Multiple Decision Analysis on Turkey's Tax Justice: An Institutional Perspective

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Türkiye'de Vergi Adaleti Üzerine Çoklu Karar Analizi: Kurumsal Bir Bakış

Öz

Kurumsal tercihler, vergi politikası da dahil olmak üzere kamu politikalarını oluştururlar. Vergi adaleti, vergi yükünün vatandaşlar arasında eşit dağıtılması olarak tanımlanmaktadır. Vergi mükellefleri, vergi sisteminin adil olduğunu algılar ise vergiye uyumla birlikte vergi gelirleri de yükselecektir. Bu çalışmanın amacı Türkiye'de ki kurumsal değişimlerin 1980-2015 yılları arasında vergi adaletine etkisini değerlendirmektedir. Bu amaçla Fuzzy AHP, TOPSIS ve VIKOR gibi çoklu karar verme yöntemleri kullanılmıştır. Sonuçlar 1991-1995 döneminin vergi adaleti açısından en başarılı dönem olduğuna işaret etmektedir.

Anahtar Kelimeler: Vergi adaleti, kurumlar, Fuzzy AHP, TOPSIS, VIKOR

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Abstract

Institutional preferences produce public policies, including tax policies. Tax justice can be defined as the fair distribution of the tax burden between all citizens. When taxpayers perceive the tax system as fair, tax compliance can be ensured accompanied with rising tax revenue. This study aimed to assess whether institutional changes impacted tax justice between 1980 and 2015 in Turkey. Multiple decision-making methods Fuzzy AHP[3], TOPSIS[4] and VIKOR[5].is used for assesment. The results indicated that the period between 1991 and 1995 is the most representative period in terms of tax justice criteria.

Keywords: Tax justice, Institutions, Fuzzy AHP, TOPSIS, VIKOR

1. Introduction

Public administration is mainly concerned with the production and provision of public services. Taxes constitute the primary funding source for such services. During the creation of a tax system, policymakers should not only consider their personal attitudes about taxes, but also consider the priorities of the public (Mikesell 1974:615-616) why tax policies have economic, political and social consequences on society.

The framework of an institution is an important factor in determining the results of policies, such as political culture, public opinion, and international competitiveness (Peters, 1991:1-22). Formal and informal institutions, interest groups, political power, historical backgrounds and state capacity linkage with tax system put institutional analysis at the center of tax policy. Institutions', "rules of game" serve the individual and group interests, as well as determine policy outcomes (Haldenwnang and Schiller, 2016:1-5; Steinmo, 1989, 501-504; Checchi ve Penolasa, 2008:607; Acemoğlu, 2010:2).

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[2] Asst. Prof. Dr., Cukurova University, Business Administration Department. bkiran@cu.edu.tr. ORCID ID:0000-0002-9695-2668.

[3] Analytical Hierarchy Process.

[4] Technique for Order Preference by Similarity to Ideal Solution.

[5] Vise KriterijumskaOptimizacija I KompromisnoResenje.

Justice is one of the basic principles of tax policy that plays a defining role in the development of a tax system, along with the need for increased income (OECD, 2014:30). Justice in taxation asserts that citizens are subject to the same tax laws within the rule of law and irrespective of any differences based on religion, language or race. Although the concept of justice refers to an ideal standard and hence has a normative character, it is not always clear what that ideal is. The concept therefore varies from society to society and from culture to culture (Lang, 2000:3).

Considering tax justice in Turkey, it is crucial to note that the tax system in Turkey has witnessed significant institutional reforms since 1980. Accordingly, since 1985, the proportion of indirect taxes imposed based on consumption has started to increase in comparison with direct taxes imposed based on income and profits. The examination of this transformation by means of variables that directly or indirectly affect the taxpayer's perception of tax justice is therefore particularly significant as it helps identify the consequences of tax policies.

This paper examines Turkey's institutional change about tax policies between 1980 and 2015 with a focus on the prevalent understanding of justice during this period. First, the Turkish tax system is explained in general terms. This is followed by a more detailed literature review in the second section. The third section of the study applies the fuzzy AHP method through pair-wise comparisons that were formulated by five decision-making professors with special expertise on tax with respect to criteria on the perception of justice, and determines the priority weights assigned to these criteria. Subsequently, the paper presents the ranking of the perception of tax justice in each period by drawing on the quantitative data for the criteria as well as using the TOPSIS and VIKOR methods, two of the most important techniques of multi-criteria decision analysis. Finally, the paper discusses the findings of the analysis and presents a general evaluation based on the results of the ranking

2. Tax Policies and Tax Justice in Turkey

Article 73 of the 1982 Constitution represents the fundamental institutional norm of taxation in Turkey. This Article stipulates that everyone is obliged to pay tax in line with their financial power in order to meet public expenditures, that a fair and balanced distribution of the tax burden is the social purpose of the fiscal policy, that the taxes, duties and fees are introduced and changed by law, and that the exemption exception and discount rates are determined by the Council of Ministers. In this respect, the principles of taxation set out per this Article are deemed as embodying what it means to be a social state bound by rule of law (Soydan, 2000:83).

While there are several other ways of categorizing taxes, a categorization based on the distinction of direct and indirect taxes represents an ideal one in terms of showing the extent to which the principle of justiceis embodied in taxation (Çelik, 2016:256). The direct taxes in Turkey include Income and Corporate Tax, Inheritance and Transfer Tax; Motor Vehicle Estate Tax imposed from 1959 to1970.The indirect taxes in Turkey Value Added Tax (VAT), Private Consumption Tax (SCT), which was introduced after 1980s. Additionally, taxes on international trade and transactions are mainly comprised of Customs Tax of 1999 and VAT imposed on imports (Mutlu and Çelen 2012:35-40).

1980 represents a year of significant developments in terms of the Turkish Tax System. The liberalization of financial markets in 1989 can be deemed as a repercussion of these policies. The main targets were to expand credit volume in the country's economy, decrease

interest rates and increase investments. However, financial liberalization which took place in the absence of necessary institutional infrastructure rendered the country's economy vulnerable to the destabilizing influences of external shocks. When being evaluated in terms of public finance, these periods also indicate high budget deficits, high inflation and interest rates. The Economic Implementation Plan was introduced in 1994 in order to tackle the economic crisis which was reinforced by the dollarization born out of the attempts to suppress high interest rates. Rather than the taxation of non-taxable economic activities, the existing tax rates were increased in addition to the introduction of Economic Balance Tax, Net Asset Tax, Supplemental Real Estate Tax and Additional Motor Vehicles Tax to reduce tax losses. Further, the 1990s proved a period when developing countries competed for attracting foreign capital in parallel with the increasing influence of globalisation. For instance, corporate tax rebates in particular can be noted as a significant consequence of this competition. Indeed, the corporate tax which was 46% in 1990 receded back to 25% in 1995 whereas it rose to 33% in 2000 and was again reduced to 20% in 2006. The financial markets were plunged into a gridlock due to the crisis that took place in November 2000, thereby increasing the interest rates and turning taxes into a tool through which to pay state loans, causing disruption in the provision of public services. In February 2001, the second big economic crisis was caused by a combination of factors such as a high primary surplus target, the weakening of public banks, current accounts deficit, outstanding external debts and political tensions (Candan, 2012:81-83; Paksoy ve Bakan, 2010:159-161; Şimşek, 2007:53; Kargı ve Özuğurlu, 2007:179).

The global financial crisis which started in the USA in 2007, Turkey adopted new tax policies, as effective of 1 January 2008, as part of the fight against the crisis that caused economic stagnation (Kaya and Kaygısız, 2015:182-183).

Table 1: Tax Statistics of Some Selected Years

Year	Share of Income Tax in Tax Revenues %	Share of Corporate Tax in Tax Revenues%	Share of VAT in Tax Revenues %	Tax Mix
1988	33.7	14.9	29.3	1.01
1990	41.0	10.2	27.2	0.91
1995	30.4	9.5	32.7	1.35
2000	23.4	8.9	31.6	1.44
2005	20.3	9.6	32.1	2.27
2010	21.0	9.7	32.1	2.16
2015	22.4	8.0	33.1	1.98

Source: Revenue Administration, 2015 (Tax mix was calculated by use of the data obtained.)

Table 1 shows the percentage share of income tax and corporate tax in the total tax revenue as direct taxes and of VAT as indirect taxes. Accordingly, it can be observed that the share of income tax in total tax revenues rapidly decreased in the period after 1995. The share of corporate tax in total tax revenues was also diminished as the corporate tax rate dropped over the years. VAT is noted as the tax whose share in tax revenues showed a remarkable increase over the years. Tax mix which is obtained through proportioning indirect taxes to direct taxes shows its highest values in the period between 2005 and 2015.

3. Literature Review

Tax policy affects tax burden via macroeconomic structure, political preferences, changes in public attitudes and institutional framework. Taxes are related to economic –e.g., labour market, trade unions- and political –e.g., voting rule, political preferences- institutions. Therefore, inequal economic outcomes are results of economic and political institutions (Grilli, Masciandaro and Tabellini, 1991:342-392; Steinmo and Tolbert, 1998:165-187; Hartmann et al. 2017:75-93).

As well as justice (Hay, 2004:500-508) , tax justice (Prasad and Deng, 2009:1-10) and institutions (Voigt, 2012:1-26) are difficult concepts to define and measure. Since Ancient Greece, many ideas have been put forward regarding the nature of justice. While Aristotle argued that the matter of justice could not be elucidated with a general approach, he also made a distinction between distributive and corrective justice, which remains valid today (Güriz, 1990: 13-14). The two most prominent figures in contemporary theories of justice are John Rawls and Robert Nozick. Rawls argues about equality about rights and responsibilities and involves taking the most disadvantaged in society into consideration. However, Nozick's theory of justice is a process-oriented one and links distributive justice to historical principles. Nozick highlights the significance of the ways in which people acquire wealth, how goods and properties need to be exchanged and whether the distribution of property in the past coincided with the principles of justice (Rawls, 1958:165-167; Varian, 1975:224).

Institutions are rule of games and humanly devised to constrain shape interactions. The Rawlsian perspective on institutions and economic policy relations is explained by Murphy (1999: 252): "For Rawls, the significance of institutions is not causal, in a fundamental way, institutions are what normative political theory is all about**. Therefore, distribution of resources between citizens are related to institutional framework Taxes and expenditures with their redistrubition function is product of institutional prefences".

Ricciuti, Savoiave and Sen (2016:1-43) argue that citizens perceive tax policy to be neutral and that their resistance to taxation decreases when institutions put constraints on executives through check and balance mechanisms. Furthermore, public good provision determined by fiscal capacity is interconnected with rule of law, accountability and bureaucratic quality. Bird, Rasquezve and Tortler (2008) compare tax policy outcomes of both developing and developed countries. Findings support that institutional quality with good governance increase tax compliance for citizens

Musgrave (1958) state that an effective tax system is a straightforward one that equally allocates the tax burden. The main challenge that comes into play at this point is the lack of agreement over what the equal shares ought to be despite the consensus that a taxation system should be egalitarian. This draws attention to the difficulties involved in implementing the definitions of horizontal and vertical justice, which are used as the two means of ensuring equality in modern tax policies. Tax theoreticians use these two principles in assessing the equality of tax laws. Vertical justice involves ensuring the fairness of tax rates among taxpayer groups, while horizontal justice involves the difficulty determining the groups of taxpayers (Musgrave, 1958:199-200). Kornhauser (1995:607-661) argues that the clash between equality and freedom, which is caused by taxation as a tool of fiscal policy ensuring the state's direct intervention in economy, is associated with the clash between efficiency and equality. At the basis of these clashes lie the choices of tax base and tax rate structure. It is this choice that specifies which tax rate will be levied on whom.

Head (1992:65-125) argues that for the allocation of the cost of public services, the taxation system has a vital role in the alteration of income and prosperity, being combined with the exchange system. Therefore, a fair taxation system has both economic and social significance in democracies. Infanti (2007:1-47) argues that a well-formulated tax policy plays an effective role in ensuring equal access to socio-economic opportunities, macro-economic policies and structural reforms that contribute to economic growth. In addition to socio-economic constraints such as limited access to education and health, high unemployment and absolute poverty, the scarcity of business opportunities and competition in domestic markets are also associated with that perception

When tax justice and institutions examine empirically, it is seen that index and definitions variety have impact on results (Holcombe and Boudreux, 2016:263-276; Voigt 2012:1-26). Many studies (Kaplow, 1989:139-154; Berliant and Strauss 1985:179-2014) highlight that there is an inconsistency between the conceptualisation of justice in applied studies and established definitions of horizontal and vertical justice or related concepts in the literature. Despite these limitations, notable studies are shown in Table 2.

Table 2: Applied Studies on Tax Justice

Author/s	Period	Method	Findings
Etzioni (1986)	1960-1980	The correlation analysis	The perception of taxes as unfair increases tax evasion.
Berliant and Strauss (1985)	1966-1977	Household surveys and forming indices.	Horizontal justice was lower in married people that those who are single.
Roberts & Hite (1994)	1981-1991	Discriminant and multivariate variance analysis.	Tax justice has a correlation with income level and demographic factors.
Aurbach & Hassett (1999)	1979-1990 1994	Statistical discrimination techniques	The society's tendencies in terms of horizontal and vertical justice are identical.
Azmi & Perumal (2008)	2006	Factor analysis	The difference in the criteria of tax justice between western and eastern societies is explained with a reference to educational and cultural differences.
Creddy et al. (2008)	2006-2007	The Treasury's micro-simulation model	Australia is more successful in terms of tax justice.
Ryu & Lee (2013)	1998-2011	Data envelopment analysis.	Seoul and Gwbanju are identified as the most efficient cities.

These research are a few example which uses empirical methodologies to assess tax justice. Altough there are some challenges to measure tax policies impact on tax justice, it is not found any example for Turkey.

If institutions and tax justice are considered together, it is a challenge to make an empirical analysis. Instead of measuring institutions and tax justice, we prefer to analyze and to compare how institutional changes affect tax justice via policy outcomes. Therefore, the present study aims to evaluate all the significant criteria used in the assessment of tax justice based on periods by putting these criteria with their specific weights into one set. Multi-criteria decision analysis is a popular methodology to make such an evaluation.

3. Methodology

Multi-Criteria Decision Analysis (MCDM) is an umbrella term to describe approaches that take into account multiple and conflicting criteria in the solution of problems (Zionts, 1979:94). Based on this definition, to explicate the structure of a MCDM problem, it is necessary to present the decision-makers or individuals in the decision-making unit, elucidate the relationship between the criteria and attributes, and identify appropriate alternative sets. A solid analysis can be performed by writing the appropriate objective function and adding the decision-maker's preference judgments to the model. Interviews were conducted with five professors with special expertise on tax in order for the present study to determine the varying degrees of significance of all the criteria identified in the literature review in assessing the perception of tax justice. Following the calculation of the criteria weights by using Fuzzy AHP based on Chang's extent analysis, an important assessment was made by means of the TOPSIS and VIKOR method to identify the period(s) which stand(s) out in terms of the perception of justice in tax system. Before proceeding to the application section, the following delineates these methods which have different characteristics from one another.

3.1. Fuzzy AHP

Fuzzy Analytic Hierarchy Process (FAHP), introduced by Thomas Saaty in the 1970s, using in order to determine the relative significance of each criterion and offering the chance to rank and select the alternatives according to each criterion. This method is used as a guiding technique for decision-makers in several social science fields (Yıldırım and Önder, 2015:21). FAHP, a hybrid technique, has been developed by combining AHP with the concept of fuzzy logic which eliminates these uncertainties by help of linguistic variables. This study employs the FAHP method based on Chang's extent analysis which stands out as the most recently developed one among all the other methods and ascertains the goal of each object in clearer and shorter process steps in comparison with other methods. For the purposes of this study, it was deemed as more appropriate to use triangular fuzzy numbers rather than trapezoidal fuzzy numbers since the aim here is to compare the criteria and indicate the degree of importance for each criterion.

Let $X = \{x_1, x_2, \ldots, x_n\}$ be object set and $U = \{u_1, u_2, \ldots, u_m\}$ target set. Each object is taken and extent analysis for each goal g_i is performed respectively (Chang, 1992:352-355). Therefore, m extent analysis values for each object can be obtained. The application of extent analysis on fuzzy AHP can be explained in the following steps:

Step 1. Calculating the fuzzy extent value with respect to object i.

$$S_i = \sum_{j=1}^{m} M_{g_i}^{j} \otimes \left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^{j} \right]^{-1} \tag{1}$$

S_i. shows the value of fuzzy synthetic extent with respect to the goal and $M_{g_i}^{j}$ represents the extent value with respect to each goal. To obtain $\sum_{j=1}^{m} M_{g_i}^{j}$, perform the fuzzy addition operation of m extent analysis values for a particular matrix such that.

$$\sum_{j=1}^{m} M_{g_i}^{j} = \left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j \right) \tag{2}$$

To obtain $\left[\sum_{i=1}^{n}\sum_{j=1}^{m}M_{g_i}^{j}\right]^{-1}$, perform the fuzzy addition operation of $M_{(g_i)}^{j}$ $(j=1,2,3,....m)$ values as in the following equation.

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m}M_{g_i}^{j}\right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n}u_i}, \frac{1}{\sum_{i=1}^{n}m_i}, \frac{1}{\sum_{i=1}^{n}l_i}\right) \tag{3}$$

Step 2. Comparing two fuzzy numbers

While $M_1 = (l_1, m_1, u_1)$ and $M_2 = (l_2, m_2, u_2)$ represent two triangular fuzzy numbers, the likelihood degree of $M_2 \geq M_1$ is as described in the equation

$$V(M_2 \geq M_1) = \sup_{y \geq x}\left[\min(\mu_{M_1}(x), \mu_{M_2}(y))\right] \tag{4}$$

For this equality relation, inequality of i $y \geq x$ s calculated according to the extension principle. Equality shows the relation of magnitude between the number pair (x, y) as $y \geq x$ and $\mu_{M_1}(x) = \mu_{M_2}(y)$.The likelihood ratio for a higher median value of M_2 than is M_1 1. In the contrary case, probability calculation is needed. To make this calculation, it is primarily important to make a precise and correct calculation of $V(M_1 \geq M_2) \cdot V(M_2 ³ M_1) =$height

$$(M_1 \cap M_2) = \mu_{M_2}(d) = \begin{cases} 1, if\ m_2 \geq m_1 \\ 0, if\ l_1 \geq u_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}, other\ conditions \end{cases} \tag{5}$$

Step 3. Defining the degree possibility for a convex fuzzy number to be greater than k convex fuzzy numbers

$\widetilde{M}_i (i = 1,2,\ldots\ldots,k);$

$$V(\tilde{M} \geq M_1, M_2, \ldots\ldots M_k) = V\left[(\tilde{M} \geq M_1), (M \geq M_2), \ldots\ldots\ldots(\tilde{M} \geq M_k)\right] = \min V(\tilde{M} \geq M_1) 1, 2,..k \tag{6}$$

In this case, weight vector calculation is presented under the assumption that S_j 's, $k = 1,2,..,n ; k \neq j$ for $d'(A_i) = \min V(S_1 \geq S_k)$.

$$W' = (d'(A_i))^{T}, \quad (i = 1, 2\ldots,n) \tag{7}$$

*Step 4. Normalized weight vector W is obtained via normalization and this number is no longer a fuzzy number.*he section of findings and comments presents the criterion weights which are obtained through these steps.

$$W = (d(A_i))^{T}, \quad (i = 1, 2\ldots,n) \tag{8}$$

3.2. TOPSIS

Formulated by Hwang and Yoon (1981), TOPSIS is one of the MCDM techniques that rank alternatives by means of distance measures and suggests that the best alternative has the shortest distance to the positive ideal solution and farthest distance from the negative ideal solution. This technique consists of five different steps in total which are shown as below:

Step 1: Generating a normalized decision matrix

The first important step following the construction of a decision matrix is to normalize that decision matrix. Normalization operation is important for all the data to be standardized, that is, to be transformed into a specific range. It thus facilitates making comparisons between the qualities. The present study employs this technique which can also be called vector normalization.

$$r_{ij} = x_{ij} \Big/ \sqrt{\sum_{i=1}^{m} x_{ij}^2} \tag{9}$$

i. in the decision matrix x_{ij} shows the real value of the alternative according to the criterion *j*.

Step 2: Determining the positive-ideal solution and the negative-ideal solution

$J = \{j = 1, 2, \ldots, k\}$ shows the benefit maximization and $J' = \{j = 1, 2, \ldots, k\}$ shows the cost minimization. Both the positive-ideal and negative-ideal solution sets are equal to m number of evaluation factors. A_j^{+} represents the best value and A_j^{-} the worst value for *J* among all the alternatives.

$$A^{+} = \left\{ \left(\max_i r_{ij} \mid j \in J \right), \left(\min_i r_{ij} \mid j \in J' \right) \mid i = 1, 2, \ldots.m \right\} = \left\{ A_1^{+}, A_2^{+} \ldots, A_j^{+}, \ldots, A_k^{+} \right\} \tag{10}$$

$$A^{-} = \left\{ \left(\min_i r_{ij} \mid j \in J \right), \left(\max_i r_{ij} \mid j \in J' \right) \mid i = 1, 2, \ldots.m \right\} = \left\{ A_1^{-}, A_2^{-} \ldots, A_j^{-}, \ldots, A_k^{-} \right\}$$

Step 3. Calculating the distance measures between alternatives

The distance of *J* alternative from the ideal solution, positive-ideal separation S_i^{+}, and its distance from the negative-ideal solution, the negative-ideal separation S_i^{-}, are obtained in the following equations (Yaralıoğlu, 2010).

$$S_i^{+} = \sqrt{\sum_{j=1}^{k} (r_{ij} - A_j^{+})^2} \qquad S_i^{-} = \sqrt{\sum_{j=1}^{k} (r_{ij} - A_j^{-})^2} \quad i = 1, 2, \ldots.m \tag{11}$$

The calculated numbers of S_i^{+} and S_i^{-} are equal to the number of alternatives.

Step 4: Determining the proximity value relative to the ideal solution

The sum of the ranking scores of each alternative's proximity value relative to A^{+} are obtained in the following equation:

$$C_i^{*} = \frac{S_i^{-}}{S_i^{+} + S_i^{-}} \quad 0 \leq C_i^{*} \leq 1 \tag{12}$$

Step 5: Making the relative ranking of each alternative

Alternatives are ranked according to the proximity value C_i^{*} calculated in thefourth step. Alternative which has the maximum value is ranked highest and preferred in case of a selection. An alternative reaches the value of 1 as it gets closer to an ideal alternative.

3.3.VIKOR

The VIKOR method, which was first proposed by Opricovic (1998) and later developed by Opricovic and Tzeng(2004), is one of the MCDM techniques used in the optimization of complex systems. Unlike TOPSIS, this technique is an emerging method which has only begun to be used in recent years. The calculations of this technique, which aims to maximize the benefits of the majority group and minimize the personal regrets of competitors, are straightforward and clear as explained below (Ju&Wang, 2013).

Step 1. Determining the best (f_i^*) and worst (f_i^-) values in the decision matrix (i = 1, 2, …., n) for each criterion.

The best and worst values are calculated by using the equation $f_i^* = max_j f_{ij}$ and $f_i^- = min_j f_{ij}$ if *i.* represents the benefit function, and the equation $f_i^* = min_j f_{ij}$ and $f_i^- = max_j f_{ij}$ if *i.* represents the cost function.

Step 2. Calculating S_j ve R_j values (j = 1, 2,….,J)

$$S_j = \sum_{i=1}^{n} w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \qquad\qquad R_j = max_i \left[w_i \frac{(f_i^* - f_{ij})}{(f_i^* - f_i^-)} \right] \qquad\qquad (13)$$

w_i in the equations are the weights that represent the relative significance of the criteria.

Step 3. Calculating Q_j value (j = 1, 2,….,J)

$$Q_j = v \frac{(S_j - S^*)}{(S^- - S^*)} + (1-v) \frac{(R_j - R^*)}{(R^- - R^*)} \qquad\qquad (14)$$

Here, while $S^* = min_j S_j$, $S^- = max_j S_j$ and $R^* = min_j R_j$, $R^- = max_j R_j$, v represents the strategic weight of the majority criterion (or maximum benefit of the group) and is calculated separately for $v = \{0, 0.5, 0.75, 1\}$ and the agreed value varies depending on the type of the problem.

Step 4. Ranking the alternatives according to S, R and Q values

This ranking facilitates sorting the alternatives from small to big and creating three ranking lists.

Step 5. Proposing the compromised alternative a´ which ranks the alternatives according to Q_{min} values if the following two conditions are provided.

O1: Acceptable advantage

$$Q(a^{''}) - Q(a^{'}) \geq DQ \qquad\qquad (15)$$

a'' represents the alternative in the second position in the compromise ranking and is obtained through the formula $DQ = 1/(J-1)$. J in the formula indicates the number of alternatives in the study.

O2: Acceptable stability in decision-making

The compromise ranking is stable within a decision-making process if the alternative a' is ranked as the best alternative according to S and/or R values. Here, v represents the strategic weight of the majority criterion. A compromise solution set is proposed if Condition O1 or O2 is not satisfied. The alternatives that will fall into this compromise solution set are:

a' and a'' alternatives if only Condition O2 is not satisfied.

a', a'',....$a^{(M)}$ alternatives if Condition O1 is not satisfied, and $a^{(M)}$ is determined by the relation $Q\left(a^{(M)}\right) - Q\left(a'\right) < DQ$ for maximum M (the positions of these alternatives are "in closeness").The best alternative ranked according to Q values is one of the alternatives which have Q_{min} value.

4. Data

This study utilizes the MCDM techniques to provide a solid evaluation on the perception of justice in the tax system of Turkey. A decision matrix was constructed by using as the criteria 10 different variables in the five-year periods between 1981 and 2015. In addition to facilitating comparisons between the periods, the reason for determining the alternatives in five-year periods is also the need to identify an average amount of time to assign local and national administrations which have an influence on tax policy. C1: Tax Mix (Indirect/Direct Taxes), C2: Increasing Progression, C3: Taxes Imposed on Income/Total Tax Revenues, C4: Net Minimum Wage/Gross Minimum Wage, C5: Effective Rates of Tax, C6: Public Expenditures on Education/Total Public Expenditures, C7: Public Expenditures on Health/Total Public Expenditures, C8: Economic Freedom, C9: Size of Unrecorded Economy and C10: Accountability. Since the concept of tax justice rests on the principles of universality, relativity and equality, the variables that are considered as tangible in terms of these principles are selected as the appropriate criteria for this study. Table 3 illustrates the criteria used in the study, the sources of data and their purposes of use and definitions. The criteria identified in the literature review include the following.

Table 3: Selected Criteria for the Evaluation of Tax Justice

Criterion	Data Source	Function and Definition
C1	BUMKO (General Directorate of Budget and Fiscal Control)	The ratio of indirect taxes to direct taxes.
C2	ÜNLÜKAPLAN	An indicator of horizontal and vertical justice.
C3	BUMKO	The ratio of the revenue collected from income and corporate tax to total tax revenues.
C4	The Ministry of Labour and Social Security	An indicator used to measure taxes imposed on minimum wage and the tax burden of labour. *
C5	ÜNLÜKAPLAN&ARISOY	A rate of the real tax burden *
C6	BUMKO	The share of allocated for the Ministry of National Education from the Central Administration's Budget.
C7	BUMKO	The share of allocated for the Ministry of Health from the Central Administration's Budget.
C8	QUALITY OF GOVERNANCE DATA SET	The dataset to identify the state's level of intervention in economy.
C9	ERKUŞ&KARAGÖZ	The dataset to determine the position of non-taxable incomes in total economic activity.*
C10	C&R INDEKS	A large index about human rights.

*Missing years in the datasets marked with an asterisk (*) are filled in by using STATA software pack. In fact, the construction of these datasets is a separate research topic on its own.

Since it is considered that it is not possible for each of 10 different indicators of tax justice selected in the study to have equal significance, binary evaluations of all the criteria were

made through a face-to-face survey with 5 professors with special expertise in tax. According to Chang's (1996) extent analysis method, the triangular fuzzy numbers and their reciprocal scale corresponding to the linguistic variables used by decision makers are as shown in Table 4.

Table 4: Fuzzy Importance Degrees

Linguisticvalues	TriangularFuzzy NumberScale	TriangularFuzzyNumber ReciprocalScale
Equally important	(1,1,1)	(1,1,1)
Weakly more important	(2/3, 1, 3/2)	(2/3, 1, 3/2)
Strongly more important	(3/2, 2, 5/2)	(2/5, 1/2, 2/3)
Very strongly important	(5/2, 3, 7/2)	(2/7, 1/3, 2/5)
Absolutely more important	(7/2, 4, 9/2)	(2/9, 1/4, 2/7)

Source: Chang, D. Y. (1996), "Application of the Extent Analysis Method on Fuzzy AHP",

European Journal of Operational Research, 95(3), p.651

The weighted normalized decision matrix is calculated by also taking into consideration the priority weights of the criteria determined by using the fuzzy AHP method. Any failure to construct a correct decision matrix shown in Table 5 may cause massive errors in the study. Therefore, the weighted and normalized decision matrix, which is the standardized version of the dimensions of different criteria, is of vital importance.

Table 5: Weighted and Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
1981-1985	0.018088632	0.020112785	0.05331858	0.04736327	0.026185925	0.045306761	0.034691839	0.028214308	0.000247329	0.012247821
1986-1990	0.023661545	0.029171215	0.047325057	0.050964879	0.022615116	0.043250633	0.042260046	0.031154917	0.000709029	0.024495642
1991-1995	0.026854162	0.038229644	0.042509072	0.054566488	0.023271817	0.062409323	0.054099033	0.03505414	0.000635218	0.034293899
1996-2000	0.033850723	0.047288074	0.038973956	0.049445009	0.028997422	0.038237684	0.041650542	0.037606122	0.000816906	0.053890413
2001-2005	0.049702252	0.047005866	0.030828659	0.05006513	0.035441295	0.037001183	0.044170263	0.038137245	0.002667028	0.044092156
2006-2010	0.049677374	0.032712703	0.029099716	0.039914986	0.036118513	0.048038858	0.074686966	0.044381183	0.021931422	0.024495642
2011-2015	0.054154681	0.018419539	0.028624057	0.037757315	0.039196788	0.05320868	0.024663409	0.044458909	0.04741325	0.024495642

Following this step, ideal A^+ and negative ideal A^- solution sets are constructed. In each column of the weighted decision matrix, the highest values are selected for creating the values in the A^+ set and the smallest values for creating the values in the A^- set. Accordingly, these sets are as follow.

$$A^+ = \left\{ \begin{array}{c} 0.0181, 0.0473, 0.0533, 0.0378, 0.0226, 0.0624, 0.0747, 0.04450, 0.0002 \\ , 0.0539 \end{array} \right\}$$

$$A^- = \left\{ \begin{array}{c} 0.0542, 0.0184, 0.0286, 0.0546, 0.039200.037000.024660.028210.047410 \\ .01225 \end{array} \right\}$$

The point of distance between periods in tax justice is calculated by using n-dimensional Euclidean space. The proximity to positive and negative ideal solution, that is, distance measures are calculated by subtracting the values in positive and negative ideal value sets from the values in the column of each criterion.

$$S^+ = \{0.0688, 0.0550, 0.0381, 0.0485, 0.0595, 0.0594, 0.0932\}$$

$$S^- = \{0.0673, 0.0661, 0.0763, 0.0759, 0.0661, 0.0643, 0.0310\}$$

The values of proximity to ideal solution are calculated by using S^+ and S^- distance measures and dividing the value of the negative ideal solution for each period to the total of its own value and the positive ideal solution value of the same period. Table 6 shows the values obtained and the ranking made according to these values.

Table 6: Ranking the Periods Based on Their Proximity Values to the Ideal Solution

Periods	C^*	Ranking
1981-1985	0.4945	6
1986-1990	0.5457	3
1991-1995	0.6666	1
1996-2000	0.6101	2
2001-2005	0.5263	4
2006-2010	0.5199	5
2011-2015	0.2493	7

The period between 1991 and 1995 was found to be the most effective one in terms of the perception of tax justice according to the values of proximity to the ideal solution. In addition to the evaluation results based on the TOPSIS method, it is important to look at the results from the application of the VIKOR method for the overall outcome. By using the VIKOR method, the best and worst values for each criterion were determined as shown in Table 7

Table 7: The Best and the Worst Values for the Criteria

	f_i^*	f_i^-
C1	0.725208	2.171164
C2	2.717647	1.058571
C3	0.569028	0.305482
C4	0.221872	0.320647
C5	22.04	38.19999
C6	0.13727	0.081384
C7	0.052298	0.01727
C8	6.864	4.356
C9	3.572	684.756
C10	4	1

The best and worst values that facilitate the evaluation of the criteria are used in the calculation of S_j and R_j values in Table 8.

Table 8: S and R Values

	S_j	R_j
1981-1985	0.5420	0.1013
1986-1990	0.5135	0.0995
1991-1995	0.3765	0.1267
1996-2000	0.4682	0.1205
2001-2005	0.6051	0.1267
2006-2010	0.4842	0.1031
2011-2015	0.6763	0.1267

The results obtained after making the calculations regarding all the steps involved in the method are illustrated first in Table 8 and then in Table 9. Different **v** values are calculated to measure the impact of the maximum group benefit on the solution of the problem. The sensitivity analysis and Q_j values for each period are presented in the following table.

Table 9: Q Values

	v=0	*v*=0.25	*v*=0.50	*v*=0.75	*v*=1
1981-1985	2	2	3	**5**	5
1986-1990	1	1	1	**3**	4
1991-1995	5	5	4	**1**	1
1996-2000	4	4	5	**4**	2
2001-2005	5	6	6	**6**	6
2006-2010	3	3	2	**2**	3
2011-2015	5	7	7	**7**	7

The compromised solution values for all **v** values used in the calculation are shown in Table 9. Ensuring the validity of these results rests on the evaluation of these values and verification of the conditions of acceptable stability and acceptable advantage

Table 10: Ranking the Q Values

	v=0	*v*=0.25	*v*=0.50	*v*=0.75	*v*=1
1981-1985	2	2	3	**5**	5
1986-1990	1	1	1	**3**	4
1991-1995	5	5	4	**1**	1
1996-2000	4	4	5	**4**	2
2001-2005	5	6	6	**6**	6
2006-2010	3	3	2	**2**	3
2011-2015	5	7	7	**7**	7

The ranking of the alternatives corresponding to the Q values which are separately calculated for each **v** value is shown as in Table 10. Determining the rankings to be used is predicated on the selection of the ranking result that meets two significant conditions and reflects the positive impact of the maximum group benefit on the group. The DQ value should be calculated to evaluate whether the condition of acceptable stability, the first condition to be looked at to make this selection, is satisfied or not. Accordingly, the DQ value is calculated to be 0.1666 for 7 periods by using the formula (1/(7-1)). The ranking result which satisfies the condition that the difference between the Q values of the periods in the first two positions should be greater than or equal to the DQ value is the one with the *v* value of 0.75. The ranking of the Q values with *v* = 0.75 is the one which satisfies the condition that the alternative in the first place of the ranking done according to the calculated S and R values is equal to the one in the first place of the ranking done according to the Q values. This evaluation which satisfies all the conditions is accepted as the ranking result by the VIKOR method. According to this ranking result, the period between 1991 and 1995 is found to come in the first place in the ranking of the most effective periods in terms of the perception of tax justice.

Table 11: Application Results of the TOPSIS and VIKOR Method

	TOPSIS Ranking	VIKOR Ranking
1981-1985	6	5
1986-1990	3	3
1991-1995	**1**	**1**
1996-2000	2	4
2001-2005	4	6
2006-2010	5	2
2011-2015	7	7

The ranking results of the periods which are obtained by applying the TOPSIS and VIKOR methods are as shown in Table 11.Although not all the results do not completely match with each other, the period between 1991 and 1995 comes in the first place in both rankings. The similarity between the rankings of the periods is considered to result from the fact that the calculations in each technique rely on the proximity to ideal solution. While the TOPSIS uses the vector normalization, the VIKOR is a technique that refers to the linear normalization technique. The reduction of all the data to one dimension by means of different techniques in measuring the perception of tax justice and generating findings testifies to the applicability of the MCDM techniques to different areas of research.

5. Conclusion

The difficulties involved in defining the concept of justice and institutions renders it difficult to define the concept of tax justice and its institutional framework as well. Tax justice in which many socioeconomic factors interact each other is a concept that points to the subjection of all citizens to the same tax laws under the roof of a constitutional state without any discrimination as to religion, language, and race. Therefore, it can be suggested that the perception of tax justice is difficult to measure with institutional framework as is also shown by the studies in the literature. The factors identified as the most significant ones in terms of the

institutional change outcome on tax justice include the following: Tax Mix (Indirect/Direct Taxes), Increasing Progression, Tax Imposed on Income/Total Tax Revenues, Net Minimum Wage/Gross Minimum Wage, Effective Rates of Tax, Public Expenditures on Education/Total Public Expenditures, Public Expenditures on Health /Total Public Expenditures, Economic Freedom, Size of Unrecorded Economy and Accountability. In addition to being treated as the criteria for making quantitative evaluations, these factors used in the present study can also help to reach a compromised solution, based on the idea that tax justice relies on the principles of universality, proportionality and equality. What underlies this study's selection of the methods which can take many factors into account at the same time is that these methods facilitate compromised solutions. This study aimed to provide an analysis which differed from the previous works in this field in order to make evaluations between the periods and determine the best period in terms of the institutional change effect on tax equity. To this end, this study employed the multi-criteria decision-making models like the fuzzy AHP, TOPSIS and VIKOR methods, which have increasingly been used in recent years. It adopted a different approach to the evaluation of the of tax justice. For the 10 different criteria in question, the study drew on the evaluation of 5 professors specialized in the field of tax.

The importance weights of the criteria were calculated by applying the fuzzy analytical hierarchy process based on Chang's extent analysis method and drawing on the views of the academics who used a pair-wise comparison matrix to evaluate 10 different criteria as equally important, weakly more important, strongly more important, very strongly important, and absolutely more important. According to the ranking results of all the criteria, the most important set of criteria is the one which includes Net Minimum Wage/Gross Minimum Wage, Public Expenditures on Education/Total Public Expenditures, and Public Expenditures on Health/Total Public Expenditures. The rest of the criteria was ranked in terms of their importance degree in the following order: Tax Imposed on Income/Total Tax Revenues, Tax Mix, Economic Freedom, Increasing Progression, Accountability, Effective Rates of Tax, and Size of Unrecorded Economy, which represents the least important criterion.

Although the same data sets are used in the application of the TOPSIS and VIKOR methods, the techniques and steps followed in each are different from one another. The reason for drawing on two different methods in this analysis was the desire to enhance the reliability of the study's findings, due to the belief that one single method would not suffice to evaluate the perception of tax equity. Further, another source of motivation in using both methods was to apply these methods in an area which had never been employed before and thus to measure the contribution of the findings.

Application results of the TOPSIS and VIKOR method supports the period between 1991 and 1995 to be the one in which the tax justice was understood to be the highest. One reason for this is that the revenues obtained through direct taxes in the given period, which is an important indicator of the tax system, were higher than indirect taxes. The ratio between direct and indirect taxes changed to the disadvantage of direct taxes in the following periods. Although direct taxes can be individualized and prove to be a more effective instrument in ensuring tax justice, indirect taxes yielded more revenues in the periods after 1995. A second reason is related to the corporate tax rates. The corporate tax rates were high in the 1990s but declined in the following periods, which caused naturally persons to have higher tax bur-

dens than companies and institutions did. This led to the emergence of taxes being levied on labor incomes. When it comes to taxes, it is necessary to consider the impact of the VAT rates as well. The fact that the rate of VAT increased from 10% in 1985 to 12% in 1995 and to 18% in 2000 can be considered as another reason that distinguished the period between 1991 and 1995 from the other periods. As a final reason, the economic programs that have been implemented since 1999 set fiscal discipline goals and preferred to increase tax rates rather than levying taxes on the non-taxable areas of economic activity. The fact that these economic programs continued to carry out the same policies even during the struggles related to the 1994, 2000 and 2001 financial crises enabled the 1991-1995 period to stand out from when compared to the other periods.

This study contributes to the diversity of the literature in two respects. The first is through using the MCDM techniques in the evaluation of the measurability of institutions' policy outcomes related the perception of tax justice, which is unusual for this field. The second is through evaluating the findings in terms of both the analytical techniques used and developments that took place in the field of tax. This supports that institutional changes in tax policy do not serve tax justice and that the shadow economy increases day by day in Turkey. Institutional changes that improve tax justice perception improve state capacity.

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