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CROSS-COUNTRY DIFFERENCES, DYNAMICS AND CONVERGENCE OF TRANSPORT TAX REVENUE-TO-GDP RATIOS: EVIDENCE FROM OECD COUNTRIES

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Abstract: *Transport tax revenue-to-GDP ratios differ considerably across OECD countries, both in their levels and changes over time. This paper examines these differences, the dynamics of transport tax revenue as a share of GDP, and convergence between 2017 and 2024. The analysis covers 38 countries and uses a balanced panel of 304 country-year observations. The results show a general downward trend in transport tax revenue relative to GDP. Compared with 2017, the decline became statistically significant in 2019 and reached 0.104 percentage points of GDP by 2024. Countries with higher initial transport tax revenue-to-GDP ratios experienced larger absolute reductions. However, this pattern may largely reflect proportionally similar declines across countries rather than genuine convergence, as it is not confirmed by the logarithmic specification or measures of cross-country dispersion.The results also show no significant change in the level or trend of transport tax revenue relative to GDP around 2020, as the decline had started earlier and continued afterwards. These findings demonstrate that declining transport tax revenue-to-GDP ratios and cross-country convergence represent distinct processes and highlight the persistence of substantial heterogeneity across OECD economies. From a policy perspective, the results underscore the importance of monitoring the fiscal evolution of transport taxation at a time when changes in mobility, vehicle technologies, and environmental policy are reshaping traditional transport-related tax bases.*

Key words: *transport tax revenue-to-GDP ratio, cross-country differences, convergence, fixed effects, OECD countries*

JEL classification*: H20, R48, C23*

1. INTRODUCTION

Environmental taxation has become an increasingly important component of contemporary fiscal and environmental policy, reflecting governments' efforts to reconcile revenue generation with broader sustainability objectives (Domguia et al., 2026; Dmytrenko et al., 2026; Cascavilla et al., 2026). By incorporating environmental costs into market prices,

environmentally related taxes can influence the behaviour of households and businesses while simultaneously generating public revenues. Their role is therefore not limited to correcting environmental externalities; they also form part of the broader tax structure and may contribute to the transition towards more sustainable patterns of production, consumption and mobility (Pigou, 1920; Baumol & Oates, 1988; Newbery, 1990; Parry & Small, 2005; Small et al., 2007).

Within environmental taxation, transport taxes occupy a particularly important position. Transport activities generate multiple external costs, including greenhouse gas emissions, local air pollution, congestion, noise and road-related externalities, creating a rationale for fiscal intervention. At the same time, vehicle ownership, registration and road use constitute established tax bases and important sources of government revenue. According to the OECD classification, transport taxes mainly include one-time taxes related to the import or sale of motor vehicles, recurrent taxes on vehicle ownership or registration, and other transport-related taxes, while taxes on transport fuels are generally classified as energy taxes (OECD, 2019). This distinction is important because changes in transport tax revenues may reflect not only explicit tax policy decisions but also changes in the underlying tax base (Bjertnæs, 2025; Nilsson et al., 2024; Wójtowicz & Mazurek-Chwiejczak, 2025). The fiscal dimension of transport taxation has become particularly relevant in the context of the transformation of the transport sector. The increasing penetration of electric and alternative-fuel vehicles, together with changes in vehicle registration, ownership and taxation policies, may affect the revenue base of transport taxes. Unlike fuel taxes, which are classified as energy taxes under the OECD taxonomy, transport taxes are primarily influenced by vehicle-related tax structures, exemptions and changes in fleet composition. This creates a policy challenge: measures that support decarbonization may simultaneously weaken revenues generated from conventional transport taxation. The OECD (2019) consequently emphasizes the potential need for a gradual transition from traditional energy- and vehicle-based taxation towards greater reliance on road-use and distance-based charges in order to establish a more stable long-term revenue base. Transport tax revenues should therefore be considered not only from an environmental perspective but also in terms of their fiscal sustainability and evolution over time. Recent empirical evidence further suggests that transport taxation may have broader economic implications. Stameski et al. (2024), examining Nordic countries over the period 2013–2022, find that transport tax revenues have a significant positive effect on economic development measured by GDP per capita. For the European Union, Kalaš et al. (2025) similarly report a positive long-run relationship between transport tax revenues and economic development, while emphasizing that short-run effects differ across tax categories and national settings. More recent evidence also points to potential asymmetries. Kalaš et al. (2026) show that positive and negative changes in transport tax revenues may affect economic growth differently in Benelux and Baltic economies and that these effects vary across country groups. Taken together, these findings reinforce the view that transport taxation represents a policy instrument with fiscal, environmental and broader economic implications.

Despite this growing literature, considerably less attention has been devoted to the evolution and cross-country distribution of transport tax revenue-to-GDP ratios. This distinction is important. Most empirical studies treat transport tax revenue as an explanatory variable and investigate its effects on economic growth, emissions or other environmental outcomes. However, before evaluating these effects, it is relevant to understand whether the fiscal importance of transport taxation, measured as a share of GDP, is increasing or decreasing, whether countries follow a common trajectory, and whether initially large differences between countries are narrowing over time. Revenue levels are determined jointly by tax rates, tax design and the size and composition of the underlying tax base. Consequently, a decline in transport tax revenue as a share of GDP cannot automatically be interpreted as a reduction in tax policy effort, just as high revenues do not necessarily indicate stronger environmental taxation. The cross-country dimension is particularly relevant in the OECD context. OECD countries differ substantially in their vehicle fleets, transport infrastructure, tax structures, income levels and approaches to taxing vehicle ownership and road use. These differences may generate persistent heterogeneity in transport tax revenue-to-GDP ratios even when countries face similar environmental and fiscal challenges. At the same time, common trends in transport technology, decarbonization policies and tax reform may create pressures towards greater similarity. This raises an important question of convergence: are countries with initially high levels of transport tax revenue moving towards those with lower levels, or do substantial differences persist? The period surrounding 2020 provides an additional motivation for examining the dynamics of transport tax revenues. The sharp disruption of mobility and economic activity during that period could suggest a break in transport-related fiscal revenues. However, identifying lower revenues

after 2020 is not sufficient to establish such a break, particularly if a downward trajectory had already emerged beforehand. Distinguishing a discrete change around 2020 from the continuation of an existing trend is therefore important for understanding the temporal pattern of transport tax revenue-to-GDP ratios.

Against this background, this study examines cross-country differences, dynamics and convergence in transport tax revenue-to-GDP ratios across 38 OECD countries over the period 2017–2024. Specifically, it addresses three research questions: (1) whether transport tax revenue as a share of GDP changed systematically over the observed period; (2) whether countries with higher initial revenue levels moved closer to countries with lower levels, indicating β- and/or σ-convergence; and (3) whether the level or trajectory of transport tax revenue relative to GDP changed around 2020. These questions are examined using a balanced panel of 304 country-year observations, country fixed-effects models, β- and σ-convergence measures, and segmented regression. The study contributes to the literature in three respects. First, rather than treating transport tax revenues primarily as a determinant of economic or environmental outcomes, it examines the dynamics of the revenues themselves across a broad sample of OECD economies. Second, it distinguishes between a general decline in transport tax revenue-to-GDP ratios and cross-country convergence, demonstrating that these represent conceptually and empirically different processes. Third, it evaluates whether the trajectory observed after 2020 constitutes a statistically identifiable change or a continuation of an earlier trend. In doing so, the analysis provides evidence relevant to the fiscal sustainability and cross-country evolution of transport taxation during a period of substantial transformation in mobility and environmental policy.

The remainder of the paper is organized as follows. Section 2 reviews the theoretical and empirical literature on transport taxation, with particular emphasis on its fiscal role, cross-country heterogeneity, revenue dynamics and convergence. Section 3 describes the data and empirical methodology. Section 4 presents and discusses the results, while Section 5 concludes with the main findings, policy implications, limitations and directions for future research.

2. LITERATURE REVIEW

2.1. FISCAL AND ENVIRONMENTAL ROLE OF TRANSPORT TAXATION

Environmentally related taxes are designed around tax bases that have particular environmental relevance and are commonly classified into energy, transport, pollution and resource-related categories. Within this framework, transport taxation occupies a specific position because it combines traditional revenue-raising objectives with incentives capable of influencing vehicle ownership, fleet composition and transport choices. In the OECD classification, motor vehicle and other transport taxes constitute one of the major categories of environmentally related taxation and primarily comprise registration taxes and recurrent taxes imposed on vehicle owners or users (OECD, 2019). The economic rationale for transport taxation originates partly from the external costs generated by transport activities. Vehicle use can impose costs through emissions, congestion, accidents, noise and infrastructure use that are not fully reflected in private transport decisions. Taxation provides one mechanism for incorporating at least part of these costs into economic decisions. Nevertheless, the relationship between environmental objectives and tax revenue is not straightforward. A tax that successfully changes behaviour may reduce its own tax base, meaning that environmental effectiveness and revenue growth do not necessarily move in the same direction.

This distinction is particularly important when transport tax revenues are used as an empirical indicator. OECD (2019) stresses that differences in environmentally related tax revenues across countries reflect both tax rates and the size of the underlying tax bases. Low vehicle-tax revenue, for example, may result from low tax rates or a narrow tax base, but it may also reflect behavioural responses to relatively strong taxation if consumers shift towards smaller, cleaner or more efficient vehicles. Consequently, transport tax revenue should not be interpreted as a direct measure of either tax stringency or environmental effectiveness.

The transformation of road transport creates an additional fiscal challenge. Increasing fuel efficiency and the diffusion of alternative-fuel vehicles can reduce revenues from traditional fuel-related tax bases, while changes in vehicle ownership and use may also alter revenues from other forms of transport taxation. Van Dender (2019) argues that these developments strengthen the case for reforming transport taxation and increasing reliance on road-use and distance-based charges. Such reforms can potentially improve the alignment between taxation and transport externalities while providing a more sustainable revenue base over the longer term. More recent evidence confirms that the fiscal sustainability of transport taxation is increasingly challenged by vehicle electrification and improvements in fuel efficiency. The International Transport Forum

(2023) stresses that these developments can substantially erode traditional fuel-tax revenues and strengthen the case for alternative road-use and distance-based charging mechanisms. OECD (2024) similarly emphasizes that the electrification of road transport is likely to reduce revenues from conventional energy taxation and increase the importance of alternative transport-pricing instruments. Although these developments primarily concern fuel taxes, which are generally classified as energy rather than transport taxes in environmental tax accounts, they illustrate the broader fiscal transformation of transport-related taxation.

2.2. TRANSPORT TAX REVENUES, ECONOMIC OUTCOMES AND CROSS-COUNTRY HETEROGENEITY

Empirical studies increasingly examine transport taxation as a separate component of environmental tax systems rather than considering environmental taxes only in aggregate. This distinction is relevant because different environmental tax categories operate through different tax bases and may therefore produce heterogeneous fiscal, economic and environmental effects.

Evidence from Nordic countries illustrates this heterogeneity. Stameski et al. (2024) analyse Denmark, Finland, Iceland, Norway and Sweden over 2013–2022 and find that both energy and transport tax revenues have statistically significant positive effects on economic development, measured by GDP per capita. Their findings suggest that transport tax revenues can coexist with favourable economic outcomes and reinforce the importance of examining individual components of environmental taxation rather than relying exclusively on aggregate environmental tax measures.

Using a broader EU sample for the same general period, Kalaš et al. (2025) investigate the dynamic relationship between different environmental tax revenue categories and economic development. Their long-run estimates indicate a statistically significant positive relationship between transport tax revenues and GDP per capita. Importantly, however, the study also identifies variation across tax categories and between short- and long-run effects, demonstrating that the relationship between environmental taxation and economic performance is not uniform.

The importance of heterogeneity is further supported by Kalaš et al. (2026), who analyse the asymmetric effects of energy, transport, pollution and resource taxes in Benelux and Baltic economies. Their findings show that positive and negative shocks in transport tax revenues do not necessarily have equivalent economic effects. Positive transport-tax shocks are associated with growth-enhancing effects, whereas negative shocks can generate contractionary effects, with the magnitude and direction of country-group effects differing between Baltic and Benelux economies. These results highlight that institutional conditions, economic structure and existing transport systems may influence the consequences of transport taxation.

The literature therefore provides considerable evidence that the effects of transport taxation vary across countries and economic contexts. Such heterogeneity also creates a strong rationale for examining transport tax revenues at the country level. Differences in tax design, vehicle ownership, mobility patterns, infrastructure and the composition of national tax systems can produce substantial cross-country differences in revenues even among economies facing similar environmental policy objectives.

Although these studies provide useful insights into the broader economic implications of transport taxation, they primarily examine the relationship between tax revenues and economic performance rather than the dynamics and convergence of transport tax revenues themselves. The present study therefore shifts the analytical focus towards changes in the fiscal importance of transport taxation and the persistence of cross-country differences.

2.3. REVENUE DYNAMICS AND CONVERGENCE

While a substantial part of the environmental taxation literature focuses on the effects of taxes on emissions, energy consumption or economic development, comparatively less attention has been given to whether environmental and transport tax revenues themselves converge across countries. Convergence analysis provides a useful framework for determining whether initially heterogeneous fiscal systems become more similar over time.

The distinction between β- and σ-convergence is particularly relevant in this context. Following the general convergence framework of Barro and Sala-i-Martin (1992), β-convergence occurs when units with higher initial values subsequently experience lower growth or larger reductions than units starting from lower levels. In the context of transport taxation, this would imply that countries with relatively high initial transport tax revenues subsequently experience larger declines. However, β-convergence does not necessarily imply that the overall dispersion of revenues across countries decreases. The latter requires σ-convergence, reflected in a decline in cross-country dispersion over time. Considering both concepts is therefore necessary before concluding that national transport

tax systems are becoming more similar. Direct evidence on convergence is provided by Delgado et al. (2022), who analyse environmental, energy and transport taxes across EU countries and identify convergence patterns in transport taxation expressed as a percentage of GDP. More recently, Li et al. (2024) find evidence of convergence in transport taxation across EU member states, indicating that national transport-tax systems may become more similar over time despite persistent differences in tax design and economic structure. These findings suggest that convergence in transport taxation is empirically plausible, but existing evidence is concentrated mainly on EU countries and cannot automatically be generalized to the broader OECD sample.

Recent research provides some evidence of convergence in environmental taxation (Delgado et al., 2022; Li et al., 2024). Research examining EU countries has found convergence tendencies in environmental tax revenues and their individual components, including transport taxation. Such findings suggest that common policy frameworks, peer effects and gradual adaptation of national environmental tax systems may contribute to greater similarity across countries. Nevertheless, evidence of convergence within the EU cannot automatically be generalized to the broader OECD, where institutional arrangements, transport systems and tax structures are considerably more heterogeneous.

Longer-term OECD evidence also indicates that environmentally related tax revenues as a share of GDP have not followed a uniformly increasing trajectory. OECD evidence shows that the share of environmentally related tax revenues declined in many countries over earlier periods and that this aggregate decline was partly associated with reductions in energy and motor vehicle and transport tax revenues. These developments reinforce the importance of distinguishing changes in the average level of taxation from changes in cross-country dispersion. A simultaneous decline across countries does not, by itself, imply convergence.

The dynamics of transport tax revenues have become even more relevant as the underlying transport tax base evolves. More efficient conventional vehicles, electrification and changing patterns of vehicle use may weaken some established revenue sources, while governments increasingly consider alternative instruments such as distance-based road pricing. Consequently, observed changes in transport tax revenues may reflect several overlapping processes: tax policy reforms, behavioural responses, technological transformation and changes in the underlying tax base. An analysis focused on revenue dynamics can identify common temporal patterns, although establishing their specific causal determinants requires additional explanatory variables.

A further empirical issue concerns the period around 2020. Mobility restrictions and disruptions in economic activity created an unusual environment for transport-related tax bases. However, a decline observed after 2020 should not automatically be interpreted as a structural break attributable to that period. If transport tax revenues had already been declining, subsequent lower levels could instead represent the continuation of a pre-existing trajectory. Segmented regression provides a useful approach for distinguishing changes in level from changes in trend around a specified point (Bernal et al., 2017).

2.4. RESEARCH GAP

The reviewed literature demonstrates that transport taxation has important fiscal, environmental and economic dimensions. Existing empirical studies show that transport tax revenues may be associated with economic development and that their effects differ across countries, tax structures and institutional settings (Stameski et al., 2024; Kalaš et al., 2025; Kalaš et al., 2026). At the same time, OECD research emphasizes that technological change and decarbonization can erode conventional transport tax bases and create pressures for tax reform.

However, an important gap remains. Existing studies predominantly examine what transport taxes affect, whereas less attention has been paid to how transport tax revenue-to-GDP ratios evolve across a broad group of countries. In particular, limited evidence exists on whether recent changes in transport tax revenue relative to GDP represent a common OECD-wide trajectory, whether differences between countries are narrowing, and whether the period around 2020 altered the underlying revenue path.

Taken together, the recent literature indicates that transport-tax revenue dynamics are shaped not only by tax-policy decisions but also by technological change, decarbonization and the gradual transformation of traditional transport-related tax bases.

The present study addresses this gap by examining transport tax revenue-to-GDP ratios in 38 OECD countries between 2017 and 2024. Rather than attempting to identify the causal determinants of transport tax revenue, it focuses on three distinct dimensions of their evolution: changes within countries over time, convergence between countries, and potential changes in the revenue trajectory around 2020. This framework makes it possible to distinguish a general decline in

transport tax revenue as a share of GDP from a genuine reduction in cross-country disparities and thereby provides a more precise characterization of recent transport tax revenue-to-GDP ratio dynamics across OECD economies.

3. METHODOLOGICAL FRAMEWORK

3.1. RESEARCH DESIGN AND DATA

This study analyses changes in transport tax revenue-to-GDP ratios across OECD countries between 2017 and 2024. The empirical analysis uses a balanced panel of 38 countries observed over eight consecutive years, providing 304 country-year observations. Transport tax revenue, expressed as a percentage of GDP, constitutes the main variable of interest. Data were obtained from the OECD Environmentally Related Tax Revenue database (OECD, 2026), which draws primarily on the OECD Policy Instruments for the Environment database and complementary official sources. The analysis uses tax revenue associated with the transport tax-base category, expressed as a percentage of GDP. The analysis focuses exclusively on the transport tax-base category, excluding taxes on transport fuels, which are classified as energy taxes. The year 2017 was selected as the starting point to provide a consistent eight-year observation period preceding and following the disruptions associated with the COVID-19 pandemic. The relatively short time dimension of the dataset limits the scope for estimating long-run fiscal relationships. However, the panel structure makes it possible to determine whether the changes observed during the period represent a common pattern across OECD countries or reflect persistent differences between them. The analysis addresses three related questions. First, did transport tax revenue as a share of GDP change systematically between 2017 and 2024? Second, did countries with higher initial revenue levels move closer to those with lower levels? Third, did the trajectory of transport tax revenue relative to GDP change around 2020?

The analysis is conducted at the country level, as substantial differences may exist among countries within the same geographical region. The panel data are used to examine changes over time and convergence across OECD countries.

3.2. EMPIRICAL SPECIFICATION

Three empirical procedures are used to address the research questions. First, annual changes in transport tax revenue-to-GDP ratios are estimated using a country fixed-effects model:

$$TTRit = a_i + \sum_{t=2018}^{2024} \beta t Yeart + \varepsilon it$$

where TTRit denotes transport tax revenue expressed as a percentage of GDP in country i and year t, while αi captures time-invariant country-specific effects. Yeart represents a set of year dummy variables. The year 2017 is omitted and used as the reference category. Each coefficient βt therefore measures the average difference in transport tax revenue as a share of GDP between year t and 2017. Standard errors are clustered at the country level. Second, cross-country convergence is examined using the concepts of β- and σ-convergence (Barro & Sala-i-Martin, 1992). β-convergence occurs when countries with higher initial revenue levels experience larger subsequent reductions, while σ-convergence refers to a decline in cross-country dispersion over time. Absolute β-convergence is estimated as follows:

$$TTR_{i,2024} - TTR_{i,2017} = \alpha + \beta TTR_{i,2017} + \varepsilon_i$$

A negative and statistically significant coefficient β indicates that countries with higher initial transport tax revenue-to-GDP ratios experienced larger absolute reductions in these ratios, providing evidence of β-convergence. As a robustness check, convergence is also estimated in logarithmic form:

$$\ln(TTRi_{,2024}) - \ln(TTR_{i,2017}) = \alpha + \beta \ln(TTR_{i,2017}) + \varepsilon_i$$

Changes in cross-country dispersion are assessed using the annual standard deviation and coefficient of variation:

$$CVt = \frac{SD(TTRt)}{TTRt}$$

To assess σ-convergence, the annual standard deviation and coefficient of variation are regressed separately on a linear time trend. A negative and statistically significant trend coefficient would indicate declining cross-country dispersion and provide evidence of σ-convergence. Finally, a segmented regression approach is applied to determine whether the level or trend of transport tax revenue-to-GDP ratios changed around 2020 (Bernal et al., 2017):

$$TTR_{it} = \alpha_i + \beta_1 Trendt + \beta_2 Post2020_t + \beta_3 PostTrend_t + \varepsilon_{it}$$

where Trend t is a linear time trend, Post2020t equals one from 2020 onwards and zero otherwise, and PostTrendt measures the number of years since 2020. The coefficient β1 captures the pre-2020 trend, β2 measures the level change around 2020, and β3 indicates whether the trend changed after 2020. Standard errors are clustered at the country level.

3.3. RESULTS

This section first describes the differences in transport tax revenue-to-GDP ratios across OECD countries and their changes over time. It then considers whether these differences narrowed during 2017–2024 and whether the revenue trend shifted around 2020.

Table 1. Descriptive statistics

Country	Mean	SD	Min	Max
Australia	0.781	0.041	0.73	0.84
Austria	0.909	0.045	0.85	0.96
Belgium	0.335	0.019	0.31	0.36
Canada	0.211	0.030	0.17	0.25
Chile	0.330	0.024	0.30	0.37
Colombia	0.169	0.017	0.15	0.20
Costa Rica	0.733	0.120	0.48	0.84
Czechia	0.335	0.080	0.24	0.43
Denmark	1.168	0.338	0.67	1.51
Estonia	0.024	0.005	0.02	0.03
Finland	0.740	0.185	0.50	0.97
France	0.310	0.021	0.29	0.34
Germany	0.283	0.017	0.26	0.30
Greece	0.768	0.045	0.68	0.83
Hungary	0.290	0.035	0.24	0.34
Iceland	0.594	0.112	0.44	0.76
Ireland	0.449	0.119	0.33	0.63
Israel	0.793	0.047	0.72	0.84
Italy	0.579	0.040	0.53	0.62
Japan	0.438	0.027	0.40	0.47
Korea	0.469	0.045	0.40	0.52
Latvia	0.375	0.043	0.32	0.43
Lithuania	0.075	0.029	0.04	0.13
Luxembourg	0.113	0.015	0.09	0.13
Mexico	0.113	0.010	0.10	0.13
Netherlands	0.919	0.107	0.80	1.05
New Zealand	0.558	0.101	0.39	0.64
Norway	0.555	0.187	0.33	0.85
Poland	0.188	0.032	0.15	0.23
Portugal	0.575	0.102	0.46	0.70
Slovak Republic	0.209	0.044	0.15	0.26
Slovenia	0.364	0.027	0.32	0.40
Spain	0.223	0.015	0.20	0.24
Sweden	0.419	0.030	0.37	0.45
Switzerland	0.640	0.041	0.59	0.69
Türkiye	1.188	0.380	0.66	1.91
United Kingdom	0.425	0.051	0.34	0.49
United States	0.216	0.053	0.14	0.27
Total	0.470	0.304	0.02	1.91

Source: *Authors' calculations*.

The descriptive statistics reported in Table 1 show substantial cross-country differences in transport tax revenue-to-GDP ratios among the 38 OECD countries over the period 2017–2024. The data reveal considerable differences in the level of transport tax revenue relative to GDP across countries. The sample mean is 0.470% of GDP, although country averages are spread over a much wider range. Estonia has the lowest average, at 0.024% of GDP, while Türkiye records the highest, at 1.188%. Denmark follows closely with an average of 1.168%, while the Netherlands and Austria also report relatively high values of 0.919% and 0.909%, respectively. Australia, Israel, Greece and Finland form another group of countries in which average transport tax revenue-to-GDP ratios exceed 0.7% of GDP. At the lower end of the distribution, Lithuania records an average of 0.075%, while Luxembourg and Mexico both average 0.113% of GDP. Colombia, Poland, the Slovak Republic, Canada, the United States and Spain also remain below 0.25% of GDP on average. The distance between the upper and lower ends of the distribution is therefore substantial, even though all countries belong to the OECD.

The country statistics also differ in terms of variation over time. In several countries, transport

tax revenue-to-GDP ratios remain within a relatively narrow interval throughout the eight-year period. Estonia is the clearest example, with annual values ranging from 0.02% to 0.03% of GDP and a standard deviation of only 0.005. Limited variation is also recorded in Mexico, Luxembourg, Spain, Germany, Belgium and France. In these cases, the relatively small standard deviations indicate that differences between individual years are modest compared with the differences observed between countries.

A different pattern is found in countries where transport tax revenue-to-GDP ratios changed more markedly during the period. Türkiye records values between 0.66% and 1.91% of GDP and has the highest standard deviation in the sample (0.380). Denmark also displays substantial variation, with revenues ranging from 0.67% to 1.51% of GDP and a standard deviation of 0.338. Norway and Finland have standard deviations of 0.187 and 0.185, respectively, while Costa Rica and Ireland also show greater year-to-year variation than most countries in the sample. These cases indicate that the observed cross-country differences cannot be described solely in terms of countries having persistently high or low levels of transport tax revenue. The extent to which these ratios changed during 2017–2024 also differs considerably across countries.

Table 2. Country Fixed-Effects Estimates of Transport Tax Revenue-to-GDP Ratio Dynamics

Year	Coefficient	Clustered SE	t-statistic	p-value
2018	−0.0108	0.0087	−1.24	0.223
2019	−0.0274**	0.0133	−2.06	0.047
2020	−0.0445**	0.0167	−2.67	0.011
2021	−0.0737***	0.0197	−3.73	0.001
2022	−0.0968***	0.0262	−3.69	0.001
2023	−0.0821**	0.0354	−2.32	0.026
2024	−0.1037***	0.0302	−3.43	0.002
Obs.	304			
R2	0.1368			
F-stat	2.91			
Prob > F	0.0158			

Source: *Authors' calculations.*

The fixed-effects estimates in Table 2 trace annual changes in transport tax revenue-to-GDP ratios relative to 2017, which serves as the reference year. The estimated coefficients show a downward movement in transport tax revenue relative to GDP during the period. The coefficient for 2018 is negative but small and statistically insignificant (β= -0.0108). A statistically significant difference from the 2017 level first appears in 2019, when the estimated coefficient is -0.0274 percentage points of GDP. The decline becomes larger in the following years. The estimated difference reaches -0.0445 percentage points in 2020 and -0.0737 percentage points in 2021, with both coefficients statistically significant. The largest reductions relative to 2017 are recorded toward the end of the period. The coefficient for 2022 is -0.0968, while the estimate for 2024 reaches -0.1037. The coefficient for 2023 is somewhat smaller, at -0.0821, but remains statistically significant at the 5% level. The sequence of coefficients is therefore not perfectly linear, particularly because the decline becomes temporarily smaller in 2023, but the estimates show that transport tax revenue-to-GDP ratios remained below their 2017 level throughout the later part of the sample. The year effects are jointly statistically significant (F-stat=2.91), indicating that transport tax revenue-to-GDP ratios did not remain constant over the observed period once country-specific fixed effects are taken into account. The estimates point to a decline in transport tax revenue relative to GDP that became statistically detectable in 2019 and persisted through 2024. The size of the coefficients also increased over most of the period, from −0.0274 percentage points of GDP in 2019 to -0.1037 percentage points in 2024. The temporary moderation recorded in 2023 does not alter the broader pattern, as the coefficient remains negative and statistically significant.

Table 3. Convergence of Transport Tax Revenue-to-GDP Ratios across OECD Countries

Specification	Coefficient	Robust SE	p-value	R2
Absolute β-convergence	−0.3045	0.1422	0.039	0.300
Log β-convergence	−0.0170	0.0151	0.268	0.092
σ-convergence (SD)	−0.0046	0.0037	0.259	0.206
Relative dispersion (CV)	0.0120	0.0067	0.121	0.352

Source: *Authors' calculations.*

Table 3 examines whether the decline in transport tax revenue-to-GDP ratios was accompanied by convergence across OECD countries. The absolute β-convergence specification provides some support for convergence. The coefficient on the initial 2017 level is negative and statistically significant (β= -0.3045). This means that countries with higher initial transport tax revenue-to-GDP ratios at the beginning of the period tended to experience larger absolute reductions by 2024. An initial difference of one percentage point of GDP is associated with a 0.3045 percentage point larger decline over the seven-year interval. The model

explains approximately 30% of the cross-country variation in the change between 2017 and 2024. This conclusion is not supported when convergence is measured in proportional terms. In the log specification, the coefficient on the initial level remains negative (β= -0.0170), but is not statistically significant. The negative sign is consistent with the direction found in the first specification, but the estimate does not provide sufficient statistical evidence that countries with higher initial revenues experienced systematically lower proportional growth rates. The measures of cross-country dispersion provide no clear evidence of σ-convergence. The standard deviation of transport tax revenue-to-GDP ratios declined from 0.331 in 2017 to 0.277 in 2024, but the estimated annual trend is not statistically significant (β=-0.0046). The coefficient of variation produces a positive coefficient of 0.0120, which is also statistically insignificant. The results provide limited evidence of convergence across OECD countries. Although absolute β-convergence is statistically significant, this may reflect similar proportional declines, with higher initial ratios leading to larger absolute reductions. Neither the logarithmic specification nor the dispersion measures confirm convergence. These findings highlight the importance of distinguishing changes in tax revenue levels from changes in cross-country differences when interpreting environmental tax indicators (European Commission, 2024). These results differ from those of Delgado et al. (2022) and Li et al. (2024), who report convergence in transport taxation among EU countries. The difference may reflect the broader OECD sample, the shorter observation period and the different convergence methods used in this study. While previous studies identify convergence within the EU, the present results suggest that such patterns are not clearly observed across OECD countries as a whole.

Table 4. Changes in the Trend of Transport Tax Revenue-to-GDP Ratios around 2020

Variable	Coefficient	Clustered SE	t-statistic	p-value
Pre-2020 trend	−0.0137**	0.0066	−2.07	0.045
Level change around 2020	−0.0147	0.0225	−0.65	0.517
Change in post-2020 trend	0.0010	0.0105	0.10	0.925
Obs.	304			
R2	0.1300			
F-stat	5.14			
Prob > F	0.0045			

Source: *Authors' calculations.*

The estimates reported in Table 4 assess whether 2020 marked a change in either the level or the trend of transport tax revenue-to-GDP ratios. The coefficient on the pre-2020 trend is negative and statistically significant (β= -0.0137). Before 2020, transport tax revenue as a share of GDP was declining by approximately 0.014 percentage points of GDP per year. The decline observed in the later years of the sample therefore appears to have started before 2020 rather than emerging only after that year. The estimated level change around 2020 is also negative (β= -0.0147), but it is not statistically significant. The data therefore do not indicate a discrete shift in the level of transport tax revenue-to-GDP ratios in 2020 beyond what would be expected from the preceding downward trend. This distinction is relevant because the lower revenue levels observed after 2020 could otherwise be interpreted as evidence of a sudden break in that year. The coefficient measuring the change in the post-2020 trend is 0.0010 and is far from statistical significance. Its magnitude is also very small relative to the estimated pre-2020 trend. The annual trajectory after 2020 therefore does not differ significantly from the trajectory already present before 2020. The implied post-2020 trend therefore remained negative, at approximately -0.0127 percentage points of GDP per year. Overall, the estimates indicate continuity in the downward trajectory rather than a statistically significant structural break around 2020.

CONCLUSION

This study examined transport tax revenue-to-GDP ratios in 38 OECD countries between 2017 and 2024. The country level data reveal substantial differences in both the level of revenues and their movement over time. Average values range from 0.024% of GDP in Estonia to 1.188% in Türkiye, while the degree of variation within countries also differs considerably. Some countries maintained relatively stable revenue levels throughout the period, whereas others recorded much larger changes. The fixed effects estimates show that transport tax revenue-to-GDP ratios followed a downward path during the period. The difference relative to 2017 is not statistically significant in 2018, but becomes significant from 2019 onwards and remains so through 2024. By 2024, transport tax revenue as a share of GDP was estimated to be

0.104 percentage points of GDP below its 2017 level. Although the size of the decline varies across years, the estimates point to a sustained reduction in the transport tax revenue-to-GDP ratio rather than a temporary movement.

The convergence results are mixed. Although countries with higher initial transport tax revenue-to-GDP ratios experienced larger absolute declines, this may reflect similar proportional reductions rather than genuine convergence. Neither the logarithmic specification nor the dispersion measures provide statistically significant evidence of convergence, suggesting that substantial differences across OECD countries persist. The analysis does not identify a statistically significant turning point in 2020. Transport tax revenue relative to GDP had already been declining, while neither the estimated level change nor the subsequent shift in trend is significant. The lower values recorded in later years therefore reflect the continuation of an earlier downward trajectory.

The contribution of this study lies in providing country level evidence on the dynamics of transport tax revenue-to-GDP ratios across OECD countries, distinguishing between changes within countries, cross country convergence, and a possible shift in the revenue trajectory around 2020. This distinction matters because the general decline in transport tax revenue-to-GDP ratios could otherwise be interpreted as evidence that national revenue levels are becoming more similar. The results show that these are separate processes. Transport tax revenue as a share of GDP declined within countries, but the evidence of convergence between countries remains limited (International Transport Forum, 2023).

From a policy perspective, the persistence of large differences across countries suggests that a common OECD trend should not be treated as representative of individual national experiences. The downward movement in revenue relative to GDP may also be relevant for countries in which transport taxation serves both fiscal and environmental objectives. The present analysis does not identify the factors behind the observed decline in the transport tax revenue-to-GDP ratio, however, and the results should not be used to attribute it to particular tax reforms, changes in transport behaviour or environmental policies.

The main limitation is the relatively short observation period and the absence of variables that would allow the sources of the observed changes to be identified. Because the dependent variable is expressed as a percentage of GDP, observed changes may reflect movements in both transport tax receipts and the GDP denominator. They should therefore not be interpreted as changes in absolute tax revenue. The results establish the pattern of transport tax revenue-to-GDP ratios during 2017 to 2024, rather than its causes. Extending the analysis with information on tax structures, vehicle use and other country specific factors would allow the differences documented here to be examined in more detail. The central result remains the coexistence of substantial differences between OECD countries and a downward movement in transport tax revenue-to-GDP ratios within countries. Countries starting from higher levels recorded larger absolute reductions, but these movements did not produce clear convergence across the full sample. The decline was already present before 2020 and continued afterwards without a statistically significant change in its trajectory.

REFERENCES

[1] Barro, R. J., & Sala-i-Martin, X. (1992). Convergence. Journal of Political Economy, 100(2), 223–251. https://www.econstor.eu/bitstream/10419/160567/1/cdp645.pdf

[2] Baumol, W. J., & Oates, W. E. (1988). The theory of environmental policy. Cambridge university press.

[3] Bernal, J. L., Cummins, S., & Gasparrini, A. (2017). Interrupted time series regression for the evaluation of public health interventions: A tutorial. International Journal of Epidemiology, 46(1), 348–355. https://doi.org/10.1093/ije/dyw098

[4] Bjertnæs, G. H. (2025). Economical driving and taxation of road use. Energy Economics, 142, 108193.

[5] Cascavilla, A., D'adamo, I., Desideri, S., & Iannilli, M. (2026). Environmental taxes and subsidies for sustainability: Experimental evidence on consumer preferences for business strategy. Business Strategy and the Environment, 35(3), 3357-3369.

[6] Delgado, F. J., Freire-González, J., & Presno, M. J. (2022). Environmental taxation in the European Union: Are there common trends? Economic Analysis and Policy, 73, 670–682. https://doi.org/10.1016/j.eap.2021.12.019

[7] Dmytrenko, D., Prokop, V., & Zapletal, D. (2026). The impact of environmental policy stringency and environmental taxes on GHG emissions in Western and Central European countries. Energy Systems, 17(1), 39–57.

[8] Domguia, E. N., Nkengfack, H., Pondie, T. M., & Ngounou, B. A. (2026). Do environmental taxes encourage the

decarbonization of economies?. Environment, Development and Sustainability, 28(7), 15953-15986.

[9] European Commission (2024). Environmental taxes – a statistical guide. Publications Office of the European Union. doi: 10.2785/730717

[10] International Transport Forum. (2023). Decarbonisation and the pricing of road transport: Summary and conclusions (ITF Roundtable Reports No. 191). OECD Publishing. https://doi.org/10.1787/54809337-en

[11] Kalaš, B., Mirović, V., Bolesnikov, D., Akadiri, S. S., & Radulescu, M. (2025). Environmental taxes and sustainable development in the EU: A decade of data-driven insights. Systems, 13(7), 503. https://doi.org/10.3390/systems13070503

[12] Kalaš, B., Mirović, V., Radulescu, M., & Stameski, N. (2026). Asymmetric and cross-country effects of environmental taxes on economic growth: Evidence from Benelux and Baltic economies. Environmental Sciences Europe, 38, 133. https://doi.org/10.1186/s12302-026-01424-6

[13] Li, Z., Sun, Z., Wang, K., & Lobonț, O.-R. (2024). Symphony or solo: Does convergence exist in environmental taxation among EU countries? Sustainability, 16(17), 7678. https://doi.org/10.3390/su16177678

[14] Newbery, D. M. (1990). Pricing and congestion: economic principles relevant to pricing roads. Oxford review of economic policy, 6(2), 22-38.

[15] Nilsson, P., Tarduno, M., & Tebbe, S. (2024). Road pricing with green vehicle exemptions: Theory and evidence. CEPR Discussion Paper No. 18955. Centre for Economic Policy Research. https://cepr.org/publications/dp18955

[16] OECD. (2024). Pricing greenhouse gas emissions 2024: Gearing up to bring emissions down. OECD Series on Carbon Pricing and Energy Taxation. OECD Publishing. https://doi.org/10.1787/b44c74e6-en

[17] Parry, I. W. H., & Small, K. A. (2005). Does Britain or the United States have the right gasoline tax?. American Economic Review, 95(4), 1276-1289.

[18] Pigou, A. C. (1920). The economics of welfare. Routledge.

[19] Small, K. A., Verhoef, E. T., & Lindsey, R. (2007). The economics of urban transportation (Vol. 2). London: Routledge.

[20] Stameski, N., Radulescu, M., Zelenović, V., Mirović, V., Kalaš, B., & Pavlović, N. (2024). Investigating the effects of environmental tax revenues on economic development: The case of Nordic countries. Sustainability, 16(18), 7957. https://doi.org/10.3390/su16187957

[21] van Dender, K. (2019). Taxing vehicles, fuels, and road use: Opportunities for improving transport tax practice. OECD Taxation Working Papers, No. 44. OECD Publishing. https://doi.org/10.1787/e7f1d771-en

[22] Wójtowicz, K., & Mazurek-Chwiejczak, M. (2025). The role of vehicle taxation in the EU transport sector's energy transition: A systematic literature review. Economics and Environment, 93(2), Article 980. https://doi.org/10.34659/eis.2025.93.2.980

[23] OECD, (2019). The use of revenues from carbon pricing. OECD Taxation Working Papers, (43), 0_1-67.

[24] OECD. (2026). Environmentally related tax revenue [Data set]. OECD Data Explorer. https://data-explorer.oecd.org/

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