Acta Universitatis Danubius
ŒCONOMICA

Fiscal Structure and Tax Revenue Dynamics in Morocco: A Disaggregated Time Series Analysis

Mounir Atlassi[1], Mohamed Karim[2], Ilham Dkhissi[3]

Abstract: This paper examines the dynamics of tax revenues and fiscal structure in Morocco over the period 2000–2024, with a particular focus on the temporal behavior of major tax components and their adjustment to revenue fluctuations. Building on the literature on fiscal dynamics in emerging economies, the study emphasizes the role of tax composition in shaping revenue stability. The empirical analysis relies on autoregressive integrated moving average (ARIMA) models. Unit root tests are first conducted to determine the stochastic properties of the series, followed by model identification, estimation, and diagnostic validation. The results indicate that all tax series are integrated of order one, suggesting persistent shocks and long-lasting effects. The findings also reveal heterogeneous dynamic patterns across tax instruments: personal income tax is sensitive to short-term fluctuations, corporate income tax exhibits dynamics consistent with a highly cyclical tax base, while value added tax displays greater stability due to its broader base. These results highlight the central role of fiscal structure in shaping revenue resilience. The paper contributes to the literature by showing that fiscal performance depends not only on the level of taxation, but also on the stochastic behavior and dynamic properties of its components.

Keywords: fiscal resilience; cyclical dynamics; revenue volatility; fiscal shocks; tax composition

[1] Ph.D. student, FSJES-Salé, Mohammed V University, Rabat, Morocco, Address: Route Outa Hssain, Sala Al Jadida B.P. 5295 Salé, Morocco, Corresponding author: atlassmounir@gmail.com.
[2] Full Professor, Ph.D., FSJES-Salé, Mohammed V University, Rabat, Morocco, Address: Route Outa Hssain, Sala Al Jadida B.P. 5295 Salé, Morocco, E-mail: xmedkarimx@gmail.com.
[3] Associate Professor, Ph.D., BEAR Lab, Rabat Business School, International University of Rabat, Morocco, Address: Parc Technopolis, Rocade de Rabat-Salé, 11 100 Sala Al Jadida, Rabat, Morocco, E-mail: ilham.dkhissi@uir.ac.ma.

JEL Classification: C22; H21; H23; E62

1. Introduction

The mobilization of tax revenues constitutes a central challenge for emerging economies, as it determines governments' capacity to finance public expenditure, support economic growth, and ensure fiscal sustainability. In this context, understanding the behavior of tax revenues is essential for assessing both the performance of tax systems and their resilience to economic fluctuations. However, beyond aggregate revenue levels, the temporal properties and adjustment mechanisms of tax revenues remain insufficiently explored, particularly in emerging economies.

In Morocco, tax reforms initiated since the 1980s have significantly modernized the fiscal system and strengthened domestic resource mobilization. Despite these advances, persistent structural constraints continue to shape the tax system, including a narrow tax base, the importance of the informal sector, and a high concentration of the tax burden on a limited number of taxpayers, particularly salaried workers and formal firms. These features call for a more refined analytical framework that goes beyond aggregate indicators and explicitly accounts for the dynamic behavior of tax revenues.

The empirical literature has largely focused on the macroeconomic determinants of tax revenues and their long-run relationship with economic growth. By contrast, relatively limited attention has been devoted to modeling the intrinsic dynamics of tax revenues, especially at a disaggregated level. In particular, the stochastic properties and temporal adjustment patterns of major tax components—personal income tax, corporate income tax, and value added tax—remain underexplored in the Moroccan context.

Against this background, this paper examines the dynamics of tax revenues in Morocco over the period 2000–2024 using autoregressive integrated moving average (ARIMA) models. This approach makes it possible to characterize short-term adjustment patterns, assess shock persistence, and identify heterogeneous dynamic behaviors across tax instruments. The analysis covers both the main components of domestic taxation and overall tax pressure, thereby providing a comprehensive and disaggregated perspective on the evolution of the Moroccan tax system.

The empirical results reveal differentiated dynamic structures across tax categories. Corporate income tax displays patterns consistent with a highly cyclical tax base and a marked sensitivity to fluctuations reflected in revenue series, whereas value added tax exhibits greater stability, reflecting the breadth and diversification of its base. Personal income tax occupies an intermediate position, with dynamics largely driven by short-term adjustments. These findings highlight the critical role of fiscal structure in shaping the stability and resilience of public revenues.

This paper contributes to the literature in several ways. First, it provides updated empirical evidence on tax revenue dynamics in an emerging economy by adopting a disaggregated time series perspective. Second, it shows that fiscal resilience is not only determined by the aggregate level of taxation, but also by the stochastic behavior and dynamic properties of individual tax components. Third, it emphasizes the importance of fiscal composition by uncovering heterogeneous adjustment patterns across tax instruments. Finally, it offers policy-relevant insights by showing how the internal structure of the tax system conditions its capacity to absorb and transmit shocks.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 presents the data and methodology. Section 4 reports the empirical results. Section 5 discusses the main findings and their policy implications. Section 6 concludes and outlines avenues for future research.

2. Literature Review

2.1. Taxation and Revenue Mobilization in Emerging Economies

Tax revenue mobilization is widely recognized as a fundamental determinant of governments' capacity to finance public policies and sustain economic growth, particularly in emerging economies. The literature highlights the structural role of key factors such as the level of development, the productive structure, trade openness, and institutional quality in shaping tax performance (Tanzi, 1992; Bird & Zolt, 2008; Besley & Persson, 2014).

In this context, several studies emphasize that emerging economies face structural constraints that limit their tax capacity, including the prevalence of informality, narrow tax bases, and institutional weaknesses (IMF, 2011; Keen, 2012). These

features often result in a high concentration of the tax burden on a limited number of formal taxpayers, thereby affecting both efficiency and equity.

Beyond the level of revenues, an important strand of the literature underscores the role of tax structure in determining fiscal stability. Indirect taxation, particularly value added tax, is generally found to be more resilient to economic fluctuations due to the breadth and diversification of its base (OECD, 2010; Arnold et al., 2011). In contrast, direct taxes, especially corporate income tax, tend to be more sensitive to business cycle conditions given their dependence on profit variability (Devereux et al., 2004).

2.2. Tax Revenue Dynamics and Macroeconomic Sensitivity

Beyond structural determinants, a growing body of research has focused on the dynamic behavior of tax revenues and their sensitivity to macroeconomic fluctuations. These studies consistently highlight the procyclical nature of certain tax categories, particularly those linked to income and profits, which respond strongly to changes in economic activity (Gale & Samwick, 2016).

The underlying mechanisms are mainly associated with the variability of tax bases, tax elasticities, and institutional adjustment processes (Sancak et al., 2010). Within this framework, corporate income tax is typically identified as the most volatile component of tax revenues, whereas value added tax tends to exhibit greater stability due to the relative persistence of consumption patterns (Auerbach & Gorodnichenko, 2012).

However, despite these advances, the literature remains predominantly focused on identifying macroeconomic determinants rather than examining the intrinsic temporal properties of tax series. In particular, issues such as shock persistence, short-term adjustment dynamics, and heterogeneous temporal responses across tax instruments remain relatively underexplored, especially in emerging economies.

2.3. Time Series Approaches and ARIMA Models in Public Finance

Time series analysis provides a relevant methodological framework for investigating the dynamic properties of fiscal variables. The Box–Jenkins methodology (1976) allows for the modeling of stochastic processes by capturing temporal dependencies and persistence patterns in economic series.

Autoregressive integrated moving average models are particularly suitable for analyzing non-stationary data, as they explicitly account for autoregressive and moving average components that govern the evolution of time series. These models have been widely applied in macroeconomic forecasting and empirical analysis, including in the field of public finance (Asteriou & Hall, 2011).

Nevertheless, in the fiscal domain, the use of ARIMA models remains relatively limited and is often confined to forecasting exercises (Edwards et al., 2016). Their application to the disaggregated analysis of tax revenue dynamics, particularly with the aim of identifying adjustment mechanisms and persistence across different tax categories, is still insufficiently developed, especially in the context of emerging economies and in the case of Morocco.

2.4. Research Gaps and Contribution of the Study

Despite the richness of the existing literature, several limitations can be identified. First, most studies adopt a macro-determinant perspective, focusing on long-run relationships while largely overlooking the short-run dynamics and intrinsic temporal properties of tax revenues. Second, disaggregated analyses by tax category remain relatively scarce, despite the well-documented heterogeneity in the behavior of different tax instruments. Third, the application of time series approaches—particularly ARIMA frameworks—to the analysis of fiscal dynamics in emerging economies remains limited and is often confined to forecasting purposes rather than structural interpretation.

Against this background, this paper contributes to the literature by showing that fiscal resilience is not only determined by the aggregate level of taxation, but also by the stochastic behavior and dynamic properties of each tax component. By adopting a disaggregated time series perspective, it provides an empirical characterization of tax-specific adjustment mechanisms and highlights how the internal composition of the tax system shapes revenue stability. In doing so, the paper moves beyond aggregate approaches to fiscal performance and emphasizes the importance of dynamic heterogeneity across tax instruments in understanding fiscal resilience.

3. Methodology

3.1. General Analytical Framework

The objective of this study is to analyze the dynamics of tax revenues in Morocco using a time series approach based on autoregressive integrated moving average models. This framework allows for the characterization of the dynamic properties of fiscal series by capturing their dependence on past values and the effects of stochastic shocks.

Unlike structural approaches that aim to establish causal relationships between macroeconomic variables, autoregressive integrated moving average models adopt a univariate perspective focused on the intrinsic temporal behavior of each series. This approach is particularly suitable for examining short-term adjustment mechanisms, shock persistence, and memory effects in tax revenues.

The analysis is conducted separately for the main components of domestic taxation—personal income tax, corporate income tax, and value added tax—as well as overall tax pressure, in order to highlight potential differences in their dynamic behavior.

3.2. Model Specification

Each tax series is modeled using an autoregressive integrated moving average process of order (*p,d,q*), defined as follows:

$$\Delta^{\mathrm{d}}\mathrm{T}_{\mathrm{k,t}} = \mathrm{c}_k + \sum_{i=1}^{p} \phi_{k,i}\Delta\mathrm{T}_{\mathrm{k,t-i}} + \sum_{j=1}^{q} \theta_{k,j}\varepsilon_{k,t-j} + \varepsilon_{\mathrm{k,t}}$$

where $\mathrm{T}_{\mathrm{k,t}}$ denotes tax category *k* (personal income tax, corporate income tax, value added tax, or overall tax pressure) expressed as a percentage of gross domestic product; *d* represents the degree of differencing; *p* and *q* denote the autoregressive and moving average orders, respectively; and $\varepsilon_{\mathrm{k,t}}$ is a white noise error term with zero mean and constant variance.

The parameter *d* plays a central role, as ensuring stationarity is a necessary condition for valid estimation and inference.

3.3. Data and Variable Construction

The empirical analysis is based on annual data covering the period 2000–2024. The variables correspond to the main components of tax revenues expressed as a percentage of nominal gross domestic product, namely personal income tax, corporate income tax, value added tax, and overall tax pressure.

The data are obtained from official sources, including the High Commission for Planning and the Directorate of Studies and Financial Forecasts. Expressing variables as ratios to gross domestic product allows for controlling scale effects and improving comparability over time.

3.4. Estimation Strategy: Box–Jenkins Methodology

The estimation follows the Box–Jenkins methodology, which consists of three main steps.

First, the identification stage determines the degree of integration of each series using unit root tests, particularly the augmented Dickey–Fuller test. The orders *p* and *q* are then selected based on the analysis of autocorrelation and partial autocorrelation functions.

Second, the estimation stage relies on maximum likelihood techniques. Several alternative specifications are estimated for each series, and the optimal model is selected using the Akaike and Schwarz information criteria, ensuring a balance between goodness of fit and parsimony.

Third, the validation stage assesses model adequacy through diagnostic tests applied to residuals. These include the Ljung–Box test for serial correlation, the Jarque–Bera test for normality, and tests for conditional heteroskedasticity. A model is considered valid when residuals behave as a white noise process:

$$Et \sim WN(0,\sigma^2)$$

3.5. Limitations of the Approach

Despite its relevance, the autoregressive integrated moving average framework presents certain limitations. Its univariate nature does not allow for the identification of causal relationships between tax revenues and macroeconomic determinants. In

addition, the presence of structural breaks—particularly those associated with fiscal reforms—may affect the stability of the estimated models.

4. Results

4.1. Descriptive Analysis and Time Series Properties

The evolution of the main tax revenues in Morocco is presented in Figure 1. The level series—personal income tax (PIT), corporate income tax (CIT), value added tax (VAT), and overall tax pressure (TP)—exhibit a generally upward trend over the study period, reflecting both economic expansion and the effects of fiscal reforms.

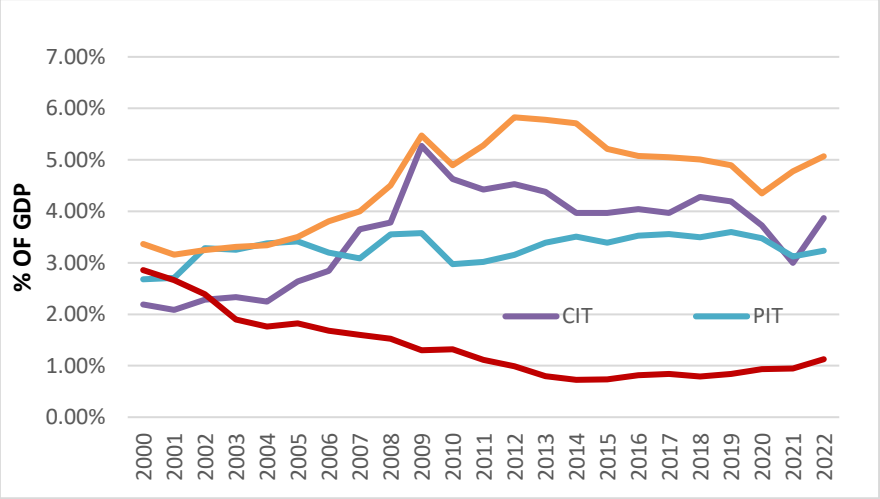

Figure 1. Evolution of tax revenues in Morocco (PIT, CIT, VAT, TP, % of GDP)
Source: Authors' calculations based on HCP (High Commission for Planning) and DEPF (Directorate of Financial Studies and Forecasts) data

Figure 2 presents the series in levels and their first differences.

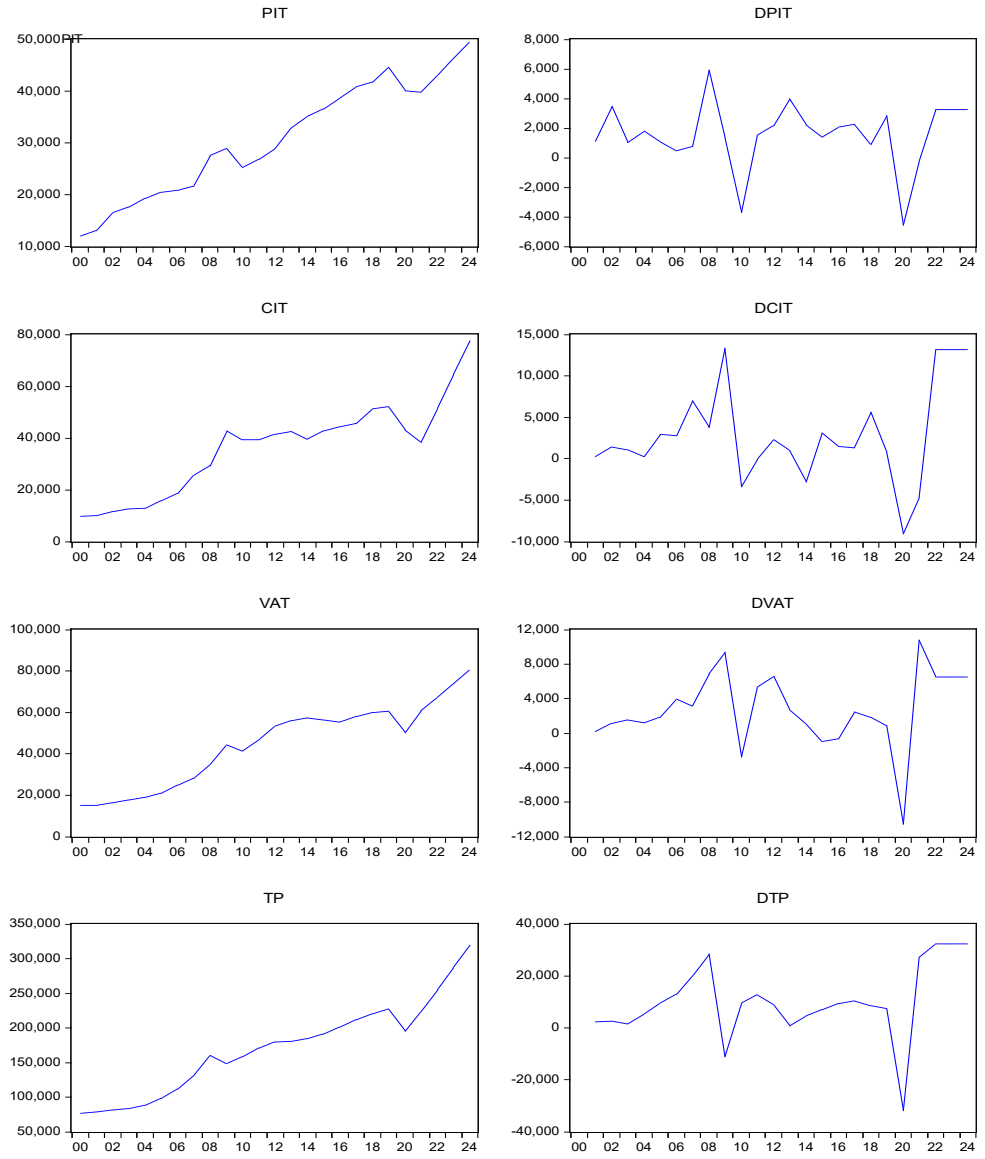

Figure 2. Evolution of tax series and their first differences (PIT, CIT, VAT, TP)

Source: Authors' calculations based on HCP and DEPF data, EViews estimations

The graphical analysis indicates that the level series are non-stationary, characterized by a pronounced trend. In contrast, the first-differenced series fluctuate around a stable mean, indicating stationarity. This suggests that shocks have persistent effects in levels but are transitory in differences.

4.2. Unit Root Tests

The results of the augmented Dickey–Fuller (ADF) tests are reported in Table 1.

Table 1. Unit root tests (ADF)

Variable	Level ADF	p-value	Conclusion	Difference ADF	p-value	Conclusion
PIT	-2.908	0.060	Non-stationary	-5.432	0.000	Stationary
CIT	-0.183	0.928	Non-stationary	-4.987	0.000	Stationary
VAT	-0.017	0.948	Non-stationary	-5.201	0.000	Stationary
TP	-3.555	0.015	Borderline	-6.012	0.000	Stationary

Source: Authors' calculations based on HCP and DEPF data, EViews estimations

The results confirm that all series are integrated of order one:

$$T_{k,t} \sim I(1), \qquad \Delta T_{k,t} \sim I(0)$$

4.3. Model Identification

The autocorrelation (ACF) and partial autocorrelation (PACF) functions are presented in Figure 3, providing insights into the underlying dynamic structures.

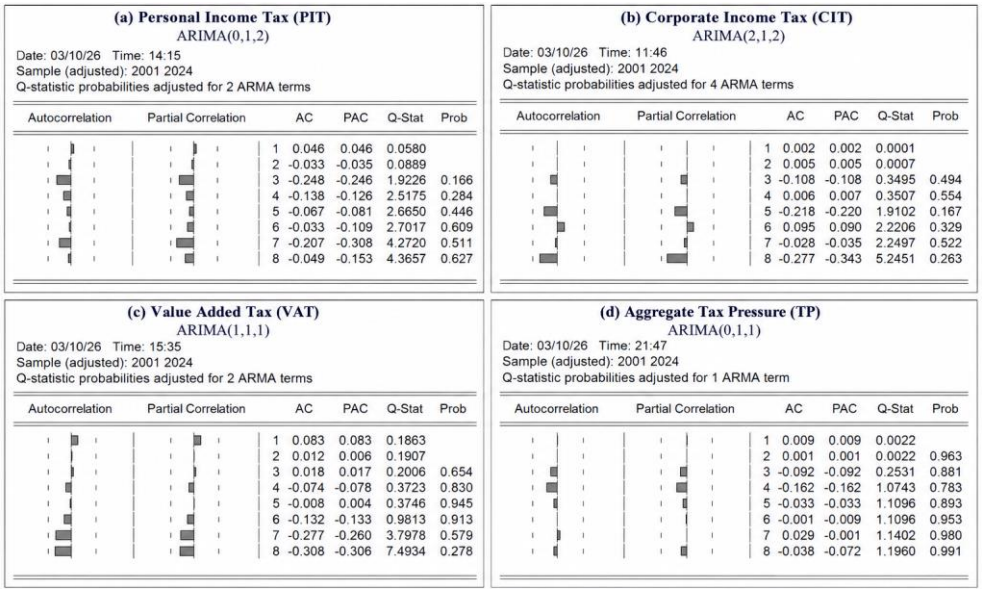

Figure 3. Correlograms (ACF and PACF) of differenced series

Source: Authors' calculations based on HCP and DEPF data, EViews estimations

Based on these diagnostics, the selected models are reported in Table 2.

Table 2. Selected ARIMA models

Variable	Model	AIC	BIC	Durbin-Watson
PIT	ARIMA(0,1,2)	18.197	18.393	1.89
CIT	ARIMA(2,1,2)	20.275	20.570	1.93
VAT	ARIMA(1,1,1)	19.824	20.020	1.78
TP	ARIMA(0,1,1)	22.166	22.314	1.89

Source: Authors' calculations based on HCP and DEPF data, EViews estimations

These results indicate heterogeneous dynamic structures across tax categories, reflecting differentiated adjustment mechanisms.

4.4. Estimation of ARIMA Models

The estimation results are presented in Table 3.

Table 3. ARIMA estimation results

Variable	Constant	AR(1)	AR(2)	MA(1)	MA(2)
PIT	1488.87	—	—	-0.39	-0.61
CIT	2315.19	1.202	-0.627	-1.164	0.164
VAT	2657.27	0.744	—	-1.000	—
TP	10238.80	—	—	0.190	—

Note: The magnitude of the estimated constants reflects the scaling and transformation of the series used in the ARIMA specification and does not carry a direct economic interpretation. The coefficients should therefore be interpreted in terms of dynamic adjustment rather than absolute magnitude.

Source: Author's calculations based on HCP and DEPF data, EViews estimations.

The estimated equations are as follows:

$$\Delta PIT_t = 1488.87 + \varepsilon_t - 0.39\varepsilon_{t-1} - 0.61\varepsilon_{t-2}$$

$$\Delta CIT_t = 2315.19 + 1.202\Delta CIT_{t-1} - 0.627\Delta CIT_{t-2} - 1.164\varepsilon_{t-1} + 0.164\varepsilon_{t-2} + \varepsilon_t$$

$$\Delta VAT_t = 2657.27 + 0.744\Delta VAT_{t-1} - 1.000\varepsilon_{t-1} + \varepsilon_t$$

$$\Delta TP_t = 10238.80 + \varepsilon_t + 0.190\,\varepsilon_{t-1}$$

These results highlight the presence of differentiated dynamic structures across tax series, characterized by specific combinations of autoregressive and moving average components.

4.5. Model Validation

Diagnostic test results are presented in Table 4.

Table 4. Diagnostic tests

Variable	Ljung-Box (p)	Jarque-Bera (p)	ARCH (p)	Conclusion
PIT	0.651	0.440	0.783	Valid
CIT	0.263	0.679	0.513	Valid
VAT	0.278	0.000	0.953	Acceptable
TP	0.991	0.070	0.223	Valid

Source: Authors' calculations based on HCP and DEPF data, EViews estimations.

Residuals can be approximated as a white noise process:

$$\varepsilon_t \sim WN(0,\sigma^2)$$

These results confirm the econometric validity of the estimated models.

4.6. Synthesis of Empirical Results

Table 5. Summary of tax dynamics

Tax	Volatility	Dynamics	Nature
PIT	Medium	Short-term	Adjustment
CIT	High	Persistent	Cyclical dynamics
VAT	Low	Stable	Inertial
TP	Moderate	Aggregated	Composite

Source: Authors' calculations based on HCP and DEPF data, EViews estimations.

This synthesis highlights the heterogeneity of fiscal dynamics, reflecting differentiated behavior across tax bases and adjustment mechanisms.

4.7. Empirical Characteristics of Tax Dynamics

The results reveal several empirical regularities. Tax revenues exhibit significant persistence in levels, reflecting the lasting effects of economic shocks. Furthermore, the dynamics differ across tax instruments, with some series dominated by short-term adjustments and others characterized by greater inertia.

These findings confirm the existence of tax-specific dynamic structures, without prejudging their economic implications, which are examined in the following section.

5. Discussion

The empirical findings reveal pronounced heterogeneity in the dynamics of tax revenues in Morocco, reflecting the diversity of tax bases and the distinct adjustment mechanisms associated with each tax category. More fundamentally, these results show that tax systems cannot be adequately understood through aggregate indicators alone, since fiscal dynamics are strongly shaped by the structural composition of taxation. This perspective is consistent with the theoretical and empirical literature emphasizing asymmetric responses of public revenues to economic fluctuations (OECD, 2010; Arnold et al., 2011). The ARIMA framework does not identify the macroeconomic sources of these fluctuations; rather, it captures how each tax component absorbs, transmits, or smooths shocks once they are reflected in revenue series.

Corporate income tax emerges as the most dynamically sensitive component of the tax system, displaying dynamics consistent with a highly cyclical tax base. The presence of strong autoregressive dynamics, combined with persistent shock effects, suggests that variations in the underlying profit base are closely reflected in fiscal revenues. This interpretation is consistent with Devereux et al. (2004) and Auerbach and Gorodnichenko (2012), who show that corporate taxation tends to amplify economic fluctuations rather than smooth them. In the Moroccan context, this pattern is likely reinforced by the concentration of the tax base on a relatively small number of formal firms, thereby increasing exposure to shocks and revenue variability.

In contrast, value added tax displays a more stable and inertial dynamic structure. Its weaker sensitivity to short-term fluctuations reflects the broader and more diversified nature of its tax base, which is less directly tied to economic variability than corporate profits. This finding reinforces the view that indirect taxation plays a stabilizing role in public finances (OECD, 2010). In Morocco, value added tax therefore appears to function as a key buffer against revenue instability, partially offsetting the variability associated with direct taxation.

Personal income tax occupies an intermediate position, characterized by limited persistence and a predominance of short-term adjustments. This dynamic reflects its

dependence on wage income and labor market conditions, which tend to adjust more gradually than corporate profits but remain sensitive to economic conditions. At the same time, the concentration of this tax on formal-sector employees limits its capacity to act as a fully effective stabilizing instrument in the presence of a large informal sector, thereby constraining its contribution to overall fiscal resilience.

At the aggregate level, overall tax pressure exhibits a relatively stable dynamic pattern. However, this apparent stability results from offsetting mechanisms across tax components rather than from an intrinsic property of the system. In particular, the stabilizing effect of value added tax partly compensates for the variability of corporate income tax, thereby masking underlying structural imbalances. This result underscores the limitations of aggregate fiscal indicators and highlights the need for a disaggregated analytical framework to capture fiscal dynamics more accurately.

From a broader perspective, these findings contribute to the literature on taxation in emerging economies by emphasizing the central role of tax structure in shaping revenue dynamics. They suggest that differences in the composition of tax systems may help explain variations in fiscal volatility across countries, beyond traditional macroeconomic determinants. In this regard, fiscal performance should be assessed not only in terms of revenue levels, but also in terms of the stability and resilience of its underlying components.

From a policy standpoint, the analysis points to a fundamental trade-off in tax system design between revenue stability and economic sensitivity. Greater reliance on broad-based and less volatile taxes, such as value added tax, may enhance fiscal resilience, but may also raise concerns related to equity and distribution. Conversely, maintaining a significant share of direct taxation, particularly corporate income tax, may improve progressivity but at the cost of higher revenue variability. This highlights the importance of a balanced tax structure that reconciles efficiency, stability, and equity objectives.

Finally, these results should be interpreted in light of the methodological limitations of the study. The autoregressive integrated moving average framework provides valuable insights into the temporal properties of tax revenues, but it does not allow for causal inference or the explicit modeling of macroeconomic interactions. Future research could address these limitations by incorporating structural breaks associated with major fiscal reforms and by extending the analysis to multivariate or structural models, thereby providing a more comprehensive understanding of fiscal dynamics in emerging economies.

6. Conclusion

This paper has examined the dynamics of tax revenues in Morocco using a disaggregated time series framework based on autoregressive integrated moving average models. By focusing on the intrinsic temporal properties of fiscal series, it provides new empirical evidence on the heterogeneous behavior of tax components and their implications for fiscal stability.

The results indicate that tax revenues exhibit significant persistence, suggesting that shocks affecting fiscal series tend to have lasting effects. More importantly, the analysis reveals clear heterogeneity in the dynamic behavior of tax instruments. Corporate income tax displays dynamics consistent with a highly cyclical and volatile tax base, reflecting its dependence on profit fluctuations, whereas value added tax exhibits greater stability, likely due to the breadth and diversification of its base. Personal income tax occupies an intermediate position, with dynamics largely driven by short-term adjustments.

A key implication of these findings is that fiscal resilience is not solely determined by the aggregate level of taxation, but also by the stochastic behavior and dynamic properties of its components. This result challenges conventional aggregate approaches to fiscal performance and underscores the importance of tax structure as a central determinant of budgetary stability. In this regard, indirect taxation emerges as a stabilizing component, while direct taxes—particularly corporate income tax—tend to be associated with greater revenue variability.

Beyond the Moroccan case, this study contributes to the literature on taxation in emerging economies by highlighting the relevance of a dynamic and disaggregated perspective. It shows that analyzing the stochastic properties of tax revenues provides complementary insights to standard approaches based on macroeconomic determinants or long-run relationships.

From a policy standpoint, the findings suggest that enhancing fiscal resilience may require a careful rebalancing of the tax structure. Strengthening broad-based and less volatile tax instruments could improve revenue stability, while reducing reliance on more volatile tax bases may help mitigate fiscal vulnerability. These implications should, however, be interpreted with caution given the univariate nature of the empirical framework, which does not allow for causal inference.

Finally, this paper opens several avenues for future research. In particular, incorporating structural breaks associated with major fiscal reforms, as well as

extending the analysis to multivariate or structural frameworks, would provide a more comprehensive understanding of the interactions between tax revenues and macroeconomic dynamics, especially in emerging economy contexts.

References

Achy, L. (2003). *Fiscal policy and economic growth in Morocco*. Institut National de Statistique et d'Économie Appliquée.

Arnold, J., Brys, B., Heady, C., Johansson, Å., Schwellnus, C., & Vartia, L. (2011). Tax policy for economic recovery and growth. *The Economic Journal*, *121*(550), F59–F80.

Barro, R. J. (1979). On the determination of public debt. *Journal of Political Economy*, *87*(5), 940–971.

Barro, R. J. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy*, *98*(5), S103–S125.

Beer, S., de Mooij, R., & Liu, L. (2020). International corporate tax avoidance: A review of the channels, magnitudes, and blind spots. *Journal of Economic Surveys*, *34*(3), 660–688.

Bouoiyour, J., & Miftah, A. (2016). Fiscal policy and economic growth in Morocco: An empirical analysis. *Economic Modelling*, 52, 972–980.

Box, G. E. P., & Jenkins, G. M. (1976). *Time series analysis: Forecasting and control*. Holden-Day.

Crivelli, E., de Mooij, R., & Keen, M. (2016). *Base erosion, profit shifting and developing countries*. IMF Working Paper, No. 16/118. International Monetary Fund.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366), 427–431.

Engle, R. F. (1982). Autoregressive conditional heteroskedasticity with estimates of the variance of United Kingdom inflation. *Econometrica*, *50*(4), 987–1007.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, *55*(2), 251–276.

Gupta, A. S. (2007). *Determinants of tax revenue efforts in developing countries*. IMF Working Paper, No. 07/184. International Monetary Fund.

Jarque, C. M., & Bera, A. K. (1987). A test for normality of observations and regression residuals. *International Statistical Review*, *55*(2), 163–172.

Laffer, A. B. (2004). *The Laffer curve: Past, present, and future*. The Heritage Foundation.

Ljung, G. M., & Box, G. E. P. (1978). On a measure of lack of fit in time series models. *Biometrika*, *65*(2), 297–303.

OECD. (2010). *Tax policy reform and economic growth*. OECD Publishing.

OECD. (2015). *Measuring and monitoring BEPS: Action 11 – 2015 final report*. OECD Publishing.

Olivera, J. H. G. (1967). Money, prices, and fiscal lags: A note on the dynamics of inflation. *Banca Nazionale del Lavoro Quarterly Review*, 20, 258–267.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326.

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335–346.

Ramsey, F. P. (1927). A contribution to the theory of taxation. *The Economic Journal*, *37*(145), 47–61.

Scully, G. W. (1994). *What is the optimal size of government in the United States?* Policy Report No. 188. National Center for Policy Analysis.

Tanzi, V. (1977). Inflation, lags in collection, and the real value of tax revenue. *IMF Staff Papers*, *24*(1), 154–167.

Tanzi, V. (1992). Structural factors and tax revenue in developing countries. In I. Goldin & L. A. Winters (Eds.), *Open economies: Structural adjustment and agriculture* (pp. 19–44). Cambridge University Press.

Tanzi, V., & Zee, H. (2000). Tax policy for emerging markets: Developing countries. *National Tax Journal*, *53*(2), 299–322.