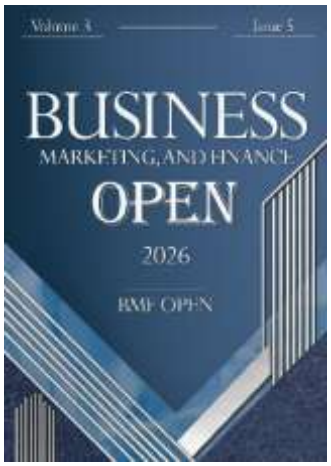
The Role of Value-Added Tax in the Development of Social Justice in Iran

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Citation: Laeini, M. E., Khezri, M., & Safavi, B. (2026). The Role of Value-Added Tax in the Development of Social Justice in Iran. *Business, Marketing, and Finance Open*, 3(5), 1-17.

Received: 07 April 2026
Revised: 08 September 2026
Accepted: 16 September 2026
Initial Publication: 28 September 2026
Final Publication: 01 October 2026

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Abstract: Value-added tax (VAT) is considered one of the most important fiscal policy instruments available to governments for financing public revenues and, at the same time, a potential instrument for income redistribution and the realization of social justice. The present study aimed to examine the role of value-added tax in promoting social justice in the Iranian economy. In terms of purpose, this research is applied, and in terms of methodology, it is a descriptive-correlational study based on time-series analysis. The statistical population and sample comprised annual macroeconomic data for Iran over the period 1992–2022 (31 observations), collected from the Statistical Bulletin of the Central Bank, the World Bank, and the World Income Inequality Database. Data were analyzed using the Pesaran, Shin, and Smith bounds-testing approach and the unrestricted error correction model (UECM), together with unit root tests, classical diagnostic tests, and the CUSUM structural stability test using econometric software. The findings indicated that although the inclusion of structural control variables substantially increased the explanatory power of the model, no conclusive evidence was found at the 95% confidence level for a statistically significant long-run relationship between value-added tax and the Gini coefficient. It is concluded that the effectiveness of value-added tax in promoting social justice is strongly conditional upon complementary redistributive policies and the structural conditions of the macroeconomy.

Keywords: value-added tax; social justice; Gini coefficient; autoregressive distributed lag (ARDL) model; Iranian economy.

1. Introduction

Taxation constitutes one of the principal mechanisms through which governments mobilize financial resources, regulate economic activity, redistribute income, and finance public goods and services. Beyond its conventional fiscal function of generating public revenue, a tax system is increasingly evaluated according to its capacity to promote distributive fairness, enhance citizens' trust in public institutions, reduce socioeconomic disparities, and support sustainable social development. Accordingly, the quality of a tax system cannot be assessed solely on the basis of the volume of revenue it generates; rather, its distributive consequences, administrative efficiency, transparency, perceived fairness, and compatibility with broader social objectives are equally important. Within this framework, tax justice has emerged as a central component of fiscal governance because taxpayers' perceptions of fairness can influence both the legitimacy of the tax system and their willingness to comply with tax obligations. Studies on tax compliance indicate that perceived justice, institutional trust, and the belief that tax revenues are used appropriately are closely associated with taxpayers' behavioral

responses and their willingness to participate in the fiscal system [1, 2]. From a broader social perspective, taxation can therefore function not merely as an instrument for financing government expenditures but also as a policy mechanism through which economic resources are distributed across social groups and opportunities for more equitable development are created.

The concept of tax justice encompasses several interconnected dimensions, including horizontal equity, vertical equity, procedural fairness, transparency, proportionality, and the equitable distribution of tax burdens and public benefits. Horizontal equity implies that taxpayers with similar economic capacities should be treated similarly, whereas vertical equity requires taxpayers with greater ability to pay to bear a relatively larger fiscal burden. Procedural justice additionally concerns the transparency, predictability, and impartiality of tax administration. In this regard, justice-oriented indicators embedded in direct taxation and value-added taxation legislation provide a basis for evaluating whether tax rules and administrative procedures are aligned with distributive and social objectives [3]. The relationship between taxation and justice also extends beyond taxes on consumption. Research on property and wealth taxation demonstrates that the design of the tax base, exemptions, enforcement mechanisms, and distribution of the tax burden can significantly affect the realization of tax justice within society [4]. Consequently, a comprehensive assessment of tax policy requires attention to both its direct revenue effects and its broader consequences for income distribution, economic welfare, and social inclusion.

Among the various forms of taxation, value-added tax (VAT) has become one of the most widely employed consumption taxes worldwide. VAT is generally levied on the value added at successive stages of production and distribution and ultimately transfers most of the effective tax burden to final consumption. Its widespread adoption is attributable to several characteristics, including its broad tax base, relatively high revenue-generating capacity, administrative traceability, and potential to reduce some forms of tax evasion through the invoice-credit mechanism. In many economies, VAT has therefore become an integral part of modern public finance and an important source of stable government revenue. Nevertheless, the distributive implications of VAT remain subject to considerable theoretical and empirical debate. Because lower-income households typically allocate a larger proportion of their disposable income to consumption, a broadly applied consumption tax may impose a proportionally greater burden on such households unless exemptions, reduced rates, targeted transfers, or other compensatory mechanisms are implemented. Thus, the contribution of VAT to social justice depends not only on its statutory structure but also on the manner in which its revenues are collected, allocated, and redistributed through public policy.

The potential contradiction between the revenue efficiency of VAT and its distributive implications has made the tax an important subject of public policy analysis. From one perspective, VAT can provide governments with predictable fiscal resources required to finance health care, education, social protection, infrastructure, and poverty-reduction programs. When VAT revenues are transferred effectively to social sectors or redistributed toward disadvantaged regions and households, the tax may indirectly contribute to improvements in social welfare. Evidence from Nigeria, for example, indicates that transfers of VAT revenue may have implications for regional social development, emphasizing that the social effect of VAT cannot be understood independently of the mechanisms through which tax revenue is allocated and spent [5]. From another perspective, however, if VAT revenue is not accompanied by adequate redistribution or if essential consumption goods are insufficiently protected from taxation, the tax may exacerbate the burden on lower-income groups. Accordingly, the impact of VAT on social justice is conditional rather than predetermined and is strongly dependent on institutional design, expenditure policies, tax exemptions, compliance, and the overall structure of the economy.

The political and institutional environment within which VAT is implemented further influences its distributive outcomes. Tax policy is rarely a purely technical matter; instead, it is shaped by political priorities, administrative capacities, interest-group pressures, fiscal needs, and the broader relationship between governments and citizens. An examination of VAT policy in Ghana, for instance, illustrates the political dimensions involved in the formulation and implementation of VAT and demonstrates how political processes can shape tax design and public acceptance [6]. This observation is particularly important when considering social justice because taxation inevitably determines how fiscal burdens and benefits are distributed among different sectors, income groups, and generations. A tax that is administratively efficient may not necessarily be perceived as socially legitimate, and a tax system that raises substantial revenue may nevertheless encounter resistance if taxpayers consider the distribution of burdens or benefits to be unfair.

Taxpayer behavior constitutes another critical link between VAT policy and the broader effectiveness of the tax system. The sustainability of VAT depends heavily on compliance by businesses and consumers, accurate invoicing, proper reporting, and the capacity of tax authorities to identify noncompliance. Empirical research has repeatedly emphasized that taxpayers' perceptions of justice influence voluntary compliance. Greater tax knowledge and stronger perceptions of fairness can enhance taxpayers' willingness to fulfill their obligations, suggesting that compliance policies should incorporate educational and justice-related considerations rather than relying exclusively on deterrence and penalties [7]. Similarly, Iranian research has identified justice and trust as central dimensions in the prioritization of tax compliance indicators, highlighting the importance of taxpayers' confidence in government institutions and the perceived fairness of fiscal arrangements [2]. These findings suggest that the effectiveness of VAT is inseparable from institutional legitimacy, because a tax system perceived as unfair may generate avoidance, evasion, resistance, or declining cooperation even when its formal administrative architecture is well designed.

Trust in government is especially important in the context of VAT compliance because the tax is embedded in numerous transactions and requires continuous cooperation among taxpayers, firms, and tax authorities. Experimental evidence shows that trust in government and tax compliance costs can influence incentives for VAT compliance, indicating that compliance behavior is shaped not merely by statutory obligations but also by institutional and administrative conditions [8]. Where taxpayers perceive public institutions as trustworthy and the cost of complying with tax rules as manageable, voluntary compliance can be strengthened. Conversely, complex procedures, administrative uncertainty, and weak institutional trust may undermine compliance and ultimately reduce both revenue efficiency and the redistributive capacity of the tax system. Therefore, the relationship between VAT and social justice involves a circular mechanism: perceived fairness can improve compliance, higher compliance can increase public revenue, and effective use of revenue for socially beneficial purposes can, in turn, strengthen perceptions of legitimacy and justice.

Organizational factors within tax administrations can likewise affect the implementation quality of tax policy. The effectiveness of a tax authority depends not only on legislation and digital infrastructure but also on the behavior, motivation, and performance of its personnel. Evidence concerning organizational justice and psychological empowerment among tax-service employees indicates that perceptions of fairness within tax organizations can influence innovative work behavior and organizational performance [9]. This organizational dimension has implications for VAT administration because efficient taxpayer services, consistent enforcement, transparent decision-making, and responsive administrative practices depend substantially on institutional capacity. Accordingly, social justice in taxation should not be interpreted only as the final distribution of tax

burdens; it also encompasses the fairness and effectiveness of the processes through which tax regulations are administered.

In Iran, discussions surrounding taxation and social justice have acquired increasing importance as the government has sought to diversify public revenue sources and reduce structural dependence on volatile resource revenues. VAT has become an important component of this transition and has increasingly occupied a central position in the country's tax system. At the same time, the Iranian economy has experienced substantial macroeconomic fluctuations, inflationary pressures, sanctions, changes in household purchasing power, and persistent distributional concerns. These conditions make the distributive consequences of consumption taxation particularly important. Research examining the macroeconomic effects of VAT has emphasized its potential relationships with major economic indicators and inflation, demonstrating that the implications of VAT extend beyond revenue mobilization to broader macroeconomic outcomes [10]. Inflation is especially relevant to social justice because increases in consumer prices may disproportionately affect households with limited capacity to adjust consumption or protect their real income. Consequently, evaluation of the social implications of VAT in Iran requires consideration of the tax within the wider macroeconomic environment.

The Iranian tax literature has also increasingly emphasized the institutional and normative dimensions of tax justice. A policy model for tax justice aligned with national development principles has highlighted the necessity of incorporating fairness into the design and implementation of taxation policy [11]. Moreover, assessments of justice-oriented indicators in Iran's direct tax and VAT laws have underscored the significance of legal provisions, exemptions, administrative rules, and taxpayer rights in determining the overall fairness of the fiscal system [3]. These studies indicate that the concept of justice in taxation is multidimensional and cannot be reduced to the nominal tax rate. Rather, the interaction among tax legislation, enforcement, economic structure, exemptions, administrative transparency, and the use of tax revenues ultimately determines whether taxation contributes to or detracts from broader social justice.

Legal and regulatory developments also affect the functioning of VAT systems. Contemporary fiscal systems increasingly encounter new forms of economic activity, digital transactions, cross-border commerce, and financial innovation that challenge traditional tax administration. Research examining the regulation of VAT and cryptocurrency speculation in the European Union demonstrates that emerging digital assets create new legal and regulatory questions concerning the scope, applicability, and enforcement of VAT rules [12]. Although such developments arise in different institutional contexts, they underline a broader point relevant to Iran: modern VAT systems must evolve continuously in response to changes in transaction technologies and economic structures. A tax system that fails to adapt to emerging forms of economic activity may generate unequal treatment across taxpayers, weaken the effective tax base, and create opportunities for avoidance, thereby compromising both revenue efficiency and tax justice.

Digital transformation has consequently become a major component of modern VAT reform. In Iran, the development of taxpayer information systems has been regarded as an important step toward the digital transformation of VAT administration, while implementation challenges, institutional consequences, and infrastructure requirements remain substantial [13]. Digitalization can potentially enhance the traceability of transactions, reduce manual administrative burdens, improve data integration, limit opportunities for underreporting, and create more transparent relationships between taxpayers and the tax authority. These mechanisms may also have implications for social justice because more effective identification of the tax base can reduce unequal enforcement and prevent compliant taxpayers from bearing a disproportionate burden due to

widespread evasion by others. Nevertheless, the effectiveness of digital transformation depends on technological infrastructure, interoperability, administrative competence, data quality, cybersecurity, and taxpayers' capacity to comply with new systems.

Blockchain technology represents another emerging avenue for strengthening VAT administration. Systematic reviews of blockchain-based VAT systems suggest that distributed ledger technologies may improve transparency, transaction traceability, real-time verification, and resistance to invoice fraud, while also introducing technical, legal, governance, and implementation challenges [14]. A parallel body of research similarly emphasizes the potential role of blockchain in redesigning VAT processes and strengthening the reliability of transactional records [15]. However, technology adoption is not automatic, and the feasibility of blockchain-based VAT depends on institutional readiness, perceived usefulness, regulatory support, technological competence, cost structures, and stakeholder acceptance. Research on critical factors affecting blockchain adoption in VAT systems confirms that technological transformation requires attention to organizational, regulatory, and sustainability-related conditions rather than technological capabilities alone [16]. Consequently, modernization may contribute to tax justice only when technological reforms are integrated with broader institutional and distributive objectives.

Recent approaches to VAT reform have therefore shifted toward an ecosystem perspective in which tax administration is conceptualized as an interconnected system involving taxpayers, government agencies, technological infrastructures, regulations, data networks, and administrative processes. Research proposing an agile VAT ecosystem model emphasizes the importance of flexibility, institutional coordination, responsiveness, and integrated structures in enhancing the performance of VAT systems [17]. This perspective is particularly relevant for economies characterized by rapid regulatory, technological, and macroeconomic changes because rigid tax structures may not adequately respond to emerging fiscal challenges. An agile tax ecosystem can potentially enhance administrative efficiency and compliance; however, improvements in operational efficiency do not necessarily guarantee distributive justice. It therefore remains necessary to examine whether changes in VAT revenue and the institutionalization of this tax are empirically associated with improvements in income distribution and broader indicators of social justice.

The relationship between taxation and justice must also be understood in light of the distinction between formal legal fairness and actual socioeconomic outcomes. Legal rules may incorporate principles of equality and procedural fairness while the effective incidence of taxation continues to differ substantially across income groups. The Iranian administrative and judicial context demonstrates that tax-related disputes and interpretations may raise important questions concerning taxpayer rights and the equitable application of fiscal rules, as illustrated by research on tax treatment in decisions of the Administrative Court of Justice [18]. Such evidence demonstrates that the practical implementation of tax law is an essential component of tax justice. Formal statutory provisions alone cannot ensure equitable outcomes unless administrative practices, adjudicatory mechanisms, and enforcement procedures operate consistently and transparently.

Despite the expansion of research on VAT administration, taxpayer compliance, technological modernization, tax justice, and macroeconomic effects, an important empirical issue remains insufficiently resolved: whether VAT has contributed measurably to the development of social justice in Iran over the long term. Much of the existing research addresses particular legal, institutional, behavioral, technological, or administrative dimensions of taxation. Studies have examined fairness and trust in taxpayer compliance [1, 7], justice-oriented tax policies and indicators [3, 11], wealth taxation and tax justice [4], organizational processes within tax authorities [9], VAT compliance incentives [8], macroeconomic effects of VAT [10], and the modernization of VAT administration

through digital systems and emerging technologies [13, 16]. However, these strands of literature do not, by themselves, establish whether changes in the relative importance of VAT within Iran's fiscal structure have been associated with sustained changes in income inequality.

This empirical gap is especially significant because the association between VAT and social justice can be influenced by multiple structural macroeconomic factors. Income distribution is shaped not only by taxation but also by economic growth, sectoral composition, trade integration, demographic changes, inflation, labor-market conditions, subsidy policies, and government transfers. Consequently, a simple contemporaneous relationship between VAT revenue and inequality may produce misleading conclusions if broader structural variables and the time-series characteristics of the data are ignored. An appropriate empirical examination should therefore account for stationarity, short-run dynamics, potential long-run equilibrium relationships, and relevant macroeconomic controls. The autoregressive distributed lag framework and the associated bounds-testing approach provide a suitable basis for such an investigation because they permit the simultaneous examination of short-run adjustments and possible long-run relationships within a dynamic time-series framework.

The growing emphasis on technologically advanced, agile, transparent, and justice-oriented tax systems also increases the practical relevance of determining whether VAT is associated with measurable distributive improvements. Digital transformation, blockchain-based administration, compliance reforms, and institutional redesign may strengthen collection efficiency, but the ultimate social justification of these reforms depends partly on how fiscal resources and tax burdens affect social welfare and income distribution. The modernization of VAT administration should therefore be evaluated not only according to operational indicators such as revenue collection and compliance but also in relation to broader socioeconomic outcomes. In this respect, the coexistence of administrative modernization and persistent concerns about inequality raises an important policy question concerning whether the expansion and institutionalization of VAT in Iran have translated into progress toward social justice.

Accordingly, the aim of the present study is to examine the short-run and long-run role of value-added tax in the development of social justice in Iran during 1992–2022, using the Gini coefficient as an inverse indicator of social justice and controlling for key structural macroeconomic factors within an ARDL-UECM bounds-testing framework.

2. Methods and Materials

In terms of purpose, the present study is applied, and in terms of method, it is descriptive and correlational, based on time-series data analysis. The statistical population consisted of all available macroeconomic data for Iran over the period 1992–2022. Given the nature of macroeconomic time-series data, which are collected on a census basis rather than through probabilistic sampling, the statistical sample was identical to the statistical population and included all 31 available annual observations for this period. In other words, the sampling method constituted a complete enumeration (census) of the available data, and no observations were excluded from the statistical population. The research variables included the Gini coefficient (dependent variable, used as an inverse indicator of social justice), the share of value-added tax and taxes on goods and services in gross domestic product (the principal independent variable), and the control variables of per capita gross domestic product, agriculture value added as a share of GDP, trade openness (the sum of exports and imports), and the country's total population. All variables were measured on a ratio scale, which provides the highest level of measurement precision and permits

the full application of mathematical and statistical operations, including logarithmic transformation and differencing.

Data for all research variables were collected through a documentary-library method based on official databases. Data on the Gini coefficient were extracted from the World Income Inequality Database, while the other macroeconomic variables were obtained from the statistical bulletins of the Central Bank of the Islamic Republic of Iran and the World Bank's World Development Indicators database. The validity of the data collection instrument was ensured by relying on the institutional and official credibility of these statistical sources, which serve as principal references for domestic and international economic research. Reliability was assessed through cross-validation of overlapping data across different sources and examination of the methodological notes accompanying each variable. For data analysis, descriptive statistics and the correlation matrix were first calculated. Subsequently, the stationarity of the variables was examined using the Augmented Dickey-Fuller (ADF) and KPSS unit root tests. The Pesaran, Shin, and Smith bounds-testing approach and an autoregressive distributed lag–unrestricted error correction model (ARDL-UECM) were then employed to estimate the short-run and long-run relationships among the variables. A series of classical diagnostic tests, including the Breusch-Godfrey, Breusch-Pagan, White, Jarque-Bera, and Ramsey tests, as well as the CUSUM structural stability test, were conducted to assess the validity of the estimates. All calculations were performed using Python and ordinary least squares (OLS)-based econometric procedures. Finally, the main hypothesis and four subsidiary hypotheses were evaluated at the 95% confidence level based on the results of the aforementioned statistical tests.

3. Findings and Results

This section presents the quantitative findings of the study, including descriptive statistics, unit root tests, the bounds test, estimation of the unrestricted error correction model, diagnostic tests, the structural stability test, and hypothesis testing. The results are presented sequentially in tables and figures, together with an introduction and interpretation for each analysis.

Prior to estimating the econometric model, descriptive statistics for the main research variables, including the mean, median, standard deviation, and Jarque-Bera normality test, were calculated and are presented in Table 1.

Table 1. Descriptive Statistics of the Main Research Variables (1992–2022, n = 31)

Variable	Mean	Standard Deviation	Minimum	Maximum	Jarque-Bera Statistic
Gini coefficient (GINI)	40.273	4.049	34.00	44.80	4.44
Value-added tax, % of GDP (V)	6.369	1.199	3.86	10.16	11.59***
Log of GDP per capita	8.416	0.159	8.15	8.61	3.82
Agriculture share, % of GDP	8.975	2.033	4.64	12.61	1.08
Trade openness, % of GDP	43.909	6.463	29.22	56.62	0.33
Log of population	18.116	0.126	17.93	18.31	2.40

According to Table 1, the mean Gini coefficient for Iran during the study period was 40.27, with a standard deviation of 4.05. The mean share of value-added tax in GDP was also estimated at 6.37%. Its relatively high skewness and kurtosis, reflected in the statistically significant Jarque-Bera statistic, indicate a structural shift associated with the enactment of the Value-Added Tax Law in 2008. The remaining variables follow approximately normal distributions.

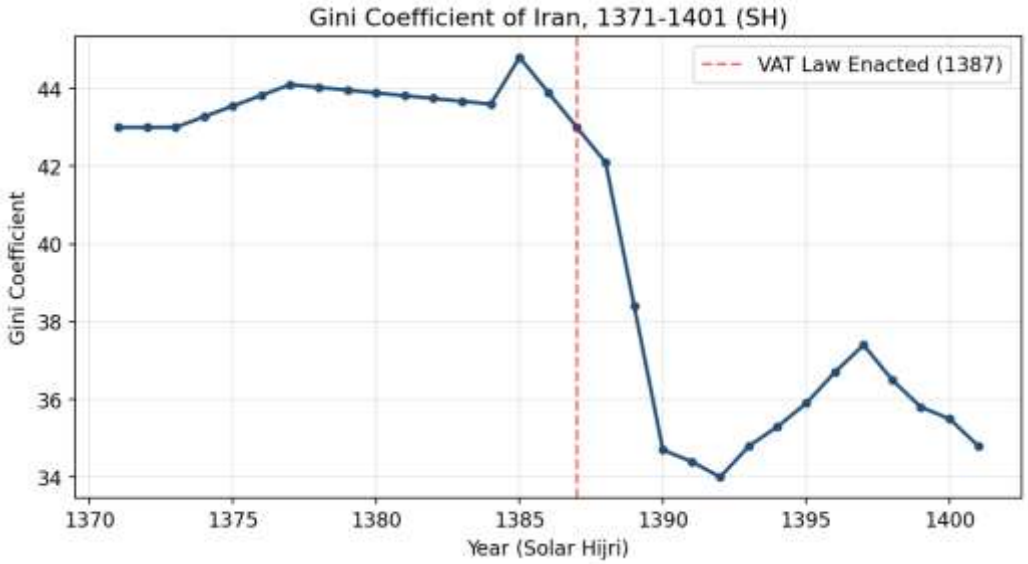


Figure 1. Trend of Iran's Gini Coefficient, 1992–2022

Figure 1 illustrates the trend of the Gini coefficient, which experienced a relatively noticeable decline following the enactment and implementation of the Value-Added Tax Law in 2008 (red dashed line) and concurrently with the implementation of the targeted subsidy reform program. However, because this decline coincided with other policy interventions, identifying the net effect of value-added tax without statistical controls is difficult.

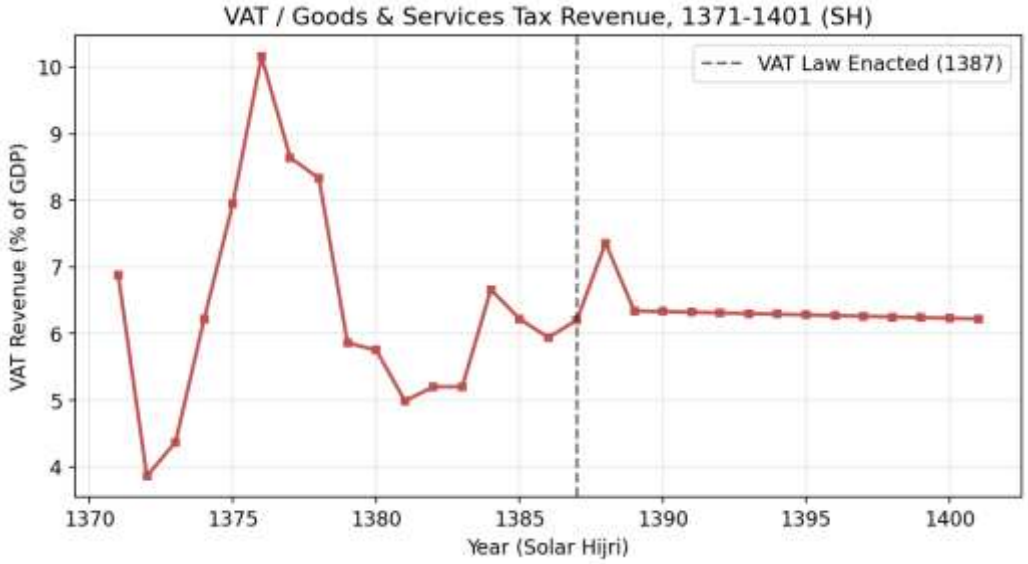


Figure 2. Trend of Value-Added Tax Revenue (% of GDP)

Figure 2 indicates that, following fluctuations during the 1990s, the share of value-added tax revenue stabilized within a relatively narrow range of 6%–7% of GDP after the formal enactment of the law in 2008, indicating the institutionalization of this tax base within the government's revenue structure.

To ensure the absence of any variable integrated of order two [I(2)], which is a prerequisite for the valid application of the bounds-testing approach, the Augmented Dickey-Fuller (ADF) unit root test with an intercept and no trend was performed for the research variables both at level and at first difference. The summarized results are presented in Table 2.

Table 2. Results of the Augmented Dickey-Fuller Unit Root Test (Approximate Critical Value at 95% ≈ −2.97)

Variable	ADF Statistic (Level)	ADF Statistic (First Difference)	Order of Integration
Gini coefficient	−0.76	−3.28	I(1)
Value-added tax	0.16	−7.46	I(1)
GDP per capita	−1.31	−4.68	I(1)
Agriculture share	−2.00	−5.24	I(1)
Trade openness (OPEN)	−1.86	−3.63	I(1)
Population (logarithm)	−1.10	−3.55	I(1)

The results presented in Table 2 indicate that the null hypothesis of a unit root cannot be rejected for any of the variables at level. However, after first differencing, the null hypothesis is rejected for all variables at the 95% confidence level. Therefore, all variables are integrated of the same order, I(1), and the prerequisite for applying the bounds test is satisfied.

Following confirmation that the variables are I(1), the bounds-testing approach developed by Pesaran, Shin, and Smith (2001) was employed to investigate the existence of a long-run cointegrating relationship between the Gini coefficient and the explanatory variables in two specifications: a bivariate model containing only value-added tax and an extended model including the control variables. The results are presented in Table 3.

Table 3. Results of the Pesaran-Shin-Smith Bounds Test for Cointegration

Model	Number of Regressors (k)	F-Statistic	5% Bounds [I(0)–I(1)]	Conclusion
Bivariate model (V)	1	0.023	4.04–4.94	No cointegration
Extended model (V + controls)	5	2.618	2.39–3.38	Inconclusive

As shown in Table 3, the F-statistic for the bivariate model (0.023) is substantially below the lower bound; therefore, the null hypothesis of no cointegration cannot be rejected. The F-statistic for the extended model (2.618) lies between the lower and upper bounds, yielding an inconclusive result. The complementary bounds t-test based on the coefficient of the error correction term was also statistically insignificant in both models ($t = -0.211$ and $t = -1.441$, respectively). Overall, no conclusive evidence of a long-run cointegrating relationship between value-added tax and the Gini coefficient was obtained at the 95% confidence level.

Despite the inconclusive result of the bounds test, the short-run coefficients and adjustment coefficient of the unrestricted error correction model (UECM) were estimated for the extended specification to examine the direction and magnitude of the effects. The principal estimated coefficients are presented in Table 4.

Table 4. Estimation of the Unrestricted Error Correction Model (UECM)—Dependent Variable: ΔGINI

Variable / Indicator	Coefficient	t-Statistic	p-value
GINI(−1) [adjustment coefficient, φ]	−0.1681	−1.441	0.167
V(−1) [level coefficient of value-added tax]	−0.0019	−0.006	0.995
ΔV [short-run coefficient of value-added tax]	0.1203	0.504	0.620
R^2 / Adjusted R^2	0.528 / 0.240	—	—
Overall model F-statistic (p-value)	1.832 (0.123)	—	—

The coefficient of the error correction term ($\varphi = -0.168$) has the theoretically expected negative sign and is consistent with the error-correction mechanism; however, it is not statistically significant ($p = .167$). The short-run coefficient of changes in value-added tax is likewise not statistically significant at the 95% confidence level ($p = .620$). The model's coefficient of determination ($R^2 = .528$) indicates that the inclusion of the control variables

substantially increases explanatory power compared with the simple bivariate model, for which R^2 was only .012. Nevertheless, the overall F-statistic of the model is not statistically significant at the 95% confidence level.

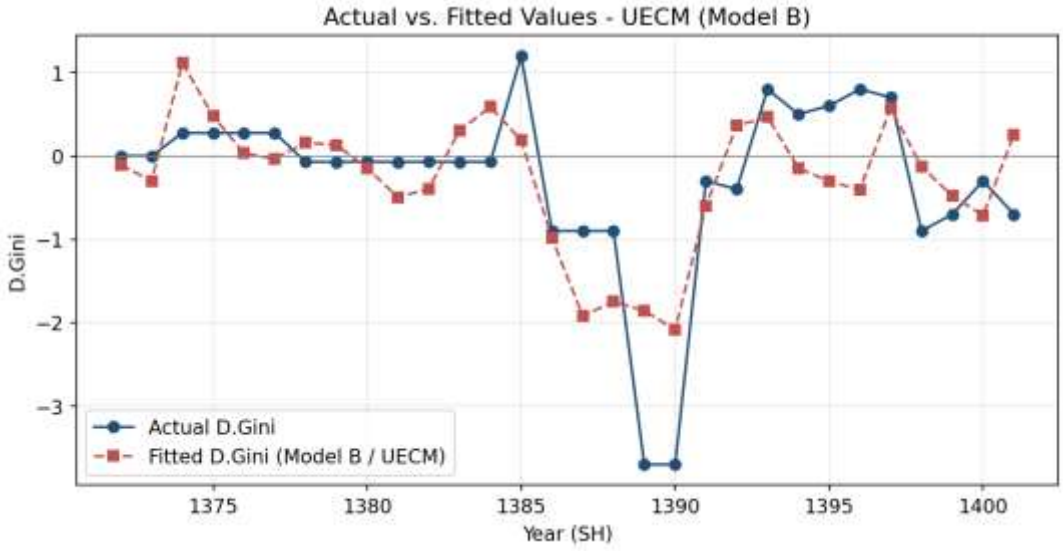


Figure 3. Actual Versus Fitted Changes in the Gini Coefficient (Extended Model)

Figure 3 demonstrates that the estimated model captures, to some extent, the general direction of changes in the Gini coefficient, particularly its pronounced decline between 2009 and 2011, which coincided with the broad implementation of value-added taxation and the targeted subsidy reform program. Nevertheless, the magnitude of actual fluctuations in some years exceeds the values predicted by the model.

To assess the validity of the estimates obtained from the extended model, a set of classical diagnostic tests was conducted for serial correlation, heteroskedasticity, normality, and functional-form specification. The results are summarized in Table 5.

Table 5. Summary of Diagnostic Tests for the Extended Model

Test Type	Test	p-value	Conclusion (5% Level)
Serial correlation	Breusch-Godfrey	0.188	Fail to reject the null hypothesis ✓
Heteroskedasticity	Breusch-Pagan	0.263	Fail to reject the null hypothesis ✓
Heteroskedasticity	White	0.214	Fail to reject the null hypothesis ✓
Residual normality	Jarque-Bera	0.356	Fail to reject the null hypothesis ✓
Functional-form specification	Ramsey RESET	0.034	Reject the null hypothesis ✗

The results in Table 5 indicate that the residuals of the extended model do not exhibit serial correlation, heteroskedasticity, or non-normality. Only the Ramsey specification test rejects the null hypothesis of correct linear functional-form specification at the 95% confidence level, which may indicate the presence of omitted nonlinear relationships in the model specification.

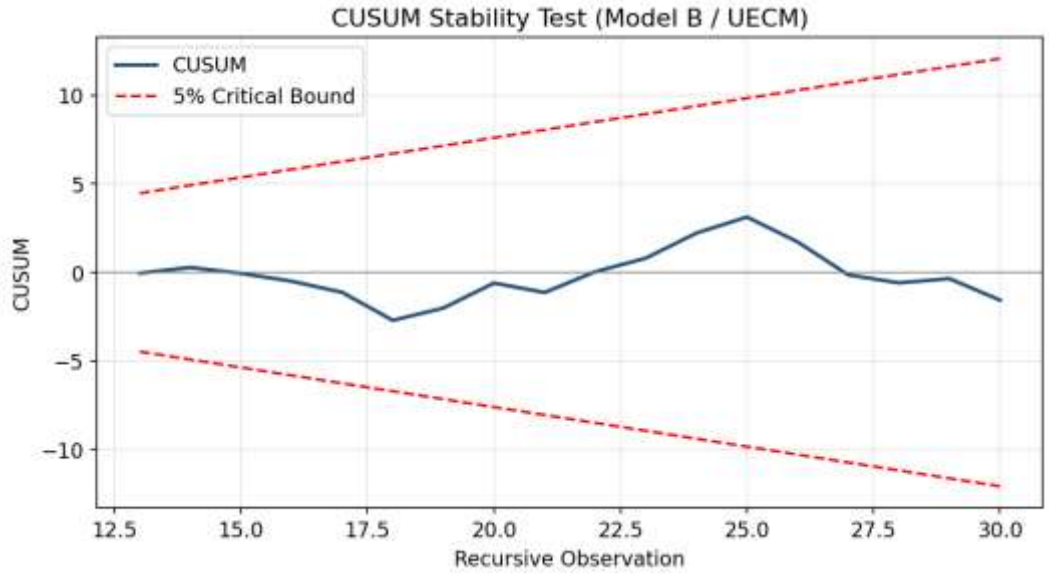


Figure 4. CUSUM Structural Stability Test for the Extended Model

Figure 4 shows that the trajectory of the CUSUM statistic remains within the 5% critical bounds throughout the entire study period, indicating structural stability of the estimated model coefficients despite several policy-related and sanctions-related shocks during the period under investigation.

Finally, by integrating the above results, the main hypothesis and the four subsidiary hypotheses were evaluated at the 95% confidence level. A summary of the conclusions is presented in Table 6.

Table 6. Summary of the Research Hypothesis Testing Results

Hypothesis	Subject	Final Conclusion
Main	Significant relationship between VAT and the development of social justice	Not supported (inconclusive bounds test)
Subsidiary 1	Relationship between VAT and social inequality in the short run	Not supported
Subsidiary 2	Role of control variables	Partially supported (90% confidence level)
Subsidiary 3	Effect of VAT on income inequality in the long run	Not supported
Subsidiary 4	Significant long-run relationship between VAT and social justice	Not supported

Table 6 indicates that, within the framework of the available data, only the subsidiary hypothesis concerning the role of the control variables receives partial support at the 90% confidence level, whereas the remaining hypotheses do not receive conclusive support at the conventional 95% confidence level. This finding is fully consistent with the theoretical ambiguity identified in the relevant literature.

4. Discussion and Conclusion

The present study examined the role of value-added tax in the development of social justice in Iran over the period 1992–2022 using the Gini coefficient as an inverse indicator of social justice and applying the ARDL bounds-testing framework and an unrestricted error correction model. The empirical findings showed that, although the inclusion of structural control variables substantially improved the explanatory power of the model, no conclusive evidence was obtained at the 95% confidence level for a statistically significant long-run relationship between value-added tax and the Gini coefficient. In the bivariate specification, the bounds-test F-statistic was clearly below the lower critical bound, indicating the absence of cointegration between VAT and the Gini coefficient. In the extended specification including macroeconomic controls, the F-statistic fell between the lower and upper bounds,

producing an inconclusive result. The complementary t-bounds test based on the error correction term was also statistically insignificant. In addition, neither the short-run coefficient of VAT changes nor the lagged VAT level coefficient was statistically significant. These results indicate that, within the period and model specification examined, changes in VAT revenue as a share of GDP did not independently generate a statistically robust improvement or deterioration in income distribution.

This result is consistent with the theoretical proposition that the distributive consequences of VAT are conditional rather than automatic. VAT is primarily designed as a broad-based consumption tax and an instrument for revenue mobilization, and its effect on social justice depends on the interaction between tax design, exemptions, tax incidence, household consumption structures, public expenditure, and redistributive policies. The findings therefore support the view that the mere expansion of VAT revenue should not be interpreted as equivalent to progress in tax justice or social justice. Justice-oriented tax policy requires attention not only to the volume of collected revenue but also to the distribution of tax burdens and the use of those revenues across income groups [3, 11]. Similarly, research on wealth and property taxation has emphasized that the capacity of a tax system to advance social justice depends on the composition of the tax base and the way fiscal obligations are distributed throughout society [4]. Accordingly, the absence of a significant independent long-run VAT effect in the present study can be interpreted as evidence that consumption taxation alone is unlikely to alter inequality unless it is embedded within a broader redistributive fiscal architecture.

The insignificant short-run coefficient of VAT also suggests that annual changes in VAT revenue do not immediately translate into measurable changes in the Gini coefficient. This is economically plausible because income distribution is affected by multiple simultaneous processes, including inflation, employment, real wages, public transfers, economic growth, sectoral shifts, trade exposure, and demographic change. VAT may influence household welfare through prices and consumption costs, but the magnitude and direction of this effect can be offset by subsidies, transfer programs, exemptions on essential goods, or changes in other taxes and government expenditures. Research on the macroeconomic effects of VAT has similarly indicated that the consequences of VAT extend beyond revenue generation and may interact with inflation and other macroeconomic variables [10]. This is particularly relevant in the Iranian context, where macroeconomic volatility can weaken any direct statistical link between a single tax instrument and inequality.

The partial improvement in explanatory power after the inclusion of control variables is therefore an important finding. The R^2 of the extended model increased substantially relative to the simple bivariate model, indicating that inequality is better explained when VAT is considered alongside broader structural determinants. Although the overall F-statistic remained statistically insignificant at the 95% confidence level, the increase in model fit suggests that the social distributional environment is shaped by a combination of fiscal and macroeconomic forces rather than by VAT in isolation. This result aligns with the broader literature on tax justice, which treats fairness as a multidimensional outcome influenced by institutional, economic, administrative, and behavioral conditions. Theoretical and empirical work has shown that taxpayers' perceptions of fairness, trust, and the optimal use of tax revenues are important components of tax legitimacy and compliance behavior [1, 2]. In this sense, the distributive effectiveness of VAT may depend not only on tax rates or revenue levels but also on how taxpayers perceive the broader fiscal system and how governments convert tax revenue into public services and social benefits.

The finding that the error correction coefficient was negative but statistically insignificant also deserves attention. The negative sign is theoretically consistent with convergence toward a long-run equilibrium, but the lack of statistical significance indicates that deviations from a putative long-run relationship between inequality and the

explanatory variables were not corrected strongly or systematically during the period under study. This may reflect structural instability in the broader economy even though the CUSUM test suggested that the estimated model coefficients remained within the conventional stability bounds. The coexistence of coefficient stability with weak long-run adjustment implies that the model may be structurally stable while the underlying relationship remains economically weak. In other words, the absence of parameter instability does not necessarily imply the existence of a meaningful long-run distributive effect.

The inconclusive long-run relationship is also compatible with the international literature showing that the social impact of VAT depends heavily on fiscal recycling and revenue allocation. Evidence from Nigeria indicates that VAT revenue transfers can contribute to regional social development when tax proceeds are redistributed through governmental mechanisms and directed toward social objectives [5]. This reinforces the interpretation that VAT can support social justice indirectly through expenditure channels rather than through the tax mechanism itself. Consequently, if VAT revenue in Iran is not sufficiently targeted toward lower-income households, deprived regions, social protection, public health, or education, the distributive effect may remain statistically weak even when VAT constitutes an important source of public revenue. The present findings therefore support a distinction between the revenue effect of VAT and its redistributive effect.

The results are also consistent with evidence emphasizing the importance of compliance and institutional trust in determining the effectiveness of VAT systems. A tax system with weak compliance may generate unequal burdens because compliant taxpayers bear a larger effective share of the fiscal obligation while noncompliant actors escape or reduce their liabilities. Studies have shown that perceived justice and tax knowledge are associated with taxpayer compliance [7], while justice and trust are central to compliance behavior in the Iranian tax context [2]. Experimental evidence has further shown that trust in government and compliance costs influence VAT compliance incentives [8]. These findings help explain why increases in statutory or collected VAT revenue do not necessarily produce direct distributive improvements. If enforcement is uneven, if compliance costs differ across taxpayers, or if institutional trust is weak, the tax burden may remain unevenly distributed and the potential contribution of VAT to social justice may be diluted.

Administrative quality is another factor that may explain the weak direct relationship between VAT and inequality. Research on tax administration has indicated that organizational justice and employee empowerment can affect innovative work behavior and institutional performance within tax organizations [9]. A more capable and procedurally fair tax administration can improve consistency, taxpayer service, audit effectiveness, and dispute resolution. These institutional attributes are relevant to social justice because unequal enforcement, administrative discretion, and procedural complexity can undermine the fairness of a tax system even when the statutory rules are formally neutral. Therefore, the insignificant relationship observed in the present study may partly reflect the difference between formal VAT policy and its actual implementation within the administrative system.

The legal and regulatory environment also contributes to this interpretation. Research on tax-related decisions in the Administrative Court of Justice has demonstrated that the implementation and interpretation of tax rules can generate disputes that affect taxpayer rights and perceptions of fairness [18]. This suggests that tax justice is influenced by both substantive tax rules and their legal-administrative application. In the context of VAT, exemptions, refunds, filing requirements, invoice rules, audit practices, and appeal mechanisms can all shape the actual distribution of costs. Accordingly, the absence of a clear statistical association between VAT and the Gini coefficient does not imply that VAT is irrelevant to justice; rather, it indicates that its impact is mediated through institutional and administrative channels that are not fully captured by an aggregate revenue-to-GDP ratio.

The modernization of VAT administration may also affect future distributive outcomes, even if the historical relationship observed in this study is weak. Recent research in Iran has emphasized the role of digital taxpayer systems in the transformation of VAT administration and has identified implementation challenges and institutional requirements associated with digital reform [13]. Digital systems can potentially reduce underreporting, improve invoice matching, increase transaction traceability, and make enforcement more consistent across taxpayers. In principle, these improvements could strengthen horizontal equity by reducing opportunities for evasion and ensuring that similarly situated taxpayers face more comparable tax burdens. However, the benefits of digitalization depend on infrastructure, system integration, taxpayer capability, data quality, and administrative readiness.

Similarly, blockchain-based VAT systems have been proposed as mechanisms for improving transparency, traceability, and fraud prevention. Systematic reviews have highlighted the potential of blockchain to strengthen VAT administration while also drawing attention to legal, organizational, and technical challenges [14, 15]. Research on the critical factors influencing blockchain adoption in VAT systems further shows that technological effectiveness depends on institutional preparedness, regulatory support, stakeholder acceptance, and implementation capacity [16]. These findings are relevant to the present study because they suggest that the relationship between VAT and justice may change over time as tax administration becomes more technologically advanced. The historical data analyzed here largely reflect a period in which the Iranian VAT system was still developing administratively and technologically; future effects may therefore differ as digital reforms mature.

The finding that VAT did not exhibit a statistically significant long-run effect on inequality should also be interpreted in light of the evolving nature of fiscal systems. An agile VAT ecosystem, characterized by coordination among taxpayers, tax authorities, digital systems, and regulatory institutions, has been proposed as a more responsive model of tax administration [17]. Such an ecosystem may improve the efficiency and adaptability of VAT collection, but efficiency alone does not guarantee distributive fairness. To contribute to social justice, improvements in collection must be accompanied by decisions concerning tax exemptions, targeted relief, expenditure allocation, and compensation for vulnerable households. Therefore, the empirical insignificance found in this study may reflect a structural disconnect between tax collection efficiency and redistributive policy.

The broader political economy of VAT is also important. The adoption and implementation of VAT are shaped by political priorities, public acceptance, fiscal constraints, and institutional bargaining. Research on VAT policy in Ghana has shown that political processes can significantly influence the design and implementation of the tax [6]. This perspective is useful for interpreting the Iranian case because decisions concerning tax rates, exemptions, implementation timing, and revenue use are not purely technical. Political and institutional considerations can determine whether VAT functions mainly as a revenue instrument or as part of a broader redistributive strategy. The weak statistical association with the Gini coefficient found in the present study suggests that VAT may have operated primarily as a fiscal financing mechanism rather than as an independently effective instrument of inequality reduction.

The results are additionally consistent with research emphasizing that fairness in taxation is not confined to a single tax instrument. Tax justice is produced by the overall configuration of the tax system, including direct taxes, indirect taxes, wealth taxes, exemptions, administrative procedures, and public expenditures [3, 4]. This is particularly important because VAT is generally less progressive than well-designed direct taxation. Therefore, a tax mix that relies heavily on consumption taxation without sufficiently progressive income, wealth, or property taxes may have limited capacity to reduce inequality. The lack of a strong VAT effect in the present study thus

reinforces the need to evaluate tax justice at the system level rather than attributing distributive outcomes to one tax source.

Finally, the Ramsey RESET test indicated a potential functional-form misspecification, suggesting that nonlinear or omitted relationships may exist. This finding is substantively important because the effect of VAT on inequality may vary across different VAT levels, inflation regimes, growth periods, or policy episodes. The distributive effect may also depend on interaction terms, such as the interaction between VAT and social transfers, VAT and inflation, or VAT and the degree of informality in the economy. Therefore, the absence of a significant linear effect should not be interpreted as definitive evidence that VAT has no distributive implications. Rather, the results indicate that the relationship is likely to be complex, conditional, and mediated by structural and policy variables.

The principal limitation of this study is the relatively small number of annual observations available for the 1992–2022 period, which restricts statistical power and the number of parameters that can be estimated reliably in a dynamic time-series framework. In addition, the use of aggregate national indicators may conceal heterogeneous effects across income deciles, regions, household types, and consumption categories. The VAT variable represents tax revenue as a share of GDP rather than the effective tax burden borne by specific socioeconomic groups, and the Gini coefficient captures overall income inequality without identifying the channels through which taxation affects household welfare. The study is also limited by the possibility of omitted variables, as reflected in the Ramsey RESET result, and by the potential influence of major policy changes, sanctions, inflationary episodes, subsidy reforms, and institutional transformations that may not be fully captured by the included controls.

Future research should extend the analysis by using household-level or decile-level data to estimate the effective incidence of VAT across different income groups and to distinguish between nominal tax liability and actual consumption burden. Researchers should also examine nonlinear ARDL specifications, threshold models, structural break models, or regime-switching approaches to determine whether the effect of VAT changes across macroeconomic conditions. Additional explanatory variables such as inflation, unemployment, government transfers, subsidy payments, informality, social expenditures, tax exemptions, and effective VAT rates should be incorporated where data permit. Comparative studies between Iran and other countries with similar fiscal structures could also help identify institutional conditions under which VAT contributes more effectively to social justice.

From a practical perspective, policymakers should avoid treating VAT expansion as an independent instrument of social justice and should instead integrate VAT policy with targeted redistribution, progressive direct taxation, social transfers, and protection of essential consumption. Exemptions and reduced rates should be evaluated periodically to ensure that they effectively protect lower-income households without creating excessive complexity or opportunities for abuse. Tax administration should continue to improve digital reporting, invoice verification, interoperability, taxpayer services, and enforcement consistency in order to reduce unequal compliance burdens. In addition, greater transparency regarding the allocation of VAT revenues to social programs could strengthen public trust and reinforce the legitimacy of the tax system. A coordinated fiscal strategy that links efficient VAT collection with explicit redistributive objectives is more likely to promote social justice than reliance on VAT revenue growth alone.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

Acknowledgments

Authors thank all participants who participate in this study.

Conflict of Interest

The authors report no conflict of interest.

Funding/Financial Support

According to the authors, this article has no financial support.

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