluster 2 contains TP regulations that are not very detailed, which is reflected by the lowest variable means of all TP variables (see Table B1 in Appendix B). Cluster 3 has, on average, the most detailed TP rules and includes all the main provisions suggested by the OECD TP Guidelines (e.g., TP documentation requirements, TP methods, APAs). Cluster 1 has somewhat less detailed, but still comprehensive TP rules, which differ from Cluster 3's rules, for example, in the absence of APA legislation and in not allowing MNEs to use commissioner arrangements or cost-sharing agreements. In sum, the three clusters represent different levels of detail in the TP regulations.

3.3 Evolution of Clusters Over Time

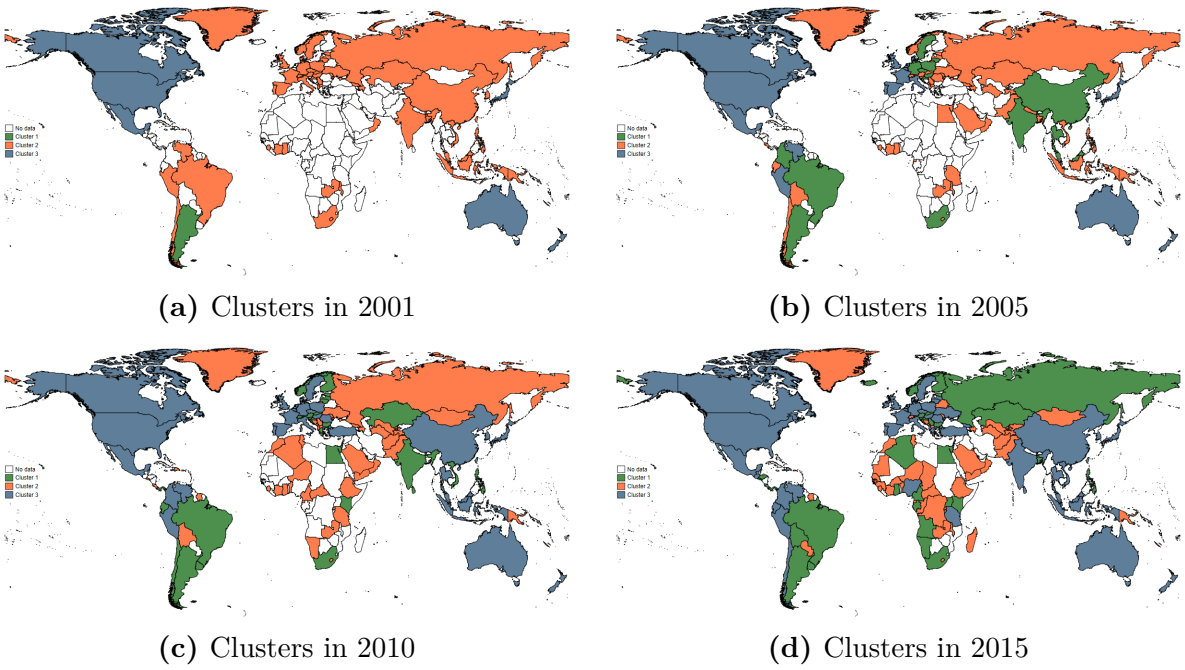
We conduct a pooled cluster analysis on our panel dataset of TP regulations, which includes both time and country dimensions. This approach allows us not only to compare

the differences in TP regulations across countries but also to track their evolution over time. Figures 3 and 5 show the country clusters in the world maps for the years 2001, 2005, 2010, 2015 and 2019, from which we can make three preliminary observations: First, most countries that adopted TP legislation early did not have very detailed TP regulations to begin with, and thus were part of Cluster 2 (see Figure 5, Panel (a)). Second, countries amended their TP regulations during our sample period, so that many early adopters moved from Cluster 2 to Clusters 1 or 3, which represent more detailed TP regulations. Third, the world maps also show where countries introduced new TP legislation over time. For example, in 2001, only 7 countries in sub-Saharan Africa had TP legislation in place, whereas in 2019, 44 countries in Sub-Saharan Africa have TP legislation. In total, 177 countries have adopted TP legislation in their national tax laws by 2019. Of these, 69 countries have not very detailed TP regulations (Cluster 2), 65 countries have more detailed TP regulations that deviate in parts from the OECD TP Guidelines (Cluster 1), and 43 countries have very detailed TP regulations that fully implement the OECD TP Guidelines (Cluster 3).

Regarding our first observation – that the existing TP rules in 2001 were mostly not very detailed – we further investigate what kind of TP rules countries introduced after 2001. The level of detail of TP regulations in our sample can be measured by the number of missing observations in our raw TP data. Therefore, we plot the year of introduction of TP legislation of all 177 countries against the level of detail of their TP regulations in 2019 (see Figure 6). In addition, we use the color and shape of the dots to indicate to which cluster countries belong in the year of introduction of TP legislation (or the first year of our sample, i.e. 2001). We find that the majority of countries did not have very detailed TP legislation in the first place (Cluster 2), regardless of whether countries introduced TP legislation before or after the beginning of our sample period in 2001. This is shown in Figure 6, where most countries are part of Cluster 2 in the year of introduction of their TP legislation. However, there are a few countries that directly introduced more detailed TP regulations and joined Clusters 1 or 3 from the first year. Figure 6 also shows that there is only a modest negative correlation[14] between the year of introduction and the

[14]The correlation coefficient between the year of introduction of TP legislation and the level of detail

Figure 5: World Maps of Clusters in 2001, 2005, 2010 and 2015



(a) Clusters in 2001 **(b)** Clusters in 2005

(c) Clusters in 2010 **(d)** Clusters in 2015

Notes: The maps show the results of the pooled cluster analysis on TP regulations data for four different years, where all country-year observations are mapped into three clusters. See the main text for more details on the cluster analysis.

level of detail of TP regulations in 2019, that is, countries that introduced TP legislation earlier tend to have more detailed TP regulations on average today. Most of the early adopters that introduced TP legislation before 2000 have detailed TP regulations in place in 2019, but there are some outliers (e.g., Kuwait, Monaco and Sint Maarten; see lower left corner in Figure 6). For the countries that introduced TP legislation after 2001, there is a group of countries that do not have very detailed rules in 2019 (circles in the bottom right corner). On the other hand, there are late adopters that have detailed rules in 2019, even though they did not have very detailed rules in the year of implementation (circles in the top right corner). In general, we do not observe a strong correlation between the age of TP regulations and their level of specificity. Therefore, other factors or events must have influenced the level of detail in TP regulations.

In Figure 7, we examine how many countries in the three clusters have joined the Inclusive Framework on BEPS, which was created in 2016 as an extension of the OECD/G20 BEPS project. Member countries commit to implement at least four minimum standards

of TP rules in 2019 is -0.25.

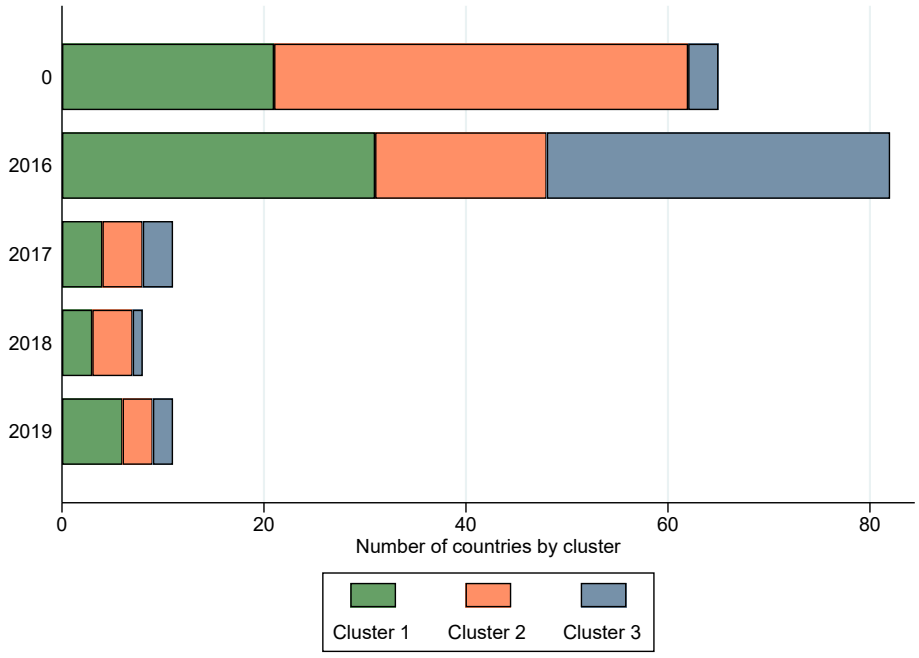
Figure 6: Scatterplot on Introduction Years of TP Legislation and Detailedness of TP Rules in 2019

Notes: The horizontal axis measures the year of introduction of the TP legislation. The vertical axis indicates the number of TP regulation variables available in 2019. The dots represent countries and are colored and shaped by the initial cluster assigned to a country-year observation in the year of introduction or the first sample year (2001).

to combat tax avoidance. However, the four minimum standards do not include the initial BEPS Transfer Pricing Actions (Actions 8-10, BEPS Action Plan 2015). In the first year of operation, 89 countries joined the Inclusive Framework, including 31 countries from Cluster 1, 17 countries from Cluster 2 and 34 countries from Cluster 3 (mostly OECD and G20 countries). For seven member countries, we are not aware of any existing TP legislation. In recent years, the Inclusive Framework has seen a steady increase in membership, comprising 44 countries from Cluster 1, 28 countries from Cluster 2 and 40 countries from Cluster 3 in 2019. It is mainly composed of countries from Clusters 1 and 3, which have comprehensive TP regulations in line with the OECD TP Guidelines. In addition, we have observed a growing number of countries from Cluster 2 that have joined the Inclusive Framework despite not having specific TP regulations. Nevertheless, 65 countries that appear in our cluster analysis and have TP regulations were not part of the Inclusive Framework until 2019.

Moreover, we are interested in whether countries have changed their TP rules after joining the Inclusive Framework, so we examine whether countries have switched between

Figure 7: Inclusive Framework on BEPS and TP Regulations by Cluster



Notes: This bar graph shows how many countries joined the Inclusive Framework on BEPS in the years 2016 to 2019, or are not member (0). Data on when countries joined is taken from the OECD Inclusive Framework's website.

clusters around the year of joining. In particular, we observe an increase in the number of countries (21 in total) that switched between different clusters in 2017 – one year after the establishment of the Inclusive Framework and the publication of the latest OECD TP Guidelines.[15] In total, 17 countries entered Cluster 1 in 2017, of which 11 countries entered the Inclusive Framework in 2016 or 2017. Thus, for these countries, joining the Inclusive Framework was accompanied by a change in their TP regulations. It is worth noting that these countries do not fully align their TP rules with the OECD TP Guidelines, as joining the Inclusive Framework requires countries to implement the four minimum standards and not necessarily to fully endorse the OECD standards.

[15] Among these switchers, five countries switched from Cluster 2 to Cluster 1, introducing more detailed TP rules; two countries switched from Cluster 1 to Cluster 3; 12 countries switched from Cluster 3 to Cluster 1; and two countries switched to Cluster 2.

3.4 Economic Characteristics Across Clusters

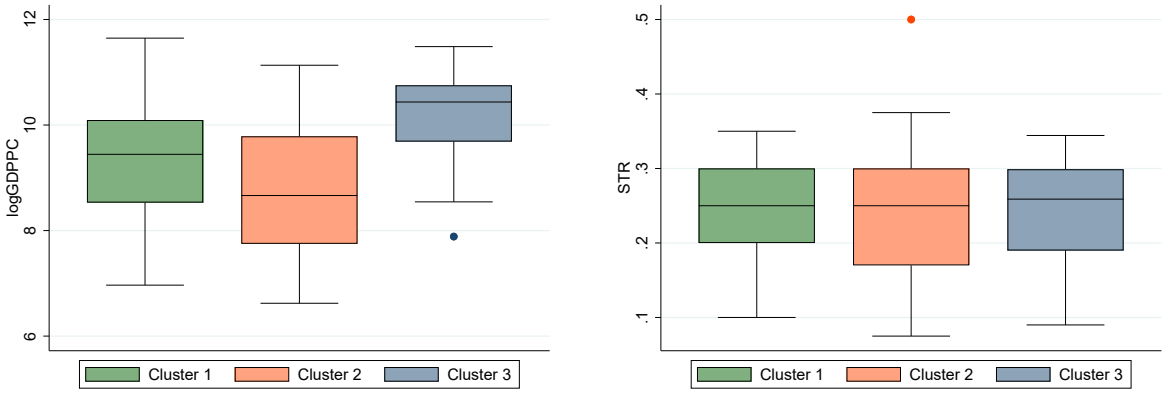
In a final analysis, we examine how the clusters correlate with various economic characteristics of the countries, namely GDP per capita, the statutory corporate income tax rate, the size of exports and government expenditure (both as % of GDP). We expect richer countries to have more detailed TP regulations because they want to maintain their high welfare levels by creating a sustainable tax environment. Moreover, we expect high-tax countries to have more detailed TP regulations because they have an interest in protecting their corporate tax base. In addition, countries with high levels of trade and exports might have more detailed TP regulations because they provide more tax certainty to investors. Finally, countries with higher administrative capacity and higher government spending might have more detailed TP rules, which help to protect their level of revenue collection.

Figure 8 shows boxplots for the four economic variables by cluster for the year 2019. Panel (a) shows that Cluster 3 has, on average, the highest income levels (median log GDP per capita equals 10.44), while Cluster 2 has the lowest income levels (median log GDP per capita equals 8.66). This confirms that Cluster 3 consists mainly of high-income countries, while Cluster 1 includes some high-income as well as middle-income countries. Cluster 2 includes both low-income and middle-income countries without detailed TP rules. Thus, our descriptive analysis confirms that richer countries tend to have more detailed TP regulations and are therefore more likely to be in Cluster 1 or 3.

Comparing the variation in tax rates across clusters in Panel (b), we see that the median tax rate values are identical for all three clusters at 25%. However, Cluster 2 has the largest range of tax rate values, as indicated by the size of the boxplot. Considering the world map graph for 2019, Cluster 2 includes many African countries, which tend to have high tax rates, and at the same time many small island states with low tax rates. In fact, Cluster 2 includes 20 tax havens from the list provided by Dharmapala and Hines (2009), while the other two clusters include only seven tax havens in total. However, we find no clear indication of a correlation between the tax rate and the level of detail of the TP regulations.

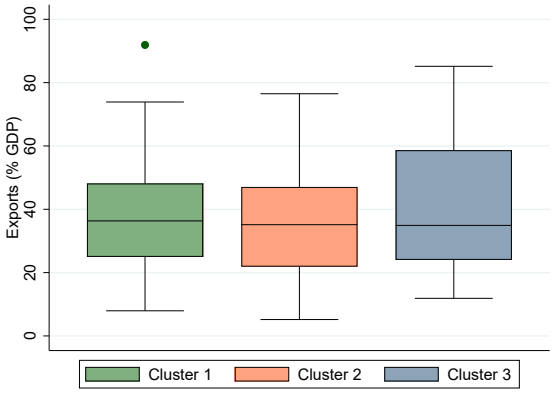
Panel (c) of Figure 8 shows the boxplots for trade openness by cluster. All clusters have

Figure 8: Correlations Between Clusters and Economic Indicators in 2019

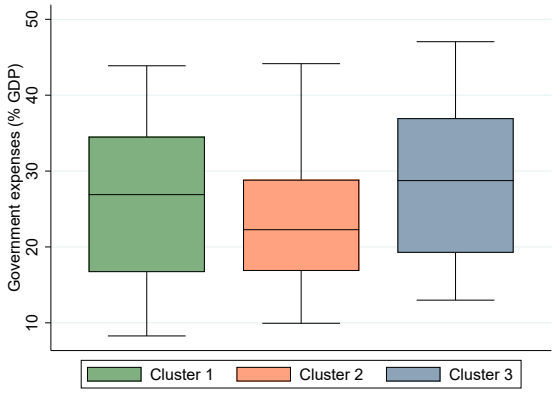


(a) log (GDP per capita)

(b) Statutory corporate income tax rate



(c) Exports (% GDP)



(d) Government expenses (% GDP)

Sources: World Development Indicators Database (World Bank, 2021); Tax Foundation (2022).
Notes: The boxplots show the variation of the variables within clusters by showing the minimum and maximum values (bottom and top lines). The 25th and 75th percentiles of the data bound the box and the median is indicated by the horizontal line in the box. Some extreme outliers are not shown, i.e. export shares above 100% of GDP and government expenditure above 80% of GDP.

similar median export shares of around 35% of GDP, but Cluster 3 has more countries with export shares above 50% of GDP. In fact, the top 5% of export shares in Cluster 3 are above 100% (not shown in Figure 8). The variation of export shares in Clusters 1 and 2 is very similar. Thus, we conclude that in Cluster 3, we have the countries with the highest export shares in 2019 and also the most detailed TP regulations, indicating a positive correlation between trade openness and more detailed TP regulations.

Government expenditure (as % of GDP) is also highest in Cluster 3 with a median value of 28.74%, followed by Cluster 1 (26.89%) and Cluster 2 (22.84 %). We also see that the boxplot of Cluster 2 is the smallest and for half of the countries in Cluster 2, government spending ranges between 16.8 and 29%. On the contrary, half of the countries in Cluster 3 have government spending above 29%. This is consistent with our expectation that countries with higher government spending tend to have higher administrative capacity and thus have developed more detailed TP regulations.[16]

In summary, we find that countries tend to have more detailed TP regulations when they have higher income levels, higher export shares and higher levels of government spending. However, we do not find any clear correlation between the tax rate and our TP regulation clusters.

4 Regression Analysis

In this section, we assess the determinants of the (dis)similarity of TP regulations across countries and over time in a linear regression framework. Figure 2 shows that over time – as more and more countries introduce TP regulations – these regulations become more similar (as measured by the average Jaccard distance between the vector of regulations of any two countries). Nevertheless, there are still many differences in TP regulations across countries. As shown in the previous section, we identify three groups of countries in terms of the similarity of their TP regimes. We now turn to the analysis of which country characteristics are systematically related to the similarity of TP regulations across

[16] In this line, Figure B3 in Appendix B shows how TP enforcement correlates with the three clusters.

country pairs. We develop three hypotheses that we believe are the most influential for countries to adopt similar TP regulations. Our first hypothesis is that countries adopt similar TP regimes when they have strong trade relations. When two countries trade a lot, both sides have an interest in having harmonized TP regimes to avoid costly TP disputes (UN, 2021). Second, we expect that countries that share a common official language or have a common colonial history are also likely to have similar TP rules, because one country's TP rules can serve as a model.[17] Finally, we hypothesize that countries with similar corporate income tax rates – hence, low tax rate differentials – also have similar TP rules. For example, it is likely that two countries with low tax rates both do not have very detailed TP regulations to allow more transfer pricing discretion.

4.1 Data and Estimation Strategy

Our dependent variable measures how dissimilar, or distant, the TP regimes of any two countries are in a given year. The dissimilarity measure is computed as the Jaccard distance between any two countries' vector of binary TP characteristics.[18] A pair of countries has distant TP legislation if many of their binary TP regulations do not overlap. We expect similarity in TP legislation to be related to close trade relations, as well as cultural proximity and similar tax rates. Our unbalanced panel dataset includes 2,016 country pairs with TP regulations in 2001 and 15,225 country pairs in 2019. Table C1 in Appendix C provides summary statistics for all bilateral variables. In the regression analysis we use data from several sources: geographic and cultural distance data (CEPII's GeoDist database, 2011), bilateral trade data (BACI database, 2022), economic development indicators (World Bank, 2021), and industry shares (UNIDO, 2019). Some of the bilateral variables are highly correlated (see Figure C1 in Appendix C). As expected, bilateral trade has the highest negative correlation with our dependent variable distance in TP regulations (-0.444). In addition, trade is correlated with the difference in GDP (0.472)

[17] See Goderis and Versteeg (2014) for empirical evidence on the diffusion of constitutional law along colonial ties.

[18] We use 29 binary variables describing TP regulatory characteristics (see Section 2).

and geographical proximity indicated by sharing a common border (0.223). Thus, these correlates may be picking up the effect of trade on TP distance in the regression specifications. Note that most of our explanatory variables are endogenous, and we do not aim to resolve endogeneity with our estimation strategy, but to identify the main drivers of TP regulatory similarity.

We regress our bilateral TP dissimilarity measure on both time-varying and time-invariant country pair characteristics, while controlling for unobserved time-invariant heterogeneity across countries. Specifically, we estimate the following specification

$$TPdistance_{ijt} = X_{ijt}\beta + \mu_i + \gamma_j + \pi_t + \epsilon_{ijt}. \tag{3}$$

The dependent variable *TP distance*$_{ijt}$ is the bilateral Jaccard distance in TP regulations between country i and country j in year t. The $1 \times K$ vector X_{ijt} contains country-pair specific variables that may vary over time. β is the $K \times 1$ vector of parameters to be estimated. Our main independent variable of interest is a measure of the amount of bilateral $trade_{ijt}$ between two countries i and j in year t. To account for cultural proximity we include indicators for official *common language*$_{ij}$, colonial ties (*colony*$_{ij}$), or *common colonizer*$_{ij}$. We include the *tax rate differential*$_{ij}$ between two countries' statutory corporate income tax rates in a given year. In addition, we include a common border indicator (*contiguity*$_{ij}$) as a measure of geographic proximity. Economic similarity is captured by the difference in GDP (*log(GDP differential*$_{ijt}$)) and GDP per capita (*log(GDP p.c. differential*$_{ijt}$)) of a pair of countries in a given year. We also include a measure of industry-composition dissimilarity (*Industrial distance*$_{ijt}$), which is computed as the Euclidean distance between a country pair's vector of industry shares in a given year.[19] We include country fixed-effects μ_i and γ_j, which capture any unobserved time-constant country-level characteristics that might determine TP regulation. π_t are time dummies and ϵ_{ijt} is the error term.

[19]The Euclidean distance of country pair XY is: $d(X,Y) = \sqrt{\sum(x_i - y_i)^2}$ for all industries $i \in [1; L]$. Industry shares for each country are computed using the UNIDO Industrial Statistics Database.

4.2 Panel Regression Results

Table 3 shows results from OLS fixed-effects regressions where distance in TP regulations is regressed on various country pair characteristics. In column (1), we include only bilateral trade as a regressor and country and year fixed effects, and they already explain about half of the variation in TP distance (see R^2 =0.497). The results show that the more two countries trade with each other, the less distant – i.e. the more similar – their TP regulations are. The coefficient of interest is negative and highly significant at the 1% level. In column (2), we add three time-invariant variables on the cultural proximity of the country pairs and find that having a common official language or having a common colonizer reduces the distance in TP regulations. On the contrary, country pairs with a colonial bond, that is, one country colonized the other, have more distant TP regulations. In a next step, we add the tax rate differential as a regressor and find that country pairs with larger tax rate differentials also have more distant TP regimes. Thus, we find support for all three of our hypotheses.

In columns (4) to (6), we add further control variables on the geographic and economic proximity of country pairs to check the robustness of our results. The results show that countries sharing a common border have more similar TP regulations (see column (4)). In column (5), we add control variables for country pairs' differences in GDP and GDP per capita: countries with similar GDP and income levels tend to have more similar TP regimes. This is consistent with our findings in Figure 8 Panel (a): the level of detail of TP regulations correlates with the income level of countries, and richer countries tend to have more detailed TP regulations. However, by including the economic control variables, the coefficients of colony and tax rate differential become insignificant. In addition, the size of the trade coefficient decreases, corroborating that similar GDP and income levels explain the variation in TP distance through the trade channel.[20]

In column (6), we include the variable on distance in industry shares between country pairs as another time-varying regressor, assuming that countries with similar industry shares might have similar TP regimes. For example, countries with large intangible asset

[20]We re-estimate Table 3 without restricting all specifications to use the same sample as in column (5) and the results are robust (see Table C2 in Appendix C).

Table 3: Panel Regression Results (2001-2019)

	(1)	(2)	(3)	(4)	(5)	(6)
log(trade)	-0.00779***	-0.00535***	-0.00510***	-0.00400***	-0.00304***	-0.00227*
	(0.000706)	(0.000725)	(0.000726)	(0.000729)	(0.000677)	(0.00127)
Common language		-0.0356***	-0.0348***	-0.0318***	-0.0266***	-0.0258***
		(0.00640)	(0.00640)	(0.00641)	(0.00593)	(0.00993)
Colony		0.0236*	0.0244*	0.0311**	0.00947	-0.00383
		(0.0131)	(0.0130)	(0.0127)	(0.00984)	(0.0123)
Common colonizer		-0.0570***	-0.0566***	-0.0547***	-0.0399***	-0.0419**
		(0.00906)	(0.00906)	(0.00906)	(0.00849)	(0.0172)
Tax rate differential			0.0874***	0.0811***	0.000610	0.200***
			(0.0285)	(0.0285)	(0.0268)	(0.0363)
Contiguity				-0.0612***	-0.0367***	-0.0270**
				(0.0105)	(0.00963)	(0.0111)
log(GDP differential)					0.0415***	0.0298***
					(0.00135)	(0.00220)
log(GDP p.c. differential)					0.0198***	0.0133***
					(0.00141)	(0.00193)
Industrial distance						-0.0306
						(0.0299)
Country 1 FE	✓	✓	✓	✓	✓	✓
Country 2 FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	89,154	89,154	89,154	89,154	89,154	31,421
R^2	0.497	0.500	0.500	0.502	0.538	0.657

Notes: The coefficients represent OLS estimates. The dependent variable is the bilateral Jaccard distance in TP regulations between country pairs. Spec. (1) to (5) cover the same sample. The sample size decreases in Spec. (6) because UNIDO data are available for fewer countries. Standard errors in parentheses, clustered at country-pair level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

industries might favor different TP methods than countries with large tangible asset industries. However, we do not find a significant effect of the distance in industry shares on distance in TP regulations.[21]

4.3 Cross-Section Regression Results

Table 4 shows the results of cross-sectional regressions for five different years (2001, 2005, 2010, 2015 and 2019), including the same regressors as in the panel regression. The sample size increases for later cross-sections as more countries introduce TP regulations and are included in our TP distance matrix. We find that the results differ for each cross-sectional regression, suggesting that the determinants of TP distance change over time. For example, economic proximity and a common colonizer are significant indicators of similar TP regimes in all years. In 2005, 2010 and 2019, a common border is associated with more similar TP regimes; starting in 2010, the common language variable yields significant estimates; and in 2015 and 2019, increasing bilateral trade relations are associated with more similar TP regimes. On the contrary, we observe no significant effects of the tax rate differential. The R^2 of the different cross-sectional regressions increases from 0.291 in 2001 to 0.76 in 2019, explaining more than three times the variation in the distance of TP regulations in 2019 compared to 2001. This could be due to the fact that more countries are added to the sample over time, especially developing countries, so that the cultural proximity variables become more relevant.

In columns (6) to (8), we estimate the cross-sectional specification for 2019 by cluster (as derived in Section 3) and use only pure within cluster distance of TP regulations. We find that in Cluster 1, common language and common border decrease within cluster distance in TP regulations. In Cluster 2 with no detailed TP regulations, common language, tax rate differential, and GDP differential determine the similarity of TP regulations within cluster. This recalls our finding in Figure 8 that the tax rate and income levels have a wide range in Cluster 2. For Cluster 3, the bilateral variables have no signifi-

[21] Including the industry share variable shrinks the sample size to about one third, but increases the R^2 to 65.9%.

Table 4: Cross-Section Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2001	2005	2010	2015	2019			
					All	Cluster 1	Cluster 2	Cluster 3
log(trade)	-0.00444	-0.00127	-0.00113	-0.00360***	-0.00238**	-0.000436	-0.00491	-0.000218
	(0.00433)	(0.00355)	(0.00187)	(0.00109)	(0.000977)	(0.000971)	(0.00595)	(0.00142)
Common language	-0.0284	0.00235	-0.0236*	-0.0461***	-0.0494***	-0.0196**	-0.0856**	0.00126
	(0.0244)	(0.0232)	(0.0122)	(0.00800)	(0.00714)	(0.00762)	(0.0425)	(0.00796)
Colony	-0.00829	-0.0238	0.0153	0.0185	0.0274***	-0.0568*	0	-0.00470
	(0.0285)	(0.0232)	(0.0149)	(0.0121)	(0.00998)	(0.0314)	(.)	(0.0143)
Common colonizer	-0.182**	-0.196***	-0.0389*	-0.0360***	0.00321	-0.00146	0.0353	0.00215
	(0.0732)	(0.0503)	(0.0210)	(0.0115)	(0.00960)	(0.0102)	(0.0357)	(0.0122)
Tax rate differential	-0.116	0.150	0.0623	-0.0428	0.0260	0.00677	0.599**	-0.0247
	(0.169)	(0.0917)	(0.0695)	(0.0448)	(0.0449)	(0.0508)	(0.244)	(0.0411)
Contiguity	-0.0551	-0.0524*	-0.0529**	-0.0184	-0.0269**	-0.0259**	0.0159	0.00204
	(0.0376)	(0.0295)	(0.0217)	(0.0125)	(0.0133)	(0.0125)	(0.0803)	(0.0112)
log(GDP differential)	0.0598***	0.0435***	0.0583***	0.0424***	0.0338***	-0.000823	0.0522***	0.00197
	(0.00758)	(0.00549)	(0.00342)	(0.00210)	(0.00220)	(0.00171)	(0.0156)	(0.00179)
log(GDP p.c. differential)	0.0185***	0.0370***	0.0184***	0.0228***	0.00955***	0.00181	0.00231	0.000494
	(0.00538)	(0.00521)	(0.00280)	(0.00208)	(0.00172)	(0.00202)	(0.0125)	(0.00179)
Country 1 FE	✓	✓	✓	✓	✓	✓	✓	✓
Country 2 FE	✓	✓	✓	✓	✓	✓	✓	✓
N	1,276	2,232	4,171	7,685	8,769	1,584	443	811
R^2	0.291	0.437	0.564	0.642	0.760	0.634	0.379	0.845

Notes: The coefficients represent OLS estimates. The dependent variable is the bilateral Jaccard distance in TP regulations between country pairs. Standard errors in parentheses, clustered at country-pair level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

cant effect on TP distance, supporting our argument that the TP regulations of countries in Cluster 3 are already very similar because they are closely based on the OECD TP Guidelines.

5 Conclusion

The aim of this study is to provide a comprehensive picture of the evolution of TP regulations across countries and over time. We present a novel dataset that includes information on the introduction years of TP regulation in 177 countries worldwide and provides detailed information on 40 TP rules for the period 2001 to 2019. In doing so, we fill an important data gap on a widely used anti-tax avoidance rule. Furthermore, we find that TP regulations can be grouped into three levels of detail, as shown by our cluster analysis: countries with no detailed regulations, countries with more detailed regulations, and countries with very detailed regulations based on the OECD TP Guidelines. Many countries started with simple TP rules and then strengthened the rules over time by adding more provisions. Although this is a well-known phenomenon, we are the first to show it systematically and across a large number of low-, middle-, and high-income countries. Finally, we examine the economic and cultural determinants of country pairs adopting similar TP rules. We find that strong bilateral trade relations, as well as cultural and economic proximity, are the main drivers of similar TP rules. This result may be driven by the group of high-income OECD countries that have very similar TP rules.

Our analysis does not address the question of which type of TP rules are the most effective in curbing tax avoidance, and whether or not full harmonization of TP rules worldwide is desirable. We hope that our dataset and analysis will be helpful to other researchers and policymakers in evaluating different TP regimes in the future.

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Appendices

A Additional Material on the Transfer Pricing Data

Data Collection

Our dataset on TP regulations consists of two main parts: the first part covers the years of introduction of GAARs, basic TP legislation, TP documentation guidelines and legal requirements, and APAs. The second part of the dataset is collected only if TP legislation exists in a country in a given year and includes more details on the specific TP regulations (e.g., allowed methods, comparables, penalties, audits, etc.). Table A1 lists all variables included in the dataset, their coding, description, remarks and data sources.

The primary data sources used for our dataset are the *IBFD Corporate Taxation Guides* and the *EY Worldwide Transfer Pricing Reference Guides*. These annual tax guides provide country-level information on TP legislation for a large number of countries for the time period 2009 to 2019. The IBFD source includes information on 141 countries in 2009 and 206 countries in 2018, with annual coverage varying by country. The EY source covers 49 countries in 2009 and adds countries to its report annually, so that the 2019 edition includes 124 countries. Note that EY did not publish a TP guide in 2011 and 2017. Overall, the IBFD source provides greater country coverage and also indicates if a country has no TP legislation in place. However, the level of detail of existing TP regulations varies strongly by country in the IBFD guides, which provide only very basic information for the majority of countries. In contrast, the EY Guides have a clear and consistent structure across countries and over time, allowing the same variabes to be collected and coded in a comparable manner for all countries included in the Guides.

To include earlier years and to achieve better coverage of all variables, we extend our data sources as follows: the *KPMG Global Transfer Pricing Reviews (2009-2015)* are used to code missing years for the introduction of TP legislation and TP documentation requirements; the *IBFD Global Corporate Tax Handbooks* are used to cover earlier years, covering 43 countries in 2004 and 95 countries in 2008; the *EY Worldwide Corporate*

Tax Guides[22] from 2001 onwards are also used for the earlier years and to fill gaps in the years up to 2019; the specific TP regime variables are filled with information from the *Deloitte Strategy Matrix for Global Transfer Pricing (2002-2010)*, the *Deloitte Global Transfer Pricing Desktop Reference (2011)*, the *Deloitte Global Transfer Pricing Country Guides (2013-2016)*, and the *PwC International Transfer Pricing* guides for the period 2004 to 2015. As a final step, we amend the information on the variables included in the Mescall and Klassen (2018) dataset for the years 2001 to 2012. If the year of introduction of TP legislation could not be verified from any of these sources, we consulted government websites, national tax codes, or reached out to global tax advisors.

The coding of all variables follows a general strategy, but may differ for some variables (see Table A1 in Appendix A). In general, a zero indicates that we can verify that a TP rule does not exist or that a particular TP rule is not allowed. The coding of 1 indicates the opposite, that is, a TP rule is in force or a particular TP provision is allowed. For some detailed TP variables, we extend the coding to 2 (no with exceptions) and 3 (yes with exceptions). This coding is used, for example, for the variable foreign comparables, which are often allowed only if no domestic comparables exist (i.e. coding 3 = yes, with exceptions). For the TP methods, we use a scaled coding from 1 to 5, which indicates the level of priority (1= first priority, 5= last priority). In addition, we imputed the missing values for the specific TP variables of the second part of the dataset with -999, which indicates "not applicable" if we found no TP legislation. These missings can be replaced by zeros when using the data for quantitative analysis.

Thus, our dataset provides the most comprehensive data on TP regulations available in terms of coverage of countries, years, and variables. Previous datasets on TP regulations are computed for a limited number of countries and years (e.g., Mescall and Klassen (2018) compiles data for 33 countries in 2000 to 2012) or cover only a few variables (e.g. Zinn et al., 2014). Rathke et al. (2020) extend the latter paper and collect information on TP regulations for 44 countries from 2010 to 2016, covering 57 variables. In comparison, our approach is much more comprehensive, as we search for TP regulations worldwide and also include countries with no TP legislation in our dataset. We consult a wide range of

[22]This source has a large initial country coverage, but reports only very basic information on TP rules.

publicly available sources and code the information in a comparable format, prioritizing the sources IBFD Tax Guides and EY Transfer Pricing Guides. The weakness of using different data sources is that it can lead to inconsistencies in the coding of the variables. However, we have ensured that variables are coded consistently across sources. Moreover, the source of each data point is indicated in the *Source* variables and the *Datereport* variables indicate the date or year of publication of the source (see RSIT meta-dataset, forthcoming).

Table A1: List of Variables

Variable	Coding	Description	Remarks	Sources
Part I: Years of introduction of TP regulations[23]				
General anti-avoidance rule (GAAR)	0/year	This variable indicates the year of introduction of General Anti-Avoidance Rule legislation.	In some countries, a GAAR is in place, but no TP rules; in other countries, no GAAR is in place, but specific rules such as TP rules are in force; in other countries GAARs and TP rules are in force.	IBFD guides, Global Tax Handbooks, EY Worldwide Tax Guides, PwC
TP legislation	0/year	This variable indicates the year of introduction of TP legislation.	The TP legislation variable measures all kinds of TP legislations ranging from very basic legislation based solely on the ALP to more comprehensive and very detailed TP rules. If legislation is basic or very detailed, is indicated in part two on specific provisions of TP legislation.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, Deloitte, PwC
TP legislation change	0/year	This variable indicates whether and when there was a major change in the TP legislation.	A major change in TP legislation might be the introduction of more detailed TP regulations.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, Deloitte, PwC
TP documentation requirements	0/year	This variable indicates the year of introduction of TP documentation requirements.	This variable states more generally if a country has a TP documentation requirement, either in law or in guidelines.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, Deloitte, PwC
TP documentation requirements in national law	0/year	This variable indicates the year of introduction of TP documentation requirement in national law.	This variable is uneqal to zero if TP documentation requirement is included in law, and otherwise zero if no requirement exists or the requirement is only included in non-binding guidelines.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, Deloitte, PwC
APA legislation	0/year	This variable indicates the year of introduction of Advanced Pricing legislation.	Some countries have APA legislation in force, but have not yet concluded any APAs.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC, TPA Country Summary.
Part II: Detailed characteristics of TP regulations				

Continued on next page

[23] All these variables are also included as binary variables in the TP regulations dataset where the variables equal one from the year of introduction onwards and zero otherwise.

Table A1: List of variables (continued)

Variable	Coding	Description	Remarks	Sources
Arm's-length principle (ALP)	0/1	This variable equals one if the country applies the Arm's length principle in that year.	This variable measures if the ALP is included in national law or used in practice, e.g. by the Commissioner and the tax authorities.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, PwC
Adoption of OECD Guidelines	0/1	This variable equals one if the country adheres to the OECD Guidelines in that year.	This variable measures quite broadly if OECD TP guidelines are adopted/followed/referred to/broadly based on/. . . . Therefore, its coding has to be interpreted with caution.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, Deloitte, PwC
Documentation:				
Disclosure of related-party transactions	0/1/2/3	This variable equals one if related-party transactions have to be disclosed on the tax return or elsewhere in that year.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Contemporaneous documentation requirements	0/1/2/3	This variable equals one if the MNE has to keep contemporaneous documentation in that year.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, Global Tax Handbooks, KPMG, Deloitte, PwC, Mescall/Klassen
Materiality limit and tresholds	0/1/2	This variable equals one if there is a treshold for being subject to documentation requirements in that year.	If a materiality status exists, the following three variables are filled in.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Treshold	value	This variable gives the treshold above which the MNE has to fulfill documentation requirements.		
Unit		needed for treshold interpretation		
Basis		needed for treshold interpretation		
Statute of limitations on TP assessments	years/-1	This variable measures the number of years for which the tax authority can ask for documentation.	To keep the variable as numeric, we inserted -1 if none statute of limitations exists.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
APAs:				
APA unilateral	0/1	This variable equals one if unilateral APAs are allowed.	Unilateral APAs are only concluded by one country.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC, TPA Country Summary.
APA bilateral	0/1	This variable equals one if bilateral APAs are allowed.	Bilateral APAs are concluded between a country pair.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC, TPA Country Summary.

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Table A1: List of variables (continued)

Variable	Coding	Description	Remarks	Sources
APA multilateral	0/1	This variable equals one if multilateral APAs are allowed.	Bilateral APAs are concluded between several countries.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC, TPA Country Summary.
Methods:				
Comparable uncontrolled price (CUP) method	0-5	This variable measures whether the Comparable uncontrolled price method is allowed to calculate transfer prices. Higher values indicate lower priority.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Resale price method (RPM)	0-5	This variable measures whether the Resale price method is allowed to calculate transfer prices. Higher values indicate lower priority.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Cost-plus method (CPM)	0-5	This variable measures whether the Cost plus method is allowed to calculate transfer prices. Higher values indicate lower priority.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Transactional net margin method (TNMM)	0-5	This variable measures whether the Transactional net margin method is allowed to calculate transfer prices. Higher values indicate lower priority.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Profit split method (PSM)	0-5	This variable measures whether the Transactional proft split method is allowed to calculate transfer prices. Higher values indicate lower priority.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Other methods	0/1	This variable measures whether others methods are allowed to calculate transfer prices.		IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Global Tax Handbooks, Deloitte, PwC
Comparables:				
Availability of benchmarking/comparative data	0/1/2/3	This variable equals one if benchmarking/comparative data are available to the taxpayer in that year.	In many countries, the access to comparative public data is limited.	EY TP Guides, KPMG, Deloitte, PwC, Mescall/Klassen
Foreign comparables	0/1/2/3	This variable equals one if foreign comparables are allowed to the taxpayer in that year.	In many cases, foreign comparables are only allowed if no domestic/local comparables exist.	EY TP Guides, KPMG, Deloitte, PwC, Global Tax Handbooks, Mescall/Klassen
Secret comparables	0/1/2/3	This variable equals one if secret comparables are allowed/used to the tax authority in that year.	Little countries officially allow secret comparables, but they are often used in practise.	IBFD guides, EY TP Guides, KPMG, Deloitte, PwC, Mescall/Klassen
Additional arrangements:				

Continued on next page

Table A1: List of variables (continued)

Variable	Coding	Description	Remarks	Sources
Allowance of commissionaire arrangements	0/1/2/3	This variable equals one if commissionaire arrangement are allowed in that year. This means that the MNE can enter a country via a commissionaire.	This variable is only available for a limited number of countries.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, Deloitte, Mescall/Klassen
Allowance of cost contribution arrangements (CCA)/cost sharing agreements (CSA)	0/1/2/3	This variable equals one if cost contribution arrangements (CCA)/cost sharing agreements (CSA) are allowed in that year. This means that the MNE is allowed to split costs across subsidiaries in different countries.	This variable is only available for a limited number of countries.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, Deloitte, PwC, Mescall/Klassen
Taxpayer set-offs for other related-party transactions	0/1/2/3	This variable equals one if set-offs are allowed to the taxpayer. This means that the MNE can bundle transactions between countries.		IBFD guides, Deloitte
Penalties:				
Penalties on TP adjustments	0/1/2/3	This variable equals one if there are penalties on TP adjustments in that year.	Note that TP adjustment penalties can have a wide range and differ a lot across countries. In most cases, they are calculated as a %age of the additional tax payed.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, Global Tax Handbooks, PwC
Amount of the penalty in % (range)	value (0-100)	This variable gives the value or range in % of the penalty on TP adjustments.	Note that the base of calculation might differ. See line "Base".	same as above
Base	"% of the unpaid tax" or "% of the adjusted amount"	This variable gives the base on which the penalty on TP adjustment is calculated.	Note that there still might be countries which calculate their penalties in a different way.	same as above
Fines for not complying with TP documentation requirements	0/1/2	This variable equals one if there are fines for not complying with TP documentation requirements in that year.	This variable depends on the existence of binding TP documentation requirements in law.	IBFD guides, EY TP guides, EY Worldwide Tax Guides, KPMG, Deloitte, PwC
Fines for not complying with TP documentation requirements are capped	0/1	This variable equals one if the fines for not complying are capped at a certain level or the fine is a single payment		EY TP guides
Absolute value of fines for not complying with TP documentation requirements (maximum and per year)	Absolute value in local currency	This variable gives the absolute value of the fine for not complying with TP documentation requirements in the local currency (capped amount or maximum amount per fiscal year)		EY TP guides
Fine for not complying with the CbC report requirments	0/1	This variable equals one if there are specific fines for not complying with the CbC report		IBFD guides, EY TP guides, KPMG, Deloitte
Absolute value for not complying with CbC report requirements (maximum and per year)	Absolute value in local currency	This variable gives the absolute value of the fine for not complying with CbC requirements (maximum and per year)		EY TP guides
Other fines and penalties	0/1	This variable equals one if there are other fines or penalties in that year.	Other penalties are imposed if e.g. tax fraud or other crime has been dicovered. They can be monetary penalties or impose imprisonment.	IBFD guides, EY TP guides, KPMG, Deloitte, Global Tax Handbooks, PwC

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Table A1: List of variables (continued)

Variable	Coding	Description	Remarks	Sources
Imprisonment	0/1	This variable equals one if imprisonment is a possible punishment for TP offences		IBFD guides, EY TP guides, KPMG, Deloitte
Temporary disclosure/Obstacles to business activity	0/1	This variable equals one if temporary disclosure of the company or obstacles to business activity are possible punishments for TP offences		IBFD guides, EY TP guides, KPMG, Deloitte
Reputational damage	0/1	This variable equals one if a violation of applicable rules also cause a damage of reputations.	Reputational damage means that companies are considered as non-compliant with respect to tax issues.	IBFD guides, EY TP guides, KPMG, Deloitte
Penalty relief	0/1/2/3	This variable equals one if the tax authority has the power to conduct penalty reliefs in that year.	In many cases, penalty relief is allowed if the taxpayer can provide sufficient documentation requirements.	IBFD guides, EY TP guides, KPMG, Deloitte
Enforcement:				
Frequency/likelihood of tax audit	0-5	This variable measures the likelihood of a tax audit on a 5-level scale (1 is low, . . . , 5 is high ; 0 is no tax audit at all).		EY TP guides, PwC
TP audit	0/1	This variable equals one if a TP audit is explicitly mentioned.	A TP audit can take place seperately or within a normal tax audit.	IBFD guides, EY TP guides, PwC
TP scrutiny	1-5	This variable measures the scrutiny of a TP audit on a 5-level scale (1 is low, . . . , 5 is high).	For years prior 2013, this variable has been extended by the variable TP enforcement (multiplied by 5 for re-scaling) from the Mescall/Klassen data which have coded the information as well from EY guides.	EY TP guides, EY Worldwide Tax Guides, IBFD guides, PwC, Mescall/Klassen
TP scrutiny increasing	1/2	This variable equals 1 if TP scrutiny is increasing; and equals 2 if TP scrutiny is expected to increase.		EY TP guides, EY Worldwide Tax Guides, IBFD guides, PwC
Challenging of methodology	1-5	This variable measures whether the methodology is challenged by the tax authority. The variable ranges from 1 to 5 (1 is low, . . . , 5 is high).		EY TP guides
Identifiers:				
Country or Area		panel identifier		
Year		panel identifier		
Source		gives the main source for each observation		
Date report		gives the date of the report used as source for each observation		

Notes: If not indicated differently, the general coding of the variables is: 1 = a rule is in force, 0 = no rule in force or not allowed, 2 = no with exceptions, and 3 = yes with exceptions.
We inserted -999 for variables of part II if no TP rules in part I exist and thus the variables are not applicable.
We inserted appropriate fill-in (up to three lags) if the values before and after a missing observation are the same.

B Additional Material on the Cluster Analysis

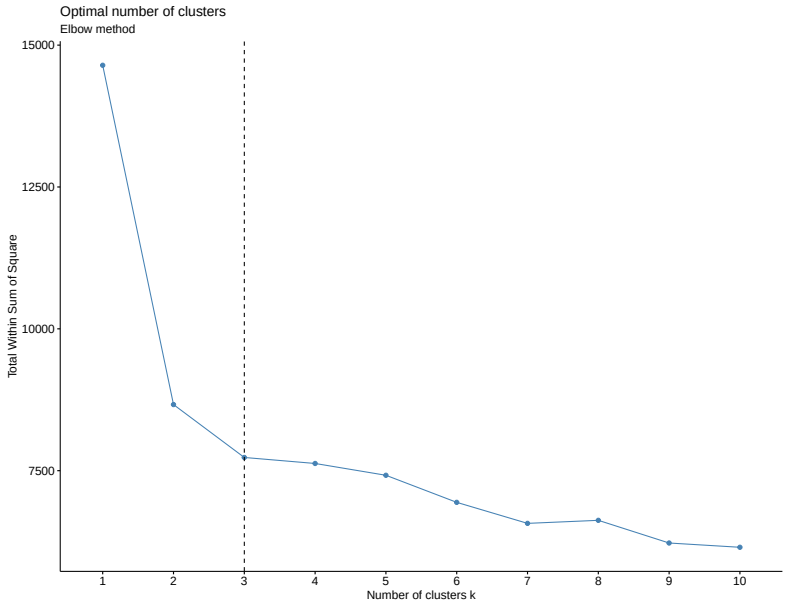
List of countries per cluster in 2019

Cluster 1 (N=65): Algeria, Angola, Argentina, Armenia, Austria, Azerbaijan, Bangladesh, Belarus, Bolivia, Bosnia & Herzegovina, Brazil, Bulgaria, Cambodia, Cameroon, Cape Verde, Chile, Colombia, Congo-Brazzaville, Cook Islands, Costa Rica, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Fiji, Finland, Georgia, Ghana, Greenland, Honduras, Indonesia, Israel, Kazakhstan, Kenya, Kosovo, Latvia, Liberia, Luxembourg, Madagascar, Malawi, Mozambique, Namibia, Nicaragua, North Macedonia, Norway, Pakistan, Panama, Philippines, Qatar, Russia, Saudi Arabia, Senegal, Serbia, Slovakia, South Africa, South Sudan, Sweden, Taiwan, Tunisia, Uganda, Ukraine, Uruguay, Zambia, Zimbabwe.

Cluster 2 (N=69): Afghanistan, Andorra, Aruba, Benin, Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Congo-Kinshasa, Côte d'Ivoire, Curaçao, Cyprus, Dominica, Equatorial Guinea, Falkland Islands, Faroe Islands, French Polynesia, Gambia, Gibraltar, Guadeloupe, Guam, Guinea, Guinea-Bissau, Iceland, Jamaica, Kuwait, Kyrgyzstan, Lebanon, Lesotho, Liechtenstein, Maldives, Mali, Martinique, Mauritania, Mauritius, Moldova, Monaco, Mongolia, Montenegro, Montserrat, Nauru, Nepal, New Caledonia, Niger, Northern Mariana Islands, Oman, Papua New Guinea, Paraguay, Puerto Rico, Rwanda, Samoa, San Marino, São Tomé & Príncipe, Seychelles, Sierra Leone, Sint Maarten, Solomon Islands, St. Vincent & Grenadines, Suriname, Switzerland, Tajikistan, Togo, Tonga, Turkmenistan, U.S. Virgin Islands, Uzbekistan, Yemen.

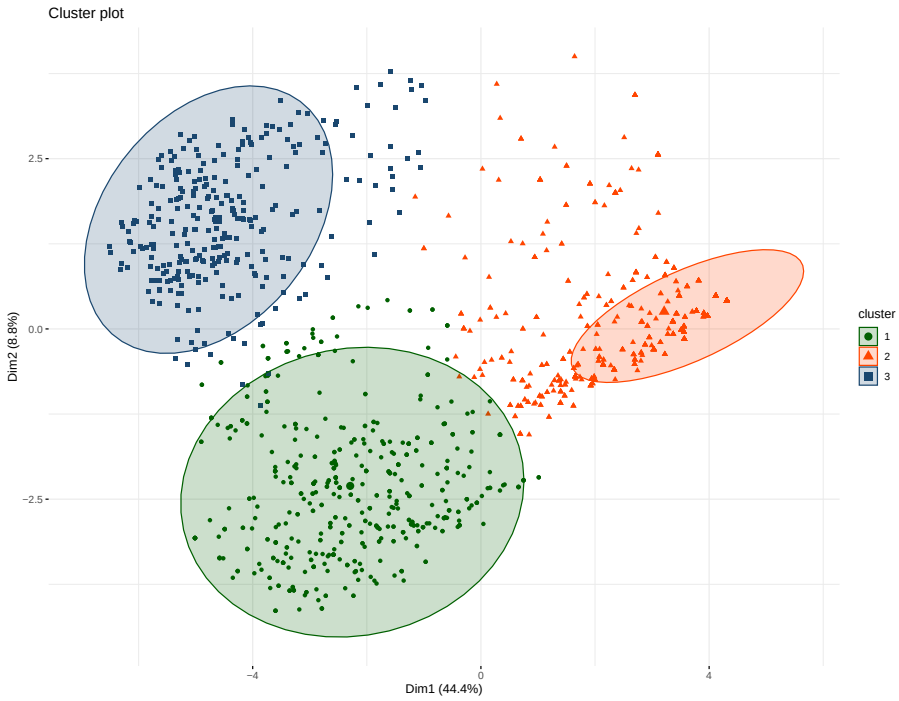
Cluster 3 (N=43): Albania, Australia, Belgium, Canada, China, Croatia, Czechia, Denmark, Dominican Republic France, Gabon, Germany, Greece, Guatemala, Hong Kong SAR China, Hungary, India, Ireland, Italy, Japan, Lithuania, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Peru, Poland, Portugal, Romania, Singapore, Slovenia, South Korea, Spain, Sri Lanka, Tanzania, Thailand, Turkey, United Kingdom, United States, Venezuela, Vietnam.

Figure B1: Elbow Plot Kmodes Clustering 2019



Notes: This elbow plot shows the total within sum of squares (vertical axis) for our binary TP regulations dataset used for the pooled cluster analysis at different possible numbers of clusters (horizontal axis). At three clusters, there is a kink in the line graph, which flattens out for clusters greater than three. Therefore, the optimal number of clusters for our data is three.

Figure B2: Kmodes Pooled Clustering Results, 2001-2019



Notes: Cluster 1 has 543 country-year observations, Cluster 2 has 1,226 country-year observations and Cluster 3 has 584 country-year observations. Only binary TP regulation variables are used for clustering (see Table B1). The axes represent the first two principal components of the data, which explain 44.4% and 8.8% of the variation in the TP rules data, respectively.

Table B1: Summary Statistics TP Clustering Data (2019)

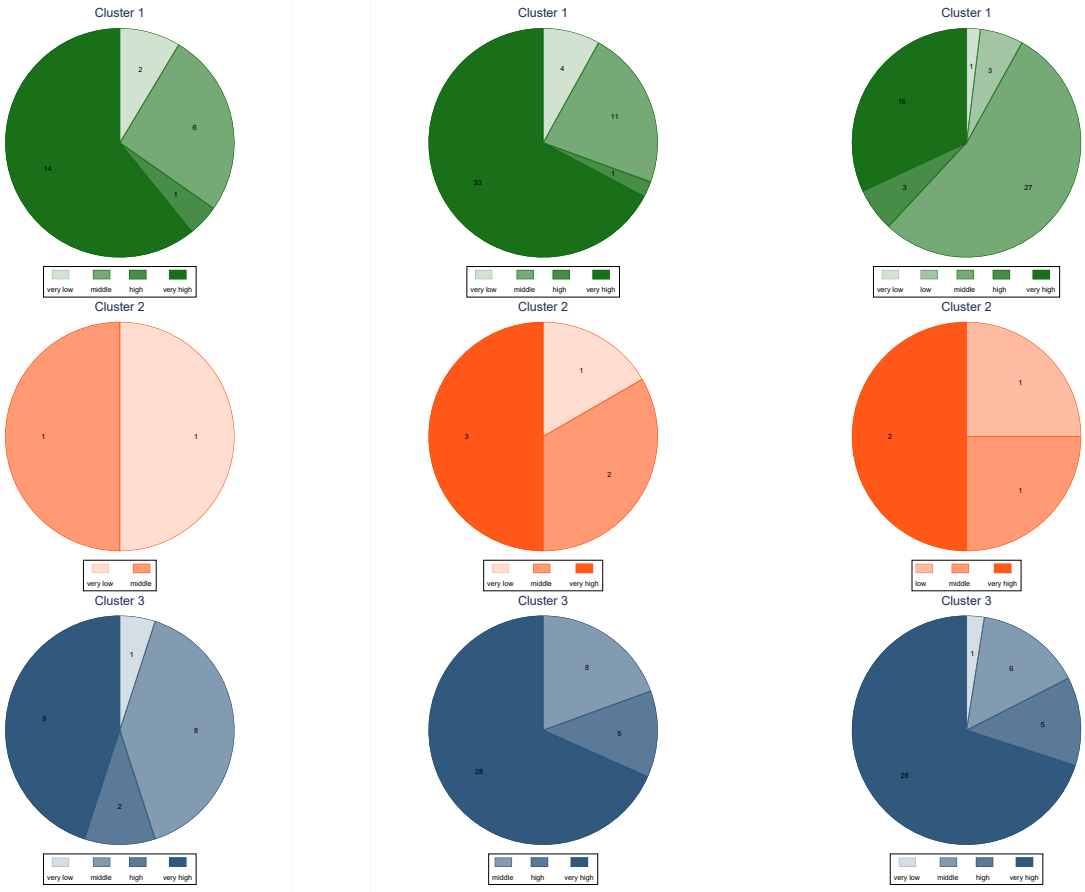
Variable	Mean 1	Mean 2	Mean 3	diff 1 - 2	diff 2 - 3	diff 1 - 3
GAAR	0.698	0.458	0.832	0.24***	-0.374***	-0.134***
OECD guidelines	0.777	0.111	0.856	0.666***	-0.745***	-0.079***
ALP	0.948	0.537	0.974	0.412***	-0.438***	-0.026**
TP documentation	0.917	0.184	0.918	0.733***	-0.734***	-0.001
TP documentation law	0.696	0.132	0.666	0.564***	-0.534***	0.03
CUP method	0.982	0.185	0.990	0.796***	-0.804***	-0.008
RPM method	0.958	0.132	0.985	0.826***	-0.853***	-0.027***
CPM method	0.980	0.148	0.985	0.832***	-0.837***	-0.005
TNMM method	0.869	0.014	0.908	0.856***	-0.894***	-0.038**
PSM method	0.891	0.032	0.969	0.86***	-0.938***	-0.078***
Other methods	0.381	0.035	0.442	0.346***	-0.407***	-0.06**
Method hierarchy	0.381	0.183	0.574	0.199***	-0.391***	-0.193***
Foreign comparables	0.652	0.107	0.813	0.545***	-0.707***	-0.162***
Secret comparables	0.168	0.027	0.356	0.141***	-0.329***	-0.189***
CAs	0.354	0.100	0.623	0.254***	-0.524***	-0.27***
CSAs	0.297	0.059	0.709	0.238***	-0.65***	-0.413***
Disclosure	0.562	0.039	0.711	0.522***	-0.671***	-0.149***
Contemporaneous doc.	0.418	0.012	0.685	0.406***	-0.672***	-0.267***
Materiality limit	0.293	0.024	0.396	0.269***	-0.371***	-0.103***
Statute of limitations	0.908	0.112	0.957	0.796***	-0.846***	-0.05***
Penalty TP adjust.	0.807	0.084	0.890	0.723***	-0.806***	-0.084***
Fine TP doc.	0.529	0.006	0.397	0.523***	-0.392***	0.132***
Other fines	0.359	0.035	0.363	0.324***	-0.328***	-0.004
Penalty relief	0.331	0.011	0.714	0.32***	-0.703***	-0.383***
TP audit	0.707	0.063	0.813	0.644***	-0.751***	-0.106***
APA legislation	0.269	0.077	0.985	0.192***	-0.908***	-0.716***
APA unilateral	0.276	0.091	0.930	0.185***	-0.839***	-0.653***
APA bilateral	0.129	0.060	0.911	0.069***	-0.851***	-0.782***
APA multilateral	0.083	0.028	0.783	0.055***	-0.755***	-0.7***

Notes: This table shows the means by cluster of the 29 binary variables used in the pooled cluster analysis. Mean 1 is based on 543 observations from Cluster 1; Mean 2 is based on 1,226 observations from Cluster 2; and Mean 3 is based on 584 observations from Cluster 3. The differences in the means between two clusters are also shown. The asterisks indicate whether the two means are statistically different based on a t-test. Significance levels: ***: 0.01, **: 0.05, *: 0.1.

Enforcement of TP Regulations Across Clusters

Figure B3 shows how TP enforcement varies across the three clusters. Three different enforcement variables are shown: tax audit indicates how likely it is for a firm in a given country to be audited (range from 1 = very low to 5 = very high); TP scrutiny indicates the scrutiny of a TP audit on the same scale; and challenging methodology measures how likely it is that the tax authorities challenge the methodology of transfer pricing calculation (scale 1 = very low to 5 = very high). For each enforcement measure, we show how countries perform within each cluster. For Cluster 2, the enforcement variables are not available for more than 90% of the countries in 2019. Of course, this does not directly imply that enforcement is low in these countries. However, the fact that TP regulations are not very detailed in these countries suggests that there is also little guidance on the enforcement of the regulations. Cluster 3 shows the highest ranks in "TP scrutiny" and "challenging methodology". More than half of the countries in Cluster 3 have a high levels of TP scrutiny and very high levels of challenging of TP methodology. Cluster 1 also shows medium to high TP enforcement. Two-thirds of the countries in Cluster 1 have a high level of tax audit and TP scrutiny, while half of the countries have only a medium level of TP methodology challenge.

Figure B3: Enforcement of TP Regulations by Clusters, 2019

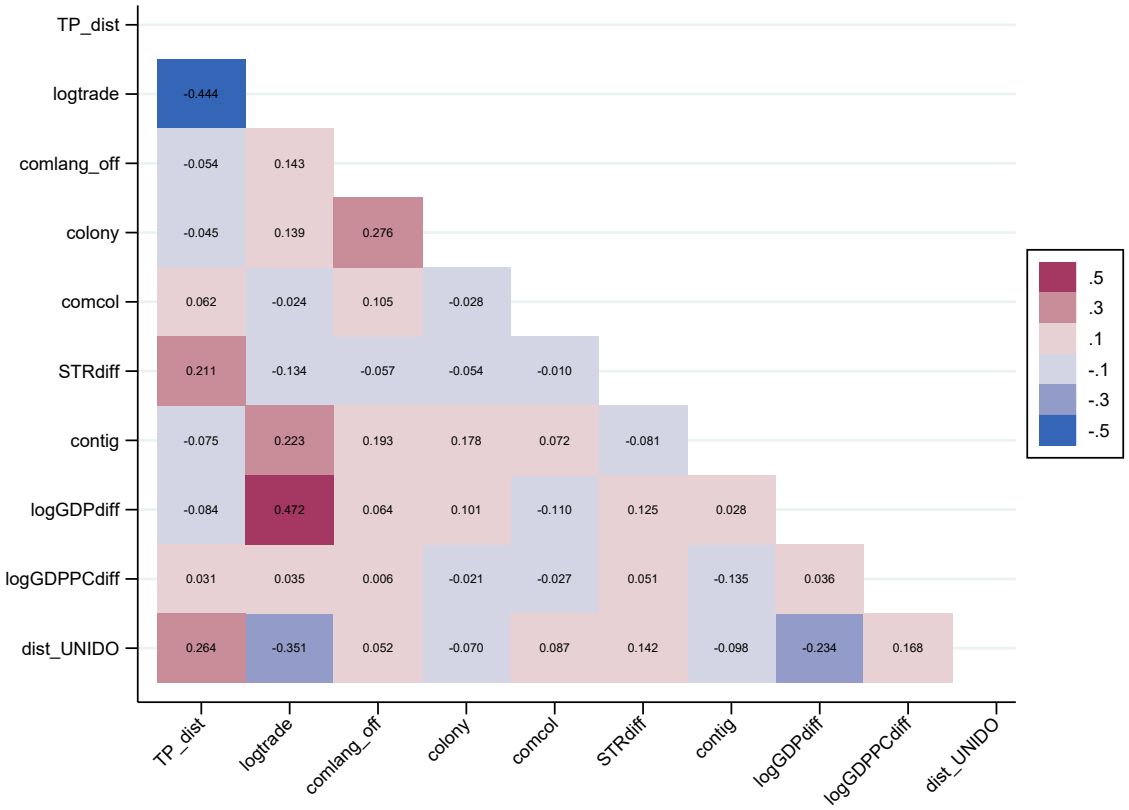


(a) Tax audit **(b)** TP scrutiny **(c)** Challenging methods

Notes: The pie slices indicate the total number of countries per cluster, and the colors indicate the probability of each enforcement variable. The probability levels range from very low to very high.

C Additional Material on the Regression Analysis

Figure C1: Correlation Matrix - Bilateral Variables



Notes: Correlation coefficients between all bilateral variables are shown, where darker colors indicate stronger correlations. The upper diagonal is excluded due to the symmetry of the correlation matrix.

Table C1: Summary Statistics on Bilateral Data

Variable	Obs	Mean	SD	Min	Max	Description	Sources
Dependent variable:							
TP distance	156,595	0.725	0.273	0	1	Bilateral distance in TP regulations based on Jaccard distance between two countries	Research School of International Taxation (2022)
Cultural and geographic proximity controls:							
Common language	137,397	0.135	0.341	0	1	Common offcial language indicator	CEPII's GeoDist database, see
Colony	137,397	0.016	0.124	0	1	Colonial ties indicator	Mayer and Zignago (2011)
Common colonizer	137,397	0.064	0.244	0	1	Common colonizer indicator	
Contiguity	137,397	0.018	0.134	0	1	Common border indicator	Mayer and Zignago (2011)
Economic proximity controls:							
log(trade)	112,376	8.752	4.145	0.001	20.032	Bilateral trade volume (all imports & exports) in thousand US dollars	BACI database by Gaulier and Zignago (2010)
log(GDP differential)	121,314	26.377	1.937	13.348	30.746	Absolute difference between log of GDP in US dollars of two countries	World Bank (2021)
log(GDP p.c. differential)	121,314	9.436	1.276	0.148	11.640	Absolute difference between log GDP per capita in US dollars of two countries	World Bank (2021)
Industrial distance	36,569	0.286	0.138	0	1.230	Bilateral distance in industry shares based on Euclidean distance	Industrial Statistics Database UNIDO (2019)
Tax proximity control:							
Tax rate differential	130,576	0.087	0.067	0	0.55	Absolurte difference in statutory corporate income tax rates of two countries	Tax Foundation (2022)

Notes: Our unbalanced panel dataset covers up to 15,225 country pairs for the years 2001 to 2019.

Table C2: Panel Regression Results (2001-2019) - Full Samples

	(1)	(2)	(3)	(4)	(5)	(6)
log(trade)	-0.01000***	-0.00737***	-0.00568***	-0.00468***	-0.00304***	-0.00227*
	(0.000642)	(0.000701)	(0.000672)	(0.000675)	(0.000677)	(0.00127)
Common language		-0.0357***	-0.0325***	-0.0297***	-0.0266***	-0.0258***
		(0.00627)	(0.00598)	(0.00598)	(0.00593)	(0.00993)
Colony		0.0312**	0.0256**	0.0314***	0.00947	-0.00383
		(0.0129)	(0.0124)	(0.0121)	(0.00984)	(0.0123)
Common colonizer		-0.0671***	-0.0562***	-0.0545***	-0.0399***	-0.0419**
		(0.00917)	(0.00858)	(0.00858)	(0.00849)	(0.0172)
Tax rate differential			0.0979***	0.0912***	0.000610	0.200***
			(0.0269)	(0.0269)	(0.0268)	(0.0363)
Contiguity				-0.0595***	-0.0367***	-0.0270**
				(0.0103)	(0.00963)	(0.0111)
log(GDP differential)					0.0415***	0.0298***
					(0.00135)	(0.00220)
log(GDP p.c. differential)					0.0198***	0.0133***
					(0.00141)	(0.00193)
Industrial distance						-0.0306
						(0.0299)
Country 1 FE	✓	✓	✓	✓	✓	✓
Country 2 FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	112,376	104,886	95,413	95,413	89,154	31,421
R^2	0.457	0.458	0.506	0.507	0.538	0.657

Notes: The coefficients represent OLS estimates. The dependent variable is the bilateral Jaccard distance in TP regulations between country pairs. The sample size varies by the availability of the included control variables. Standard errors in parentheses, clustered at the country-pair level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table C3: Cross-Sectional Regression Results for Restricted Country Pairs

	(1) 2001	(2) 2005	(3) 2010	(4) 2015	(5) 2019
log(trade)	-0.00444	-0.00401	0.00278	-0.00157	0.00118
	(0.00433)	(0.00369)	(0.00318)	(0.00344)	(0.00199)
Common language	-0.0284	0.0123	0.00629	-0.0102	-0.00771
	(0.0244)	(0.0244)	(0.0182)	(0.0156)	(0.0134)
Colony	-0.00829	-0.0453*	-0.0450**	-0.0214	-0.0193
	(0.0285)	(0.0232)	(0.0197)	(0.0137)	(0.0135)
Common colonizer	-0.182**	-0.213***	-0.0923	-0.0395	-0.0202
	(0.0732)	(0.0687)	(0.0565)	(0.0316)	(0.0221)
Tax rate differential	-0.116	-0.0254	0.190	-0.0447	0.0602
	(0.169)	(0.104)	(0.126)	(0.0899)	(0.0778)
Contiguity	-0.0551	-0.0247	-0.0252	-0.0286	-0.00584
	(0.0376)	(0.0307)	(0.0190)	(0.0188)	(0.0115)
log(GDP differential)	0.0598***	0.0392***	0.0315***	0.0176***	0.00666**
	(0.00758)	(0.00662)	(0.00444)	(0.00326)	(0.00274)
log(GDP p.c. differential)	0.0185***	0.0464***	0.0214***	0.0161***	0.00838***
	(0.00538)	(0.00686)	(0.00407)	(0.00350)	(0.00267)
Country 1 FE	✓	✓	✓	✓	✓
Country 2 FE	✓	✓	✓	✓	✓
N	1,276	1,353	1,236	1,443	1,438
R^2	0.291	0.583	0.799	0.816	0.873

Notes: The coefficients represent OLS estimates. The dependent variable is the bilateral Jaccard distance in TP regulations between country pairs. We include only country pairs if both countries had TP legislation in 2001. Spec. (1) to (5) show cross-sectional regressions for the years 2001 to 2019, respectively. Standard errors in parentheses, clustered at the country-pair level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.