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Environmental Revenue and Expenditure of Turkish Municipalities: A Perspective From Club Convergence

Türkiye'deki Belediyelerin Çevresel Gelir ve Harcamalari: Kulüp Yakinsama Perspektifi

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ÖZ

Bir ülkedeki çevresel harcamalar ve gelirler, uzun vadeli kalkınma ve refahın temel ölçütleridir. Çevresel gelir ve harcamaların iller arasındaki dağılımı, uygulanan stratejilerin başarısını değerlendirmede kritik öneme sahiptir. Bu çalışma, bu amaçla, belediyelerin çevresel harcamaları ile çevresel gelirlerinde yakınsamanın varlığını araştırmayı amaçlamaktadır. Bu sebeple, Türkiye'nin 81 ilinde 2001-2016 yılları arası dönemi değerlendirmek için, Phillips ve Sul (2007) tarafından önerilen kulüp yakınsama analizi kullanılmıştır. Bulgulara göre, 81 il tek bir durağan duruma yakınsamamaktadır. Buna rağmen bulgular, belediyenin çevre harcamalarının, belediyenin çevre gelirlerinden daha homojen dağıldığını ortaya koymaktadır.

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ABSTRACT

Environmental expenditures and revenues in a country are key measures of long-term development and welfare. The distribution of environmental revenue and expenditure among provinces is critical in evaluating the success of strategies implemented. This study aims to investigate the existence of convergence in municipal environmental expenditures and environmental revenues for this purpose. To this end we employ a club convergence analysis proposed by Phillips and Sul (2007) for 81 provinces of Türkiye over the period between 2001 and 2016. Based on the findings, 81 provinces do not converge to a single steady-state. Despite this, the findings reveal that municipal environmental expenditures are more homogeneous than municipal environmental revenues.

1. Introduction

Environmental degradation and pollution are essential components of the United Nations' Sustainable Development Goals (SDGs), which were approved in 2015 and aim to achieve sustainable development by 2030. The emphasis is particularly on environmental degradation in the context of protecting the seas and marine resources, preventing acidification of the seas, and overfishing in target 14, and conservation of terrestrial ecosystems, preventing biodiversity loss, and re-greening of forests in target 15 (United Nations General Assembly 2015). For the achievement of sustainable development goals, it is therefore crucial to concentrate on and deal with environmental degradation.

Numerous studies in the literature indicate how environmental pollution and economic development or economic growth are related (Ali and Puppim De Oliveira,

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2018; Barnes, 2019; Khan et al., 2019; Nazeer et al., 2016; Ozcan et al., 2020; Sun et al., 2019; Zhu et al., 2022). There are conflicting results regarding the relationships between environmental pollution and economic development or growth for different country groups. The Environmental Kuznets Curve (EKC) concept, which illustrates the connection between environmental indicator and growth, is the theoretical foundation for the conflicting results of these investigations (Dinda, 2004). The pattern that EKC follows might take a variety of shapes; the types that appear and are tested in the literature the most frequently are U-shaped, N-shaped, and inverted. These relationships, which shift between the two variables as income level rises, account for the various patterns that the EKC exhibits. At certain per capita income levels, there could be a positive association between the environmental degradation indicator and income, but at other levels, there could be a negative relationship.

The studies, however, agree on the direction of the relationship between human well-being and environmental pollution. Air pollution, for example, endangers human health as well as the development of animals and plants (Almetwally et al., 2020; Sofia et al., 2020; Wang et al., 2020). Similarly, water and soil pollution have a significant negative impact on both humans and the environment as a whole (Alcamo, 2019; Raimi et al., 2022; Wang et al., 2022). As a result, it is critical to prevent these pollutions in terms of the SDGs, as well as for the well-being of people and the welfare of the environment in nations that have different per capita incomes and exposure to these environmental pollutions.

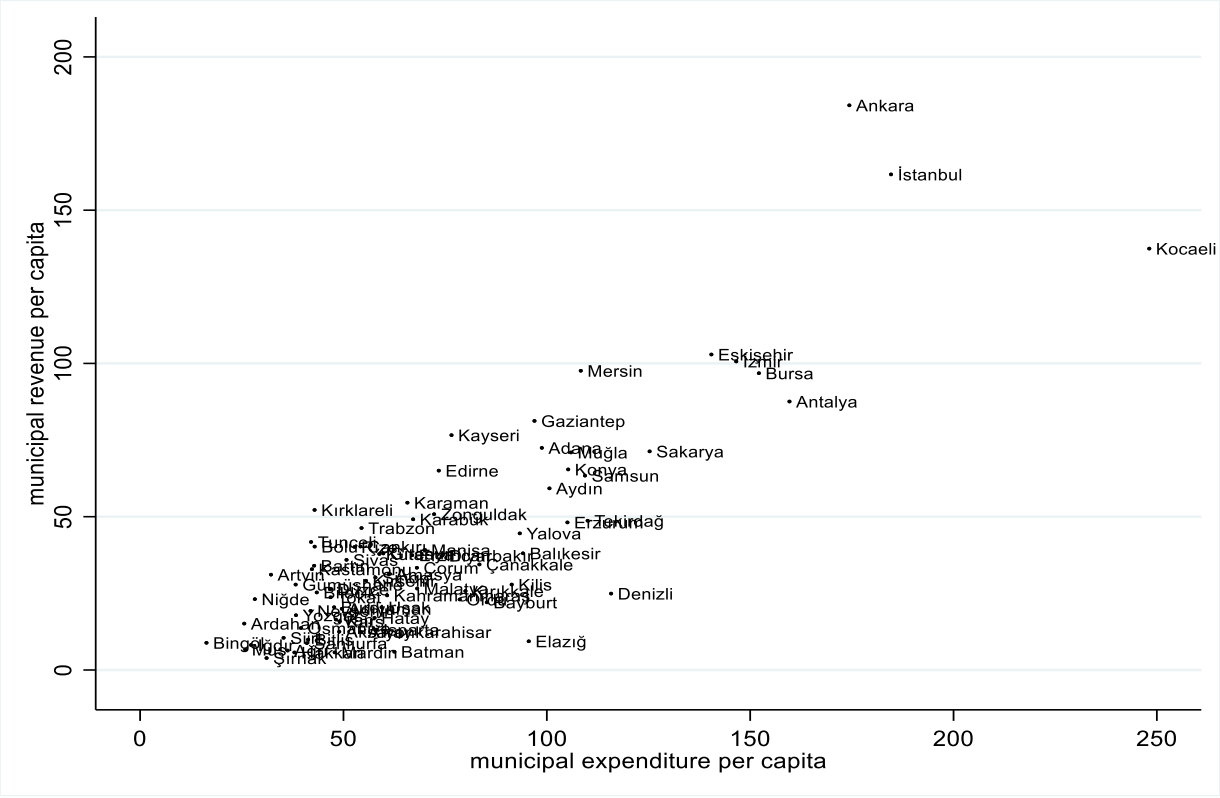
In this context, it is crucial to implement broad national policies and actions to reduce pollution. However, municipalities must also put these decisions into practice for the chosen policies and actions to be successful. Municipal actions made at the local level contribute to achieving targets and standards set at the national level. The degradation of the environment and environmental expenditures and revenues of a government or municipals are directly and significantly correlated. Spending for environmental protection and solving environmental problems are referred to as environmental expenditure. In this sense, it also reflects the policies of a state or a municipal government for the protection of natural resources and the prevention of environmental degradation. The rise in environmental spending helps to promote sustainable growth. However, to provide funding for environmental expenditures, environmental revenue generation at the national or municipal level is also crucial. Therefore, some specific sustainable development objectives can be reached by using environmental revenue to fund environmental expenditure.

The convergence of municipal revenue and expenditure policies in relation to reducing regional development disparities and equalisation between more advanced and less advanced provinces is an important indicator of the extent to which the provincial level contributes to the national level targets. Thus, the municipalities must collaborate to accomplish a common aim of sustainable development by coordinating their environmental expenditures and revenues. Municipal environmental spending convergence at the provincial level refers to the idea that municipality of a province should allocate their resources in a way that is consistent with the general goals and objectives of the government. In the same way, municipal environmental revenue convergence at the provincial level refers to the idea that municipality of a province should collect and allocate their environmental money in a way that is compatible with the general goals and objectives. In other words, municipalities must collaborate to accomplish the particular goals such as livable cities and sustainable environment through coordinating environmental revenue collection and expenditure.

In Türkiye's Eleventh Development Plan, within the framework of the target of "Livable Cities and Sustainable Environment", various targets and policies are adopted to protect the environment, to improve the quality of life in cities and rural areas, and to reduce inter-regional development disparities in parallel with increasing social benefits (Presidency of the Republic of Türkiye Presidency of Strategy and Budget 2019). In this study, it is aimed to empirically investigate the existence of convergence and subgroups in the context of expenditures and revenues per capita of municipalities in 81 provinces of Türkiye for the period between 2001 and 2016. This will demonstrate the level to which the 81 provincial municipalities contribute to the national goal. Furthermore, it will be possible to determine which provinces converge through clubs.

Figure 1 attempts to show the reason for selecting Türkiye for the study. According to the figure, there is a substantial disparity between provinces in terms of average per capita environmental expenditure and revenue from 2001 to 2016. The average per capita environmental revenue from cities and the average per capita environmental expenditure have a positive relationship. Where there is a high average per capita environmental income, there is also a high average per capita environmental expenditure, and vice versa. While per capita expenditures and incomes are found to be reasonably high and balanced in metropolitan areas such as Istanbul and Ankara, they are found to be fairly low in provinces in the Eastern region such as Bingöl, Muş, Iğdır and Şırnak. Furthermore, while the per capita environmental revenue of municipalities in the provinces of Elazığ, Denizli and Batman is fairly low, the spending is quite high in comparison to the income in these regions. The fact that this variation across provinces provides a diverse range of academic options and laboratories is the motivation that drew our attention to Türkiye. We believe that this study is critical for Türkiye's long-term development in terms of correctly evaluating regional sustainable environment and livable city policies and generating appropriate conclusions. In addition, this study is the first study in the context of environmental expenditure and income convergence at the provincial level for Türkiye.

Figure 1. Average per capita Environmental Expenditure and Revenue Values of Provinces for the period 2001-2016*



2. Literature Review

The process of raising the standard of living and well-being of individuals and communities through economic, social, and environmental methods is referred to as sustainable development (Giddings et al., 2002; Romagnoli and Mastronardi, 2020). Local governments, as the closest administrations to citizens, bear responsibility for the success of sustainable development in the context of their responsibilities (Benito et al., 2023). Because municipal environmental expenditure is the deployment of resources to local environmental sustainability. Therefore, there is a clear link between sustainable development, and municipal, local or public environmental expenditure and many studies in the literature reveal this relationship from different perspectives (Benito et al., 2023; Gupta et al., 1995; Soukopova and Bakos, 2010; Soukopová and Struk, 2011).

There are also researches in the literature that examine the variables influencing environmental expenditures, as well as studies that investigate convergence in environmental expenditures. Broietti et al. (2018) examined the variables that influenced Brazilian municipalities' environmental expenditure between 2012 and 2016. According to the results they obtained, revenue, population, density, gross domestic product and human development index are statistically significant determinants of environmental expenditure. Convergence studies are particularly useful for uncovering patterns of expenditure/income behaviour among the units under consideration. These studies can be divided into two categories: national/regional and municipal/local. We can use the Ercolano and Romano (2018) study as an example of the national/regional category. Ercolano and Romano (2018) explore the convergence of environmental expenditure across European countries. Their findings reject the hypothesis of convergence in levels of government expenditure on environmental protection. Their findings also demonstrate that the size of European member countries' expenditure for environmental protection remained virtually unchanged from 2002 to 2010, and that cross-country heterogeneity in public expenditure for the environment increased slightly during the study period.

Municipalities should collect and allocate their resources in a way that is consistent with the government's overall environmental goals and objectives. They can also ensure that environmental benefits and expenses are dispersed equally across communities within a region or area by working together. This can aid in the reduction of environmental inequities and the provision of clean air, water, and natural resources to all communities. The

convergence approach is useful in demonstrating both whether they are aligned with the government's goals, whether they are working together, and whether environmental resources are equally distributed among communities. Municipal environmental expenditure convergence could also help in the promotion of equitable development and long-term well-being. Of course, this statement holds acceptable for convergences in cases when expenditures tend to rise. Chen et al. (2019) study, for example, shows convergence, but it discovers inter-provincial convergence in the direction of reducing spending. Chen et al. (2019) conducted research on environmental expenditures in 30 Chinese provinces from 2000 to 2015. The "race-to-the-bottom" effect, in which environmental expenditure behaviours are imitated among areas, explains why environmental expenditures are constantly low in the long term across Chinese regions. This negative race has been emphasised as the reason for China's incapacity to fix its environment. The study is significant since it has shown that the regions can influence each other. Alataş and Sarı (2021) explore evidence of convergence in public expenditures and its nine separate sub-categories in Turkey to uncover regional differences. Environmental protection expenditure is one of the sub-categories evaluated. According to the investigation, the environmental protection expenditures of Turkey's provinces converge to a single steady-state. That is, the provinces do not exhibit multiple behaviour patterns in this regard. However, there is no convergence study in the literature for Turkey or other countries that evaluates both municipal environmental expenditure and municipal environmental revenue jointly. While this study attempts to fill the gap in the literature, it also serves as a recommendation for policymakers.

3. Methodology and Data

This section contains detailed information about the methodology and data to be used to investigate whether there is a convergence in terms of environmental expenditure and income at the provincial level, as well as which provinces, if any, act similarly to each other.

3.1. Methodology

The neoclassical growth model, developed by Solow (1956), demonstrated that, given certain assumptions, per capita output in different countries will converge to the same level, regardless of initial capital endowment. However, a series of theoretical studies, beginning with Romer (1986) and Lucas (1988), have led to the creation of viewpoints opposing the neoclassical model's theory. As a result of the considerable differences in actual results between neoclassical and new growth perspectives, a literature has emerged that formally tests the convergence hypothesis. Two distinct fields have emerged that are undergoing convergence. While some research examines at initial levels of per capita output and subsequent growth rates, others focus on differences in per capita output across countries as a matter of convergence. As a result, various approaches for measuring the convergence hypothesis have emerged.

In the literature, there are four different approaches for investigating convergence: β, σ, stochastic, and club convergence. The study of Islam (2003) explains and discusses these approaches in great detail. This study's definition of the approaches is as follows. The approach that explains the existence of a negative correlation between initial income level and subsequent growth rate is known as β -convergence. Over time, the view emerged that convergence should be evaluated directly by examining the dynamics of income level dispersion and/or growth rate disparities among countries. This point of view gave rise to the σ-convergence approach. Furthermore, the convergence that is attempted to be explained using time series econometric methods is referred to as stochastic convergence. The club convergence approach, in contrast to all these three approaches, permits heterogeneity among cross-section units. This method not only reveals whether the units have a common steady-state, but it also allows for the identification of subgroups, if any, by taking into account unit-specific characteristics (Phillips and Sul, 2007).

The convergence of municipal environmental revenues and expenditures at the provincial level is investigated in this study using the club convergence approach proposed by Phillips and Sul (2007). The large number of cross section units consisting of 81 provinces is the primary reason for using club convergence in this study. It is critical to consider heterogeneity in the context of 81 provinces with distinct characteristics. Furthermore, it is intended to reveal whether the characteristics of municipal expenditure and revenue behaviour create subgroups and, if so, which provinces converge.

For the concept of panel data (for example, X_{it} variable consisting of t-time values of unit i), the Phillips and Sul (2007) study first decompose X_{it} using the following equation (1), where g_{it} represents permanent common components and a_{it} represents transitory components:

$$X_{it} = g_{it} + a_{it} \quad (1)$$

In equation (1), g_{it} and a_{it} elements contain both common and idiosyncratic components. They use the following model (2) to separate them for all i and t.

$$X_{it} = \left(\frac{g_{it}+a_{it}}{\mu_t}\right)\mu_t = \delta_{it}\mu_t \quad (2)$$

In Equation 2, μ_t represents single common component and δ_{it} represents time varying idiosyncratic element. δ_{it} indicates the individual economic distance between μ_t and X_{it}, thus allowing to test the existence of convergence. However, in equation (2), the number of observations in the panel is less than the number of unknown elements of model. For practical considerations, therefore they define the following relative transition parameter (h_{it}) to estimate δ_{it}:

$$h_{it} = \frac{X_{it}}{\frac{1}{N}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_{i=1}^{N} \delta_{it}} \quad (3)$$

According to Equation 3, if δ_{it} converges to a constant δ term, h_{it} also converges to unity. In the long run, h_{it}'s cross

sectional variance converges to zero, thus obtaining equation 4.

$$\sigma_t^2 = H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \quad (4)$$

They use semiparametric for the development of a test for the null hypothesis of convergence and an empirical algorithm of convergence clustering and assume the following form of δ_{it}:

$$\delta_{it} = \delta_i + \sigma_{it}\xi_{it} \quad (5)$$

where σ_{it} equals to $\frac{\sigma_i}{L(t)t^{\alpha}}$. If equation (5) is rewritten accordingly, equation (6) is obtained where $\xi_{it} \sim iid(0,1)$across i.

$$\delta_{it} = \delta_i + \frac{\sigma_i}{L(t)t^{\alpha}}\xi_{it} \quad (6)$$

In equation (6), α represents the speed of convergence and L(t) denotes slowly varying function. Phillips and Sul (2007), which makes detailed mathematical explanations about the selection of the L(t) function, prefers $L(t) = \log t$ because of its asymptotic power and we follow them in this study. According to the conclusion from this equation, if α is greater than or equal to zero, δ_{it} converges to δ_i. Thus, we can express the null hypothesis of the convergence as $H_o: \delta_i = \delta$ and $\alpha \geq 0$ and the alternative hypothesis of no convergence as $H_A: \delta_i \neq \delta$ for all i or $\alpha < 0$. Equation (7) represents log t regression and is used to test the hypothesis.

$$\log\left(\frac{H_1}{H_t}\right) - 2logL(t) = \widehat{a} + \hat{b}\log t + \widehat{\mu_t} \quad \text{for} \quad t = [tT], [rT] + 1, \dots, T \text{ with } r > 0 \quad (7)$$

Phillips and Sul (2007) also emphasize that accepting r=0.3 is preferable choice, if T ≤ 50, that is, if T is small and moderate. According to equation (7), if t statistic of $\hat{b}$ is less than -1.65, null hypothesis can be rejected at the 5% significance level. However, this just demonstrates that not all units converge to a certain steady-state level, implying that there is no convergence for the panel. It is also possible for different units to converge to different steady states. Thus, the data-driven clustering algorithm described by Phillips and Sul (2007) can show the possible number of convergence clubs and their members.

To investigate the existence of possible convergence in subgroups, the Phillips and Sul (2007) developed an algorithm and Schnurbus et al. (2017) suggested some minor adjustments to this algorithm. In five steps, Du (2017) briefly explains the entire procedure of testing club convergence. In the first stage, the units in the panel are sorted in decreasing order based on their last observations. In the second stage, the core convergence club that produces the highest value for the log t statistic is revealed. In the third stage, other panel members not included in the core group are eliminated by testing whether they will be a member of this core club. If adding a member from this complementary group raises the t statistic of $\hat{b}$ above the criterion value, the new member is added to the core group. In the fourth stage, it is determined whether there is convergence among individuals who are not part of the core convergence group, and the groups with which the t statistic of $\hat{b}$ converges become other subgroups. If this is not accomplished, the previous stages are repeated. In the last stage, it is tested whether the formed clubs converge within themselves or not. In other words, club merging is tested in a certain order, starting from the first clubs. As a result, all convergence choices are evaluated, and clubs are formed.

3.2. Data

This study uses municipal environmental revenue (Turkish Lira) (MER) and municipal environmental expenditure (Turkish Lira) (MEE) data from Public Sector Environmental Statistics database of the Turkish Statistical Institute to conduct club convergence research on municipal environmental revenues and expenditures in Turkish provinces. The dataset for 81 provinces (NUTS-3 level) covers the period from 2001 to 2016. However, the official statistics database does not have 2011 data for municipal environmental revenue and expenditure. In addition, there are no data for Düzce province in 2001 and 2002. In order to obtain per capita expenditure and revenue, the provincial population data contained in the database of the Turkish Statistical Institution Address-based Population Registration System is used. However, the provincial level of population data is incomplete for the period 2001-2006. In panel data with a stable trend over time such as population, this is usually not a problem and can be corrected by extrapolation method. The small deficiencies in environmental revenue and expenditure data are also complemented by extrapolation and interpolation methods, which are usually used in the panel data. The aforementioned methods are performed in Stata/SE 17.0, using the *ipolate* commands and *epolate* option. With the generated series, MER per capita and MEE per capita are calculated through dividing MER and MEE by population. They are abbreviated as MERP and MEEP respectively. Table 1 presents descriptive statistics of the variables.

The time and cross-section dimensions for each series are 16 and 81, respectively, so there are 1296 observations in total. Standard deviation has been found to be higher in terms of revenue compared to expenditure. In other words, the highest volatility is in MER with a standard deviation of 1.1977. It is closely related to the fact that MER is at the initiative of individuals and enterprises, but the MEE are carried out by municipalities compulsively.

4. Empirical Findings

The coefficient and t statistics of the log t test are provided in Table 2. In both variables, the null hypothesis of convergence is rejected for the whole sample.

Table 1. Descriptive Statistics

Variables	Abbr	Mean	Std. Dev	Min	Max	Obs
Municipal environmental revenues per capita	LNMERP	3.0544	1.1977	-0.5428	5.9452	1296
Municipal environmental expenditures per capita	LNMEEP	3.8688	0.9395	0.1045	6.3151	1296

Note: All series are in natural logarithm.

This result indicates that no convergence exists at the full-panel level. However, we stated that, while there is no convergence for the whole panel, it is possible to identify whether there are convergence clubs around different steady state levels. As a result, Table 2 also includes the initial and final club numbers in the "Clubs" column. According to the findings, the initial club numbers for LNMEEP and LNMERP are different from one, which is consistent with the log t test results. The final clubs are the same as the initial and three for LNMERP, but the number of clubs for LNMEEP has fallen from four to two. It has also been found that there is a province that does not converge with any club for LNMEEP. The province of Bingöl does not converge to the steady-state levels of the other clubs, hence it is classified as a separate group that does not demonstrate convergence.

According to these findings, more clubs develop in municipal environmental revenues collected per capita as compared to municipal environmental expenditures per capita. As a result, while received revenue differs more, municipalities appear to be attempting to act more similarly in terms of expenditure. Indeed, the fact that municipalities have some responsibilities that they must do regardless of revenue plays a part to the creating this conclusion.

Table 2. Club Convergence Results

Variables	Whole sample		Clubs		
	Coefficient	t-stat	N/T	Initial clubs	Final clubs
LNMEEP	-0.3857	-16.0906	81/16	4+1	2+1
LNMERP	-0.7727	-40.1466	81/16	3	3

Note: N and T represent the number of individual and number of time periods, respectively. +1 is used to express that there is a non-convergent group.

Table 3 shows the number of members of the clubs obtained for each variable. For per capita expenditure, it is seen that Club 1 has 58 members, Club 2 has 22 members, and there is one province that does not converge. For revenue per capita, club 1 had 28 members, club 2 had 32 members, and club 3 had 21 members. For each of the two variables, the provinces with the members of the existing clubs are shown in Figures 2 and 3.

Table 3. The Number of Provinces in Each Clubs for Variables

Variables	Club 1	Club 2	Club 3	Non-convergent	Total
LNMEEP	58	22	-	1	81
LNMERP	28	32	21	-	81

Figure 2 shows which provinces are the members of the clubs determined in terms of per capita environmental revenue of the municipalities. From the figure, it is observed that club 1 and club 2 are relatively more homogeneously distributed throughout Turkey. It is seen that metropolitan cities such as Istanbul, Ankara, Izmir, Konya, Antalya and Mersin have club 1 members. These are the provinces with relatively high per capita income, and it can be noted that their environmental income per capita is also relatively high. In addition to this, it can be noticed that provinces that have become relatively new metropolitan municipalities are largely represented in Clubs 2 and 3. For example, Aydın, Balıkesir, Malatya, Manisa, Tekirdağ, Trabzon are in Club 2, and Denizli, Hatay, Kahramanmaraş, Mardin, Ordu, Şanlıurfa are in Club 3. On the other hand, Club 3 members are mostly composed of Eastern provinces. Another noteworthy feature is that none of the provinces in the Marmara region are members of Club 3.

Figure 3 presents which provinces are the members of the clubs determined in terms of per capita environmental expenditure of the municipalities. When the results of environmental expenditure are examined, it is evident that there are less clubs than Figure 2, indicating that the difference between provinces is more homogeneous. This case can be explained by the fact that environmental expenditures are made by local government units that have the status of public institutions, whereas environmental income is generated by individual responsibility. As emphasized above and seen from the figure, there are two different clubs converging among themselves. When Turkey is divided into two halves by a symmetrical line, it is clear that the provinces in Club 1 are concentrated in the west, while the provinces in Club 2 are concentrated in the east.

At the regional level, it is seen that the expenditure policies of the municipalities in the Marmara region (excluding Yalova), the Aegean region (excluding Uşak) and the Mediterranean region (except Isparta and Osmaniye) are similar and converged for almost all their provinces. However, the region where the policies are applied most unsuccessfully is the Eastern Anatolia region. In this region, there are six provincial club 1 members, seven provincial club 2 members, and the province of Bingöl, which does not converge to any of these clubs.

Figure 2. Estimated Club Membership for LNMERP

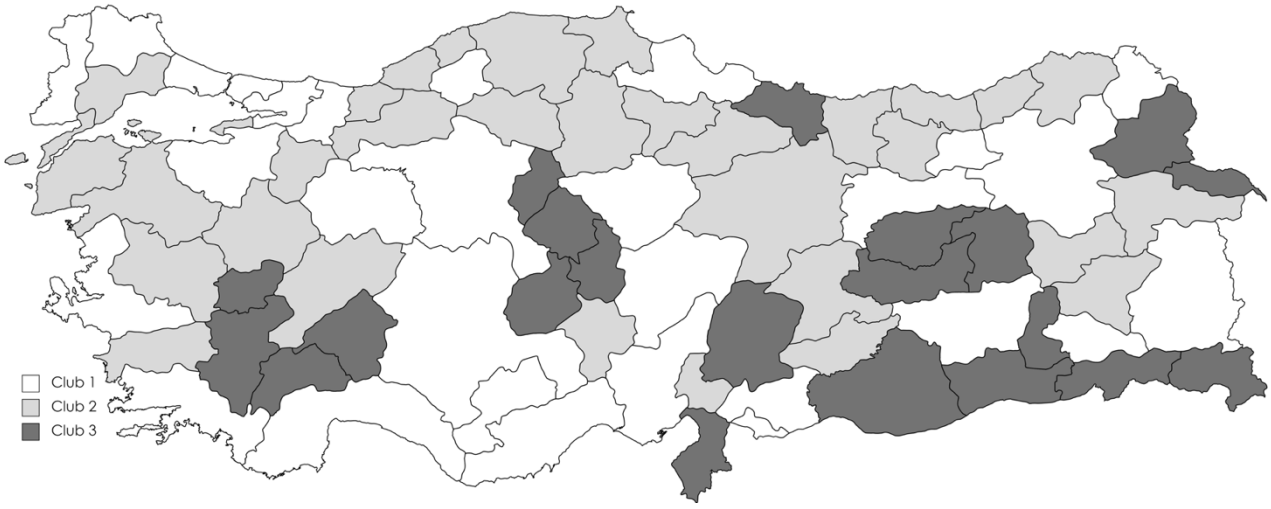
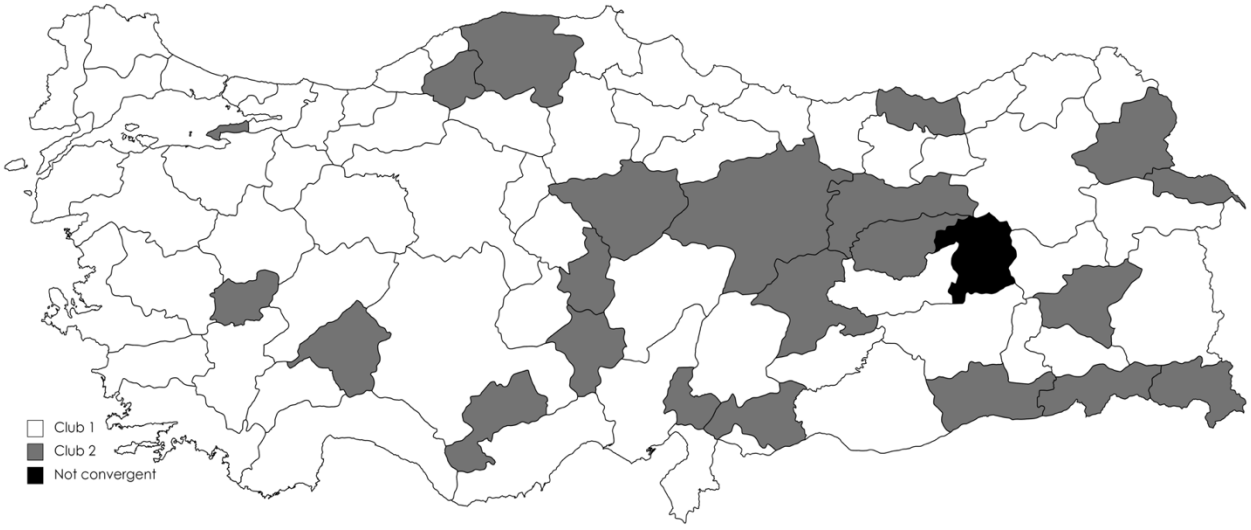


Figure 3. Estimated Club Membership for LNMEEP



Note: Edited using mapchart.net.

5. Conclusion

Convergence in municipal environmental expenditures can be viewed as a critical strategy for supporting local well-being and development. Municipalities may contribute to guarantee that economic, social, and environmental growth occurs in a sustainable and fair manner by coordinating their efforts towards common environmental goals. The convergence of all provinces to a single steady-state level, with high environmental expenditure and revenue per capita, demonstrates that per capita expenditures and revenue are distributed homogeneously across cross-section units. It also signifies municipal achievement in terms of policies implemented. Therefore, the purpose of the present study is to determine whether there is a convergence in municipal environmental expenditures and revenues across Turkey's provinces. A further objective is to assess if municipalities are successful in terms of environmental expenditures and revenue strategies.

According to the analysis' findings, the cross-section units are unable to converge to a single steady state in terms of both environmental spending and environmental revenue. In other words, there is no homogeneous distribution of both variables among provinces. This suggests that the municipalities' policy implementations are also not performing optimally. However, municipalities have formed two different clubs based on two separate steady-state levels of environmental expenditure, and three different clubs have evolved in terms of environmental revenue. This circumstance can be considered a success in terms of demonstrating that environmental expenditures initiated by the municipality are spread more homogeneously than environmental incomes initiated by individuals. Furthermore, it is also discovered that the municipality's environmental spending strategy is unsuccessful in Bingöl, which do not converge to the two steady-states specified in

environmental expenditure.

When we compare our results to the Alataş and Sarı (2021), we observe the significance of public intervention in this area of study once more. The provinces did not behave differently from one another and converged to a single steady state in the study of Alataş and Sarı (2021), which analysed public environmental protection expenditures in Turkey. This is a predictable and intended outcome for government expenditures. This anticipated situation, however, could not be attained in our study in terms of municipal expenditures. This case demonstrates that municipalities should reconsider the significance they place on environmental expenditure in order to improve social welfare and strengthen inter-municipal and public-municipal collaboration.

According to the conclusions of the investigation, policymakers have major responsibilities in providing incentives and raising awareness for individuals to pay their taxes. It is critical to identify the situation at the province level and formulate policies at the provincial level in order for environmental expenditures to be implemented more successfully in line with sustainable development goals.

Not

*The data used was obtained from the Turkish Statistical Institute (TURKSTAT). However, due to the incompleteness of the data utilised and the absence of per capita figures, data are completed using appropriate methods. The applied transformations are detailed in the Data section of this paper. For more details, please see the Data section.

Kaynakça

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