

Morocco at the External Growth Ceiling: Evidence from Thirlwall's Law, 1998-2024

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Abstract

This paper asks whether Morocco's long-run growth remained balance-of-payments constrained after the pandemic and whether travel receipts, workers' remittances, foreign direct investment and the terms of trade jointly alter that constraint. The central research question is whether observed growth over 1998-2024 matches the external ceiling predicted by Thirlwall's Law. The primary hypothesis expects the two rates to be close; three secondary hypotheses assess non-trade foreign-exchange earnings, capital inflows and relative-price effects. This empirical article uses 27 annual observations from Morocco's Office des Changes and the World Development Indicators. It estimates the income elasticity of merchandise imports by ordinary least squares with Newey-West standard errors and supplements the levels relationship with ADF and Phillips-Perron unit-root tests, Engle-Granger and Johansen cointegration tests, an error-correction model, Granger-causality, structural-break and variance-inflation diagnostics. Moving-block bootstrap intervals propagate numerator and elasticity uncertainty. The preferred import-income elasticity is 1.278, implying a classical compatible growth rate of 3.50%, compared with observed real GDP growth of 3.56%. Its 95% interval, 0.51% to 6.25%, requires caution rather than a mechanical ceiling interpretation. Adding travel and remittances raises the accounting estimate to 4.31%, but does not establish a permanent structural relaxation. The error-correction coefficient is negative and significant, while the real effective exchange-rate coefficient is statistically insignificant. The main limitations are the small annual sample, borderline cointegration evidence and the use of consumer-price deflation for non-trade flows when component-specific volume indices are unavailable. The results support a coordinated strategy of export diversification, efficient import substitution and prudent management of foreign-exchange inflows.

Keywords: Morocco; balance-of-payments constraint; Thirlwall's Law; import elasticity; long-run growth.

JEL Classification: F32; F43; O11; C22.

Paper type: Empirical research.

Résumé

Cette recherche examine si la croissance de long terme du Maroc demeure contrainte par la balance des paiements après la pandémie et si les recettes de voyage, les transferts des Marocains résidant à l'étranger, les investissements directs étrangers et les termes de l'échange modifient conjointement cette contrainte. La question centrale est la suivante : la croissance observée entre 1998 et 2024 est-elle compatible avec le plafond externe prédit par la loi de Thirlwall ? L'hypothèse principale prévoit une proximité entre les deux taux; trois hypothèses secondaires testent l'effet des flux non commerciaux et des prix relatifs. Cet article empirique mobilise 27 observations annuelles issues de l'Office des Changes et des Indicateurs du développement dans le monde. Il estime l'élasticité-revenu des importations par moindres carrés ordinaires avec erreurs Newey-West, complète l'analyse par des tests ADF, Phillips-Perron, Engle-Granger et Johansen, un modèle à correction d'erreur, des tests de causalité, de rupture et de multicollinéarité, puis construit des intervalles par bootstrap en blocs. L'élasticité privilégiée atteint 1,278 et le taux compatible classique 3,50 %, contre une croissance observée de 3,56 %. L'intervalle à 95 % du taux compatible, de 0,51 % à 6,25 %, impose toutefois une interprétation prudente. Les recettes de voyage et les transferts portent l'estimation comptable à 4,31 %, sans démontrer un relâchement structurel permanent. La correction d'erreur est négative et significative, tandis que le taux de change effectif réel reste non significatif. Les principales limites sont la petite taille de l'échantillon, la puissance réduite des tests de cointégration et l'approximation des volumes non commerciaux par l'indice des prix à la consommation. Les résultats suggèrent une coordination entre diversification exportatrice, substitution efficace aux importations et gestion prudente des entrées de devises.

Mots clés : Maroc; contrainte de balance des paiements; loi de Thirlwall; élasticité des importations; croissance de long terme.

Classification JEL : F32; F43; O11; C22.

Type de l'article : Recherche empirique.

1. Introduction

Morocco's growth strategy has combined trade integration, infrastructure investment, new export platforms and a gradual modernization of the exchange-rate framework. Automotive, aeronautics, agri-food and phosphate exports have broadened the production base, while travel receipts and remittances remain major sources of foreign currency. Yet the economy still imports substantial volumes of energy, equipment and intermediate inputs, raising a classic development question: can domestic demand and productive capacity expand persistently without generating an external-financing requirement that eventually forces growth to slow?

The balance-of-payments-constrained growth approach offers a demand-led answer: in its simplest form, the long-run growth rate compatible with current-account balance equals real export growth divided by the income elasticity of import demand (Thirlwall, 1979). Supply conditions are not irrelevant, but potential output cannot be realized for long if the import content of expansion outpaces sustainable foreign-exchange earnings. Later extensions incorporate capital flows, relative prices and debt-service constraints (Thirlwall & Hussain, 1982; Moreno-Brid, 1999; Thirlwall, 2011).

The Moroccan case merits renewed examination for three reasons: the post-2019 period includes the COVID-19 collapse and rebound, supply-chain disruptions and an energy-price shock; the exchange-rate band was widened in 2018 and 2020, providing a natural setting to test whether relative prices condition import demand (Bank Al-Maghrib, 2018, 2020); and transfers, travel receipts and investment inflows are large enough that a merchandise-only calculation may understate available foreign exchange, while primary-income payments may overstate the persistence of capital-flow relief. Existing evidence is useful but incomplete. Majdoubi and Alaoui Omari (2020) found a high import-income elasticity for 1990–2018 and growth above the external ceiling, but their study predates the pandemic and the new exchange-rate regime and does not jointly quantify non-trade receipts, terms-of-trade effects and econometric uncertainty. Cross-country work also shows that results depend on trade structure, sample period and estimator (Perraton, 2003; Gouvea & Lima, 2010; Lanzafame, 2014). No recent Moroccan assessment covering 1998–2024 combines official merchandise flows with price-specific deflators, formal time-series diagnostics, explicit uncertainty intervals and a joint treatment of travel, remittances, FDI and the terms of trade.

This paper therefore asks whether Morocco's observed long-run growth over 1998–2024 is statistically and economically consistent with the balance-of-payments-compatible rate, and how non-trade earnings, capital inflows and relative prices modify that assessment. H1 posits that observed growth is close to the classical Thirlwall rate once merchandise flows are deflated by unit-value indices; H2 that travel receipts and remittances raise the compatible rate; H3 that gross FDI provides additional space, weakened when primary-income payments proxy repatriated earnings; and H4 that favorable terms-of-trade movements raise the compatible rate, although this price channel may be less stable than the income channel.

The paper contributes an update of the Moroccan evidence through 2024 using Office des Changes and World Bank series; a preferred unit-value specification alongside a CPI-deflated sensitivity case; levels, first-difference and error-correction estimates with HAC inference, endogeneity, break and multicollinearity diagnostics; and bootstrap intervals with policy simulations that distinguish a point estimate from the precision of the inferred ceiling. Section 2 reviews the theory and comparative evidence, Section 3 presents data and methods, Section 4 reports results, Section 5 discusses limits and policy implications, and Section 6 concludes.

2. Literature review and hypotheses

2.1. Foundations of balance-of-payments-constrained growth

Thirlwall's model begins from export and import demand functions in which trade volumes depend on relative prices and domestic or foreign income. Under long-run balance-of-payments equilibrium, constant relative prices and a common-currency accounting identity, the growth rate compatible with external balance reduces to export-volume growth divided by the income elasticity of import demand. The result is often described as a dynamic analogue to the Harrod trade multiplier because foreign demand and the economy's import propensity determine how fast domestic income can expand without accumulating an unsustainable external imbalance (Thirlwall, 1979, 2011).

The parsimonious rule is a long-run approximation, not an immutable technological law. Relative prices can be endogenous to growth, distribution, markups and exchange-rate policy. Price elasticities may be small, unstable or offset by imported-input dependence, while the income elasticities can change with sectoral composition (Bagnai, 2010; Blecker, 2016). McCombie (2011) also shows that criticisms based on accounting identities, testing procedures and export endogeneity require careful specification rather than automatic rejection or acceptance of the law. For a small sample, this implies that price controls, integration tests and sensitivity estimates are essential.

Capital flows expand the accounting identity but do not all relax the constraint equally. Thirlwall and Hussain (1982) allow a sustainable growth rate to reflect real capital inflows. Moreno-Brid (1999) adds a long-run debt-stability condition, preventing ever-rising external liabilities from being treated as permanent resources. For Morocco, FDI is generally more stable than portfolio flows, yet gross inflows can be followed by dividend, interest and profit remittances. An approximation that subtracts primary-income payments is therefore informative, though it cannot isolate the repatriation generated by each FDI cohort.

2.2. Comparative empirical evidence

Table 1. Critical synthesis of selected studies

Study	Coverage and estimator	Main result	Methodological lesson for this study
Thirlwall (1979)	General model; long-run accounting	Export growth and import-income elasticity determine the compatible rate	Use as a benchmark, not a mechanical forecast
Moreno-Brid (1999)	Mexico; cointegration and debt stability	External constraint remains relevant when financing sustainability is imposed	Distinguish durable resources from debt-creating flows
Perraton (2003)	Developing countries; alternative estimators	Broad support with cross-country heterogeneity	Report estimator and price-treatment sensitivity
Gouvea & Lima (2010)	Multisectoral panel	Trade composition changes aggregate elasticities	Interpret the aggregate elasticity as structure-dependent
Halicioglu (2012)	Turkey; time-series tests	Evidence supports a balance-of-payments constraint	Use formal integration and cointegration diagnostics
Lanzafame (2014)	Italy; time-varying parameters	Elasticities can change across regimes	Estimate subperiods and formal break tests
Majdoubi & Alaoui Omari (2020)	Morocco, 1990-2018; aggregate model	Observed growth exceeds the estimated ceiling	Reassess the period, deflators, uncertainty and non-trade flows
Asiama (2025)	African economies including Morocco and Tunisia; aggregate and multisectoral models	Trade technology and composition shape the constraint	Place Morocco in a structural comparative perspective

Source: Authors' synthesis.

Empirical support is broad but heterogeneous. Perraton (2003) found that balance-of-payments-constrained growth estimates explain long-run growth in many developing economies, with performance varying by specification. Gouvea and Lima (2010) showed that a multisectoral formulation can capture structural change because export and import elasticities differ across sectors. LanzaFame (2014) emphasized that parameter instability matters, while Bagnai (2010) demonstrated that relative-price and structural channels can qualify the simple rule. Country applications reinforce this caution: Moreno-Brid (1999) found a binding external constraint for Mexico under a debt-stability formulation, and Halicioglu (2012) reported support for the law in Turkey. For Morocco and Tunisia, Asiama (2025) finds that both aggregate and multisectoral variants retain explanatory value but that technological composition shapes the size of the elasticities.

2.3. Research gap and testable hypotheses

Table 1 highlights four recurring choices: the treatment of prices, the definition of foreign-exchange resources, the possibility that elasticities shift, and the estimator used for persistent series. The present design addresses each choice explicitly. Merchandise volumes are preferably deflated by export and import unit-value indices; CPI deflation is retained only as a sensitivity test. Non-trade flows are introduced sequentially to avoid attributing the same status to export earnings and financing. Time-series and stability diagnostics accompany the levels estimate. Finally, uncertainty in both the numerator and the import elasticity is propagated into the compatible rate.

H1. *Morocco's observed average real GDP growth over 1998-2024 is close to the classical rate computed from real merchandise-export growth and the long-run import-income elasticity.*

H2. *Adding real travel receipts and workers' remittances raises the accounting compatible rate, but the effect is less precisely estimated than the merchandise-only benchmark.*

H3. *Gross FDI raises the accounting resource-growth rate; subtracting primary-income payments reduces the inference that all capital inflows constitute permanent external space.*

H4. *Favorable terms-of-trade growth raises the compatible rate over the available overlap, while the real effective exchange-rate coefficient remains weaker than the domestic-income coefficient.*

3. Research methodology

3.1. Analytical framework

Let M denote real merchandise imports, Y real domestic income, X real merchandise exports and q the real effective exchange rate. Lowercase letters denote proportional growth rates and logarithms are written as $\ln$. The long-run import-demand relationship is estimated as:

$$\ln(M_t) = \alpha + \pi \ln(Y_t) + \psi \ln(q_t) + u_t$$

The baseline constrains ψ to zero in line with the simple Thirlwall rule, while an augmented specification estimates it. The parameter π is the long-run income elasticity of import demand. Under long-run external balance and neutral relative prices, the classical compatible growth rate is:

$$g^{BOP} = x / \pi$$

For the accounting extensions, x is replaced by the growth of a broader real foreign-exchange resource aggregate. The first adds travel receipts and workers' remittances; the second adds gross FDI inflows; the third subtracts total primary-income payments as a deliberately conservative, imperfect proxy for profit and interest repatriation. A terms-of-trade extension adds the observed log change in the net barter terms-of-trade index over 2006-2024. Because these flows have different economic meanings, the extensions are reported as scenarios rather than as interchangeable estimates of a structural law.

3.2. Data and measurement

The annual sample contains 27 observations from 1998 to 2024. The start date is determined primarily by consistent online coverage of the Office des Changes merchandise database. A Chow test on the longer World Bank real-GDP trend identifies only marginal evidence around 1998, $F = 2.755$ and $p = 0.075$, while the Zivot-Andrews unit-root test does not identify a statistically significant endogenous break. Thus, 1998 is a data-consistency choice rather than a claim of a sharply dated regime shift.

Nominal merchandise exports and imports in Moroccan dirhams are obtained from the Office des Changes interactive foreign-trade database. Preferred real series divide these values by World Bank export and import unit-value indices. Unlike CPI deflation, this treatment allows traded-goods prices to differ from domestic consumer prices. CPI-deflated trade values are retained as a sensitivity case because unit-value indices can themselves reflect changes in product composition and quality. Real GDP, the CPI, real effective exchange rate, terms of trade, travel-service exports, personal remittances, FDI inflows, primary-income payments and the official exchange rate come from the World Development Indicators. Travel values in dollars are converted at the official annual exchange rate before CPI deflation.

The non-trade resource aggregates necessarily use CPI deflation because comparable component-specific volume indices are unavailable for the full period. This approximation can mix price and quantity changes and is a central methodological limitation. FDI inflows and primary-income payments are also volatile, can have different timing and are not linked firm by firm. The net-FDI scenario therefore tests accounting sensitivity only; it does not identify the causal contribution of foreign investment to productive capacity.

Table 2. Variables, sources and measurement choices

Variable	Construction	Source	Main limitation
Real GDP	GDP at constant local prices; natural log	World Bank WDI	Annual aggregation
Real merchandise exports	Office des Changes value divided by export unit-value index	Office des Changes; WDI	Unit values reflect composition as well as prices
Real merchandise imports	Office des Changes value divided by import unit-value index	Office des Changes; WDI	Unit values reflect composition as well as prices
CPI trade sensitivity	Nominal trade value divided by CPI	Office des Changes; WDI	Domestic prices are not trade-specific
REER	Index, natural log; an increase follows the WDI convention	World Bank WDI	Aggregate competitiveness proxy
Travel and remittances	Dollar receipts converted to MAD and CPI-deflated	World Bank WDI	No common volume deflator
FDI and primary income	Inflows and payments converted to MAD and CPI-deflated	World Bank WDI	Gross flows, volatility and timing mismatch
Terms of trade	Annual log change in net barter index; 2005-2024 levels	World Bank WDI	Shorter 2006-2024 growth overlap

Source: Authors' construction from Office des Changes and World Bank data, retrieved 29 August 2026.

3.3. Econometric strategy and diagnostics

The empirical sequence is designed to avoid interpreting a high R^2 between persistent variables as sufficient evidence. Augmented Dickey-Fuller and Phillips-Perron tests are applied to logarithmic levels with a deterministic trend and to first differences with a constant. Engle-Granger residual and Johansen trace and maximum-eigenvalue tests then evaluate the long-run relation. Because annual samples of 27 observations have limited power and the cointegration tests need not agree, the evidence is interpreted jointly rather than through a single threshold (Dickey & Fuller, 1979; Phillips & Perron, 1988; Engle & Granger, 1987; Johansen, 1988).

The levels elasticity is estimated by ordinary least squares, with Newey-West heteroskedasticity and autocorrelation-consistent standard errors using two lags (Newey & West, 1987). Durbin-Watson and Breusch-Godfrey LM tests at one and two lags diagnose residual serial correlation. A short-run error-correction model regresses import growth on contemporaneous real-GDP growth and the lagged residual from the levels relationship. A negative and significant correction coefficient supplies dynamic evidence that deviations are reversed.

Income and imports can be jointly determined: an import shock can constrain production, while a demand expansion raises imports. To probe this issue without claiming a strong external instrument, the study estimates a lagged-income specification and applies Granger-causality tests in first differences at one and two lags (Granger, 1969). These are predictive, not structural, tests. The short sample sharply limits their power, so they reduce but do not eliminate endogeneity concerns.

Stability is assessed in three ways. Elasticities are estimated for 1998-2007, 2008-2019 and 2020-2024, with the final five-observation estimate explicitly treated as descriptive. A 1998-2018 partial-sample estimate permits a closer comparison with Majdoubi and Alaoui Omari (2020). Chow tests assess the import relationship at 2019 and the longer GDP trend at 1998, while a Zivot-Andrews test allows one endogenous level break (Chow, 1960; Zivot & Andrews, 1992). In the augmented REER model, variance-inflation factors test whether an insignificant price coefficient merely reflects multicollinearity.

3.4. Compatible-rate uncertainty and policy simulation

A ratio such as x/π inherits uncertainty from both its numerator and denominator. The study therefore draws the numerator from a moving-block bootstrap of annual growth rates and draws π from a normal approximation based on its Newey-West standard error. Blocks preserve short-run dependence better than independent resampling. Ten thousand admissible draws generate the reported median and 95% interval. This interval is a small-sample uncertainty summary, not a structural forecast interval. Policy simulations then calculate either the export growth required at the current π or the import elasticity required at the current export-growth rate to sustain target GDP growth of 4.0%, 4.5% and 5.0%.

4. Results

4.1. Descriptive evidence

Table 3. Descriptive statistics for annual log growth rates

Series	N	Mean (%)	SD	Minimum	Maximum
Real GDP	26	3.56	2.87	-7.45	7.84
Merchandise exports, unit-value deflated	26	4.48	9.96	-18.38	21.95
Merchandise imports, unit-value deflated	26	4.84	8.82	-13.59	28.30
Merchandise exports, CPI-deflated	26	5.51	11.38	-33.03	27.04
Merchandise imports, CPI-deflated	26	6.08	11.23	-22.08	26.86
Exports + travel + remittances, CPI-deflated	26	5.50	9.93	-21.04	25.28
Terms of trade	19	0.05	6.63	-8.57	16.59

Source: Authors' calculations from Office des Changes and World Bank data.

Average real GDP growth was 3.56% over 1999-2024, with a standard deviation of 2.87 percentage points. The range from -7.45% to 7.84% captures the pandemic contraction and rebound. Preferred real merchandise-export growth averaged 4.48%, while real import growth averaged 4.84%. Both trade-volume proxies are considerably more volatile than GDP, which foreshadows wide uncertainty around a compatible-growth ratio. CPI deflation produces higher

average growth for both exports and imports, confirming that the price treatment is economically consequential rather than a cosmetic data choice.

4.2. Integration, cointegration and error correction

Both logarithmic series behave as integrated processes. In levels, neither ADF nor Phillips-Perron rejects a unit root for real GDP or real merchandise imports. In first differences, both tests reject at the 1% level. The high levels R^2 must therefore be evaluated alongside cointegration evidence. The Engle-Granger statistic of -3.691 rejects no cointegration at 10% but not at 5%. The Johansen trace statistic of 15.624 narrowly exceeds its 5% critical value of 15.494 for rank zero, whereas the maximum-eigenvalue statistic does not. These mixed results are described as borderline evidence, not conclusive proof.

Table 4. Unit-root tests

Series and form	ADF statistic	ADF p-value	PP statistic	PP p-value	Conclusion
ln(real GDP), level	-1.197	0.911	-0.878	0.958	Do not reject unit root
Δ ln(real GDP)	-6.473	<0.001	-6.242	<0.001	Reject unit root
ln(real imports), level	-2.949	0.147	-2.651	0.257	Do not reject unit root
Δ ln(real imports)	-5.348	<0.001	-6.864	<0.001	Reject unit root

Source: Authors' calculations. Level tests include trend; difference tests include a constant.

Table 5. Cointegration and error-correction evidence

Diagnostic	Statistic or coefficient	p-value / 5% critical value	Interpretation
Engle-Granger residual test	-3.691	p = 0.063; critical = -4.164	Reject only at 10%
Johansen trace, rank 0	15.624	critical = 15.494	Borderline rejection at 5%
Johansen maximum eigenvalue, rank 0	9.693	critical = 14.264	Do not reject
ECM: Δ ln(Y)	0.638 (HAC SE 0.567)	p = 0.272	Short-run coefficient imprecise
ECM: lagged disequilibrium	-0.649 (HAC SE 0.199)	p = 0.004	Significant annual correction
ECM diagnostics	$R^2 = 0.345$; DW = 1.769	BG(1) p = 0.158; BG(2) p = 0.322	No residual serial correlation at 5%

Source: Authors' calculations; HAC standard errors use Newey-West lag 2.

The error-correction coefficient is -0.649 and statistically significant at 1%, implying that roughly 65% of the previous year's deviation from the estimated long-run relationship is reversed within one year. The short-run income coefficient is positive but imprecise. Together with the mixed cointegration tests, this dynamic result supports a long-run adjustment mechanism while leaving substantial small-sample uncertainty. It is therefore more informative than the levels R^2 alone.

4.3. Import-demand elasticity, price sensitivity and endogeneity checks

The preferred unit-value-deflated model estimates π at 1.278, with a Newey-West standard error of 0.054. Its R^2 is 0.960, but the integration evidence and ECM are used to qualify that fit. Breusch-Godfrey tests do not reject serial independence at one or two lags, although the Durbin-Watson value of 1.340 motivates retaining HAC inference. CPI deflation raises π to 1.623 and introduces stronger one-lag serial correlation. Thus, using domestic prices for merchandise trade appears to overstate the income elasticity relative to trade-specific unit-value deflation.

Table 6. Import-demand estimates and diagnostics

Specification	Income elasticity	Other coefficient	R ²	DW / BG p-values	Robustness reading
Preferred unit-value deflation	1.278*** (HAC SE 0.054)	Constant -8.732***	0.960	1.340 / 0.094; 0.201	Central estimate
CPI deflation	1.623*** (HAC SE 0.065)	Constant -18.187***	0.960	1.151 / 0.029; 0.069	Higher π ; residual concern
Preferred + REER	1.335*** (HAC SE 0.075)	REER 0.391 (0.539); p = 0.475	0.961	1.429 / 0.130; 0.267	Price coefficient insignificant
Lagged income	1.235*** (HAC SE 0.060)	Constant -7.492***	0.954	1.238 / 0.061; 0.067	Similar magnitude

*Source: Authors' calculations. *** $p < 0.01$. BG values are p-values at lags 1 and 2; Newey-West lag 2.*

The augmented model does not show that REER insignificance is a multicollinearity artifact. The VIF is 3.37 for both $\ln(Y)$ and $\ln(\text{REER})$, below the conventional warning threshold of 5. The coefficient's sign is sensitive to the index convention and imported-input channel; more importantly, its p-value is 0.475. In first-difference Granger tests, GDP growth does not predict import growth at lag 1 ($p = 0.241$) or lag 2 ($p = 0.187$), and the reverse direction is also insignificant ($p = 0.752$ and 0.894). These results and the lagged-income elasticity of 1.235 reduce immediate simultaneity concerns, but the low power of a 26-observation difference sample means that structural exogeneity is not established.

4.4. Compatible growth rates and uncertainty

Using preferred real export growth of 4.48% and $\pi = 1.278$ gives a classical compatible rate of 3.50%. Observed average real GDP growth is 3.56%, a difference of only 0.06 percentage point. H1 is therefore supported in point-estimate terms. However, the 95% bootstrap interval ranges from 0.51% to 6.25%. Because observed growth lies well inside it, the defensible conclusion is consistency with an external constraint, not a precise estimate of an immutable ceiling.

Table 7. Balance-of-payments-compatible growth scenarios

Scenario	Compatible rate (%)	95% interval	Observed minus compatible (pp)	Interpretive status
Classical, unit-value trade	3.50	[0.51; 6.25]	+0.06	Preferred benchmark
Classical, CPI trade	3.39	[1.83; 5.16]	+0.17	Deflator sensitivity
Exports + travel + remittances	4.31	[2.14; 6.60]	-0.74	Accounting buffer; H2 supported
Previous aggregate + gross FDI	4.30	[1.66; 7.00]	-0.73	No additional point gain; volatile
Previous aggregate + FDI - primary-income payments	4.47	[1.72; 7.31]	-0.91	Sensitivity only; timing/base effects
Classical + terms of trade, 2006-2024	4.01	[1.02; 7.05]	-0.45	Shorter overlap; H4 conditional

Source: Authors' calculations. Intervals use moving-block resampling of numerator growth and HAC elasticity uncertainty.

H2 receives qualified support: adding travel receipts and remittances raises the point estimate to 4.31%, but also reflects CPI deflation and a different resource composition. H3 is not supported as a simple monotonic proposition. Gross FDI does not raise the point estimate beyond the travel-remittance aggregate, and subtracting total primary-income payments paradoxically raises average resource growth because subtraction changes the base and amplifies timing volatility. This is exactly why the net-FDI scenario is not interpreted as a

structural benefit. It demonstrates that aggregate profit-repatriation approximations are too coarse for causal inference. H4 is supported only over the shorter terms-of-trade overlap: the average terms-of-trade contribution is slightly positive and the point estimate reaches 4.01%, but the interval remains very wide.

4.5. Subperiods, comparison with earlier Moroccan evidence and break tests

The preferred elasticity rises from 1.117 in 1998-2007 to 1.645 in 2008-2019, consistent with greater import responsiveness during the expansion of global value-chain production and investment. The 2020-2024 estimate is 1.716, but its conventional standard error is 0.580 and the p-value is 0.060. With only five observations containing a collapse and rebound, this value is descriptive and cannot support a stable post-pandemic regime claim. A Chow test at 2019 fails to reject parameter stability, $F = 0.286$ and $p = 0.754$.

Table 8. Subperiod income elasticities and stability evidence

Period / test	N	Income elasticity	OLS SE	R ²	Interpretation
1998-2007	10	1.117***	0.170	0.844	Lower early-period responsiveness
2008-2019	12	1.645***	0.192	0.880	Higher pre-pandemic responsiveness
2020-2024	5	1.716*	0.580	0.745	Very imprecise; descriptive only
1998-2018	21	1.260***	0.071	0.943	Comparable endpoint to earlier study
1998-2024	27	1.278***	0.052	0.960	Preferred full-sample estimate
Chow break at 2019	27	$F = 0.286$	$p = 0.754$	-	No formal break

*Source: Authors' calculations. * $p < 0.10$; *** $p < 0.01$. Subperiod OLS standard errors are shown because HAC inference is unreliable with $N = 5$.*

For 1998-2018, the preferred elasticity is 1.260, materially below the value reported by Majdoubi and Alaoui Omari (2020). Extending the endpoint to 2024 changes this estimate by only 0.018, so the gap is not mainly a post-2018 effect. It is more plausibly attributable to the use of Office des Changes merchandise values, trade-specific unit-value deflators, the chosen observation window and specification. The CPI sensitivity elasticity of 1.623 moves toward the earlier result, confirming that price treatment accounts for an important part of the difference. Because the original micro-level series and exact estimation choices are not identical, the comparison is partial rather than a formal replication.

5. Discussion

5.1. What the preferred estimate establishes

The central finding is a near equality between observed growth, 3.56%, and the preferred compatible rate, 3.50%. Economically, the result says that Morocco's realized long-run expansion used almost all of the foreign-exchange space generated by merchandise exports, given an import-income elasticity above one. Statistically, the broad interval means that the equality cannot be interpreted with decimal-point precision. The most defensible statement is that the data do not reject the balance-of-payments-constrained interpretation and that a large permanent acceleration would require either faster export-resource growth or a lower import propensity.

5.2. Intrinsic theoretical limitations

Three qualifications are intrinsic to the model. First, relative prices are not necessarily exogenous. Exchange-rate movements affect inflation, distribution, imported-input costs and pricing decisions, while productivity and sectoral upgrading affect the equilibrium exchange rate. Second, weak price elasticities do not imply that prices never matter; they may work

through investment, market entry and composition over horizons longer than the sample, or be offset by high imported-input content. Third, π is not a deep constant. It varies with industrial structure, energy dependence, demand composition and the technological content of exports and imports (Bagnai, 2010; McCombie, 2011; Blecker, 2016). The subperiod variation in Table 8 reinforces this caution even though the formal 2019 Chow test is insignificant.

The insignificant REER coefficient is therefore not evidence that exchange-rate policy is irrelevant. It says that, conditional on domestic income and within this small annual sample, the aggregate REER does not independently explain merchandise-import levels with statistical precision. Since the VIF is only 3.37, the result is not simply caused by severe collinearity. Yet the 2018 and 2020 widening of the fluctuation band occurred too recently, and alongside large shocks, for a clean regime evaluation. Sectoral pass-through and local-currency pricing may be more informative than an aggregate coefficient.

5.3. Non-trade buffers and the quality of external finance

Travel receipts and remittances create genuine foreign-exchange capacity and support H2 in an accounting sense. They also behaved differently during the pandemic: travel collapsed while remittances remained resilient. Combining them smooths some shocks but can conceal distinct determinants. Policy should therefore protect the quality of tourism receipts, reduce transfer costs and channel remittances toward productive investment without treating either flow as a substitute for tradable-sector upgrading.

The FDI results reject a simplistic larger-inflow-equals-higher-ceiling narrative. Gross inflows finance imports, technology and capacity, but later primary-income outflows reduce net foreign-exchange availability. The available aggregate data cannot match investment vintages to subsequent profit remittances, and subtraction can generate base effects that raise rather than lower an average growth ratio. A serious sustainability assessment needs firm- or sector-level stocks, reinvested earnings, dividend payments, import content and export revenues. The present approximation is valuable mainly because it exposes this measurement problem.

5.4. International comparison

Morocco's result resembles evidence from Mexico and Turkey in showing that external demand and import responsiveness remain consequential even after trade liberalization and productive diversification (Moreno-Brid, 1999; Halicioglu, 2012). Mexico illustrates why debt stability and income payments must accompany a current-account identity. Turkey highlights the sensitivity of an import-dependent industrial economy to external finance and technological trade structure. Evidence for Morocco and Tunisia further suggests that technological composition changes sectoral elasticities and hence the aggregate constraint (Asiama, 2025). These comparisons do not imply identical institutions; they show why moving from aggregate trade growth to the technology and domestic value added of trade is the next analytical step.

5.5. Exchange-rate reform and institutional implications

The post-2018 exchange-rate reform widened the dirham's fluctuation band from $\pm 0.3\%$ to $\pm 2.5\%$ in January 2018 and to $\pm 5\%$ in March 2020, while retaining a basket dominated by the euro (Bank Al-Maghrib, 2018, 2020). The insignificant aggregate REER coefficient suggests that depreciation alone is unlikely to be a reliable long-run growth instrument when production depends on imported equipment, energy and intermediate goods. It does not invalidate gradual flexibility. Instead, it supports sequencing exchange-rate reform with deeper hedging markets, credible inflation management, competition policy and measures that increase domestic value added in exports.

Institutional responsibilities are complementary. Bank Al-Maghrib can publish sectoral pass-through, hedging and foreign-currency exposure indicators and incorporate import-elasticity

scenarios into macroprudential stress tests. The Ministry of Economy and Finance can evaluate tax and investment incentives by net export generation, domestic supplier linkages and lifetime foreign-currency effects rather than gross investment alone. The Office des Changes can integrate trade, travel, remittance, FDI-income and sectoral partner data in reproducible research extracts, including metadata on revisions. Jointly, the institutions can maintain an external-growth dashboard that reports ranges rather than single-number ceilings.

5.6. Quantitative policy simulation

The simulation translates the estimated constraint into transparent, non-forecasting benchmarks. At $\pi = 1.278$, sustaining 4.0% growth would require export-volume growth of 5.11%, 0.64 percentage point above its historical mean. A 4.5% target would require 5.75%, and 5.0% would require 6.39%. Alternatively, holding export growth at 4.48% would require π to fall to 1.119, 0.995 and 0.895, respectively. These are demanding reductions of 12.4%, 22.2% and 29.9%, which could arise only through durable domestic-supply and composition changes rather than administrative compression of productive imports.

Table 9. Policy simulation at the preferred elasticity and export-growth rate

Target real GDP growth	Required export growth (%)	Additional export growth (pp)	Required import elasticity	Reduction in π (%)
4.0%	5.11	0.64	1.119	12.4
4.5%	5.75	1.27	0.995	22.2
5.0%	6.39	1.91	0.895	29.9

Source: Authors' calculations using $x = 4.476\%$ and $\pi = 1.278$.

The policy mix follows from both sides of the ratio. Raising x requires expanding market reach and, more importantly, domestic value added in automotive, aeronautics, phosphates, agri-food and digitally delivered services. Lowering π requires competitive local energy, logistics, intermediate-input and capital-goods capabilities, not indiscriminate import restriction. IMF surveillance similarly emphasizes productivity, human capital, social protection efficiency and continued macroeconomic resilience as complements to external adjustment (International Monetary Fund, 2024, 2025).

6. Conclusion

This study reassessed Morocco's balance-of-payments-constrained growth over 1998-2024 using official merchandise flows, trade-specific unit-value deflators and a battery of time-series diagnostics. The preferred income elasticity of import demand is 1.278. With average real merchandise-export growth of 4.48%, the classical Thirlwall rate is 3.50%, compared with observed real GDP growth of 3.56%. The point estimates support H1 and place realized growth close to the external benchmark. The error-correction coefficient is negative and significant, providing dynamic support, but Engle-Granger and Johansen evidence is mixed and the 95% compatible-rate interval is wide. The conclusion is therefore plausibility, not exact identification of a fixed ceiling.

Travel receipts and remittances raise the accounting estimate to 4.31% and conditionally support H2. Gross FDI does not produce a further point-estimate gain, while a crude primary-income adjustment is dominated by volatility and timing effects; H3 is not supported as a monotonic structural claim. Terms-of-trade movements raise the shorter-overlap estimate, but with high uncertainty, giving only conditional support to H4. The aggregate REER coefficient is statistically insignificant and is not explained by severe multicollinearity. This finding favors a gradual exchange-rate strategy combined with productive transformation rather than reliance on depreciation alone.

The main limitations are explicit. The annual sample is small, the final subperiod has only five observations, cointegration tests have limited and conflicting power, and no external instrument identifies the causal income coefficient. Unit-value indices mix price and product composition, while CPI deflation is an imperfect proxy for the volume of travel, remittance and capital-flow resources. Aggregate primary-income payments do not isolate FDI profit repatriation. Bootstrap intervals summarize sampling uncertainty but cannot capture model uncertainty or future structural change.

The institutional contribution is operational. Bank Al-Maghrib can monitor sectoral exchange-rate pass-through, hedging and import elasticities; the Ministry of Economy and Finance can evaluate incentives by net lifetime foreign-exchange generation and domestic supplier linkages; and the Office des Changes can publish revision-aware, research-ready linked external accounts. A shared dashboard should report compatible-growth ranges, the composition and volatility of foreign-currency resources, and domestic value-added indicators.

Future work should answer three precise questions. Does the import-income elasticity differ across energy, capital, intermediate and consumer goods once sectoral volume indices are available? How do FDI cohorts affect net foreign exchange after their imported inputs, export receipts, reinvested earnings and profit remittances are matched over time? Did the 2018 and 2020 band widening change sectoral price pass-through and trade volumes once a longer post-reform sample permits credible identification? Addressing these questions with quarterly or sectoral data, time-varying parameters and externally instrumented demand would determine whether Morocco can lift growth through structural relaxation of the external constraint rather than temporary financing.

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