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Türkiye's Double Taxation Treaties: Cluster Analysis

Ayşe Nil Tosun 

ABSTRACT

This study aimed to investigate the 79 double taxation treaties that Türkiye has signed with various countries and provide empirical evidence of asymmetries among them. The study also highlighted the importance of neutrality in international tax policy; examined the asymmetries caused by varying definitions of concepts and withholding tax rates; and revealed the necessity of BEPS MLI for Türkiye. To conduct this analysis, the treaties were clustered according to six characteristics: (a) taxes covered by the treaty, (b) definition of permanent establishment, (c) definition of royalties, (d) withholding rates of dividends, (e) withholding rates of interests, and (f) withholding rates of royalties. Using both K-means clustering with the elbow method and a two-step clustering analysis, the results revealed substantial asymmetries among Türkiye's double taxation treaties across these six characteristics. The results should be of particular interest to policymakers and other stakeholders interested in developing treaty standardization protocols.

KEY WORDS:

asymmetry, double taxation treaties, K-means clustering analysis, two-step cluster analysis, BEPS MLI.

JEL Classification: K34, C38.

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1. Introduction

The Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting (BEPS MLI) aims to improve standardization of double taxation treaties and thus reduce treaty shopping, aggressive tax planning, tax avoidance, tax evasion, and other treaty abuses. Similar national and international measures include the International Cooperation and Information Exchange, Foreign Account Tax Compliance Act, and Common Reporting Standards. Although Türkiye signed the BEPS MLI on June 7, 2017, it has not yet been ratified, and progress in this area has been slow. The legislative proposal was submitted on June 2, 2020, and it remained with the commission until September 12, 2024 (Türkiye Grand National Assembly, 2023).

Several underlying factors may explain this delay. First, despite its political popularity, the practical success of the BEPS MLI requires broad consensus among its many participating countries. Second, some claim that the BEPS MLI reinforces unequal distribution of taxing power and that its provisions are insufficient to address double taxation problems, especially with regard to transparent entities and hybrid entity mismatches. Indeed, some asymmetries between treaties may even be unavoidable due to each country's unique capital flow dynamics, development goals, incentives for investment, and political and economic uncertainties. Third, some countries may be reluctant to eliminate the asymmetries (Burgers & Mosquera, 2017; Parada, 2021), especially if they can leverage imbalances to attract foreign direct investment such as lowering withholding tax rates and generating income transfers (Shehaj

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& Zagler, 2024). These practical challenges notwithstanding, asymmetric rules in double tax treaties often result in unequal treatment that hinders fair competition, economic growth, investment, and cooperation.

Double taxation treaties often enhance foreign direct investments (Braun & Zagler, 2014), an important consideration for countries with developing economies. Many of these countries also belong to the Organization for Economic Cooperation and Development (OECD), however, and benefit from aligning their tax systems with international standards, including BEPS rules. This tension creates imbalances in foreign policy procedures. For example, the Türkiye Grand National Assembly (2023) considers it essential that treaty harmonization efforts do not jeopardize its revenue goals. This position is evident when considering that Türkiye collaborates most with the Netherlands in terms of foreign direct investment (T. C. Sanayi ve Teknoloji Bakanlığı, n.d.). The Netherlands is a preferred location for international companies for tax abuse, raising questions about whether Türkiye is exploiting or exploited by loopholes in these tax agreements (Tax Justice Network, 2024).

The literature offers only limited evidence on the effects of treaty asymmetries, focusing mainly on how double taxation treaties affect foreign direct investment (Barthel et al., 2010; Blonigen & Davies, 2004; Edmiston et al., 2003; Petkova et al., 2020). The number of studies in the literature on Türkiye's double taxation treaties asymmetries is also very minimal. This study aimed to deepen understanding of this issue by investigating asymmetry in Türkiye's 79 double taxation treaties. It also offers novel methodological contributions, specifically the quantitative identification of tax asymmetries via K-means clustering using the elbow method and a two-step clustering analysis. The findings reveal important differences across six key characteristics: 1) taxes covered by the treaty, 2) definition of permanent establishment, 3) definition of royalties, 4) withholding rates of dividends, 5) withholding rates of interests, and 6) withholding rates of royalties. The findings, which reveal Türkiye's various attitudes and taxation approaches regarding various countries, are essential for addressing inequalities created by double tax-

ation treaties between countries. They also confirm the importance of initiatives like the BEPS MLI.

The rest of the paper is organized as follows. The Literature Review discusses relevant studies on asymmetry in double taxation treaties and the role of BEPS MLI in addressing this issue. Next, the Theoretical Background and Hypothesis section describes the data selection process and argumentation. The Methodology section explains the reasons for the selected approaches. The remaining sections then discuss the results of the analysis, followed by a discussion, and finally a brief conclusion.

2. Literature Review

Well-designed double taxation treaties significantly improve taxpayer compliance and reduce tax evasion by fostering trust and clarity in tax policy (Dumiter, 2023). Most countries choose the international OECD Model Convention as the basis for these treaties to avoid deviating from the international standard and to promote foreign direct investment and international recognition (Baistrocchi, 2006). Countries with more developed economies tend to create and promote these international tax standards, however, and they use their technical expertise and negotiation advantages to limit the capacity of other countries to levy taxes on multinational enterprises. Some asymmetry may be egregious enough to spill over, causing tax losses for countries that are part or not part of the treaties and putting nations at risk of losing vital government revenue (Hearson, 2018).

2.1. Asymmetry in Double Taxation Treaties

Approximately 41% of double taxation treaties apply different general rules (Kudla et al., 2023), and the consequences vary based on each country's practices (Castillo-Murciego & López-Laborda, 2019; Hindriks & Yukihiro, 2022; Navarro, 2022). Countries also have unique taxation techniques, income and wealth structures, trade policies, and inequalities (Chisik & Davies, 2004; Janeba, 1995; Kudla et al., 2023). Kudla et al. (2023) argue that if no intensive relationship exists between countries, the diversification of tax rules becomes redundant. However, differences in the intensity of relationships, in economic and social development, and in international tax law between countries may

lead to asymmetry (Escribano, 2023; Kudla et al., 2023; Rixen, 2011). Other factors that may affect asymmetry in double taxation treaties include the significance of negotiating powers (Rixen & Schwarz, 2009) and bureaucracy (Kudla et al., 2023).

Double non-taxation also may arise. For example, in the context of African treaties, double non-taxation occurs in the case of low or nil withholding taxes on interest, dividends, royalties, or management fees (Mohan & Gupta, 2023). Differing legal interpretations, discrepancies in tax calculation techniques, challenges in determining individuals' residency status, and other asymmetries may help explain some of these non-taxation issues (Gomes, 2018; Kudla et al., 2023; Petkova, 2021).

The literature cites several characteristics of double taxation treaties that can generate asymmetry. For example, some of Türkiye's double taxation treaties cover only taxes on income, whereas others cover taxes on income and capital, depending on the other country's definition of taxable income. If a country that exempts certain types of income from taxation has a tax treaty with a country that does not offer the same income exemptions, it can result in double taxation or a tax advantage for one country but not the other (Schneider et al., 2021). Therefore, it may be necessary to include different tax types in the treaties to tax similar income groups, which in turn may increase treaty asymmetry. Another characteristic that can lead to asymmetry is the definition of permanent establishment, which directly affects an entity's tax obligations. Challenges in determining permanent establishment status may exacerbate double non-taxation issues (Gomes, 2018; Kudla et al., 2023; Petkova, 2021). Differences in the definitions of royalties or the tax rates also may lead to imbalanced tax obligations and burdens.

2.2. The BEPS MLI

OECD and the Group of Twenty (G20) countries have collaborated to create the Inclusive Framework on Base Erosion and Profit Shifting (BEPS) and BEPS MLI, both of which address persistent tax problems in double taxation

treaties (Garbino, 2020). BEPS, established in June 2016, offers 15 suggestions for tools to prevent tax evasion and other problems related to international tax rules. However, it requires that countries amend their treaties, which can take years. The OECD thus created the BEPS MLI tool, which aims to update international tax rules via a series of tax treaty measures (Kleist, 2018; Multilateral Convention to Implement Tax Treaty Related Measures to Prevent Base Erosion and Profit Shifting, 2016) and to establish minimum standards for all tax treaties (Gutmann, 2023). Many countries have committed to implementing the new international rules, potentially affecting more than 2,000 double taxation treaties (Kleist, 2018). Although some BEPS MLI changes can be made without negotiation with the party countries, this approach is challenging (Kleist, 2018). The updates could cause some countries to lose the investments they secured under their original treaties, especially if they lack the legal framework, information access, technical know-how, capacity, and political consensus to maintain enforce the new rules (Matabudul, 2023).

The BEPS MLI allows countries to select treaties to modify, and as such, although this tool is intended to help improve standardization, it can introduce its own asymmetry problems (Bravo, 2020; Durado, 2018; Kudla et al., 2023). For example, the BEPS MLI allows countries to use different definitions of permanent establishment, as seen in the BEPS MLI articles 12–15 (OECD, 2017b). Escribano (2023) studied the impact of this particular issue in Spain and found that it leads to administrative and legal problems and that the articles' time differences on permanent issues could lead to tax avoidance. Such asymmetries in double taxation treaties could lead to tax losses or double taxation. Moreover, the BEPS MLI may introduce new asymmetries because it is virtually impossible to make similar changes to all treaties simultaneously. In sum, these tools cannot completely eliminate double taxation asymmetries. Experts therefore must remain vigilant and formulate the content of these treaties carefully to ensure the agreements serve all parties as intended. Table 1 summarizes the sources cited in this literature review.

3. Theoretical Background and Hypothesis

The theoretical frameworks underpinning this study that help explain the observed divergence or similarities among bilateral tax treaties include bargaining theory, institutional isomorphism, and global governance frameworks. According to bargaining theory, the content of an agreement is shaped by negotiation and mutual interests, making each agreement (i.e., treaty) unique (Chisik & Davies, 2004). Institutional isomorphism explains similarities due to pressure in the international arena (Lopez-Leyva & Martínez, 2024). For example, whereas international organizations like the OECD or United Nations (UN) promote the use of more balanced double taxation treaties, isomorphic pressures can disrupt that balance, leading to partial standardization between treaties. Global governance theory provides a strong conceptual framework describing how the motives and multiplicity of various actors (e.g., states, international organizations, non-governmental organizations, and private-sector entities) can cause divergence in double taxation treaties (Krisch & Kingsbury, 2006).

Asymmetries in double taxation treaties drive capital to seek tax advantages. Identifying these asymmetries thus can be viewed as a precautionary measure to prevent unintended results. To explore this issue, this study aimed to answer two relevant questions regarding double taxation treaties in Türkiye. First, what asymmetries, if any, exist in Türkiye's double tax treaties? Second, which asymmetries are most effective for classification purposes? To best capture these answers, a null hypothesis is proposed:

H0: No significant differences exist in double taxation treaties between Türkiye and other countries.

Türkiye generally follows the OECD Model Convention in aligning its tax system with international standards. Türkiye's double taxation treaties thus share similar characteristics, definitions, and provisions, reflecting a standardized approach to international economic relations. Institutional isomorphism theory explains the tendency of countries to adopt similar rules in their double taxation treaties due to the influence of interna-

tional organizations. Although Türkiye prefers the OECD model as a template for treaties, its double taxation treaties nevertheless differ significantly in their provisions, implications, definitions, tax rates, and content. These asymmetries can lead to aggressive tax planning. An alternative hypothesis thus is proposed:

H1: Significant differences exist in the double taxation treaties between Türkiye and other countries.

3.1. Data Selection

According to the data from the Republic of Türkiye Revenue Administration (2025), Türkiye signed its first double taxation treaty with Austria in 1970 and as of April 23, 2025, it holds 93 double taxation treaties with countries all around the world. Most are based on the OECD model, but some follow UN models (Kizilgül & Beşel, 2019). Due to the naming in the datasets, the country officially known as the Netherlands appears under the label 'Holland' in the tables. This study examined differences in six characteristics of these double taxation treaties: (a) taxes covered by the treaty (b) definition of permanent establishment, (c) definition of royalties, (d) withholding rates of dividends, (e) withholding rates of interests, and (f) withholding rates of royalties.

3.2. Taxes Covered by the Treaty

Treaties to prevent tax avoidance and evasion may be bilateral or multilateral and may cover numerous subjects, including taxes (e.g., income, capital, excise taxes; social security contributions; exchange of information; assistance in collection of taxes; and dispute resolution). For example, the Convention Between the United States of America and Germany (1989) covers income and excise taxes imposed on insurance premiums paid to foreign insurers, as well as corporate, trade, and capital taxes.

Türkiye generally uses the OECD Model Tax Convention as the basis for bilateral tax treaties concerning only income and capital taxes. However, some of its double taxation treaties cover only taxes on income or both income and capital. For example, Türkiye has signed income tax-related

double taxation treaties with Germany (Agreement between the Republic of Turkey and the Federal Republic of Germany for the Avoidance of Double Taxation and of Tax Evasion with Respect to Taxes on Income, 2011), Australia (Convention between the Government of Australia and Government of the Republic of Turkey for the Avoidance of Double Taxation with Respect to Taxes on Income and the Prevention of Fiscal Evasion, 2010), and Austria (Agreement between the Republic of Austria and the Republic of Turkey for the Avoidance of Double Taxation with Respect to Taxes on Income, 2008). Türkiye has also signed double taxation treaties with Albania, Bosnia-Herzegovina, and Algeria regarding taxes on income and capital (Agreement Between the Republic of Albania and the Republic of Turkey for the Avoidance of Double Taxation with Respect to Taxes on Income and on Capital, 1994; Convention between the Republic of Turkey and Bosnia and Herzegovina for the Avoidance of Double Taxation with Respect to Taxes on Income and on Capital, 2005; Convention entre la Republique de Turquie et la Republique Algerienne Democratique et Populaire en vue d'Eviter les Doubles Impositions en Matiere d'Impots sur le Revenue et sur la Fortune, 1994, respectively).

3.3. Definition of Permanent Establishment

Permanent establishment is the considerable presence of a foreign company in another country, which may result in tax liabilities for that company. Permanent establishment rules are essential for defining taxation rights between countries (Altawyan, 2023; Rixen & Schwarz, 2009). For example, according to Article 5 of the OECD Model Tax Convention (OECD, 2017a), “permanent establishment means a fixed place of business through which the business of an enterprise is wholly or partly carried on ... a building site or construction or installation project constitutes a permanent establishment only if it lasts more than twelve months.” Regarding the 12-month requirement, the OECD (2019) has conceded that countries may consider other factors to prevent abuse of this requirement. Other scholars have further suggested that the concept of permanent establishment is outdated in the modern digital world and should be replaced (Gill

& Collins, 2012). Digitalization adds even more uncertainty to treaty concepts such as permanent establishment, fixed establishment, subsidiaries, and so on (Dulevski, 2021). Yet, during the COVID-19 pandemic, the issue of permanent establishment arose when the OECD Secretariat announced that the temporary suspension of activities due to COVID-19 would not affect the determination of permanent establishments (OECD, 2020). Some scholars criticized this announcement (e.g., Moreno, 2020; Yazicioğlu, 2020) due to its disadvantages for enterprises with buildings, construction, installations, or assembly projects outside their country of residence.

In the context of Türkiye's double taxation treaties, the length of time required for permanent establishment can vary from 6 to 45 months. For example, in its Agreement Between the Republic of Turkey and Japan for the Avoidance of Double Taxation and the Prevention of Fiscal Evasion with Respect to Taxes on Income (1993), Article 5/3 states that “a building site, construction, installation or assembly project constitutes a permanent establishment only if it lasts more than 6 months.” In its Convention Between the Republic of Turkey and Bosnia and Herzegovina for the Avoidance of Double Taxation with Respect to Taxes on Income and on Capital (2005), Article 5/3 states that “a building site, construction, assembly or installation project or supervisory activities in connection therewith constitutes a permanent establishment, but only if such site, project or activities last more than 12 months.”

As previously mentioned, the BEPS MLI allows individual countries to define permanent establishment, and BEPS Action 7 includes measures to prevent misuse of these definitions for tax avoidance purposes (Akinrinde, 2024). Nevertheless, ensuing asymmetries have considerable consequences for international companies and governments that collect taxes.

3.4. Definition of Royalties

Royalty payments are the fees paid by one party to another for use of intellectual property. Royalties are regulated under Article 12 of the OECD Model Tax Convention (OECD, 2017a) as “payments of any kind received ... or the right to use, any copyright of literary, artistic or scientific work ... or for information concerning industrial, com-

mercial or scientific experience.” Royalties are often used for aggressive tax planning. For example, a firm can create a shell company in a low tax jurisdiction and pay that company high royalties, thereby reducing its own taxable income. A firm also may route its royalty payments through a treaty country to take advantage of lower withholding tax rates on royalty payments (Juranek et al., 2023; Kutera, 2017). Another problem involves the free transfer of use, which involves shortcomings concerning the appropriate taxation of royalties and interest and systematic loss of taxation in the source country. In cases of free transfer of use claims, a source country may not tax the money transfers, although some countries can make income from free transfer of use taxable (Kollruss, 2023).

Because of the possibility of tax abuse or just tax losses, withholding taxes are supported in the source country to prevent profit shifts between countries (Juranek et al., 2023). Aggressive tax planning using royalties may not be related only to withholding rates, however. It also can be affected by how those royalties are defined (Lang, 2021). For example, in Türkiye, payments for the use of industrial, commercial, or scientific equipment are treated as royalties in some treaties, but not in others. In fact, in 1992, an attempt at resolving this issue was made by deleting the words “or for use of or the right to use industrial commercial or scientific equipment” from article 12 of the OECD model tax convention (Du Toit, 1999). The change was recognized by some countries, but not others. In the Agreement Between the Government of the Republic of Turkey and the Government of the Republic of Uzbekistan for the Avoidance of Double Taxation with Respect to Taxes on Income (1996), the definition of royalties included the use of industrial, commercial, or scientific equipment. After the Protocol Amending the Agreement between the Government of the Republic of Uzbekistan and the Government of the Republic of Turkey for the Avoidance of Double Taxation With Respect to Taxes on Income (2017), the definition of royalties was changed, and payments for the use of industrial, commercial, or scientific equipment were excluded.

These differences change how Türkiye collects taxes. For example, in the aviation industry, royalty

fees may be collected for using airplanes. If aircraft rental fees are accepted royalties in the double taxation treaty between two countries, Türkiye has the right to withhold tax at the agreed-upon rates. The right to withhold tax is eliminated, however, if aircraft leases are not covered (Republic of Türkiye Presidency of the Council of State, 2013).

3.5. Withholding Rates on Dividends, Interests, and Royalties

Withholding tax is the tax collected at the source. Countries’ concerns about tax evasion and avoidance increase their withholding rates in host countries (Petkova, 2021). This procedure prevents foreign businesses from evading taxes in the source countries. Withholding rates of dividends, interests, and royalty payments in Türkiye’s double taxation treaties vary (Republic of Türkiye Revenue Administration, 2023a, 2023b). Varied withholding tax rates policies are not unique to Türkiye. Similar policies have been implemented in many countries, especially in developed and emerging economies (Baker et al., 2018), often leading to asymmetry in double taxation treaties, among other problems. Related court decisions indicate significant problems both for the government and taxpayers. For example, the previously mentioned decisions by Türkiye’s Council of State illustrate problems related to dividend withholding tax arising from commercial relations between the Netherlands and Türkiye and Germany and Türkiye (Council of State, 2016a, 2016b).

3.5.1. Withholding Rates of Dividends

According to Article 10/3 of the OECD Model Tax Convention (OECD, 2017a), dividends refer to “income from shares; jouissance shares or jouissance rights; mining shares or other rights; not being debt claims; participating in profits; as well as income from other corporate rights which is subjected to the same taxation treatments as income from shares by laws of the state of which the company making the distribution is a resident.” Article 10/1-2 states that the right to tax dividend income is allocated between two contracting states, whereas primary taxation rights are in the country of residence. The taxation rules for dividends

are regulated under Article 10 for double taxation treaties signed by Türkiye. In Türkiye's treaties, the right to tax dividend income is generally granted to the country in which an individual resides, though source countries retain some taxation rights. For example, Germany retains the right to tax the dividends a person living in Germany receives from a company in Türkiye, with a maximum tax of 15% to be levied on the dividend in Türkiye (Republic of Türkiye Revenue Administration, 2015). This rate also differs across countries and situations.

3.5.2. Withholding Rates of Interest

According to Article 11/3 of the OECD Model Tax Convention (OECD, 2017a), interest is "income from debt-claims of every kind; whether or not secured by mortgage and whether or not carrying a right to participate in the debtor's profits; and in particular; income from government securities and income from bonds or debentures; including premiums and prizes attaching to such securities, bonds or debentures." The right to tax interest income is allocated between the two contracting states, whereas the primary taxation right is in the country of residence, though source countries have limited taxation rights. Türkiye regulates the taxation rules of interest income under Article 11 and generally has limited taxation rights on interests. For example, it has the right to collect 10% tax on interest payments made to Germany. However, Türkiye applies different withholding tax rates for different conditions even in the same country. For instance, it applies a 10% withholding tax to the US if the interest arises from loans given by banks, financial or savings institutions, or insurance companies. Otherwise, it applies a 15% withholding tax. For Turkmenistan, it applies a 10% withholding tax in all cases.

3.5.3. Withholding Rates of Royalties

According to Article 12/2 of the OECD Model Tax Convention (OECD, 2017a), royalties are "payments of any kind received as a consideration for the use of, or the right to use, any copyright of literary, artistic or scientific work including cinematograph films, any patent, trade mark, design or model, plan, secret formula or process, or for information concerning industrial, commercial or scientific experiences." Taxation rights are given only to countries in which the owner

of the royalty is a resident. Withholding tax rates on royalty payments affect income inequality between high- and low-income countries (Brooks, 2007). Problems also arise from different regulations in various countries for license models and related withholdings, making it necessary to compare nations' tax relief rules (Jansen, 2021).

Türkiye does not follow the OECD model in taxing royalties and instead maintains its rights on limited taxation. For example, Türkiye has a right to collect only a 10% tax on royalty payments made to Italy, Portugal, and Poland (Republic of Türkiye Revenue Administration, 2023b). However, the withholding tax rates applied to royalties may vary depending on conditions within the same country. Some countries have more than one withholding tax rates.

4. Methodology

This study clustered data from Türkiye's 79 double taxation treaties with other countries and compared them based on differences in six key variables: 1) taxes covered by the treaty; 2) definition of permanent establishment; 3) definition of royalties; 4) withholding rates of dividends; 5) withholding rates of interests; and 6) withholding rates of royalties.

Data on the number of taxes covered in the treaties were manually collected from the datasets and manually coded. Treaties covering only income tax were coded as 1. Treaties covering income and capital taxes were coded as 2.

Data on the definition of permanent establishment were manually collected from the dataset. Periods of 6–12 months were expressed differently in the relevant articles, so the periods specified in the treaties for recognizing a construction site as a workplace were used (e.g., 6 months for the US and 12 months for Albania).

Data on the definition of royalties were manually collected from the treaties and manually coded as the acceptance of payments for the use of industrial, commercial, or scientific equipment (coded as 1) or not accepting such payments as royalties (coded as 2).

Drawing on the literature, variations in dividend, interest, and royalty withholding rates were included in this study as asymmetry indicators, specifically the number of withholding tax rates used in each agreement. Only withholding tax rates used in Türkiye were included in the calculations.

Data on the withholding rates of dividends were manually collected from the dataset. Treaties with one withholding tax rate were coded as 1, those with two withholding tax rates were coded as 2, and those with three were coded as 3.

Data on the withholding rates of interests were manually collected from the dataset. Treaties with only one withholding rate of interest were coded as 1, those with two withholding tax rates were coded as 2, and those with three were coded as 3.

Data on the withholding rates of royalties were manually collected from the dataset. Treaties with one withholding rate of royalties were coded as 1, and those with two were coded as 2.

To demonstrate that the data could be classified into distinct clusters, two clustering analyses were performed using different techniques: the k-means clustering algorithm and two-step clustering algorithm. The statistical analysis comprised four steps: choosing the optimal number of clusters via the elbow method, applying the k-means clustering algorithm, applying two-step clustering algorithm, and visualizing the results of the compared clusters. Mat Lab R2023a was used to define the optimal clusters. SPSS.23 was used to apply the k-means clustering algorithm and two-step clustering analysis, visualize the results, and compare the clusters. Table 2 summarizes the variable sources. Table 3 summarizes the descriptive statistics.

Descriptive statistics show standard deviations of the dataset indicating how much the variables differed from the average value and helping to assess the overall dispersion of the observed values. The highest standard deviations in the dataset were observed for the definition of permanent establishment and the withholding rates of interests.

5. Results

5.1. The Optimal Number Of Clusters

An advantage of the elbow clustering method is that it can identify the point at which adding more clusters does not significantly reduce the variance within each cluster (Madhulatha, 2012). The optimal number of clusters using the elbow method was four. Figure 1 shows the diagram of the elbow method.

5.2. K-Means Clustering Algorithm and Comparison of Countries in Clusters

The k-means clustering algorithm is an unsupervised, machine-learning technique used for clustering data points into “k” clusters based on similarity (Hartigan & Wong, 1979). The k-means algorithm was applied using SPSS 23 and results compared. Table 4 lists the countries in each of the four clusters: one in Cluster 1; four in cluster 2; 44 in Cluster 3; and 30 in Cluster 4. Table 5 shows the key characteristics of each cluster, and Table 6 shows the final cluster centers.

5.3. Two-Step Clustering Algorithm

In SPSS, the two-step clustering algorithm automatically determines the optimal number of clusters and directly produce a predictor importance table. Two clusters were obtained in the two-step clustering analysis. The results suggest fair cluster quality, as shown in the model summary in Figure 2.

Table 7 compares countries associated with treaty clusters 1 and 2. Cluster 1 contains treaties associated with 31 mostly wealthy countries; cluster 2 contains treaties associated with 48 countries, most of which have developing economies.

Table 8 shows the variable (predictor) importance in clustering. The variables found to most likely to contribute asymmetry in the treaties, according to the degree to which they affected clustering, were as follows (in order of most to least likely): the definition of permanent establishment, withholding rates of interests, the definition of royalties, withholding rates of dividends, taxes covered, and withholding rates of royalties.

6. Discussion

This study used two clustering techniques (i.e., k-means clustering algorithm with elbow method and two-step clustering algorithm) to assess differences in Türkiye’s tax treaties with various countries, specifically asymmetry in its double taxation treaties. The results help identify six key characteristic contributing to this asymmetry and confirm the utility and necessity of agreements like the BEPS MLI, which Türkiye signed in 2017 but has not yet fully implemented. Moreover, the elbow clustering results yielded four clusters, whereas the two-step clustering technique yielded two distinct clusters, implying that Türkiye’s double taxation treaties are diverse across attitudes and treaty rules between countries.

The reasoning underlying these different attitudes should be examined. As mentioned in the theoretical background, bargaining and negotiating power, institutional isomorphism (i.e., bureaucracy), and global governance can be important factors. The double taxation treaty process requires specialized knowledge, without which mistakes and unintended consequences can occur that take years and complex litigation to solve. Such complexity was observed in double taxation treaties between Türkiye and the Netherlands and Germany, leading to asymmetry.

Countries can try to correct these problems. Global governance theory provides a framework for understanding how multiple actors (e.g., government, private sector, legal) interact to affect the content and quality of double taxation treaties. It also underscores the importance of robust treaties that avoid potential problems. For example, some of the asymmetry observed in this study seems to be the result of efforts to revise provisions that, over time and through disputes, were determined to be harmful to the country's tax base.

The most significant variable affecting asymmetry in this study was the definition of permanent establishment, aligning with findings by Altawyan (2023), Moreno (2020), Rixen and Schwarz (2009), and Yazicioğlu (2020), followed by the definition of royalties, aligning with findings by Juranek et al. (2023), Kollruss (2023), Kutera (2017), and Lang (2021). This result indicates that defining key terms, especially those significant for defining taxation rights, is an important consideration in treaty negotiations. Echoing the previous discussion about global governance, these definitions have been adjusted in Türkiye's double taxation treaties to accommodate various entities or offer solutions to evolving problems, but often the distinctions have led to their own litigation and governance issues.

As noted by Baker et al. (2018), Brooks (2007), and Jansen (2021), withholding tax rates can promote substantial confusion in international negotiations. The literature indicates that withholding of royalties are the most conspicuous, but the results of this study determined that the most predictive withholding tax rates for creating asymmetry between groups was interests withholding. The least important variable was withholding rates differences of

royalties. Based on these results, the null hypothesis of this study ("There are no significant differences between the double taxation treaties Türkiye signed with other countries") is rejected, and H1 ("There are significant differences between the double taxation treaties Türkiye signed with other countries") is accepted.

7. Conclusion

Double taxation treaties regulate international economic relations. However, asymmetries therein may lead to tax avoidance, tax evasion, and aggressive planning, particular in a globalizing economy with more access to international trade and information. To avoid these issues, double taxation treaties should be consistent and fair to all parties involved. Tools such as the BEPS MLI can help, but they must be implemented appropriately. It is also necessary to pay attention to asymmetries that may arise due to the optional rights granted to countries in the BEPS MLI rules. For example, justifications for applying different withholding tax rates and terms should be explained clearly.

A limitation of this study is the use of only six variables in the dataset. Future studies could include additional variables to increase the robustness of the model, results, and interpretations. This study does not consider dispute resolution mechanisms or the history of treaty renegotiation history, which means some factors affecting treaty outcomes may have been missed. Also, some treaties were excluded due to political or data inconsistency. Perhaps the most important limitation of this study is that it did not investigate the underlying causes of the observed asymmetries, an endeavor that was beyond the scope of this empirical investigation.

Future investigations should explore these causes to better understand how economic, political, or cultural issues affect various aspects of treaty negotiations over time. Future researches could fill existing gap in qualitative analysis by employing interviews with treaty negotiators to shed light on the strategic motivations and reasoning that underpin renegotiation process.

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Annex A

Table 1

Summary of Literature Cited

Author	Year	Title	Source	Key Findings	Empirical Method
Du Toit	1999	Beneficial ownership of royalties in bilateral tax treaties	IBFD	Challenges in determining beneficial ownership	Normative juridical, qualitative analysis, literature review
Edmiston et al.	2003	Tax structures and FDI: The deterrent effects of complexity and uncertainty	Fiscal Studies	Tax complexity and uncertainty deter foreign direct investment	Econometric analysis
Blonigen & Davies	2004	The effects of bilateral tax treaties on US FDI activity	International Tax and Public Finance	Tax treaties have modest positive effects on US foreign direct investment, more pronounced in developing countries	Econometric analysis
Chisik & Davies	2004	Asymmetric FDI and tax-treaty bargaining: Theory and evidence	Journal of Public Economics	Greater asymmetric foreign direct investment increases the negotiated tax rates	Theoretical modeling and empirical data analysis
Baistrocchi	2006	The structure of the asymmetric tax treaty network: Theory and implications	Working paper	Why choose the OECD Model Convention as the basis for treaties	Game theory, network theory
Brooks	2007	Tax treaty treatment of royalty payments from low-income countries: A comparison of Canada and Australia's policies	eJournal of Tax Research	Differences in Canadian and Australian policies show treaty outcomes impact source-state revenues	Comparative policy analysis
Rixen & Schwarz	2009	Bargaining over the avoidance of double taxation: Evidence from German tax treaties	Finanzarchiv	Political and economic leverage influences treaty outcomes	Empirical test
Barthel et al.	2010	The impact of double taxation treaties on foreign direct investment: Evidence from large dyadic panel data	Contemporary Economic Policy	Treaties positively affect foreign direct investment	Econometric analysis
Rixen	2011	From double tax avoidance to tax competition: Explaining the institutional trajectory of international tax Governance	Review of International Political Economy	Description of institutional shift from cooperation to competition in international tax policy	Historical institutional analysis

Table 1*Summary of Literature Cited (Continued)*

Author	Year	Title	Source	Key Findings	Empirical Method
Braun & Zagler	2014	An economic perspective on double tax treaties with (in) developing countries	World Tax Journal	Double tax treaties reinforce asymmetry and may reduce host countries' tax revenues on investment income	Econometric analysis
Burgers & Mosquera	2017	Corporate taxation and BEPS: A fair slice for developing countries?	Erasmus Law Review	BEPS reforms may not protect developing countries taxing rights	Literature review, critical policy analysis
Kutera	2017	A modal of aggressive tax optimization with the use of royalties	Journal of Economics and Management	Royalties can be used for aggressive international tax planning	Present a model of aggressive tax optimization based on the flow of royalties in supranational groups.
Baker et al.	2018	Dividend policy in Türkiye: Survey evidence from Borsa İstanbul firms	Global Finance Journal	Tax treaty networks influence firms' dividend policies	Survey research and various statistical methodologies, panel data regression
Dourado	2018	Are we compatible? On multilateral tax coordination	Intertax	Evidence of challenges in harmonization in multilateral instrument commitments	Policy analysis
Gomes	2018	Implementation in practice of the principal purpose test in the multilateral convention	Intertax	Uncertainty and legal complexity in applying the Principal Purpose Text	Legal doctrinal analysis, case study review
Hearson	2018	Transnational expertise and the expansion of the international tax regime: Imposing acceptable standard's	International Political Economy	How international tax standards are created and imposed	Qualitative and comparative analysis
Kleist	2018	The multilateral convention to implement tax treaty-related measures to prevent BEPS: Some thoughts on complexity and uncertainty	Nordic Tax Journal	Administrative complexity in multilateral instrument commitments	Descriptive analysis
Castillo-Murciego & López-Laborda	2019	The effect of double taxation treaties and territorial tax systems on foreign direct investment: Evidence from Spain	Economics	Positive effects of double taxation treaties on inbound foreign direct investment into Spain, particularly from treaty partners	Econometric analysis

Table 1*Summary of Literature Cited (Continued)*

Author	Year	Title	Source	Key Findings	Empirical Method
Garbino	2020	The impact of the OECD BEPS project on tax treaties: Access, entitlement and investment protection	European Business Law Review	BEPS led to major changes in international double taxation treaties, targeting aggressive tax planning	Policy analysis
Moreno	2020	Covid-19 and fiscal policies: Unnecessary and yet harmful	Intertax	OECD guidance on tax residency during COVID-19 is vague and potentially unfair	Policy critique, interpretive analysis
Petkova et al.	2020	On the relevance of double tax treaties	International Tax and Public Finance	Tax treaties that reduce the direct tax distance, both in domestic law and the entire treaty network, increase foreign direct investments	Econometric analysis
Yazicioğlu	2020	COVID-19 salgınının gelir ve servet üzerinden alınan vergilere ilişkin çifte vergilendirmeyi önleme anlaşmalarının yorumlanması ve uygulanması üzerindeki olası etkileri	İstanbul Hukuk Mecmuası	Uncertainties in tax treaties amid exceptional global crisis	Interpretative legal analysis
Parada	2021	Hybrid entity mismatches and the MLI: A tax policy assessment	Intertax	Complexity of tackling hybrid mismatches through multilateral instrument	Legal policy analysis
Petkova	2021	Withholding tax rates on dividends: Symmetries versus asymmetries or single-versus multi-rated double tax treaties	International Tax and Public Finance	Concerns about tax avoidance and peer influence lead countries to adopt different withholding tax rates on dividend in tax treaties	Econometric analysis
Schneider et al.	2021	Asymmetric taxation, limited liability, and agency conflicts	Management Accounting Research	Impacts of asymmetric taxation	Quantitative research methods focused on theoretical modeling
Navarro	2022	Access to tax treaty dispute resolution mechanisms in cases of abuse	Intertax	Blocking access to tax dispute resolution when abuse is suspected is unfair and weakens international tax rules	Legal analysis

Table 1*Summary of Literature Cited (Continued)*

Author	Year	Title	Source	Key Findings	Empirical Method
Altawyan	2023	Challenges in applying Saudi Arabian tax treaties: Digitalization, withholding tax and permanent establishment of non-residents	Intertax	Significant ambiguity in how Saudi tax authorities and courts interpret tax treaties	Legal analysis
Dumiter	2023	The correlation between double taxation conventions, tax compliance and tax evasion: Empirical evidence from OECD countries	Technological and Economic Development of Economy	Relationship between double taxation conventions, tax payer compliance, and tax evasion in OECD countries	Econometric analysis
Escribano	2023	The arrival of the new BEPS PE clause in actual tax treaties via the MLI: Impact, risks and need for further regulatory changes (particular focus on Spain)	Intertax	Multilateral instrument implementation of PE clause increases uncertainty and administrative burdens	Legal and administrative analysis
Juranek et al.	2023	Royalty taxation under tax competition and profit shifting	Canadian Journal of Economics	Royalty withholding taxes can be effective against profit shifting	Theoretical modeling, mathematical derivation
Kollruss	2023	Taxation of deemed income in treaty law: A comparative analysis and case study	Journal of Accounting and Taxation Studies	Potential shortcomings concerning appropriate taxation of free transfer of use	Legal analysis
Kudla et al.	2023	Trade, investment and size inequalities between countries and the asymmetry in double taxation treaties	Economic Modelling	Increased economic interaction and higher trade volumes between countries reduce asymmetry in double taxation agreements, whereas disparities in economic size and wealth tend to increase it	Econometric analysis
Matabudul	2023	The multilateral instrument in Africa: A strategic analysis	Intertax	African countries face challenges aligning multilateral instrument with domestic interests and institutional capacity	Comparative analysis, statistical analysis

Table 1
Summary of Literature Cited (Continued)

Author	Year	Title	Source	Key Findings	Empirical Method
Mohan & Gupta	2023	Taxing intellectual property assets on a cross-border transaction: Application of Mobilia Sequuntur Personam and the case of the India-Mauritius Tax Treaty	British Tax Review	Due to the application of the “mobilia sequuntur personam” principle and gaps in the India-Mauritius tax treaty, cross-border transfers of intellectual property assets can result in income escaping tax in both jurisdictions	Comparative legal analysis, case study analysis
Akinrinde	2024	Understanding the impact of OECD BEPS actions on double tax treaties	Working paper	BEPS reforms reduced some avoidance opportunities, also discusses several challenges	Qualitative review of BEPS reform
Shehaj & Zagler	2024	Asymmetric double tax treaties: Relief method and tax sparing for foreign direct investment in developing countries	Public Finance Review	Whether the relief method in the residence country (OECD member state) matters for foreign direct investment	Econometric analysis

Table 2
Variable Sources

Variable	Source
V1	https://www.gib.gov.tr/node/152274
V2	https://www.gib.gov.tr/node/152274
V3	https://www.gib.gov.tr/node/152274
V4	https://www.gib.gov.tr/sites/default/files/uluslararasımevzuat/Temettuler_Uzerinden_Kaynak_Devlette_Alinacak_Vergi_Oranlari.pdf
V5	https://www.gib.gov.tr/sites/default/files/uluslararasımevzuat/Faiz_ve_Gayrimaddi_Hak_Bedelleri_Uzerinden_Kaynak_Devlette_Alinacak_Vergi_Oranlari.pdf
V6	https://www.gib.gov.tr/sites/default/files/uluslararasımevzuat/Faiz_ve_Gayrimaddi_Hak_Bedelleri_Uzerinden_Kaynak_Devlette_Alinacak_Vergi_Oranlari.pdf

Note. Data accessed on January 15, 2024

Table 3
Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Tax covered by the treaty (V1)	79	1	2	1.18	.384
Definition of permanent establishment (V2)	79	6	45	10.28	5.673
Definition of royalties (V3)	79	1	2	1.25	.438
Withholding rates of dividends (V4)	79	1	3	1.67	.499
Withholding rates of interests (V6)	79	1	3	1.23	.505
Withholding rates of royalties (V7)	79	1	2	1.09	.286
Valid N (listwise)	79				

Table 4*Comparison of Countries in Clusters 1, 2, 3, and 4: K-Means Clustering Analysis*

Cluster 1	Cluster 2	Cluster 3	Cluster 4
1. Turkmenistan	1. Macedonia	1. Albania	1. US
	2. Mongolia	2. Azerbaijan	2. Germany
	3. Sudan	3. United Arab Emirates	3. Austria
	4. Tajikistan	4. Bahrain	4. Belgium
		5. Bangladesh	5. Algeria
		6. Bosnia and Herzegovina	6. Denmark
		7. Brazil	7. Indonesia
		8. Bulgaria	8. Philippines
		9. Chad	9. Finland
		10. Czech Republic	10. France
		11. China	11. South Korea
		12. Estonia	12. India
		13. Ethiopia	13. Holland
		14. Morocco	14. Iran
		15. Gambia	15. Spain
		16. South Africa	16. Sweden
		17. Georgia	17. Switzerland
		18. Croatia	18. Italy
		19. Israel	19. Japan
		20. Qatar	20. Canada
		21. Kazakhstan	21. Luxembourg
		22. Kyrgyzstan	22. Mexico
		23. Kosovo	23. Norway
		24. Kuwait	24. Pakistan
		25. Latvia	25. Romania
		26. Lithuania	26. Singapore
		27. Lebanon	27. Tunisia
		28. Hungary	28. Jordan
		29. Malaysia	29. Vietnam
		30. Malta	30. New Zealand
		31. Egypt	
		32. Moldova	
		33. Uzbekistan	
		34. Poland	
		35. Portugal	
		36. Ruanda	
		37. Slovakia	
		38. Slovenia	
		39. Syria	
		40. Ukraine	
		41. Oman	
		42. Venezuela	
		43. Yemen	
		44. Greece	

Table 5*Key Characteristics of Each Cluster*

Cluster	Characteristic
Cluster 1	Period recognized for permanent establishment is extremely long Payment for use of industrial, commercial, or scientific equipment is accepted as royalty No diversity in withholding tax rates
Cluster 2	Period recognized for permanent establishment is very long Payment for use of industrial, commercial, or scientific equipment not accepted as royalty No diversity in withholding tax rates
Cluster 3	Period recognized for permanent establishment is quite long Payments for the use of industrial, commercial or scientific equipment is accepted as royalty Some diversity in withholding tax rates
Cluster 4	Period recognized for permanent establishment is standard Payment for use of industrial, commercial, or scientific equipment is accepted as royalty Some diversity in withholding tax rates

Table 6*Final Cluster Centers*

Key Characteristic	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Tax covered	1	1	1	1
Definition of permanent establishment	45	23	11	6
Definition of royalties	1	2	1	1
Withholding rates of dividends	1	1	2	2
Withholding rates of interest	1	1	1	2
Withholding rates of royalties	1	1	1	1

Table 7*Comparison of Countries in Clusters 1 and 2: Two-Step Clustering Algorithm*

Cluster 1		Cluster 2	
1. US		1. Albania	45. Oman
2. Germany		2. Azerbaijan	46. Venezuela
3. Austria		3. United Arab Emirates	47. Yemen
4. Belgium		4. Bahrain	48. Greece
5. Algeria		5. Bangladesh	
6. Denmark		6. Bosnia and Herzegovina	
7. Indonesia		7. Brazil	
8. Philippines		8. Bulgaria	
9. Finland		9. Chad	
10. France		10. Czech Republic	
11. South Korea		11. China	
12. India		12. Estonia	
13. Holland		13. Ethiopia	
14. Iran		14. Morocco	
15. Spain		15. Gambia	
16. Sweden		16. South Africa	
17. Switzerland		17. Georgia	
18. Italy		18. Croatia	
19. Japan		19. Israel	
20. Canada		20. Qatar	
21. Luxembourg		21. Kazakhstan	
22. Mexico		22. Kyrgyzstan	
23. Norway		23. Kosovo	
24. Pakistan		24. Kuwait	
25. Portugal		25. Latvia	
26. Romania		26. Lithuania	
27. Singapore		27. Lebanon	
28. Tunisia		28. Hungary	
29. Jordan		29. Macedonia	
30. Vietnam		30. Malaysia	
31. New Zealand		31. Malta	
		32. Egypt	
		33. Mongolia	
		34. Moldova	
		35. Uzbekistan	
		36. Poland	
		37. Ruanda	
		38. Slovakia	
		39. Slovenia	
		40. Sudan	
		41. Syria	
		42. Tajikistan	
		43. Turkmenistan	
		44. Ukraine	

Table 8
Variable (Predictor) Importance: Two-Step Clustering Algorithm

Variable	Variable (Predictor) Importance
Definition of permanent establishment	1.00
Withholding rates of interests	0.48
Definition of royalties	0.35
Withholding rates of dividends	0.19
Taxes covered	0.03
Withholding rates of royalties	0.02

Figure 1
Plot for Elbow Method

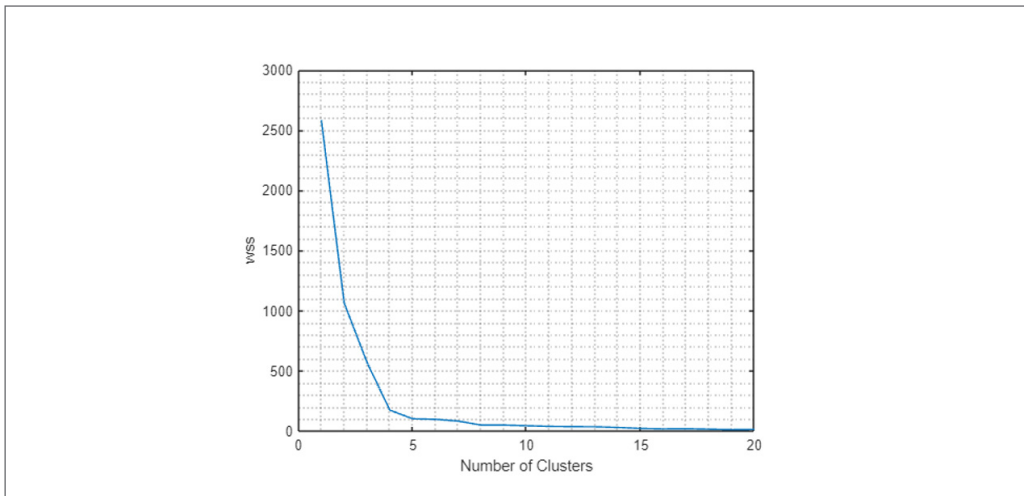


Figure 2
Model Summary

