UNVEILING FISCAL INEQUALITY IN THE EU: A PANEL DATA APPROACH TO TAX POLICY AND POVERTY DYNAMICS

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Abstract

Poverty is shaped not only by labour-market and demographic conditions but also by the design of the fiscal system. In particular, indirect taxes can reduce the real purchasing power of low-income households because these households spend a larger share of their income on consumption, whereas social transfers may offset this burden by supporting disposable income. This study examines the effects of indirect taxation and transfer expenditures on the at-risk-of-poverty rate in 13 selected European Union countries over 2010–2020. The sample was restricted to countries for which comparable and continuous annual series were available in EUROSTAT, allowing the construction of a balanced panel prior to the stronger distortions created by the COVID-19 period. The empirical model is estimated by two-step System GMM in order to address the dynamic structure of poverty and potential endogeneity. The findings show that higher indirect taxes are associated with higher poverty risk, whereas higher social transfer expenditures reduce poverty risk. The study contributes to the literature by bringing together indirect taxation and social transfers in a dynamic panel framework for developed EU economies and by discussing the distributional implications of tax design more explicitly.

Keywords: Poverty Risk, Indirect Taxation, Social Transfers, System GMM, European Union

JEL Classification: H20, I32, H53, C33

AB'DE MALİ EŞİTSİZLİĞİ AÇIĞA ÇIKARMAK: VERGİ POLİTİKASI VE YOKSULLUK DİNAMİKLERİNE PANEL VERİ YAKLAŞIMI

Özet

Yoksulluk, yalnızca işgücü piyasası ve demografik koşulların değil, mali sistemin tasarımının da şekillendirdiği çok boyutlu bir sorundur. Özellikle dolaylı vergiler, düşük gelirli hanelerin gelirlerinin daha büyük kısmını tüketime ayırmaları nedeniyle reel satın alma gücünü azaltabilmekte; sosyal transferler ise bu yükü harcanabilir geliri destekleyerek hafifletebilmektedir. Bu çalışma, 2010–2020 döneminde seçilmiş 13 Avrupa Birliği ülkesinde dolaylı vergiler ile transfer harcamalarının yoksulluk riski üzerindeki etkisini incelemektedir. Örneklem, EUROSTAT'ta değişkenlere ilişkin karşılaştırılabilir ve kesintisiz yıllık serilerin bulunduğu ülkelerle sınırlandırılmış, böylece COVID-19 döneminin olağanüstü etkileri öncesinde dengeli bir panel oluşturulmuştur. Ampirik model, yoksulluğun dinamik yapısını ve olası endojenite sorunlarını dikkate almak amacıyla iki aşamalı Sistem GMM yöntemiyle tahmin edilmiştir. Bulgular, dolaylı vergiler arttıkça yoksulluk riskinin yükseldiğini, sosyal transfer harcamaları arttıkça ise azaldığını göstermektedir. Çalışma, gelişmiş AB ekonomileri için dolaylı vergiler ile sosyal transferleri aynı dinamik panel çerçevesinde birlikte ele alarak literatüre katkı sunmaktadır.

Anahtar Kelimeler: Yoksulluk Riski, Dolaylı Vergiler, Sosyal Transferler, Sistem GMM, Avrupa Birliği

JEL Sınıflaması: H20, I32, H53, C33

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1. Introduction

Poverty refers to a situation in which individuals cannot secure the income needed to meet basic needs. Beyond income insufficiency, poverty is shaped by labour-market conditions, demographic structure, public policy, and institutional arrangements. For this reason, poverty remains a central issue not only for developing economies but also for mature welfare states, where fiscal design continues to influence living standards (Tokatlıoğlu & Tokatlıoğlu, 2014; Çınar & Has, 2022).

Taxation is one of the main instruments through which states affect both resource mobilization and distribution. At the most basic level, taxes are classified as direct and indirect. Tax expenditures, by contrast, are not a third tax type; they are preferential provisions embedded in the tax system—such as exemptions, deductions, credits, and reduced rates—that alter the effective tax burden. Keeping these concepts separate is important, because the present study is concerned specifically with the distributional effects of indirect taxation rather than with tax expenditures in general.

The link between taxation and poverty is especially important in the case of indirect taxes. Because lower-income households typically allocate a larger share of their income to current consumption, broad-based consumption taxes can reduce real purchasing power more strongly at the bottom of the income distribution. By contrast, social transfers can partly offset this burden by supporting disposable income and by cushioning unemployment, old age, disability, and other risks (Wang et al., 2012; Miežienė & Krutulienė, 2019).

This interaction between the tax mix and redistribution helps explain why the same level of public spending may produce different social outcomes across countries. Studies on European tax-benefit systems show that the redistributive gains produced by direct taxes and transfers can be weakened when indirect taxes are taken into account (Figari & Paulus, 2012; Hills et al., 2019; Blasco et al., 2023). Accordingly, the question is not only how much revenue governments raise, but also how that revenue is raised and how it is returned to households.

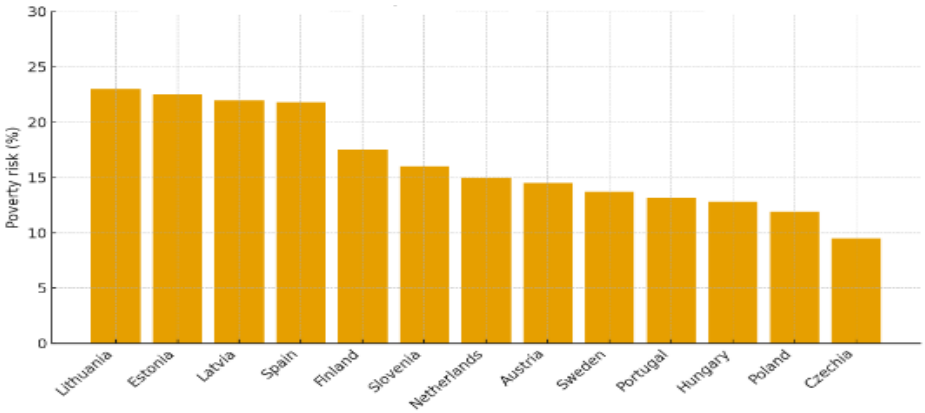
The present study focuses on indirect taxation because its distributive effects are often less visible than those of direct taxes, even though they can be highly relevant for poverty risk. At the same time, social transfer expenditures are included because they represent the main compensatory mechanism within the fiscal system. Examining these two channels together makes it possible to assess whether the poverty-increasing effect of indirect taxes is moderated by the poverty-reducing role of transfers.

Against this background, the study investigates 13 advanced EU member states—Estonia, Spain, Latvia, Lithuania, the Netherlands, Austria, Portugal, Slovenia, Finland, Czechia, Hungary, Poland, and Sweden—over the period 2010–2020. Existing developed-country evidence is concentrated mainly in microsimulation, incidence, or country-specific policy analyses. By estimating a dynamic panel model for a balanced group of EU countries and by analysing indirect taxes and social transfers jointly, the paper aims to make the empirical contribution more explicit and policy-relevant.

2. Poverty, Indirect Taxation, and Transfer Expenditures in European Union Countries

Poverty continues to be a pressing economic issue in the member states of the European Union, as it does across the globe. Reducing poverty is a fundamental necessity in order to improve individuals' economic well-being and to promote inclusive growth. In this context, indirect tax rates and transfer expenditures can serve as important policy tools for addressing poverty. Figures 1, 2, and 3 below present data from 2020 on the risk of poverty, indirect tax rates, and social transfer expenditures in selected EU member countries.

Figure 1. Risk of Poverty in Selected European Union Countries (2020)

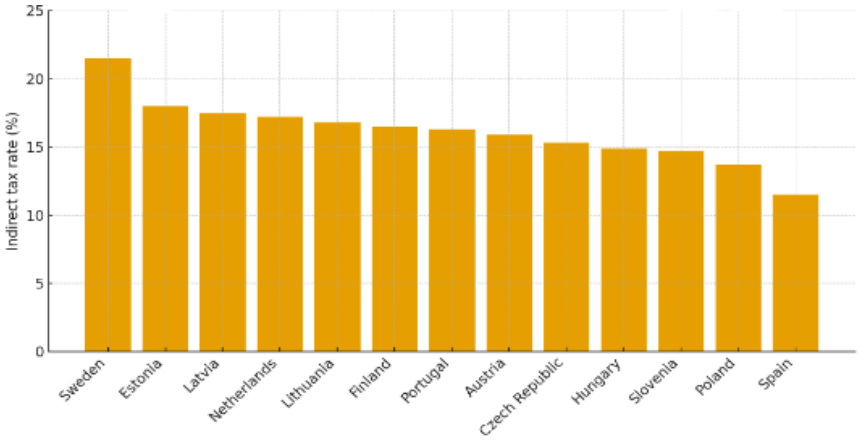


Note: The chart was created by the authors using EUROSTAT data.

Figure 1 illustrates the poverty risk rates across European Union countries. Among the selected nations, Estonia, Spain, Latvia, and Lithuania exhibit the highest poverty risk, with rates exceeding 20%. Conversely, countries such as the Netherlands, Austria, Portugal, Slovenia, Finland, Hungary, Poland, and Sweden report poverty risk rates between 10% and

20%. The poverty risk rate in Czechia stands at 9.5%. In 2020, Spain had the highest recorded poverty risk at 21.8%, whereas Czechia reported the lowest at 9.5%.

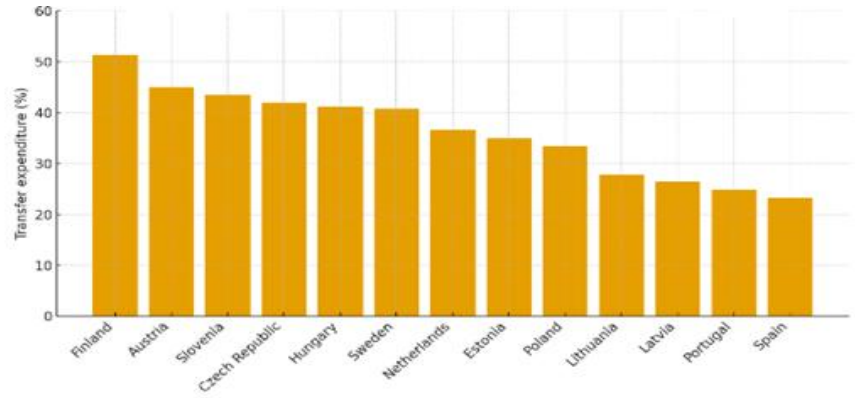
Figure 2. Indirect Tax Rates in European Union Countries (2020)



Note: The chart was created by the authors using EUROSTAT data.

Figure 2 illustrates the indirect tax rates across European Union countries in 2020. Indirect tax rates exceed 20% in Sweden, while in Estonia, Spain, Latvia, Lithuania, the Netherlands, Austria, Portugal, Slovenia, Finland, Czechia, Hungary, Poland, and Sweden, these rates range between 10% and 20%. Sweden records the highest indirect tax rate at 21.5%, whereas Spain has the lowest rate at 11.5%.

Figure 3. Transfer Expenditures in European Union Countries (2020)



Note: The chart was created by the authors using EUROSTAT data.

Figure 3 depicts transfer expenditure levels across European Union member states in 2020. Finland exhibits the highest transfer expenditure rate, exceeding 50%, specifically 51.3%. Countries such as Austria, Slovenia, Czechia, Hungary, and Sweden report rates ranging between 40% and 50%. Transfer expenditures in Estonia, the Netherlands, and Poland lie between 30% and 40%, while Spain, Latvia, Lithuania, and Portugal record the lowest rates, all below 30%. Notably, Spain has the minimum rate at 23.3%.

3. Literature Review

The literature on fiscal redistribution consistently shows that taxes and transfers cannot be evaluated in isolation. Wang, Caminada, and Goudswaard (2012) demonstrate that social transfers and taxes play different redistributive roles across countries, while Miežienė and Krutulienė (2019) show for EU members that the poverty-reducing effect of transfers depends not only on their size but also on their composition and targeting. These findings suggest that poverty outcomes are shaped by the overall structure of the fiscal system rather than by a single instrument.

A second strand of the literature focuses more directly on indirect taxes. Using EU-focused distributional analysis, Figari and Paulus (2012) show that indirect taxes tend to worsen the income distribution when compared with the effects of direct taxes and cash transfers. Similarly, Hills et al. (2019) document that tax-benefit policy changes can have markedly different poverty consequences across European countries depending on indexation rules, benefit design, and the broader policy mix.

More recent comparative evidence also reinforces the importance of consumption taxation in distributional analysis. Blasco, Guillaud, and Zemmour (2023) find that consumption taxes fall relatively more heavily on lower-income households and can offset a substantial share of the redistribution achieved through direct taxes and transfers. Thomas (2020), drawing on OECD evidence, likewise argues that any broadening of the VAT base or increases in VAT should be accompanied by compensation measures aimed at poorer households.

Taken together, these studies support two main conclusions. First, indirect taxation is not distributionally neutral, even in advanced welfare states. Second, the anti-poverty effect of social policy depends not only on spending volumes but also on whether transfer mechanisms are sufficiently targeted and adequately maintained over time.

However, the developed-country literature is concentrated largely in microsimulation and tax-benefit incidence studies. These contributions are highly valuable, but they do not directly estimate the dynamic macro-level relationship between indirect taxation and poverty

risk across a balanced panel of advanced EU economies. In other words, we know much about fiscal incidence at the household level, but less about whether changes in indirect taxation and transfer expenditures are systematically associated with changes in poverty risk across countries over time.

This study addresses that gap by estimating a dynamic panel model for selected EU countries in which poverty risk is linked jointly to indirect taxation and social transfer expenditures. In doing so, it complements the existing incidence-based literature with macro-panel evidence and sharpens the policy discussion around the distributional design of the tax-benefit system.

4. Methodology

Given the structure of the dataset—13 cross-sectional units observed over 11 annual periods (N > T)—the empirical analysis is based on a dynamic panel-data framework. In such settings, the inclusion of a lagged dependent variable may generate endogeneity and dynamic panel bias in conventional estimators. For this reason, the Generalized Method of Moments (GMM) framework is appropriate, particularly in short panels where persistence and reverse causality are plausible (Arellano & Bond, 1991; Bond, 2002). The basic dynamic specification is presented in Equation (1).

$$y_{it} = \alpha\, y_{i,t-1} + \beta' X_{it} + \gamma_i + \varepsilon_{it} \quad (1)$$

In the equation; the terms are defined as follows:

y_{it}: The dependent variable observed for unit i at time t

y_{it-1}: The one-period lag of the dependent variable

X_{it}: The independent variable vector

γ_i: Time-invariant individual fixed effects

ε_{it}: error term

To eliminate country-specific fixed effects and reduce simultaneity problems, the model can first be written in differences. However, when the series are persistent, Difference GMM may suffer from weak instruments. Arellano and Bover (1995) and Blundell and Bond (1998) therefore developed the System GMM estimator, which combines equations in first differences and in levels and typically performs better in short panels. Because poverty risk exhibits persistence and the present dataset has a limited time dimension, the two-step System GMM estimator was preferred.

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \beta' \Delta X_{it} + \Delta \varepsilon_{it} \quad (2)$$

System GMM also incorporates the level equation model, as specified in Equation 3.

$$y_{it} = \alpha\, y_{i,t-1} + \beta' X_{it} + \gamma_i + \varepsilon_{it} \quad (3)$$

In the System GMM framework, internal instruments are constructed from lagged levels and lagged differences of the variables included in the model. In the present application, the lagged dependent variable is central to the instrument set, and the overall instrument count is intentionally kept low. This is important because an excessive number of instruments can overfit endogenous variables and weaken the Hansen test. Accordingly, the instrument set was restricted so that the total number of instruments remained below the number of cross-sectional units (Roodman, 2009).

5. Data and Model

This study examines the effect of indirect taxes on poverty risk in 13 selected EU countries over 2010–2020. The countries were retained because they provide a balanced and comparable annual panel for the variables used in the analysis and because focusing on a relatively homogeneous group of advanced EU economies reduces heterogeneity arising from missing observations and major structural breaks. The period ends in 2020 in order to capture the pre-pandemic and immediate pre-disruption structure of tax and transfer relations and to avoid mixing the core analysis with the exceptional fiscal dynamics generated after COVID-19.

Panel unit root and cross-sectional dependence tests deserve careful treatment in short macro panels. Although short-panel unit root tests such as Harris–Tzavalis (1999) and Im, Pesaran, and Shin (2003) are available, first-generation panel unit root procedures rely on restrictive assumptions about cross-sectional independence, while the broader review literature emphasizes that the choice among tests becomes more delicate when T is short and cross-country dependence is plausible (Breitung & Pesaran, 2008). Similarly, Pesaran's CD test is applicable in short panels (Pesaran, 2004), but in a closely integrated group of EU economies any detected dependence would largely reflect common regional shocks and policy spillovers rather than, by itself, invalidate the use of a dynamic GMM estimator. For these reasons, the analysis prioritizes the diagnostics that are central to System GMM—Hansen and Arellano-Bond tests—while treating the absence of separate unit root and cross-sectional dependence results as a limitation of the study and an avenue for future research.

The dependent variable is the at-risk-of-poverty rate (poverty). The explanatory variables are the indirect tax rate (tax) and social transfer expenditures (transfer), all obtained from EUROSTAT. The balanced panel therefore consists of 143 country-year observations

covering Estonia, Spain, Latvia, Lithuania, the Netherlands, Austria, Portugal, Slovenia, Finland, Czechia, Hungary, Poland, and Sweden. The econometric estimations were carried out in STATA 14.

Since all variables in the study are expressed as ratios, a fully linear model was specified. The mathematical representation of the model is provided in Equation (4).

$$poverty_{it} = \varphi_1 + \beta_0\, poverty_{i,t-1} + \beta_1\, tax_{it} + \beta_2\, transfer_{it} + \eta_i + \lambda_t + u_{it} \quad (4)$$

In Equation (4), i denotes the country dimension and t denotes the time dimension. φ1 is the constant term; β0, β1, and β2 are slope coefficients; η_i captures unobserved country-specific effects; λ_t captures time-specific effects; and u_it is the idiosyncratic error term.

6. Empirical Findings

Descriptive statistics for the variables are presented in Table 1.

Table 1. Descriptive Statistics

	Poverty	**Tax**	**Transfer**
Mean	23.88322	14.27141	37.29867
Median	25.30000	13.97683	39.73000
Maximum	31.30000	22.50157	57.04000
Minimum	9.500000	9.784322	17.58000
Std. Dev.	5.250070	2.866333	10.50895
Skewness	-0.958848	1.465133	-0.071548
Kurtosis	3.037236	4.759358	1.695838
Jarque-Bera	21.92036	69.60408	10.25617
Sum	3415.300	2040.811	5333.710
Sum Sq. Dev.	3913.980	1166.653	15682.20
Observations	143	143	143

The results obtained from the System GMM estimation are presented in Table 2.

Table 2. Two-Step System GMM Results

Dependent Variable: poverty

poverty	coefficient	Standard Error	Z	P > lzl	(95% Confidence Interval)	
poverty L1.	0.5669	0.0202	27.94	0.000***	0.5271	0.6066
tax	0.1962	0.1041	1.88	0.060*	-0.0078	0.4004
transfer	-0.0754	0.0355	-2.12	0.034**	-0.1452	-0.0056
_intercept	9.5198	2.0847	4.57	0.000***	5.4337	13.6059
Number of instrumental variables			7			

Note: *** 1%, ** 5%, and * 10% denote significance levels.

Prior to interpreting the results in Table 2, the validity and reliability of the System GMM estimators were assessed. To this end, three diagnostic tests were performed: the Wald test, the Hansen test, and the Arellano-Bond test. The outcomes of these tests are summarized in Table 3.

Table 3. Validity and Reliability Tests

Test	Probability
Wald	0.0000***
Hansen	0.769
AR(1)	0.002***
AR(2)	0.399

Note: *** 1%, ** 5%, and * 10% denote significance levels.

The Wald statistic first evaluates whether the explanatory variables are jointly significant. The null hypothesis states that the coefficients on the explanatory variables are jointly equal to zero. Since the reported p-value is 0.0000, the null is rejected and the model is statistically significant as a whole.

The Hansen test is used to evaluate the joint validity of the instruments in the two-step System GMM specification. Here, the null hypothesis states that the instruments are

exogenous, whereas the alternative states that at least some instruments are not exogenous. Because the Hansen p-value is 0.769, the null cannot be rejected. This result supports the validity of the instrument set used in the model.

The Arellano-Bond serial-correlation tests provide an additional diagnostic for model validity. In dynamic panel GMM estimation, first-order serial correlation in differenced residuals is expected, whereas second-order serial correlation should not be present. The results satisfy this pattern: AR(1) is significant ($p = 0.002$), while AR(2) is insignificant ($p = 0.399$). Accordingly, the specification appears consistent with the requirements of the estimator.

Finally, the number of instruments is 7, which is lower than the number of cross-sectional units ($N = 13$). This supports a parsimonious instrument strategy and reduces concerns about instrument proliferation. On this basis, the coefficient estimates reported in Table 2 can be interpreted with greater confidence.

The coefficient estimates indicate that the explanatory variables are economically meaningful. A one-unit increase in the indirect tax rate is associated with a 0.1962-unit increase in the poverty risk rate. Since the coefficient is positive and marginally significant at the 10 percent level, the results support the view that indirect taxation increases poverty risk in the selected EU countries.

One plausible mechanism behind this result is that indirect taxes are levied through consumption and therefore reduce real purchasing power more strongly for households that spend most of their income on current needs. In this sense, the result is consistent with the distributional literature emphasizing the regressive burden of consumption taxes and their capacity to worsen post-tax inequality when not sufficiently offset by compensatory transfers (Ay & Haydanlı, 2017; Figari & Paulus, 2012; Blasco et al., 2023).

By contrast, a one-unit increase in social transfer expenditures reduces the poverty risk rate by 0.0754 units. This negative coefficient is in line with the expectation that transfers operate as an income-support mechanism for vulnerable groups and help stabilize household welfare against labour-market and life-cycle risks. The finding is also consistent with comparative evidence showing that social transfers remain one of the main channels through which European welfare states reduce poverty (Wang et al., 2012; Miežienė & Krutulienė, 2019).

7. Conclusion

This study examined the relationship between indirect taxation, social transfer expenditures, and poverty risk in 13 selected EU countries over the 2010–2020 period. Using a two-step System GMM estimator, the analysis accounted for the dynamic nature of poverty and the potential endogeneity associated with the lagged dependent variable.

The empirical results show that indirect taxes are associated with higher poverty risk, whereas social transfer expenditures are associated with lower poverty risk. Taken together, these findings suggest that the distributive consequences of the tax-benefit mix remain important even in relatively advanced welfare states. Put differently, the fiscal structure matters not only for revenue collection but also for social outcomes.

The policy implications should therefore be tied directly to the two variables analysed in this paper. If governments rely heavily on indirect taxation, poverty risks can be moderated by protecting essential goods through reduced VAT rates where appropriate, by accompanying VAT increases with targeted compensation mechanisms, and by using refundable tax credits or direct income support for low-income households (Thomas, 2020). At the same time, the negative coefficient on transfer expenditures suggests that maintaining adequate and well-targeted social transfers remains a central anti-poverty tool.

The study also has several limitations. The sample is restricted to 13 EU countries and to the 2010–2020 period because of data comparability and the need for a balanced panel. The analysis is conducted at the macro level and therefore cannot identify the distributional incidence of specific VAT reforms across household types. In addition, separate short-panel unit root and cross-sectional dependence tests are not reported; this choice was justified on methodological grounds, but it should still be viewed as a limitation.

Future research can extend the time coverage, combine macro-panel evidence with household-level microsimulation or budget-incidence analysis, and re-examine the relationship with alternative measures of poverty and tax structure. Within these boundaries, the present findings support a clear conclusion: a fiscal composition that leans more heavily on indirect taxation tends to increase poverty risk, while social transfers work in the opposite direction by cushioning the welfare losses of lower-income households.

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