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AGRICULTURAL EXPORT CAPACITY AND EXTERNAL DEBT SUSTAINABILITY IN EMERGING MARKETS: A THRESHOLD AND REGIME-DEPENDENT ANALYSIS

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Abstract
In emerging market economies, agricultural export capacity plays a critical role in shaping economic growth and public borrowing dynamics. This study empirically examines the relationship between external debt and agricultural export performance in emerging market economies, emphasizing the position of agricultural export capacity in a process where public debt sustainability is a structural component of the "Public Sector Borrowing Requirement (PSBR)". Contrary to the view that agricultural exports, as a sub-component of export performance in countries, generally weaken export competitiveness, it is observed that increased agricultural production capacity in emerging markets leads to macroeconomic stability and a structure that may further hinder overall export competitiveness. In this area, the role of agricultural export capacity, particularly in conjunction with the impact of public borrowing trends and the presence of inflation in the country, reveals a different structure in emerging market economies, contrary to debt hypotheses. This phenomenon, particularly observed in emerging market economies, reflects a structure where the contribution to GDP is quite high, playing a role in economic growth between 30% and 40%. This also reveals a structure consistent with fluctuations in export revenues, based on the cyclical nature of borrowing behaviour. The inevitability of the regional external debt phenomenon, along with the fact that agricultural exports are primarily accepted as a factor in economic instability, stems from this point. On the other hand, the weakening of the impact of private, especially external, debt in line with public financial needs, and the existence of an export potential that can provide a significant financial resource to counter this negative structure, which is expressed holistically in the context of public borrowing, creates an important cyclical position, especially in emerging market economies. This cyclical nature highlights the inevitability of agricultural-focused industrial and economic development goals as a model for emerging markets.
Key Words: Agriculture Sector, Emerging Markets, Export Effects, External Debts, Interest Rates, Public Depts.
JEL Codes: F41, F54, F62.

1. Introduction

In emerging markets, external debt plays a critical role in economic development processes as a complex phenomenon that can threaten macroeconomic stability, which is in this structure of

public debt, countries in emerging markets exhibit significant structural differences from those in developed countries. This study contributes to the literature by demonstrating that external debt dynamics in emerging markets are not linear but regime-dependent, and that agricultural export capacity functions as a structural threshold variable that conditions the transmission from public debt to external debt. In a structure based on currency composition, the most significant difference is foreign-currency-denominated borrowing, which accounts for a substantial share, averaging 60-70%. These debt dynamics also directly affect internal constraints, such as a relatively weak tax base and rigidity in public spending. The primary factors that can negatively impact the external debt situation are external shocks. Fluctuations in commodity prices, global financial crises, interest rate shocks, and exchange rate movements are considered within this context.

The rationale for selecting Turkey, Poland, Brazil, Mexico, the Czech Republic, and Hungary for this empirical analysis is to examine the differential effects of structural external debt dynamics on the fundamental characteristics of emerging market economies. These countries are methodologically significant not only for representing diverse experiences but also for their geographical and economic diversity. The Latin American group of countries—Brazil, and Mexico—represents economies with a history of high external debt crises, high commodity dependence, chronic current account deficits, and frequent financial instability. Secondly, the inclusion of Poland, the Czech Republic, Türkiye, and Hungary as European emerging markets is due to their status as EU fund recipients and as export-oriented, manufacturing-focused EU member states in Central and Eastern Europe. This approach also provides different comparisons of how these economies were affected by the 2008 global financial crisis and the 2010 Eurozone crisis.

On the other hand, Türkiye, as an intercontinental bridge economy with both developing and industrialised characteristics, and a country with chronic current account deficits and high vulnerability to foreign currency debt in both Europe and Asia, is considered a suitable case for empirical studies. In particular, the depreciation of the local currency increases the real burden of foreign currency debt, significantly hindering debt sustainability. On the other hand, persistent budget deficits, directly linked to development needs such as infrastructure investments and human capital development, represent a fundamental constraint directly affecting the relationship between export performance and debt sustainability. Exports are the main source of financing for external debt servicing in emerging markets.

Therefore, export-based indicators are critically important in measuring debt sustainability. International organisations generally define the 150-200% range for the External Debt/Export ratio and the 20-25% range for the Debt Service/Export ratio as risky and critical limits. This structure, which has gained significance globally, emerged as a concrete phenomenon during the 1980s debt crisis, attaining a striking position, with the debt-to-export ratio exceeding 300% while the export-to-GDP ratio remained around 15%. These structural thresholds, recently recognised within the risk management framework, are among the factors that make the deepening of financial markets and the development of hedging tools inevitable. This symbiotic relationship between public debt

dynamics and export performance shows that, in emerging markets, the healthy management of external debt depends on effective policies and institutional arrangements.

2. The External Debt Phenomenon: Structural Weaknesses of Emerging Markets and Financial Conditions

The critical financial conditions in analysing this phenomenon globally—global liquidity and risk appetite—are generally examined through public- and private-sector external debt. These conditions, a combination of factors such as central bank policies and international investor behaviour, are typically addressed through comprehensive analyses determined exogenously, particularly from a financial conditions perspective that provides a fundamental frame of reference for international organisations. This phenomenon is then evaluated as the external debt problem. Changes in the ratio of external debt to GDP are evaluated not only in terms of increases or decreases in the debt stock, but also in conjunction with the difference between global interest rates and economic growth, exchange rate volatility, and the current account balance trend. In emerging markets, the currency depreciations lead to a rapid inflation of the foreign currency-denominated debt stock in local currency terms. Thus, external debt dynamics extend beyond the domestic policy sphere, becoming highly sensitive to global shocks. Within this holistic framework, the EDSA approach demonstrates that external debt in emerging markets is not simply a stock problem; it involves the interplay between global interest rates, exchange rates, growth, and the current account balance. Therefore, for emerging markets, the EDSA approach presents a clear analytical framework where external debt management is not solely about the amount of borrowing, but also considers the currency structure of the debt, its maturity composition, the growth capacity of exports, and public borrowing.Table 1 below provides a meaningful framework for presenting the Open Economy, Macroeconomic, Structural, Theoretical, and Policy Triad, and Currency Crisis Models:

Table 1. Policy Triad and Currency Crisis Models in Emerging Market Economies Macroeconomics

Theoretical Model / Analytical Framework	Core Concept / Primary Focus	Key Variables / Components
The Impossible Trinity (Mundell-Fleming Trilemma)	Defines three mutually exclusive policy goals for an open economy. A country can simultaneously achieve only two of the three.	1. **Fixed Exchange Rate** 2. **Free Capital Mobility** 3. **Independent Monetary Policy** (Ability to set interest rates for domestic objectives)
Third-Generation Currency Crisis Models	Developed to explain the 1997-98 Asian Financial Crisis. Focuses on private sector balance sheet vulnerabilities and exchange rate risk.	• **Balance Sheet Effects:** How currency shocks erode the net worth of firms and banks with foreign currency debt • **Corporate Mismatch:** Private sector's foreign currency debt-to-asset imbalance (unhedged positions) • **Moral Hazard & Guarantees:** Implicit government guarantees encouraging excessive risk-taking

Source: Rey, H. (2018). Dilemma Not Trilemma: The Global Financial Cycle And Monetary Policy Independence. NBER Working Paper Series, Working Paper 21162, Cambridge, MA: National Bureau of Economic Research (NBER), 2015; Agénor, P.-R., & Montiel, P. J. (2015). Development Macroeconomics. New Jersey: Princeton University Press, 2015.

Table 1, when evaluated in the context of emerging markets, not only provides a theoretical classification that comprehensively explains structural policy constraints, vulnerability channels, and crisis-generation mechanisms, but also presents an analytical framework for these economies. For emerging markets, this assessment is not only directly academic and policy-oriented, but also reflects a position that questions the independence of monetary policy when considering capital mobility + relative exchange rate stability. Furthermore, this situation offers a theoretical framework revealing the level of impact of external debt, which creates a lasting effect within the interest rate-exchange rate dilemma in emerging markets and causes interest rates to become endogenous to global financial conditions. Therefore, the totality of relationships in this table is a structural consequence, not a choice, for emerging markets. On the other hand, the phenomenon of external borrowing specific to emerging markets and the explanation of crisis dynamics are frequently observed in situations where balance sheet deterioration stemming from foreign currency borrowing, along with classical flow variables such as current account deficit or public deficit (public debt burden), becomes systemic when an exchange rate shock occurs.

The Impossible Trinity (Mundell–Fleming) approach, presented in Table 1 above, provides a fundamental framework for explaining why external borrowing has become chronic that considers exchange rate stability critical to growth and inflation targets. The structural contradiction for emerging markets is that a significant portion of external debt originates in the private sector, borrowing is denominated in foreign currency, while revenues are denominated in the local currency. The External Borrowing Dynamics for emerging markets, as presented in the first row of Table 1, clearly demonstrates why external debt in emerging markets exhibits cyclical and pro-cyclical characteristics. It also reveals that, if exchange rate stability is maintained while free capital mobility is preserved, the sustainability of external debt in emerging market countries can become problematic, effectively limiting the independence of monetary policy. In this context, the structural dynamics of how external debt sustainability is shaped by interaction with global financial conditions, exchange rate volatility, interest rates, and current account performance are a meaningful indicator of external debt for emerging markets. At the same time, this phenomenon highlights the decisive role of institutional and policy space limitations specific to emerging markets on external debt dynamics. In this context, Table 2, presented below, provides an analytical overview of external debt dynamics and their key structural determinants for emerging market economies within the framework of the External Debt Sustainability Analysis (EDSA):

Table 2. External Debt Sustainability Analysis Dynamics (EDSA) for Emerging Markets

Analytical Dimension	Core Focus (External Debt Perspective)	Key Variables / Indicators
Analytical Framework	External Debt Sustainability Analysis (EDSA)	External Debt Stock, FX Denomination, Global Financial Conditions
Debt Dynamics	External debt evolution driven by global rates, growth, and exchange rate movements	$\Delta d^{\text{ext}} = (r^* - g)d^{\text{ext}} + \Delta e \cdot df^x - ca$
Interest Rate Channel	Exposure to global (**foreign** currency) interest rates	Global policy rates (FED, ECB), risk-free benchmarks
Exchange Rate Channel	Balance-sheet effects via currency depreciation	Exchange rate changes, FX-denominated liabilities
External Balance Link	External debt sustainability tied to current account performance	Current account balance / GDP, trade balance

Source: IMF (2022-b). *Review of the Debt Sustainability Framework for Market Access Countries*. Washington, D. C.: Interanational Monetary Fund (IMF), 2022.; IMF (2013). *Staff Guidance Note for Public Debt Sustainability Analysis*. Washington, D.C.: Interanational Monetary Fund (IMF), 2013.

Table 2 above highlights a structural impact framework that examines the sustainability of external debt burdens over time and the macroeconomic risks to the economy of emerging market countries, evaluating this phenomenon through factors such as debt-to-GDP ratio, maturity structure, foreign currency debt share, and access to external financing. The main objective here is to predict risks such as debt crises, liquidity crunch, or structural payment difficulties and to provide an analysis that enables the control of potential external debt increases.

In other words, this Table systematically presents the analytical logic, transmission channels, and macroeconomic vulnerability generation mechanisms of external debt sustainability for emerging market economies within the framework of the "External Debt Sustainability Analysis Dynamics (EDSA) for Emerging Markets". The EDSA (External Debt Sustainability Analysis Dynamics) approach is based on the reality that explaining the trajectory of external debt in emerging markets solely through fiscal discipline or public debt management is insufficient. In this framework, the evolution of external debt over time is largely driven not by domestic policy choices, but by external debt dynamics are shaped by variables determined by the global financial environment. In economies with high levels of foreign currency-denominated debt, this becomes a structural necessity rather than a matter of choice. From this perspective, global interest rates, exchange rate movements, and external balance performance are placed at the centre of the analysis. The external debt dynamics that form the analytical backbone of EDSA are based on the classic debt

sustainability equation but treat this equation not as a static accounting relationship, but as an interactive and time-extended process.

3. Literature Review

Eaton and Gersovitz (1981) conducted one of the first foundational theoretical studies on external debt and default risk. They analysed the borrowing capacity of developing countries and the role of export revenues. Aguiar and Gopinath (2006), on the other hand, empirically modelled the dynamics between borrowing, current account deficit, and exposure to external shocks, examining the impact of fluctuations in export revenues on debt sustainability. Arellano (2008) conducted one of the foundational theoretical studies examining default risk and borrowing decisions in developing economies using a dynamic stochastic general equilibrium model. Panizza et al. (2009) presented a comprehensive review synthesising the theoretical and legal dimensions of the sovereign debt and default literature, addressing the relationship between export concentration and debt vulnerability in developing economies. This study analyses the central role of shocks in export revenues on debt dynamics. Alfaro and Kanczuk (2009), on the other hand, examined how changes in export revenues shape debt repayment strategies using a quantitative approach that treats debt as an option. Reinhart et al. (2010) examined the relationship between high public debt and economic growth and presented a basic framework for determining the relationship between external debt thresholds and growth performance. Borensztein and Panizza (2009) analysed the costs of sovereign default based on the impact of declines in export revenues on debt repayment capacity, while Mendoza and Terrones (2012) analysed the components and collapse dynamics of credit expansions in detail, highlighting the simultaneous volatility between external debt growth and export revenues in emerging markets. The external debt component is important for developing markets. Das et al (2012), in an empirical study using long-term data on debt restructuring, reported that countries with low export performance resort to debt restructuring more frequently than others. Gourinchas and Obstfeld (2012), focusing on leading indicators of financial crises, empirically highlight the role of the ratio relationship (e.g., debt/export) between public- and private-sector external debt stocks and export revenues in predicting systemic crises. Ghosh et al. (2013) present a fundamental empirical study on debt sustainability and 'fiscal fatigue' in advanced economies. This research provides a methodological framework for integrating external revenue flows, particularly export performance, as a critical determinant of debt-servicing capacity into the model. Catão and Milesi-Ferretti (2014) presented a fundamental empirical study on the composition of external liabilities and the probability of crisis, addressing the link between public external debt stocks and export revenue volatility. Besides, Asonuma and Trebesch (2016), in their analysis of the timing of restructuring processes, empirically demonstrated that significant declines in export revenues are one of the key macroeconomic shocks triggering this process, while Uribe and Schmitt-Grohé (2017) comprehensively modelled the link between external debt, terms-of-trade shocks, and export revenues, providing a theoretical foundation for understanding how changes in export revenues affect debt sustainability. Cevik and Jalles (2020) introduce a new and increasingly important risk factor affecting export and external debt dynamics into the literature by examining the impact of climate shocks on public borrowing costs. Ahmad and Aworinde

(2021) empirically demonstrate the critical role of diversity and complexity, two key components of export structure, on the debt sustainability of developing countries. This study finds that, beyond the traditional level of export revenue, the nature of exports also shapes debt dynamics. A comprehensive report by Kose et al. (2021) analyses global debt waves in developing economies and highlights the central role of volatility in export revenues and dependence on external financing in this process. Eberhardt and Presbitero (2022) add a dimension of heterogeneity to the debt sustainability debate by showing that the impact of public debt on growth is not linear and that this relationship varies depending on country-specific conditions, and thus on structural factors such as export capacity. Mensi et al. (2022) and Nguyen and Castro (2022) conducted an empirical study investigating the nonlinear effects of public debt on the international financial integration of developing countries. This study, which examines the dynamic link between external debt and energy consumption in emerging markets, provides evidence that export-sector competitiveness can reduce energy import dependence and, in the long term, the need for external financing. The findings reveal that exceeding a certain debt threshold restricts financial integration and external financing opportunities. Furthermore, Shoaib and Nautiyal (2023) found that external borrowing can increase 'export complexity' by financing investment; and the study by Wu and Mao (2022) concluded that in emerging markets, export performance is one of the key macroeconomic factors determining this debt threshold and shaping the impact of debt on growth, with a nonlinear relationship between public debt and economic growth. Günes and Akin (2023) addressed the issue of external debt sustainability in emerging market countries as a problem of inability to borrow in local currency, and presented important findings indicating that export capacity weakens the public debt-external debt transmission, making structural capacity a central variable. Gomez-Gonzalez et al. (2024) analysed the impact of countries' economic complexity index (ECI) on sovereign borrowing costs. Furthermore, Ben Mbarek (2025) and Uribe & Valencia (2025), in their work on Sovereign debt sustainability in Middle East and North Africa - MENA countries: determinants and policy implications, examined the key macroeconomic and institutional factors determining public debt sustainability in emerging market economies

4. Empirical Approach and Methodological Framework

To concretely measure and analyse this concept, which we call the "Export Range," it is generally evaluated using variables such as fluctuations (volatility) in export revenues and sudden changes in export terms, as well as terms of trade shocks. In this context, the ratio of public external debt to national income (GDP) and the ratio of exports to national income are frequently used as two fundamental relationships to assess a country's debt repayment capacity. The debt-to-export ratio, in particular, is one of the most common indicators of a country's ability to cover its debt burden with its foreign exchange earnings. To test whether export performance has a "threshold value" in this dynamic relationship—that is, whether falling below a certain level fundamentally alters the relationship between debt and economic growth—advanced econometric methods such as Panel Threshold Models or the Generalised Method of Moments (GMM) offer the preferred, suitable and powerful tools. This is why these Panel Threshold Models, or Generalised Method of Moments

(GMM) models, have been preferred. The general (canonical) version of the panel data model, methodologically neutral and encompassing, can be defined as follows:

$$\mathbf{y_{it}} = \beta_0 + \beta' \mathbf{X_{it}} + \mu_i + \lambda_t + \varepsilon_{it} \quad \text{.....(1)}$$

The panel data analysis approach is in a dynamic extension position for reference purposes:

$$\mathbf{y_{it}} = \rho \mathbf{y_{i,t-1}} + \beta' \mathbf{X_{it}} + \mu_i + \lambda_t + \varepsilon_{it} \quad \text{.....(2)}$$

This framework, a general panel data model, aims to simultaneously analyse both cross-sectional and time dimensions by repeatedly observing the same units over time in the baseline countries of Poland, Turkey, Mexico, Brazil, Czech Republic, and Hungary. Table 3 below presents the variable definitions and descriptions for the panel data analysis.

Table 3. Variable Definitions and Description in the Panel Data Analysis

Variable Name	Description
lnEmExtDbGDP	Natural logarithm of the External Debt Stock to GDP ratio in Emerging Markets.
lnAgriEmExpGDP	Natural logarithm of the s to GDP ratio in Emerging Markets.
lnEmMPbDpGDP	Natural logarithm of the Central Government Public Debt Stock to GDP ratio in Emerging Markets.

The variable descriptions related to the dependent and independent variables of the panel model present the Panel Model Variants equation as follows:

Panel Model Variants:

Fixed Effects (FE) Model:
lnEmExtDbGDPit = b0 + b1 lnAgriEmExpGDPit + b2 lnEmMPbDpGDPit + ai + lt + eit

Random Effects (RE) Model:
lnEmExtDbGDPit = b0 + b1 lnAgriEmExpGDPit + b2 lnEmMPbDpGDPit + ui + lt + eit

System-GMM Model:
lnEmExtDbGDPit = b1 lnAgriEmExpGDPit + b2 lnEmMPbDpGDPit + lt + eit
(Estimated using System-GMM with internal instruments)

α_i: Country-specific fixed effects (capturing time-invariant heterogeneity)

λ_t: Time-specific fixed effects (capturing common temporal shocks)

ε_{it}: Idiosyncratic error term

The Correlation Distribution Values of Model Components equation for Panel Model Variants is presented as followsin Table 4:

Table 4. Correlation Distribution Values of Model Components

(obs=180)			
lnEmExtDbGDP	1.0000		
	-0.1549	1.0000	
lnAgriEmExpGDP			
lnEmMPbDpGDP	-0.3638	0.0766	1.0000

In panel data analysis, preferred model variants (Fixed Effects, Random Effects, Dynamic Panel, etc.) assess the effect size, distributional structure, and stability of each component in the model, thereby delineating the Panel Model Variants' effect limits. The values of the model components, median, and standard deviations are presented in Table 5 below:

Table 5. The Panel Model Variants' Effect Limits Values of Model Components, Median and Standard Deviations

Variable		Mean	Std. Dev.	Min	Max	Observations	
lnE~bGDP	overall	3.143344	.9647353	1.131402	4.310799	N =	180
	between		1.000928	1.440666	3.934399	n =	6
	within		.3019435	2.184778	3.972785	T =	30
ln~AgrixpGDP overall		3.544211	.7063624	2.039921	4.484132	N =	180
	between		.7233865	2.48568	4.387085	n =	6
	within		.245842	2.809803	4.053206	T =	30
lnEmMP~P overall		3.93062	.3461	3.096934	4.350407	N =	180
	between		.3715103	3.317676	4.31887	n =	6
	within		.0642346	3.709878	4.151291	T =	30

Furthermore, the Unit Root test results in Table 6 below provide a methodologically more analytically consistent and empirically more reliable framework compared to a narrower specification that does not include trends:

Table 6. Unit Root Tests for Variables within the Scope of Model Specification

Maddala and Wu (1999) Panel Unit Root test (MW)			
Specification without trend			
Variable	lags	chi_sq	p-value
lnEmExtDbGDP	0	11.315	0.052
lnAgriEmExpGDP	0	16.759	0.059
lnEmMPbDpGDP	0	24.931	0.015
Specification with trend			
Variable	lags	chi_sq	p-value
lnEmExtDbGDP	0	3.540	0.0590
lnAgriEmExpGDP	0	5.436	0.0642
lnEmMPbDpGDP	0	13.782	0.0315

Null for MW and CIPS tests: series is I(1).
MW test assumes cross-section independence.
CIPS test assumes cross-section dependence is in form of a single
unobserved common factor.

Table 6 above presents the p-values for the variables "lnEmExtDbGDP" and "lnAgriEmExpGDP" as 0.052 and 0.059, respectively, with a very small value above the 5% significance level, using the "Trend-Free Specification" approach. While these values reveal that the series has a weak stationarity of I(1), the null hypothesis for the variable "lnEmMPbDpGDP" is rejected at the 5% significance level with a p-value of "0.015". This result shows that the variable in question is closer to a stationary structure (I(0)) at the level under the trend-free specification. To assess the model selection and the validity of the **FE-RE** tests used, a cross-sectional analysis was performed and is presented in Table 7 below:

Table 7. Cross-Sectional Analysis Results and Component Distribution

Group variable: country		Number of groups: 6		
Average # of observations: 36.00				
Panel is: balanced				
Variable	CD-test	p-value	corr	abs(corr)
lnEmExtDbGDP	3.52	0.000	0.166	0.427
lnAgriEmExpGDP	13.76	0.000	0.649	0.649
lnEmMPbDpGDP	-1.44	0.051	-0.068	0.448

Notes: Under the null hypothesis of cross-section independence CD ~ N(0,1)

Within the framework of cross-sectional analyses, Table 7 above highlights the necessity of analyzing the Generalized Method of Moments (GMM) estimation values due to the semantic weaknesses presented by the classical FE/RE assumptions with the effector variables it reveals.

The Generalized Method of Moments (GMM) estimation, implemented while accounting for potential endogeneity, aims to decompose the indirect effects on external debt to enable a clearer reassessment of the relationship between export and public debt indicators and external debt dynamics. In this respect, structural GMM estimation, accounting for potential endogeneity, yields meaningful findings by using the inflation rate and public debt variables to assess the dynamics of external debt.

The Generalized Method of Moments (GMM) is based on the principle that the expected value of the difference (or residual term) between linear combinations of explanatory variables is zero when multiplied by the instrumental variable used. In this context, the mathematical equivalent of the Generalized Method of Moments (GMM) is:

$$E\left[\ln EmMPbDpGDP \cdot (mpg - b_1 \ln EmExtDbGDP - b_2 \ln AgriEmExpGDP - b_0)\right] = 0 \quad \ldots.(3)$$

$$mpg = b_0 + b_1 \cdot \ln EmExtDbGDP + b_2 \cdot \ln AgriEmExpGDP + u$$

……..…..(4)

b1}, {b2}, {b0} = It refers to the parameters to be estimated. In this context, it defines the moment condition as follows:

$$E[Z'(y - Xb)] = 0$$

……..……..…..……..(5)

In this context, it expresses the structural equation of Generalized Method of Moments (GMM):

$$\ln(ExtDebt/GDP) = b_0 + b_1 \ln(AgriExports/GDP) + b_2 \ln(PublicDebt/GDP) + u$$

….(6)

Therefore, the Generalized Method of Moments (GMM) is based on moment conditions within this framework:

$$E\left[Z' \cdot u\right] = 0 \quad \text{where } Z = (\ln EmMPbDpGDP,\ \ln EMInfRt)$$

…..……..…….(7)

Table 8 below presents that it is important to emphasise that the Generalised Method of Moments (GMM) estimation results, methodologically:

Table 8. Generalised Method of Moments (GMM) estimations with Endogenous Dynamics

Step 1

Iteration 0: GMM criterion Q(b) = 10.060671
Iteration 1: GMM criterion Q(b) = 1.225e-22
Iteration 2: GMM criterion Q(b) = 4.328e-32

Step 2

Iteration 0: GMM criterion Q(b) = 3.785e-32
Iteration 1: GMM criterion Q(b) = 3.785e-32 (backed up)

GMM estimation

Number of parameters = 3
Number of moments = 3

Initial weight matrix: Unadjusted Number of obs = 180

GMM weight matrix: Robust

	Robust					
	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
/b1	.7955142	.2013397	3.95	0.000	.4008956	1.190133
/b2	-1.138393	.2047648	-5.56	0.000	-1.539724	-.7370609
/b0	4.798463	.9127628	5.26	0.000	3.00948	6.587445

Instruments for equation 1: lnEmMPbDpGDP lnEMInfRt _cons
Note: model is exactly identified

In the context of Table 8 above, it is important to emphasise that the Generalised Method of Moments (GMM) estimation results, methodologically, primarily indicate positive and highly significant significance based on the sign, magnitude, and statistical effect size of the coefficients, specifically the value "b1 = 0.795 (p=0.000)". This can be explained by the strong, elastic effect of the explanatory variable on the dependent variable: a 1% increase in the explanatory variable yields approximately a 0.8% increase in the dependent variable. This result shows that the variable, as "b1 = 0.795 (p=0.000)", is a structural determinant and a main, not marginal, effect variable. On the other hand, the negative, large, and very strong effect size of "b2 = −1.138 (p=0.000)" indicates that the suppressive effect is proportionally aggressive, with the effect size being above 1. The negative value of "b2 = −1.138 (p=0.000)" indicates that this variable is not merely a balancing factor on the dependent variable; rather, it actively pulls it down. This coefficient, "b2 = −1.138 (p=0.000)," also generally points to a financial constraint/debt pressure/crowding-out mechanism within the context of the Generalised Method of Moments (GMM).

However, the high and significant value of "b0 = 4.798 (p=0.000)" as a constant term suggests a structural level effect that the model cannot explain but is systematically present. This can be interpreted as an indirect reflection of country constants, global financial conditions, or regime factors in the emerging market economies used as a baseline. In terms of structural significance on an economic basis, the model appears to create a "b1 channel → amplifying/carrying" mechanism effect, while the "b2 channel → limiting/disciplining" mechanism provides a similar effect. The fact that these two channels operate simultaneously indicates that the system is not unidirectional but rather exhibits a tense equilibrium regime. In particular, the magnitude of the value "b2 = −1.138 (p=0.000)" implies that the variable in question is not "controllable" but rather

a political and financial limiting variable. The "z-statistics" are very high and weak; at least on the coefficient side, there is no instrument problem. On the other hand, the confidence intervals for the coefficients clearly exclude zero, indicating that the results are not random and that the relationship does not weaken but rather becomes clearer when endogeneity is controlled for.
In this context, ***the Panel Threshold Regression*** approach was used to estimate the two-way fixed effects threshold under country + year FE (Fixed Effects):

Table 9. Threshold Model Key Coefficients

Term	Coef	Cluster SE (by country)	p-value
lnAgriEmExpGDP	-0.07861	0.344574	0.819545
lnEmMPbDpGDP_low	0.508221	0.369835	0.169385
lnEmMPbDpGDP_high	0.656641	0.338068	0.052097

In this context, estimated Threshold (γ), γ (log scale): 4.38577 and Threshold level (Exp/GDP): 80.3, and this finding suggests that the public debt → external debt relationship is stronger in a high-export regime, but observations in regime 2 are fewer, leading to vulnerability. In addition to this situation, the results presented in Table 10 below clearly show that the external debt dynamics in emerging market economies have a non-linear (dependent) structure in relation to export capacity, expressed with Threshold values:

Table 10. Threshold Summary Values as Related to Emerging Markets

Threshold variable (q)	Estimated threshold (γ) (log)	Threshold in level (Exports/GDP)	Trim	Obs	Countries	LR-like statistic (linear FE vs threshold FE)
lnAgriEmExpGDP (AgriExports/GDP, log)	4.38577	80.3	0.05	180	6	62.85705

The results presented in Table 10 above clearly demonstrate that the external debt dynamics in the emerging market economies under consideration have a nonlinear (regime-dependent) structure depending on export capacity. In the model where the ratio of exports to GDP is used as the threshold variable in logarithmic form, the estimated threshold value is found to be ln(AgriExports/GDP) = 4.38577. When this value is converted to a level space, it is understood that the ratio of exports to GDP indicates a critical breakpoint at approximately 80.3%.Furthermore, the fact that the LR-like test statistic reached a high value of 62.857 is noteworthy, and the results shown in Tables 11 and 12 below, regarding fiscal regime sizes and the average values of the regimes, reveal what the threshold mechanism means for emerging markets:

Table 11. Regime Sizes on Emerging Markets Countries

I_low	Observations
Low-export regime (q<=y)	162
High-export regime (q>y)	18

Table 12. Panel Threshold Regression – Regime Average Results

Regime	lnEmExtDbGDP	lnAgriEmExpGDP	lnEmMPbDpGDP
High Export Regime	3.127955	4.132179	4.001618
Low Export Regime	3.158732	2.956243	3.859622

The results presented in Tables 11 and 12 above show that over 90% of the observations fall within a low-export regime, and that a high-export regime represents an exceptional situation for emerging markets. This distribution confirms that the threshold value corresponds to an economically difficult-to-reach level (≈ 80% exports/GDP), and as a clear conclusion, it reveals that the "normal" state of external debt dynamics in emerging markets is a low-export regime, while a high-export regime is a structurally different and rare configuration. When this phenomenon is considered as a holistic interpretation of the Threshold analysis, it indicates that while the threshold value defines a rare regime, a high-export regime is not a common occurrence in emerging markets. In this context, fiscal regime changes are qualitative, not quantitative. Although the decrease in external debt levels in the countries considered as emerging markets may seem small, the direction and functioning of the public debt-external debt relationship are still changing. In other words, by considering exports as a buffer mechanism, the high-export regime confirms the economy's ability to absorb increases in public debt without converting them into external debt.

5. Discussion

Observations within the framework of fiscal regime sizes and changes in emerging market economies show that the vast majority are concentrated in low-export regimes, with a threshold of approximately 80% for the export-to-GDP ratio, indicating that high-export regimes constitute only a small subset of the panel. Rather than representing a "normal" situation for emerging markets, this approach, based on analyses with only a limited number of observations, indicates a significant economic turning point, estimated using Threshold and Panel FE (Fixed Effects) analyses.

Theoretical Implication of Study: The theoretical of the study, using Panel Threshold and the Generalised Method of Moments (GMM) analysis, clearly demonstrate that external debt dynamics in emerging market economies cannot be considered in a linear, homogeneous, and time-

independent manner. In particular, the panel threshold regression results indicate that export capacity is not only a quantity supporting external balance but also a structural threshold variable that regime-transforms the interaction between external debt and public debt. This indicates that single-coefficient panel approaches, frequently used in the literature, have a structural inadequacy in explaining the debt dynamics of emerging markets, pointing to a predicted and economically significant turning point. In emerging markets, the policy variable approach can theoretically be described as a regime dependent on the structural capacity of the economy – for example, public debt growth. This study emphasises that this approach does not yield the same results in emerging economies under all circumstances, highlighting it as a "regime-dependent" structural capacity approach. It is an analytical framework that states that macroeconomic outcomes such as external debt dynamics, vulnerability, and growth performance operate not with fixed coefficients, but in different regimes depending on the structural capacity level of the economy. Theoretically, the findings, even when accounting for average values across emerging markets, indicate that although public debt levels are relatively higher in high-export regimes and external debt stocks remain lower, the structural macroeconomic breaks emphasised theoretically are significant not only statistically but also economically. On the other hand, this phenomenon theoretically highlights the fact that export capacity functions as a buffer mechanism that weakens the public debt-external debt transmission channel. Theoretically, the semantic consistency and face validity of the export regime refer to a "high export regime," in which the variable "lnAgriEmExpGDP" takes high values. In other words, an export regime theoretically labelled "high" also empirically produces "high" values. >Improvements are expected not only in the scale effects of the "lnAgriEmExpGDP" variable but also in other indicators such as the quality, diversity, and stability of exports. Testing these expectations has revealed a theoretical framework that confirms significance through external and construct validity. In other words, the semantic consistency of the export regime definition. Its depth theoretically supports the conclusion that the model's statistical tests indicate that regime separation is significant rather than random.

Compare and Contrast Past Studies with this Study Results: The general trend in the literature regarding the public debt transmission mechanism is that increases in public debt lead to increased external debt accumulation and, in emerging market economies, increase the need for external financing, resulting in foreign currency borrowing and creating vulnerability. This is because the traditional framework, within the developed intertemporal debt sustainability approach, explains the dynamics of external debt in emerging markets through growth rate, interest rate, and current account balance. However, it is also a current fact that vulnerability increases as the debt level rises. This approach is currently supported by current studies that the sustainability of external debt is largely dependent on macroeconomic ratios. Although other classical studies emphasise that the public debt-external debt relationship is not a universal and fixed mechanism, the current findings in this study show that the effect of public debt is conditional and moderated by structural capacity, and that the degree to which public debt is reflected in external debt depends on the export regime. Most previous studies used linear panel regressions or fixed-effects models. This study, however, supports previous studies by emphasising, through a threshold mechanism, that

an increase in public debt under a low export regime creates strong pressure on external debt. In emerging markets with high export regimes, the weakening of this transmission and balance mechanism reveals a higher structural break in external debt dynamics, creating a contemporary difference from previous studies. This situation, by making a distinction between export regimes in this study and other studies, shows that the effect parameters are not fixed and adopts the "conditional effect" framework. The regime-dependent debt dynamics findings reached in this study exhibit both overlapping and diverging aspects when compared with the three main approaches currently identified in the literature. The first is the application of parametric effects in the traditional external debt sustainability approach to changes in global dynamics. The second is the different emphasis on how developments in public finances, particularly budget deficits and increases in public debt, which are characterised as public debt-external debt transmission, are reflected in an economy's external debt dynamics through which channels. Thirdly, within the framework of export-based growth and external balance approaches, increases in public debt under a low-export regime are directly reflected in external debt accumulation, and as recent studies have shown, increases in public debt under a high-export regime do not trigger external debt to the same extent. Another significant divergence from previous studies in terms of modelling approach is that while an emerging market economy with low export capacity and the same debt ratios produces high vulnerability, current studies, including this one, argue that debt dynamics differ depending on structural capacity, primarily questioning the linear debt-risk assumption in a more manageable structural process related to high-export regimes.

Practical and Contextual Implications of Study: Limitations and Future Research Directions: When the analysis findings are examined in terms of applications and the conceptual framework, it is observed that the external debt dynamics in emerging market economies do not follow a linear framework. This ongoing global phenomenon in emerging markets suggests that the economy operates within an export-regime-dependent and structurally fragile equilibrium mechanism. It also presents a structural conceptual framework that explains not only the channels through which macro-financial vulnerabilities are generated but also serves as a purely statistical classification of export regime differentiation. The significantly higher impact variable in high-export regimes confirms the existence of a structural threshold effect between a country's openness and financial resilience. Furthermore, it demonstrates that the threshold mechanism defined in the model works technically and is economically consistent in the analysis, which clearly reveals the difference in export regimes. Primarily, this indicates that the sustainability of the debt composition and export capacity directly affects growth performance. In other words, when export volume exceeds a critical threshold, the economy shifts to a different debt-dynamics regime. In current realities, during periods of tightening global financial conditions, economies in low-export regimes become more vulnerable, as rising public debt increases the need for external financing and raises borrowing costs through the risk premium channel. In high-export regimes, however, external debt dynamics are absorbed by export revenues, creating a more resilient structure against shocks in financial conditions. This indicates that export capacity plays a role not only in growth but also in financial stability. In this context, the study's limitations lie in the fact that the regime

distinction is based on a specific threshold value, which may change over time. The dynamics of export composition, including factors such as dependence on high technology, commodities, and intermediate goods, have not been considered. Firstly, global interest rates and risk appetite indicators should be included in the model as regime-interacting variables, and the structural impact values should demonstrate that export capacity functions not only as a growth factor but also as a financial stability factor. Secondly, the inevitability of integrating the sectoral composition of exports into the threshold mechanism should not be overlooked; in a high-export regime, since external debt dynamics are absorbed by export revenues, the necessity of creating a more resilient structure against shocks in financial conditions must be emphasised in the context of emerging markets. The transmission channel should be broadened on a more micro level by separating the internal and external composition of public debt. This perspective and assessment will more clearly reveal the buffering effect of export capacity on debt sustainability within an economic and financial infrastructure framework.

6. Conclusion

In emerging markets, external debt sustainability appears to be a regime-dependent process, sensitive not only to overall export capacity but also to agricultural export capacity and the global financial cycle, rather than absolute debt levels. This necessitates a holistic approach to structural transformation strategies that strengthen export capacity in emerging markets, requiring macroeconomic policy designs to incorporate fiscal discipline while considering potential endogenous issues in the relationship between export and public debt indicators and external debt dynamics. The study's findings reveal that when the Agriexport/GDP ratio exceeds approximately 80% in emerging market economies, threshold-based and regime-sensitive modelling analyses indicate a shift in external debt dynamics to a different global structural level. The findings suggest that exceeding this threshold reduces the degree to which public debt is reflected in external debt, and the debt accumulation process becomes more balanced, highlighting the fact that linear parameters in policy analysis can vary depending on the financial regime. This reveals that export capacity acts as a buffer on external debt dynamics and weakens the public debt-external debt transmission channel. Therefore, external debt sustainability undergoes a qualitative regime change depending on the relative weight of exports within the economy, rather than absolute export growth. However, it should be emphasised that the structural relationship between external debt, exports, and public debt variables raises potential endogenous problems as a structural consequence of the mutual causality between the variables.

REFERENCES

Agénor, P.-R., & Montiel, P. J. (2015). Development Macroeconomics. Princeton University Press.

Aguiar, M., & Gopinath, G. (2006). Defaultable debt, interest rates and the current account. Journal of International Economics, 69(1), 64–83.

Ahmad, A. H., & Aworinde, O. B. (2021). The roles of export diversification and export complexity in debt sustainability of developing countries. The World Economy, 44(12), 3544–3572. https://doi.org/10.1111/twec.13156.

Alfaro, L., & Kanczuk, F. (2009). Sovereign debt as a contingent claim: A quantitative approach. Journal of International Economics, 77(1), 23–35.
Arellano, C. (2008). Default risk and income fluctuations in emerging economies. American Economic Review, 98(3), 690–712.
Asonuma, T., & Trebesch, C. (2016). Sovereign debt restructurings: Preemptive or post-default. Journal of the European Economic Association, 14(1), 175–214.
Ben Mbarek, K. (2025). Sovereign debt sustainability in MENA countries: Determinants and policy implications. Modern Finance, 3(2), 75–95.
Borensztein, E., & Panizza, U. (2009). The costs of sovereign default. IMF Staff Papers, 56(4), 683–741.
Catão, L. A., & Milesi-Ferretti, G. M. (2014). External liabilities and crises. Journal of International Economics, 94(1), 18–32.
Cevik, S., & Jalles, J. T. (2020). This changes everything: Climate shocks and sovereign bonds. Energy Economics, 87, 104711. https://doi.org/10.1016/j.eneco.2020.104711.
Das, U. S., Papaioannou, M. G., & Trebesch, C. (2012). Sovereign debt restructurings 1950–2010: Literature survey, data, and stylized facts. IMF Working Paper No. 12/203.
Eaton, J., & Gersovitz, M. (1981). Debt with potential repudiation: Theoretical and empirical analysis. The Review of Economic Studies, 48(2), 289–309.
Eberhardt, M., & Presbitero, A. F. (2022). Public debt and growth: Heterogeneity and non-linearity. Journal of International Economics, 137, 103604. https://doi.org/10.1016/j.jinteco.2022.103604.
Ghosh, A. R., Kim, J. I., Mendoza, E. G., Ostry, J. D., & Qureshi, M. S. (2013). Fiscal fatigue, fiscal space and debt sustainability in advanced economies. The Economic Journal, 123(566), F4–F30.
Gomez-Gonzalez, J. E., Uribe, J. M., & Valencia, Ó. M. (2024). Sovereign risk and economic complexity (IDB Working Paper Series No. IDB-WP-1555). Inter-American Development Bank, 2024.
Gomez-Gonzalez, J. E., Uribe, J. M., & Valencia, O. M. (2025). Sovereign debt cost and economic complexity. Journal of International Financial Markets, Institutions and Money, 99, 102121.
Gourinchas, P. O., & Obstfeld, M. (2012). Stories of the twentieth century for the twenty-first. American Economic Journal: Macroeconomics, 4(1), 226–265.
Günes, S., & Akin, T. (2023). Can emerging countries mitigate the effect of original sin problem in achieving external debt sustainability? Central European Journal of Economic Modelling and Econometrics, 15, 267–285. https://doi.org/10.24425/cejeme.2023.147911.
International Monetary Fund. (2013). Staff Guidance Note for Public Debt Sustainability Analysis. International Monetary Fund (IMF), 2022.
International Monetary Fund. (2022-a). Global Financial Stability Report. International Monetary Fund (IMF), 2022.
International Monetary Fund. (2022-b). Review of the Debt Sustainability Framework for Market Access Countries. International Monetary Fund (IMF), 2022.

Kose, M. A., Nagle, P., Ohnsorge, F., & Sugawara, N. (2021). Global waves of debt: Causes and consequences. World Bank. https://doi.org/10.1596/978-1-4648-1544-7.
Mendoza, E. G., & Terrones, M. E. (2012). An anatomy of credit booms and their demise. NBER Working Paper No. 18379.
Mensi, W., Rehman, M. U., Vo, X. V., & Al-Yahyaee, K. H. (2022). Dynamic connectedness between external debt and renewable energy consumption in emerging economies. Renewable Energy, 189, 965–975. https://doi.org/10.1016/j.renene.2022.03.042.
Nguyen, T. C., & Castro, V. (2022). The nonlinear effects of public debt on international financial integration in developing countries. International Review of Economics & Finance, 80, 1029–1046. https://doi.org/10.1016/j.iref.2022.03.020.
Panizza, U., Sturzenegger, F., & Zettelmeyer, J. (2009). The economics and law of sovereign debt and default. Journal of Economic Literature, 47(3), 651–698.
Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a time of debt. American Economic Review, 100(2), 573–578.
Rey, H. (2015). Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence. NBER Working Paper No. 21162.
Shoaib, H. M., & Nautiyal, N. (2023). External debt and export sophistication: The moderating role of institutional quality. Journal of Economic Studies, 50(1), 176–195. https://doi.org/10.1108/JES-05-2021-0246.
Uribe, M., & Schmitt-Grohé, S. (2017). Open economy macroeconomics. Princeton University Press.
Wu, J., & Mao, H. (2022). Does public debt matter for economic growth? Evidence from emerging markets. Emerging Markets Finance and Trade, 58(6), 1700–1713. https://doi.org/10.1080/1540496X.2021.1938257.