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Morocco's Integration into Global Value Chains: Structural Trade Deficit and Dependence on Imported Inputs

Intégration du Maroc aux chaînes de valeur mondiales : déficit commercial structurel et dépendance aux intrants importés

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Abstract:

In Morocco, the merchandise trade deficit is the main source of the structural imbalance of the external accounts. Exports of compensating products under inward processing account for more than three quarters of exports, reflecting an effective integration into global value chains (GVCs) that has not been accompanied by a reduction of this deficit. The literature on processing trade focuses mainly on domestic value added; the link between this integration profile and the trade balance remains rarely examined, especially at the industry level. This article examines the magnitude and significance of this link. It uses Office des Changes merchandise trade data (66 industries, 1998-2025) and measures processing intensity by the share of these exports in total exports (REAT). A dynamic fixed-effects panel model, corrected for the bias specific to such models and subjected to robustness tests, is complemented by OECD TiVA indicators. Industry trade balances are persistent and show no tendency to return to equilibrium. A higher REAT is associated with a modest improvement in the coverage ratio and the Trade Balance Index, but not in the trade balance: even under the most favourable assumption, a 10-point rise in REAT in all industries would reduce the 2025 deficit by at most 5%. Nearly two thirds of the deficit outside inward processing comes from the industries most integrated into GVCs. TiVA indicators show that the domestic value-added share of manufacturing exports declined between 2010 and 2021. The results suggest that domestic value creation, rather than the intensity of integration, conditions the external balance.

Keywords: Global value chains; Inward processing; Trade balance; Dynamic panel; TiVA; Morocco.
JEL Classification : F14, F15, F10, C33.
Paper type: Empirical research.

Résumé:

Au Maroc, le déficit du commerce de marchandises est la principale source du déséquilibre structurel des comptes extérieurs. Les réexportations en suite d'admission temporaire pour perfectionnement actif représentent plus des trois quarts des exportations, signe d'une intégration effective aux chaînes de valeur mondiales (CVM) qui ne s'est pas accompagnée d'une résorption de ce déficit. La littérature sur le commerce de transformation porte surtout sur la valeur ajoutée domestique ; le lien entre ce profil d'intégration et le solde commercial reste rarement examiné, notamment par branche. Cet article mobilise les données du commerce extérieur de marchandises de l'Office des Changes (66 branches, 1998-2025) et mesure l'intensité de la transformation par la part de ces réexportations dans les exportations (REAT). Un modèle de panel dynamique à effets fixes, soumis à des tests de robustesse, est complété par les indicateurs TiVA de l'OCDE. Les soldes des branches sont persistants et ne reviennent pas vers un équilibre. Une hausse de REAT est associée à une amélioration modeste du taux de couverture et du Trade Balance Index, mais non du solde : une hausse de 10 points de REAT dans toutes les branches réduirait le déficit de 2025 d'au plus 5 %. Près des deux tiers du déficit hors admission temporaire proviennent des branches les plus intégrées aux CVM. Les indicateurs TiVA montrent que la part de la valeur ajoutée domestique dans les exportations manufacturières recule entre 2010 et 2021. Les résultats suggèrent que la création de valeur domestique, plus que l'intensité de l'intégration, conditionne l'équilibre extérieur.

Mots clés : Chaînes de valeur mondiales ; Perfectionnement actif ; Solde commercial ; Panel dynamique ; TiVA ; Maroc.
JEL Classification : F14, F15, F10, C33.
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1. Introduction

The international fragmentation of production has deeply changed the way world trade works since the 1990s. The production of manufactured goods is no longer concentrated in a single national space; it is now broken down into a succession of tasks and segments located in different countries according to their comparative advantages, production costs and technological capabilities (Grossman & Rossi-Hansberg, 2008; Baldwin, 2016). Countries no longer necessarily specialise in complete products, but in particular stages of the global production process (Gereffi et al., 2005).

In this context, integration into GVCs can be a lever of structural transformation for emerging economies, by increasing exports, attracting foreign direct investment and fostering technology transfer (Humphrey & Schmitz, 2002). The benefits of this integration are, however, neither automatic nor uniform. Strong insertion into global production networks can coexist with limited domestic value creation when the activities carried out locally remain concentrated in processing or assembly segments that depend heavily on foreign supplies (Koopman et al., 2014).

This issue is particularly important in the case of Morocco. Since the early 2000s, the country has substantially transformed its export structure, driven by the development of its global industries and by the expansion of several manufacturing activities (Hahn & Vidican-Auktor, 2017; Auktor, 2026). Merchandise exports rose from 68.6 billion dirhams in 1998 to 470.0 billion in 2025, while the trade deficit widened from 30.1 to 352.3 billion dirhams (merchandise foreign-trade data, Office des Changes, 2026). The share of exports of compensating products under inward processing in total exports rose from 67.1% to 76.3%. The coverage ratio fell from 69.5% to 57.2%; calculated on ordinary exports and imports for home use only, it fell from 32.4% to 18.6% (authors' calculations based on Office des Changes merchandise trade data). As a share of GDP, the trade deficit rose from 6.7% in 1998 to 20.7% in 2025 and has not fallen below 13.9% since 2005 (authors' calculations based on Office des Changes and HCP data). According to World Bank data (World Bank, 2026), it was the lowest of the four countries compared (Morocco, Tunisia, Egypt, Turkey) in 1998; it has been the highest since 2005, at 19.0% of GDP in 2024, compared with 11.9% in Tunisia, 11.2% in Egypt and 6.0% in Turkey.

The GVC literature has extensively analysed the effects of productive fragmentation, governance and upgrading mechanisms, and the limitations of gross trade statistics (Gereffi et al., 2005; Koopman et al., 2014). The literature on processing trade, developed mainly from the Chinese case, focuses on the domestic value added of exports (Dean et al., 2011; Koopman et al., 2012; Kee & Tang, 2016). For Morocco, Jaafari and Zenasni (2021) show that GVC participation relies mainly on backward linkages. The link between this integration profile and the trade balance, however, remains rarely examined, especially at industry level.

This article therefore seeks to answer the following question: what are the magnitude and the significance of the association between the intensity of exports of compensating products under inward processing and the trade performance of industries, both relative (coverage ratio, Trade Balance Index) and in level (trade balance)?

Three hypotheses, derived from the conceptual framework presented in Section 2.5, structure the analysis. The first (H1), descriptive in nature, concerns persistence: the trade balance of an industry depends strongly on its past level (Hausmann et al., 2007). The second (H2) concerns relative performance: a higher intensity of exports of compensating products under inward processing improves the coverage ratio and the Trade Balance Index (Koopman et al., 2012). The third (H3) concerns the level: since the contribution of these operations to the balance remains small compared with imports for home use, their effect on the balance, especially outside inward processing, is nil or too small to restore the balance of deficit industries (Thirlwall, 1979; Kee & Tang, 2016).

The shares of processing exports and imports are standard ratios in the literature, notably for China (Dean et al., 2011; Koopman et al., 2012; Kee & Tang, 2016). This article attempts to make three contributions. Empirically, it applies them to 66 industries of the national accounts classification (NCN) observed from 1998 to 2025, using detailed merchandise foreign-trade data (source: Office des Changes) that cover all of Morocco's merchandise trade, and relates them to the trade balance, whereas studies on Morocco focus on GVC participation (Jaafari & Zenasni, 2021) or on firms (Bussolo & Cruz, 2015). Methodologically, it measures processing intensity by the share of exports of compensating products under inward processing in total exports (REAT), and reliance on imported inputs by the share of imports under inward processing in total imports (INTDEP). These Office des Changes headings, « réexportations en suite d'admission temporaire pour perfectionnement actif » and « importations en admission temporaire pour perfectionnement actif », correspond to the « compensating products » and « inward processing » of the Revised Kyoto Convention (WCO, 2006) and to the « goods for processing » of international merchandise trade statistics (United Nations, 2013). These indicators directly observe operations that value-added approaches have to estimate; the OECD TiVA indicators complement them. In terms of economic policy, it attempts to shed light, based on recorded trade transactions rather than foreign-currency settlements, on a question that Bank Al-Maghrib (2024) leaves open: according to the central bank, global industries strengthen the resilience of the country's external position, but their net foreign-currency balance and their spillover effects on the national economy remain uncertain.

The remainder of the article is organised as follows. Section 2 presents the literature review, the conceptual framework and the hypotheses. Section 3 describes the data and the methodology. Section 4 presents the empirical results, which Section 5 discusses. Section 6 concludes.

2. Literature review

2.1. Specialisation in tasks and the measurement of value added

Traditional theories explain trade by comparative advantage, based in Ricardo (1817) on differences in relative labour costs, and then by differences in factor endowments in the Heckscher-Ohlin-Samuelson model (Heckscher, 1919; Ohlin, 1933; Samuelson, 1948). In both cases, each country specialises in the goods it produces at a lower relative cost, and the production of a good is assumed to take place entirely within national borders. This is exactly the assumption that today's fragmentation of production challenges.

To measure the specialisations actually observed, Balassa (1965) proposes the revealed comparative advantage index, which compares the weight of a product in a country's exports with its weight in world exports. This index, however, only takes exports into account. Measures based on both exports and imports are discussed by Vollrath (1991), and Lassudrie-Duchêne and Mucchielli (1979) show the value of taking two-way trade into account to rank comparative advantages. The normalised trade balance, often referred to in the empirical literature as the Trade Balance Index (TBI) (Widodo, 2009), measures the relative orientation of a sector towards exports or imports:

$$TBIi,t = (Xi,t - Mi,t) / (Xi,t + Mi,t)$$

Ranging from -1 to +1, the TBI is positive when the sector exports more than it imports and negative when it depends relatively on imports; normalised by the volume of trade, it allows sectors of very different sizes to be compared. It differs from the Lafay (1992) indicator, which subtracts from this normalised balance that of the country's total trade and weights the result by the sector's share in trade, in order to neutralise the effect of the overall imbalance.

The internationalisation of production processes from the 1990s onwards gave rise to the GVC paradigm. Trade no longer concerns only final goods, but increasingly components,

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intermediate services and tasks spread across several territories; the GVC paradigm analyses how these activities are organised and distributed across national spaces (Gereffi, 1994; Gereffi et al., 2005). Baldwin (2016) describes this evolution as a "second unbundling": falling transport costs first made it possible to separate the places of production and consumption; falling communication and coordination costs, driven by digital technologies, then made it possible to separate the stages of production themselves. Jones and Kierzkowski (1990) proposed one of the first frameworks for analysing this fragmentation, into production blocks linked by coordination services; Grossman and Rossi-Hansberg (2008) extended it with a theory of "trade in tasks": comparative advantage now concerns segments of the production process rather than entire industries, so that a country can specialise in the assembly of a good without mastering its design.

In fragmented chains, national exports incorporate a large share of imported inputs. Gross statistics nevertheless attribute the entire value of an exported product to the last exporting country. They thus count several times the value of inputs that cross several borders, which inflates world trade and distorts bilateral balances between partners (Koopman et al., 2014). Decomposing exports into domestic and foreign value added corrects this double counting (Johnson & Noguera, 2012; Wang et al., 2013; Timmer et al., 2014; Los et al., 2015; Borin & Mancini, 2019).

The OECD TiVA database applies this approach using a common method for many economies, based on inter-country input-output tables. Two indicators are central: the share of domestic value added in gross exports and the share of foreign value added. A high share of foreign value added reflects strong backward participation and dependence on foreign supplies; a rising domestic share signals, by contrast, a deepening of the national contribution to exports.

Domestic value added should not, however, be automatically equated with domestic income or with the value captured locally. Wang and Liu (2025) show that conventional measures of trade in value added correct a large part of the distortions due to double counting, but leave open questions on the attribution of capital income, particularly for transnational activities. This discussion does not call into question the usefulness of TiVA indicators; it underlines the need to combine them with more detailed trade data.

Nor do TiVA indicators replace gross trade statistics, which are essential for analysing actual balances, import flows and customs procedures, and they are published with a lag of several years. Combining them with detailed merchandise foreign-trade data is at the heart of the empirical strategy of this article.

2.2. Processing trade

Processing trade, which consists of importing inputs free of duties in order to re-export them after processing, is central to measuring the domestic value added of exports. Hummels, Ishii and Yi (2001) measure vertical specialisation by the import content of exports. For China, Dean, Fung and Wang (2011) and Koopman, Wang and Wei (2012) show that standard input-output tables overestimate the domestic share when this trade is large. Feenstra and Hanson (2005) study it from the angle of plant ownership and control over imported inputs, and Ma, Wang and Zhu (2015) show that a large share of the domestic value added of Chinese exports is produced by foreign-owned firms.

Kee and Tang (2012) estimate that the domestic share of Chinese processing exports rose from about 35% to 49% between 2000 and 2006, mainly through the substitution of domestic for imported inputs; in the published version of this work, they show that China is thus an exception to the decline in the domestic share of exports observed in many countries (Kee & Tang, 2016). Yu (2015) and Manova and Yu (2016) link this mode of exporting to lower productivity and profits. Comparable regimes exist in Mexico with the maquiladoras (Bergin et al., 2009) and in Tunisia with the offshore regime, which according to the World Bank (2014) has remained

confined to low value-added activities with few links to the rest of the economy. This literature focuses mainly on value added and productivity; the link with the trade balance of industries is rarely examined. The Chinese experience serves as a point of comparison in Section 4.5.

2.3. GVC participation and upgrading: mixed results

Gereffi, Humphrey and Sturgeon (2005) distinguish five forms of GVC governance: market, modular, relational, captive and hierarchical chains. They differ according to the complexity of the information exchanged between buyers and suppliers, the ability to codify this information and the capabilities of suppliers. The degree of control exercised by lead firms increases from market chains to hierarchical chains, in which production is integrated within the firm.

In captive chains, suppliers depend heavily on the specifications, technologies and decisions of their buyers. When they remain confined to standardised tasks, their autonomy is limited, which restricts learning and the local capture of value. Relational or modular chains can, by contrast, offer more opportunities for skills transfer and the integration of national suppliers, provided that local capabilities are sufficient. Assembly and simple processing functions, often located in emerging countries, therefore capture a small share of value added, while design, R&D and marketing account for most of it (Gereffi & Fernandez-Stark, 2016). This hierarchy explains why strong export growth can coexist with weak domestic value creation and persistent trade imbalances.

Humphrey and Schmitz (2002) distinguish four forms of upgrading: improving production processes (process upgrading), moving into more sophisticated products (product upgrading), moving up to more complex functions in the chain, such as design or marketing (functional upgrading), and shifting into new sectors (inter-sectoral upgrading). The experience of East Asian economies illustrates trajectories in which rising domestic content, technological learning and functional repositioning reinforced one another.

Recent studies do not reach the same conclusions, partly because they do not use the same scale of analysis. At country level, Zou (2026) finds, for 62 countries from 1995 to 2018, an N-shaped relationship between GVC participation and upgrading, with an intermediate "trap" phase in which the effects decline. At sector level, Turan et al. (2026) find positive but differentiated effects depending on the direction of participation and the sector: in MENA manufacturing, participation is accompanied by product upgrading without process upgrading. At firm level, Islam et al. (2026) show that the upgrading of suppliers depends on their strategic learning capabilities. In the automotive industry, Pardi (2018) shows that the global and centralised strategies of carmakers dominate, whereas decentralised strategies offer more upgrading opportunities to emerging countries. These results converge on one point: GVC participation does not guarantee upgrading. They concern upgrading, however, and not the trade balance.

2.4. The reconfiguration of GVCs and studies on Morocco

The Covid-19 pandemic and geopolitical tensions have not led to general deglobalisation, but to a selective restructuring of production networks (Antràs, 2021; World Trade Organization et al., 2025; OECD, 2026). Using a network analysis of value-added links in the Global South, Cerqueti et al. (2026) show that these shocks mainly produced selective regionalisation and that aggregate resilience can mask major changes of position within production networks. Joyez (2025) shows that exposure to upstream and downstream partners transmits shocks, while supplier diversification improves resilience. Doan and Le (2025) show, for country pairs from 1995 to 2020, that geopolitical distance reduces backward GVC participation. Finally, Dachs et al. (2025) address technological sovereignty from the GVC perspective: using input-output and R&D data for 38 countries over 2010-2019, they measure technological dependence by the R&D embodied in imported inputs and show that China has reduced it through the rapid growth of its domestic R&D. For economies close to Europe, such as Morocco, near-shoring is progressing, but it does not guarantee an equivalent increase in the value created locally.

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Studies on Morocco follow three approaches. Sectoral and industrial policy studies document the rise of the automotive and aeronautics industries, driven by foreign investment and successive industrial strategies (Hahn & Vidican-Auktor, 2017; Jaïdi & Msadfa, 2017; Auktor, 2026; Jaïdi, 2026). They converge on one point: local integration remains limited. In Tangier, Benabdejlil et al. (2016) show that, given the low density of Moroccan suppliers, the strategy of attracting foreign suppliers prevailed over the upskilling of local producers; nearly half of the parts are produced locally, far from the 80% of the carmaker's Romanian site, and the cluster remains "an agglomeration of activities linked to the arrival of the carmaker" rather than an integrated industrial complex.
Measures of GVC participation confirm this profile: Jaafari and Zenasni (2021) show that this participation relies mainly on backward linkages, that is, on the incorporation of foreign value added into exports. At firm level, Bussolo and Cruz (2015) show that firms with access to duty-exemption schemes for inputs benefited more from tariff reductions. Finally, Bank Al-Maghrib (2024) observes that the rise in exports of the global industries has not been accompanied by a tangible improvement in wealth creation, owing to heavy reliance on imported inputs. These studies concern industrial policy, GVC participation or firm performance; the link between the intensity of inward processing operations and the trade balance of industries is rarely examined, particularly over a long period.

2.5. Conceptual framework and hypotheses

The framework links four elements: the intensity of exports of compensating products under inward processing, the import content of these exports, the value created locally that they incorporate, and the trade balance of industries (Figure 1).

Figure 1: Conceptual framework

Element	Measure	Expected link
Processing intensity	REAT; exports of compensating products under inward processing	Starting point of the analysis
Import content and value created locally	INTDEP, REII; (R - I)/R, DVASH	An export of compensating products incorporates the imported inputs and a positive value created locally
Relative performance	Coverage ratio, TBI	Expected improvement (H2)
Balance in level	Total balance and balance outside inward processing	Nil effect or too small relative to imports for home use (H3)
Dynamics	Balance of the previous year	Persistence of balances (H1)

Source : authors' elaboration.

The first mechanism is persistence. Export structures depend on accumulated productive capabilities and change slowly (Hausmann et al., 2007); the balance of an industry therefore depends strongly on its past level. This property, descriptive in nature, is the first hypothesis (H1).
The second mechanism is the relative effect. An export of compensating products incorporates the inputs imported under inward processing and a positive value created locally; it therefore increases the industry's exports more than its imports and improves the coverage ratio and the TBI (H2), even though the domestic share of processing exports remains low (Koopman et al., 2012).
The third mechanism is the external constraint. Since the value created locally is small and inward processing operations largely balance out, their net contribution to the balance remains limited relative to imports for home use. According to Thirlwall (1979), the ratio between export growth and the income elasticity of imports determines the balance-of-payments constraint; an expansion of exports with a high import content therefore only slightly relaxes this constraint. The effect of REAT on the level of the balance, especially outside inward

processing, is nil or too small to restore the balance of deficit industries (H3), unless local inputs are substituted for imported inputs, as in China (Kee & Tang, 2016).
Table 1 positions these hypotheses relative to the main empirical evidence: none of the studies reviewed links GVC participation to the trade balance of industries.

Table 1: Summary of empirical evidence

Study	Scale and data	Main result	Limitation with respect to the question
Koopman et al. (2012)	Country (China), input-output tables distinguishing processing	Lower domestic share in processing exports	Value added, not the balance
Kee and Tang (2016)	Firms (China), 2000-2007	Rising domestic share through substitution of local inputs	Value added, not the balance
Bussolo and Cruz (2015)	Firms (Morocco)	Firms with access to exemption schemes benefit more from tariff reductions	Exports, not the balance
Zou (2026)	62 countries, 1995-2018	N-shaped relationship, with an intermediate "trap"	Upgrading, not the balance
Turan et al. (2026)	Sectors, including MENA	Product upgrading without process upgrading in MENA manufacturing	Upgrading, not the balance
Islam et al. (2026)	Suppliers in a developing economy	Upgrading conditioned by learning capabilities	Firms, not the balance
Cerqueti et al. (2026)	Value-added network, Global South	Selective regionalisation; aggregate resilience masks changes of position	Position, not the balance
Doan and Le (2025)	Country pairs, 1995-2020	Geopolitical distance reduces backward participation	Participation, not the balance
This article	66 industries (Morocco), 1998-2025	Link between exports of compensating products under inward processing and the trade balance	

Source: authors' elaboration.

3. Data and methodology

3.1. Data sources and scope

The analysis combines two sources. The first is the merchandise foreign-trade database of the Office des Changes (Office des Changes, 2026). The data are extracted by the authors at product level, according to the ten-digit customs nomenclature, for the period 1998-2025. They are aggregated into industries of the NCN classification using the Office des Changes correspondence table, supplemented by the authors for codes of former nomenclatures: 98.4% of trade value is allocated through the exact code, the rest through the code with the same six-, four- or two-digit prefix. The totals thus reconstructed are identical to the official series.
These data distinguish ordinary exports and imports for home use from operations carried out under the inward processing procedure. Defined by the Revised Kyoto Convention of the World Customs Organization (WCO, 2006, Specific Annex F, Chapter 1) and incorporated into the Moroccan Customs and Excise Code, this procedure allows inputs or products intended to undergo processing, working or repair to be imported with conditional relief from duties and taxes, and then re-exported. The statistics thus distinguish imports under inward processing and exports of compensating products under inward processing.
The method used by the Office des Changes to compile inward processing operations, with or without change of ownership, is described in the United Nations manual (2013, paragraphs 20.22 and 20.23).
From 2005, the data cover trade between the export free zones, now industrial acceleration zones, and the rest of the world, in line with international recommendations (United Nations, 2011); these zones are part of the national economic territory.
The data cover the entire merchandise foreign trade, allocated to 66 NCN industries; this is not a sample. Two industries classified as services, with near-zero amounts, are excluded, as the article concerns merchandise trade. The second source is the OECD TiVA database, 2025 edition in its second revision of January 2026 (OECD, 2025), which covers the period 1995-2022. Table 2 summarises the sources, their scope and their use.

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Table 2: Data sources, scope and use

Source	Data	Period	Scope	Variables	Use
Office des Changes (authors' extraction)	Exports, imports, imports under inward processing, exports of compensating products under inward processing	1998-2025	Ten-digit products aggregated into 66 NCN industries	ln(TC), TBI, trade balance, REAT, INTDEP	Econometric estimations; decomposition of the trade balance
HS-NCN correspondence table (Office des Changes), supplemented by the authors	Allocation of the 26,543 product codes to industries	1998-2025	98.4% of value through the exact code	Industry of each product	Aggregation consistent with official series
OECD-TiVA, 2025 edition, second revision (January 2026)	Domestic and foreign value added of exports; re-exports of imported intermediate products	1995-2022	Morocco by industry; eight economies	DVASH, FVASH, REII	Confirmation in value added

Source: authors' elaboration.

3.2. Construction of the indicators

The trade performance of industry i in year t is measured by three variables: the logarithm of the coverage ratio, $\ln(TC_{i,t}) = \ln(X_{i,t} / M_{i,t})$, which stabilises the variance of a highly skewed distribution; the TBI defined in Section 2.1; and the trade balance $X_{i,t} - M_{i,t}$, expressed in billion dirhams. The first two measures concern relative trade performance, the third trade performance in level.

Two indicators, standard in the literature on processing trade, are built from the data on inward processing. The first measures the intensity of exports of compensating products under inward processing, which correspond to the compensating products of the Revised Kyoto Convention:

$$REAT_{i,t} = 100 \times R_{i,t}^{AT} / X_{i,t}$$

where Ri,tAT denotes exports of compensating products under inward processing and Xi,t the industry's total exports. The second measures the share of imports under inward processing in the industry's total imports:

$$INTDEP_{i,t} = 100 \times I_{i,t}^{AT} / M_{i,t}$$

where Ii,tAT denotes imports under inward processing and Mi,t total imports. Both indicators are expressed as percentages. INTDEP describes the structure of integration: the share of the industry's imports carried out under the inward processing procedure, which must be re-exported, as opposed to imports for home use. It does not measure the share of all imported inputs in production. The dependence of exports on imported inputs is measured by the TiVA indicators; INTDEP describes its customs channel.

Denoting by R exports of compensating products under inward processing and by I imports under inward processing, the trade balance can be decomposed into two components:

$$X - M = (R - I) + [(X - R) - (M - I)]$$

The first is the balance of inward processing operations. Since inputs imported under inward processing must be re-exported after processing, this balance is positive by construction and corresponds to the value created by processing; it is an upper bound of it, as exports of compensating products may incorporate inputs imported for home use. The finding that the deficit arises outside these operations therefore follows from this accounting identity and not from an econometric result. The ratio (R - I)/R measures the share of the value created by processing; since exports are valued FOB and imports CIF, it slightly underestimates it, without affecting its evolution. The second component is the balance of ordinary exports and imports for home use, referred to as the balance outside inward processing. The TiVA indicators used are the shares of domestic value added (DVASH) and foreign value added (FVASH) in gross exports, and the share of intermediate imports that is re-exported after incorporation into exports (REII).

3.3. Econometric strategy

The main model is a dynamic fixed-effects panel model, estimated for the two measures of relative performance, ln(TC) and the TBI:

$$Yi,t = \alpha + \varphi\ Yi,t\text{-}1 + \beta\ REATi,t + \mu i + \lambda t + \varepsilon i,t$$

where μi denotes industry fixed effects and λt year fixed effects, which absorb common shocks such as changes in energy prices. The coefficient φ measures persistence (H1) and β the association between REAT and relative performance (H2). INTDEP, determined jointly with REAT since exports of compensating products require imports under inward processing, is only introduced with a lag, as a robustness check.

The high persistence of balances requires checking their stationarity. The panel unit root tests of Im, Pesaran and Shin (2003), Maddala and Wu (1999) and Pesaran (2007) show that the trade balance in level, both total and outside inward processing, is non-stationary, whereas its first difference and REAT are stationary; for the ratios, the results are mixed, the TBI being stationary around a trend (appendix, Table A2). Since REAT is stationary, it cannot be linked to the balance by a cointegrating relationship; the long-run multiplier is therefore not interpreted. The balance equations are estimated in first differences, and the results for the ratios are confirmed in first differences:

$$\Delta Si,t = \alpha + \beta\ \Delta REATi,t + \lambda t + \varepsilon i,t$$

In the equation for the balance outside inward processing, processing intensity is measured by the logarithm of exports of compensating products under inward processing, since the denominator of REAT is total exports, which include ordinary exports. H3 is assessed by the confidence interval of β, compared with a smallest effect size of economic interest set at 10% of the 2025 deficit.

The use of industry fixed effects follows from the structure of the model: the lasting characteristics of industries (technology, presence of foreign investors, export orientation) influence both their trade balance and their use of inward processing. A Mundlak (1978) test, robust to heteroscedasticity and within-industry correlation, confirms this choice ($W = 29.2$ for ln(TC) and 18.3 for the TBI; $p < 0.001$). Standard errors are clustered by industry. With 28 years, the Nickell (1981) bias is limited (Judson & Owen, 1999); as a check, it is corrected by the half-panel jackknife of Dhaene and Jochmans (2015). GMM estimators (Arellano & Bond, 1991), designed for panels with many individuals observed over few periods, are poorly suited to a panel of 66 industries observed over 28 years: with year effects, the number of instruments exceeds the number of industries, and the estimated persistence is much lower than with fixed effects, a sign of weak instruments (Blundell & Bond, 1998; Roodman, 2009). Inference therefore relies on fixed effects, checked by the bias correction. Table 3 summarises the approach and Table 4 the hypotheses and their test criteria.

Table 3: Methodological strategy

Step	Method	Purpose	Hypotheses
Descriptive analysis	Decomposition of the balance; typology of industries; transition matrices	Locate the deficit and its persistence	H1
Stationarity	IPS, Maddala-Wu and CIPS tests; Pesaran dependence test	Choice of specification	H1, H3
Main model	Dynamic panel with industry and year fixed effects; Mundlak test	Persistence; association between REAT and relative performance	H1, H2
Balance	First differences; confidence interval and equivalence test	Magnitude of the effect on the total balance and the balance outside inward processing	H3
Robustness	Half-panel jackknife; industry trends; sub-periods; aggregation; exclusion of industries; breaks; GMM	Stability of results	H1 to H3
Explanation	TiVA indicators; share of the value created by processing	Value created locally	H3

Source: authors' elaboration.

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Table 4: Hypotheses and test criteria

Hypothesis	Statement	Test criterion
H1	The trade balance of an industry depends strongly on its past level (descriptive property).	φ positive, significant and close to 1; non-stationarity of the balance; transition matrices
H2	A higher intensity of exports of compensating products under inward processing improves the coverage ratio and the TBI.	β positive and significant on ln(TC) and the TBI, in levels and in first differences
H3	The effect of REAT on the balance, especially outside inward processing, is nil or too small to restore the balance of deficit industries.	β not significant on the balance; upper bound of the confidence interval below the smallest effect size of interest

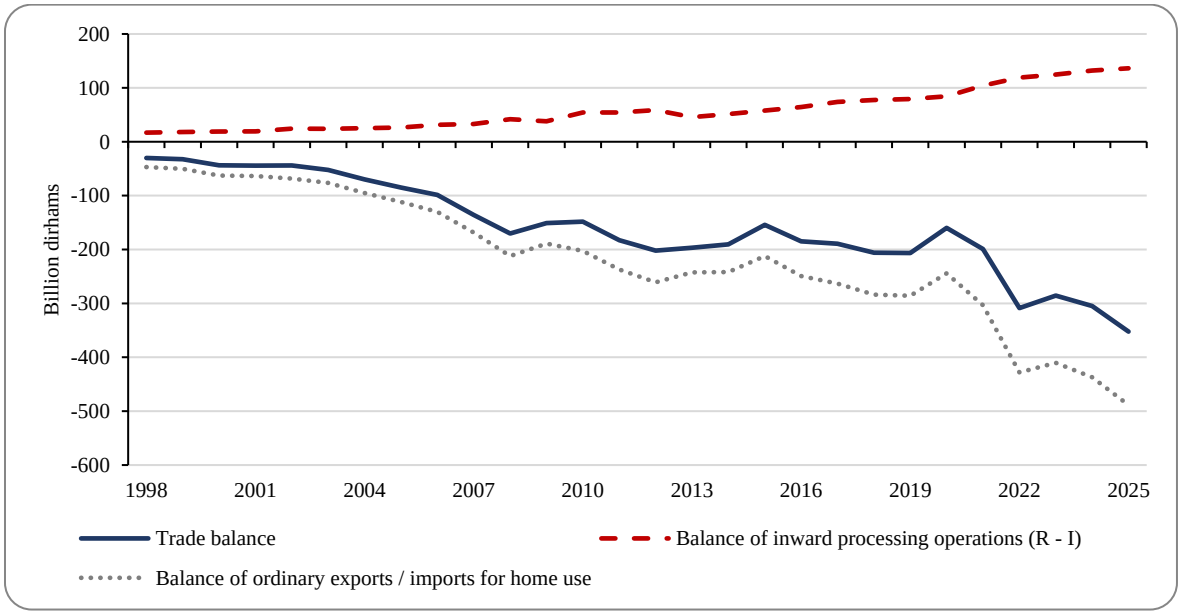
Source: authors' elaboration.

4. Empirical results

4.1. Real integration, persistent deficit

Morocco's integration into GVCs through inward processing operations is real and long-standing. The share of exports of compensating products under inward processing in total exports rose from 67.1% in 1998 to 76.3% in 2025, and the share of imports under inward processing in total imports varied between 15% and 30% over the period (27.0% in 2025). Figure 2 decomposes the trade balance using the identity of Section 3.2; detailed values are given in the appendix (Table A4). The balance of inward processing operations rose from 16.9 to 136.3 billion dirhams between 1998 and 2025, while the balance of ordinary exports and imports for home use worsened from -47.0 to -488.6 billion. The share of this deficit covered by the surplus of inward processing operations fell from 36% to 28%. The share of the value created by processing, (R - I)/R, follows a bell-shaped path: 36.7% in 1998, 51.5% in 2010, then 38.0% in 2025.

Figure 2: Decomposition of the merchandise trade balance, 1998-2025 (billion dirhams)



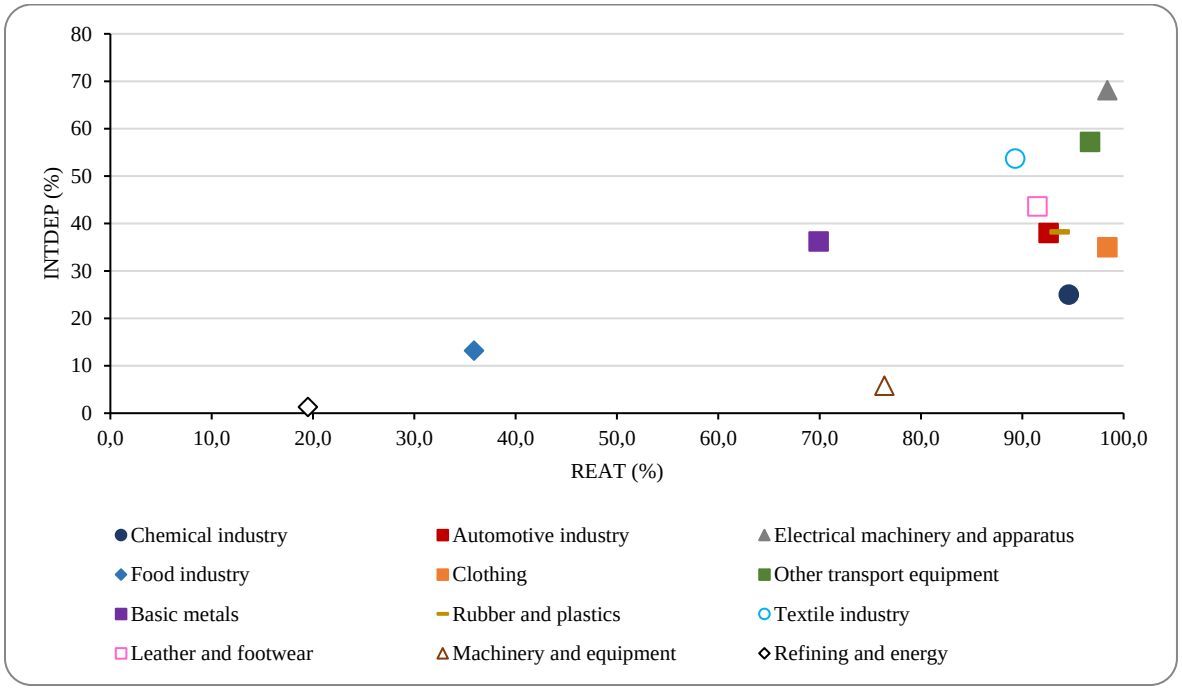
Source: authors' calculations based on Office des Changes merchandise trade data.

At national level, the trade balance shows a persistence close to 1, and the Dickey-Fuller test does not reject the presence of a unit root: shocks, such as the rise in energy prices in 2022, have lasting effects. The model in Section 4.3 examines, at industry level, the association between the intensity of exports of compensating products under inward processing and trade performance.

4.2. Contrasting sectoral patterns

Figure 3 crosses, for the main exporting industries in 2025, the intensity of exports of compensating products under inward processing and the share of imports under inward processing in total imports; Table 5 presents the ten main exporting industries of the NCN. The most integrated industries re-export more than 89% of their exports, but their trade situations differ strongly. Electrical machinery and apparatus, which includes automotive wiring, combines a REAT of 98.4% and an INTDEP of 68.1% with a coverage ratio of 148.9%. Clothing shows a large surplus, whereas the textile industry, part of whose fabrics imported under inward processing it processes, covers only 10.6% of its imports. The automotive industry, with a REAT of 92.6%, remains in deficit (coverage ratio of 77.4%).

Figure 3: Intensity of exports of compensating products under inward processing (REAT) and share of imports under inward processing in total imports (INTDEP) of the main industries, 2025 (%)



Source: authors' calculations based on Office des Changes merchandise trade data.

Table 5: The ten main exporting industries, 2025

Industry	Exports (billion DH)	REAT (%)	INTDEP (%)	Coverage ratio (%)	Balance outside inward processing (billion DH)
Basic chemicals	90.8	97.6	44.6	226.2	-20.0
Motor vehicles	60.2	90.4	14.5	90.8	-51.0
Crops, arboriculture and related services	42.2	3.6	2.1	98.0	-1.5
Wearing apparel and furs	36.7	98.4	35.0	626.6	-3.2
Accumulators, batteries and other	33.3	99.2	58.9	252.8	-5.1
Insulated wires and cables	29.3	98.2	87.2	186.7	-1.5
Fish processing	24.1	28.6	45.5	763.0	15.4
Motor vehicle parts and equipment	18.9	99.6	79.0	69.7	-5.6
Ships, aircraft and spacecraft	18.8	96.7	63.2	62.2	-10.5
Electrical machinery	12.7	96.8	59.9	58.6	-8.3

Source : authors' calculations based on Office des Changes merchandise trade data.

These contrasts show that the place of an industry in inward processing operations is not enough to judge its trade performance. Table 6 classifies industries according to the intensity of exports of compensating products under inward processing (50% threshold) and the sign of their balance in 2025. The 31 high-intensity industries in deficit account for 61.5% of the deficit

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outside inward processing: nearly two thirds of this deficit come from the industries most integrated into GVCs. By group of industries, the main sources of this deficit are energy (20.9%), the automotive industry (11.8%), machinery and equipment (11.4%) and chemicals (11.0%). The automotive industry illustrates the mechanism: the industry has a surplus on its inward processing operations, but its imports of vehicles and parts for home use keep it in deficit.

Table 6: Typology of industries by processing intensity and sign of the balance, 2025

Type of industry	Number of industries	Balance (billion DH)	Balance outside inward processing (billion DH)	Share of the deficit outside inward processing (%)
REAT ≥ 50%, deficit	31	-306.0	-300.3	61.5
REAT < 50%, deficit	24	-201.1	-183.5	37.6
REAT ≥ 50%, surplus	6	120.5	-32.2	6.6
REAT < 50%, surplus	5	34.2	27.4	-5.6
All industries	66	-352.3	-488.7	100.0

Source: authors' calculations based on Office des Changes merchandise trade data.

4.3. Results of the dynamic model

Table 7 presents the results; descriptive statistics are given in the appendix (Table A1). Persistence is the clearest result: the coefficient of the lagged variable is 0.716 for ln(TC) and 0.809 for the TBI, and the balance in level is non-stationary (Section 3.3). It concerns deficits as well as surpluses: 98.5% of industries in deficit in one year remain so the following year, and 92.9% of industries in surplus. Of the 66 industries, 40 are in deficit every year between 1998 and 2025 and 8 always in surplus. This persistence is not specific to the industries most integrated into GVCs: the probability that an industry in deficit remains so the following year is 98.1% when REAT is below the median, and 98.8% otherwise. GVC integration therefore does not break the persistence of deficits. H1 is supported.

Table 7: Results of the dynamic model and of the first-difference equations

Variable	ln(TC)	TBI	Δln(TC)	ΔTBI	ΔBalance	ΔBalance outside inward processing
Lagged dependent variable	0.716*** (0.052)	0.809*** (0.045)				
REAT (ΔREAT in differences)	0.590*** (0.163)	0.084*** (0.024)	0.907*** (0.331)	0.159** (0.061)	1.091 (0.739)	
Δln(exports of compensating products under inward processing)						-0.054 (0.033)
Observations	1,762	1,768	1,762	1,762	1,762	1,621
Industries	66	66	66	66	66	64
Within R^2	0.57	0.70	0.03	0.02	0.00	0.00
Mundlak test (W)	29.2***	18.3***				

Source: authors' estimates based on Office des Changes merchandise trade data. Year effects in all estimations; industry fixed effects in the level models; standard errors clustered by industry in parentheses. REAT as a proportion (0 to 1). *** p < 0.01; ** p < 0.05; * p < 0.10.

REAT is positively associated with both measures of relative performance. A 10-point increase in REAT is accompanied by an increase of about 6% in the coverage ratio and of 0.008 in the TBI. The association is also significant in first differences, and it is unchanged when lagged INTDEP is introduced. Its economic magnitude remains modest. The national increase in REAT between 1998 and 2025, of 9.2 points, comes almost entirely from changes within industries (9.8 points, compared with -0.6 point for the composition effect), but it is concentrated in the large exporting industries: the average change in REAT per industry is close to zero (-0.5 point, median -0.9), compared with 9.6 points on average weighted by exports. Applied to this weighted average, the association corresponds to an increase of about 6% in the

coverage ratio, whereas the national coverage ratio fell from 69.5% to 57.2% over the period. H2 is supported, with a modest relative improvement.

The association disappears for the balance. In first differences, the change in REAT is not significantly associated with the change in the total balance (1.09; p = 0.14). Table 8 specifies its magnitude. The 95% confidence interval lies between -0.36 and 2.54 billion dirhams per unit of REAT: even at its upper bound, a 10-point increase in REAT in the 66 industries would improve the balance by at most 16.8 billion dirhams, i.e. 4.8% of the 2025 deficit. This bound is below the smallest effect size of interest, set at 10% of the deficit: the effect is therefore not only non-significant, it is too small to restore the balance. The growth of exports of compensating products under inward processing is not accompanied by an improvement in the balance outside inward processing either: the estimated effect is negative, but not significant (-0.054; p = 0.11). H3 is supported.

Table 8: Magnitude of the effect of REAT on the trade balance

Item	Value
Coefficient of ΔREAT on ΔBalance (billion DH per unit of REAT)	1.09 (p = 0.14)
95% confidence interval	[-0.36; 2.54]
Maximum effect of +10 points of REAT, per industry	0.25 billion DH
Maximum effect of +10 points of REAT in the 66 industries	16.8 billion DH
Trade deficit in 2025	352.3 billion DH
Maximum effect as % of the 2025 deficit	4.8%
Smallest effect size of interest (10% of the deficit)	35.2 billion DH
Conclusion	Maximum effect below the smallest effect size of interest

Source: authors' estimates based on Office des Changes merchandise trade data.

At national level, GVC integration, as it has developed under the trade and industrial policies in force, has not been accompanied by a reduction in the merchandise trade deficit (Section 1). The industry-level results explain why: the intensity of exports of compensating products under inward processing improves the relative position of industries, but not their balance, and nearly two thirds of the deficit outside inward processing come from the industries most integrated into GVCs.

4.4. Robustness of the estimates

Table 9 brings together the checks. The associations between REAT and relative performance remain positive and significant with industry-specific trends, which absorb slow-moving factors such as foreign investment, industrial policies or trade agreements; over the period 2005-2025, during which trade of the export free zones is covered; for the 65 industries observed over the whole period; and excluding atypical observations. They remain so when each industry is excluded in turn. Aggregated into 28 NCN groups, they keep the same sign, with lower precision. After correction of the Nickell bias by the jackknife, persistence is higher and the effect of REAT smaller (0.251 for ln(TC)) and not significant, the precision of this estimator being reduced by the division of the period into two 14-year sub-periods; the relative improvement should therefore be read as modest. The effect of REAT shows no significant break. Industry-by-industry estimates reveal strong heterogeneity, but their median remains close to the pooled effect. For the balance, no variant shows a significant effect at the 5% level; relative to national total trade, which neutralises inflation and the scale effect, the effect is significant only at the 10% level. Difference-GMM estimators (Arellano & Bond, 1991), presented as a check with a single lag as instrument and year effects (52 instruments for 66 industries), give a positive effect of REAT on the coverage ratio and the TBI, significant in one step; however, they reject the validity of the instruments (Hansen test) and strongly underestimate persistence, which confirms their poor fit for this panel.

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Table 9: Robustness of the estimates (coefficient of REAT)

Specification	ln(TC)	TBI	ΔBalance
Baseline (fixed effects; first differences for the balance)	0.590***	0.084***	1.091
First differences	0.907***	0.159**	
Half-panel jackknife (Nickell bias)	0.251	0.033	
Lagged INTDEP	0.553***	0.077***	
Industry-specific trends	0.908***	0.114***	1.026
Period 2005-2025	0.765***	0.110***	1.474
65 industries observed over the whole period	0.556***	0.072***	1.090
Excluding zero exports and REAT > 100%	0.590***	0.084***	
28 NCN groups	0.697**	0.102*	3.416
Successive exclusion of each industry	0.493 to 0.649 (always $p < 0.05$)	0.072 to 0.093 (always $p < 0.05$)	0.371 to 1.243 (never $p < 0.05$)
Industry-by-industry estimates (median)	0.404	0.078	
Balance relative to national total trade			0.190*
Breaks in 2005, 2007, 2012 and 2020-2022	Not significant	Not significant	

Source: authors' estimates based on Office des Changes merchandise trade data. Coefficient of REAT (of ΔREAT for the balance); standard errors clustered by industry, industry bootstrap for the jackknife. *** p < 0.01; ** p < 0.05; * p < 0.10.

4.5. The value-added content of exports: insights from TiVA

The TiVA indicators, built from inter-country input-output tables, reason in value added over all the trade of an industry: they take into account inter-industry linkages, the imported content of all intermediate consumption and the value added by services embodied in exports, which the industry-level model does not measure (Table 10). The period 2010-2021 is used as the main period, as 2022 was marked by the rise in energy and input prices, which affects value-added shares. For Moroccan manufacturing, the share of intermediate imports that is re-exported (REII) rose from 33.8% in 2010 to 45.9% in 2021 (53.1% in 2022), while the share of domestic value added in exports fell from 67.8% to 62.1% (55.5% in 2022). The largest increases in REII concern motor vehicles, chemicals and electrical equipment, that is, the industries with the highest intensity of exports of compensating products. In line with Koopman et al. (2012), these indicators themselves probably overestimate the domestic share when inward processing operations are large; the dependence of Moroccan exports on imported inputs is therefore at least as strong as they indicate.

Table 10: Share of domestic value added (DVASH) and re-exports of imported intermediate products (REII) of Morocco, by industry (%)

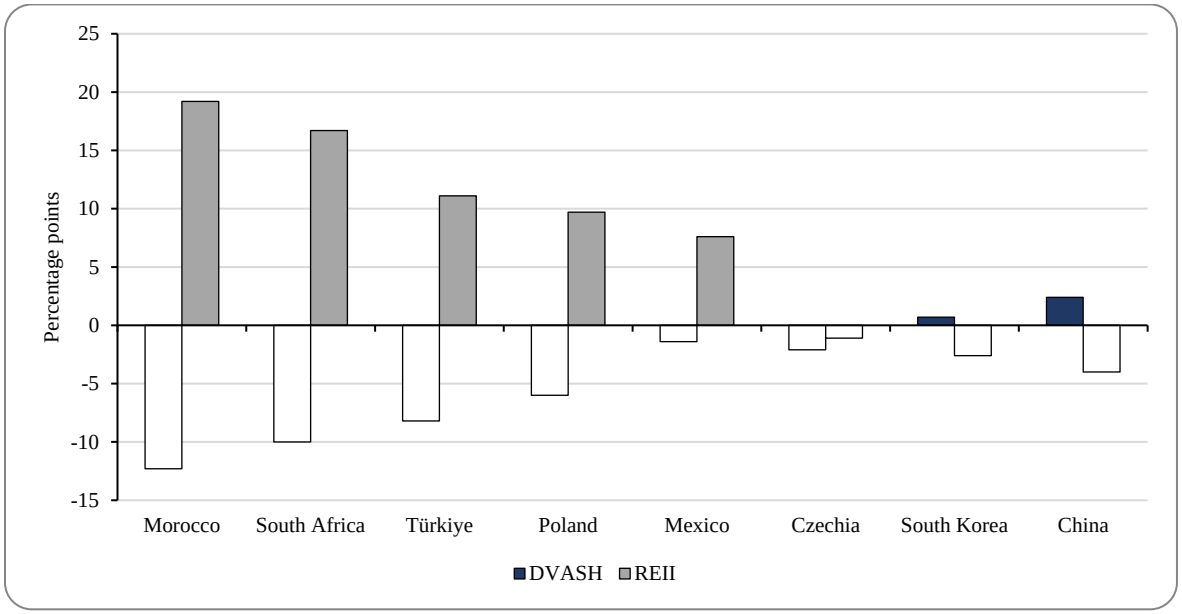
Industry (ISIC Rev. 4)	DVASH 2010	DVASH 2021	DVASH 2022	REII 2010	REII 2021	REII 2022
Total economy	77.9	71.9	66.6	34.0	41.6	47.5
Manufacturing	67.8	62.1	55.5	33.8	45.9	53.1
Food products, beverages and tobacco	84.3	80.9	74.5	26.0	23.8	31.1
Textiles, wearing apparel and leather	66.4	59.4	57.4	58.7	58.6	66.2
Chemicals	70.5	69.5	57.1	36.4	54.9	63.1
Electrical equipment	62.9	57.3	53.6	34.1	48.4	56.3
Motor vehicles	57.8	42.5	39.7	26.2	66.1	73.5

Source: OECD-TiVA data, 2025 edition, second revision (January 2026). DVASH as % of gross exports; REII as % of gross imports of intermediate products.

Figure 4 compares this trajectory with seven economies with contrasting integration profiles. Over the period 2010-2021, Morocco is, with South Africa, one of the two economies where the domestic share falls the most (-5.7 and -6.1 points) and where REII rises the most (+12.1

and +15.4 points); including 2022, the Moroccan decline reaches -12.3 points and the rise in REII +19.2 points. China and South Korea, by contrast, see their REII decline. China's fall in REII is consistent with the substitution of domestic for imported inputs documented by Kee and Tang (2016), whereas the share of imported inputs in Morocco's exports of compensating products is increasing.

Figure 4: Change in the share of domestic value added (DVASH) and in re-exports of imported intermediate products (REII) in manufacturing, 2010-2022 (percentage points)



Source: authors' calculations based on OECD-TiVA data, 2025 edition, second revision (January 2026). Detailed values in the appendix (Table A3); the main period is 2010-2021, 2022 being presented separately. The comparison situates the Moroccan trajectory and does not establish a causal relationship.

The two sources agree: integration through inward processing operations is increasing, but the value created locally per dirham exported is falling, as is the share of the value created by processing (Section 4.1). This result does not mean that domestic value added is falling in level; it shows that the import content of exports is growing faster than the value created locally. It is consistent with the result for H3. Table 11 summarises the assessment of the hypotheses.

Table 11: Assessment of the hypotheses

Hypothesis	Results	Robustness	Assessment
H1	Persistence of 0.72 (ln(TC)) and 0.81 (TBI); non-stationary balance; 98.5% of industries in deficit remain so the following year, whether REAT is low or high	Stronger persistence after correction of the Nickell bias	Supported
H2	REAT: 0.590*** on ln(TC) and 0.084*** on the TBI; confirmed in first differences	Robust to industry trends, sub-periods and exclusions; smaller and not significant after jackknife	Supported; modest improvement
H3	ΔREAT not significant on the balance; at most 4.8% of the 2025 deficit for +10 points; balance outside inward processing not improved	No variant significant at the 5% level; TiVA: decline in the domestic share	Supported

Source : authors' elaboration.

5. Discussion and implications

5.1. Relative performance modestly improved, balance unchanged

The results add to the literature on the quality of GVC integration. In line with Koopman et al. (2014), the growth of gross exports overstates the national contribution when exports incorporate a high share of foreign value: in Morocco, the foreign content of exports is rising and the share of imported inputs that is re-exported is increasing. The contrast between the

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positive but modest association of REAT with the coverage ratio and the TBI and the absence of any association with the balance is the econometric expression of this. Since the value of inputs imported under inward processing is re-exported, only the value of processing is added to the balance, while the deficit arises in imports for home use. Relative indicators thus give a more favourable picture of integration than the balance in level.

A comparison with other processing economies sheds light on the specificity of Morocco. In China, the domestic share of processing exports increased markedly through the substitution of local for imported inputs (Kee & Tang, 2012, 2016); in Morocco, the share of the value created by processing returns in 2025 to its 1998 level, after a peak in 2010 (Section 4.1). This profile brings Morocco closer to the Mexican maquiladoras or the Tunisian offshore regime, whose activities have remained weakly linked to the rest of the economy (Bergin et al., 2009; World Bank, 2014).

The high persistence of balances indicates that the trade balances of industries depend closely on their past path. This result is in line with studies that stress the slowness of upgrading processes and their dependence on learning capabilities (Humphrey & Schmitz, 2002; Islam et al., 2026), as well as the heterogeneous and non-linear effects of GVC participation (Turan et al., 2026; Zou, 2026). It is consistent with analyses of dependence on imported inputs (Dachs et al., 2025): when local activity focuses on processing imported inputs, integration progresses without the captured value following.

5.2. A new reading of the Moroccan industrial model

Successive industrial strategies have made it possible to attract foreign investment, develop new productive capabilities and position Morocco in several GVCs. The results suggest that this success still relies largely on integration based on the processing of imported inputs, logistics and proximity to European markets. The decline in the domestic share of exports, stronger in Morocco than in most of the comparison economies, indicates that export growth has not been accompanied by a similar deepening of local content, in line with the logic of dependence on lead firms described by Gereffi et al. (2005) and Pardi (2018).

The decomposition of the balance adds a further dimension to this finding: the deficit arises in imports for home use intended for domestic final and industrial demand (energy, vehicles and parts, capital goods, chemical and metallurgical inputs). Inward processing operations cannot, therefore, correct on their own a deficit that arises elsewhere. The challenge is to turn productive integration into integration that creates more domestic value and to complement it with a localisation strategy oriented towards the domestic market, building on the capabilities developed by export ecosystems. The aim is not to reduce intermediate imports, which are part of how GVCs work, but to increase the capacity of the national economy to produce the inputs, goods and functions that are imported today.

5.3. Implications for economic policy

Three economic policy directions can be drawn from the analysis, although it does not directly assess their effects. The first is to increase the value created locally by processing, by strengthening the base of local suppliers and developing higher value-added functions, such as design, engineering, R&D or industrial software (Islam et al., 2026; Turan et al., 2026). The second is a localisation strategy oriented towards the domestic market, targeting the industries that account for the deficit outside inward processing (Section 4.2): the automotive industry, machinery and equipment, and chemicals; energy, the leading source of this deficit, is a matter for the energy transition rather than for the localisation of inputs. The third is to include, in the evaluation of public policies, indicators of domestic value added and of the balance in level, in addition to export volume indicators and coverage ratios.

An order of magnitude, calculated in partial equilibrium, indicates their scope. If local production replaced 10% of the inputs imported under inward processing in the automotive and chemical industries (58.6 billion dirhams in 2025), the deficit would be reduced by about 5.9 billion; if it replaced 10% of the imports for home use of these industries (122.5 billion), it would be reduced by about 12.3 billion, together about 5% of the 2025 deficit. These figures are illustrative: they take into account neither the costs of substitution, nor its effects on other industries, nor its compatibility with Morocco's trade commitments.

These directions are not a call for productive withdrawal. GVCs remain a key component of world trade, and their recent evolution reflects a search for diversification and resilience rather than a general movement of relocation (World Trade Organization et al., 2025; OECD, 2026). For Morocco, the issue is less to reduce its integration than to improve its quality.

6. Conclusion

This article examines the magnitude and significance of the association between the intensity of exports of compensating products under inward processing and the trade performance of industries. It combines merchandise foreign-trade data from 1998 to 2025, a dynamic fixed-effects panel model subjected to stationarity and robustness tests, and the OECD value-added indicators.

Three results emerge. The trade balances of industries are persistent and do not tend to return to equilibrium. A higher intensity of exports of compensating products under inward processing is associated with a modest improvement in relative performance, but not in the balance: even under the most favourable assumption, its effect would remain below 5% of the 2025 deficit. Finally, the share of domestic value added in manufacturing exports fell between 2010 and 2021, and the share of the value created by processing is no higher in 2025 than in 1998.

The article contributes to the literature on processing trade by applying its indicators to all the industries of an economy over a long period and by relating them to the trade balance rather than to value added alone. Its results suggest that Morocco's profile of integration into GVCs, based on the processing of inputs imported under inward processing, is not such as to absorb the trade deficit: integration is effective, but its conversion into domestic value creation remains incomplete. They call for priority to be given to the industries that account for the deficit outside inward processing and for indicators of domestic value added and of the balance in level to be included in policy evaluation.

These results should be read in the light of several limitations, whose scope has been circumscribed. The estimates establish conditional associations, not causal relationships; their stability has nevertheless been checked through correction of the dynamic panel bias, industry-specific trends, the successive exclusion of each industry and restriction to the period 2005-2025. In the absence of annual sectoral series on foreign investment and production costs since 1998, these factors are not introduced explicitly, but their slow evolution is absorbed by the fixed effects and industry trends. The import content is measured by inward processing operations, which do not cover inputs imported outside this procedure; the TiVA indicators complement this measure, over a shorter period. Finally, the economic policy orders of magnitude are calculated in partial equilibrium.

These limitations open three avenues for research. A decomposition of the intermediate consumption of each industry between domestic and imported inputs, which is not published to date, could be built by combining the supply and use tables with merchandise foreign-trade data by product. A computable general equilibrium model distinguishing firms operating under inward processing (Ianchovichina, 2004) would make it possible to assess the gains and costs of a policy of input localisation, as well as its compatibility with trade commitments. Finally, firm-level data and a comparison with other economies of the South and the Mediterranean,

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such as Tunisia, Egypt and Turkey, would make it possible to deepen the identification of mechanisms and to assess the external validity of the results.

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Appendix

Table A1: Descriptive statistics of the model variables

Variable	Unit	Obs.	Mean	Std. dev.	First quartile	Median	Third quartile
ln(TC)	log	1,762	-1.32	2.27	-2.42	-1.36	-0.40
TBI	[-1 ; +1]	1,768	-0.41	0.55	-0.84	-0.59	-0.20
Trade balance	Bn DH	1,768	-2.45	10.07	-3.82	-1.00	-0.08
REAT	%	1,768	55.7	36.3	18.4	64.5	91.4
INTDEP	%	1,768	26.1	30.0	2.1	12.9	41.3

Source: authors' calculations based on Office des Changes merchandise trade data.

Table A2: Panel unit root tests (Pesaran's 2007 CIPS statistic)

Variable	Level, constant	Level, constant and trend	First difference	Conclusion
Trade balance	-1.52	-1.73	-3.15***	Non-stationary
Balance outside inward processing	-1.73	-1.70	-3.12***	Non-stationary
TBI	-1.95	-2.71**	-4.04***	Trend-stationary
TBI outside inward processing	-2.43***	-3.09***	-4.49***	Stationary
ln(TC)	-1.85	-2.48	-3.83***	Mixed result
REAT	-2.33***	-2.61*	-4.02***	Stationary

Source: authors' estimates based on Office des Changes merchandise trade data. One lag; Pesaran (2007) critical values: with constant, -2.16 at 5% and -2.31 at 1%; with constant and trend, -2.66 at 5%. The Im, Pesaran and Shin (2003) and Maddala and Wu (1999) tests lead to the same conclusions for the balances. Pesaran cross-sectional dependence test: 61.8 for the balance and 115.5 for the balance outside inward processing ($p < 0.001$). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table A3: DVASH and REII of manufacturing, eight economies (%)

Country	DVASH 2010	DVASH 2021	DVASH 2022	REII 2010	REII 2021	REII 2022
Morocco	67.8	62.1	55.5	33.8	45.9	53.1
South Africa	76.9	70.8	66.9	28.1	43.6	44.8
Türkiye	71.0	66.8	62.8	27.5	38.2	38.6
Poland	63.0	59.5	57.0	48.2	56.8	57.9
Mexico	57.5	57.1	56.1	52.2	61.0	59.7
Czechia	52.7	51.5	50.6	68.4	68.0	67.3
South Korea	58.4	65.4	59.1	49.2	45.2	46.6
China	78.6	80.6	80.9	36.7	32.3	32.7

Source: OECD-TiVA data, 2025 edition, second revision (January 2026).

Table A4: Decomposition of the merchandise trade balance, 1998-2025 (billion dirhams)

Year	X	M	R	I	(1) R - I	(2) X - R	(3) M - I	(4) = (2) - (3)	(5) = X - M	Coverage (%)
1998	68.6	98.7	46.0	29.1	+16.9	22.6	69.6	-47.0	-30.1	36.0
1999	73.6	105.9	50.1	32.0	+18.1	23.5	73.9	-50.4	-32.3	35.9
2000	78.8	122.5	53.8	34.8	+19.1	25.0	87.7	-62.8	-43.7	30.4
2001	80.5	124.7	56.8	37.6	+19.3	23.7	87.2	-63.5	-44.2	30.4
2002	86.1	130.2	62.3	37.9	+24.4	23.8	92.3	-68.5	-44.1	35.6
2003	83.6	135.9	60.6	36.5	+24.1	23.0	99.4	-76.4	-52.3	31.5
2004	87.5	157.4	64.8	39.6	+25.2	22.7	117.8	-95.1	-69.9	26.5
2005	99.3	184.4	71.5	45.0	+26.5	27.8	139.4	-111.6	-85.1	23.7
2006	112.0	210.6	81.2	49.6	+31.5	30.8	160.9	-130.1	-98.6	24.2
2007	125.5	261.3	90.9	58.0	+32.9	34.6	203.3	-168.6	-135.8	19.5
2008	155.7	326.0	106.0	64.1	+41.8	49.8	261.9	-212.1	-170.3	19.7
2009	113.0	264.0	77.5	39.4	+38.0	35.6	224.6	-189.0	-151.0	20.1
2010	149.6	298.0	105.6	51.2	+54.4	44.0	246.7	-202.7	-148.4	26.8
2011	175.0	357.8	121.6	67.2	+54.3	53.4	290.5	-237.1	-182.8	22.9
2012	184.9	386.9	129.7	70.7	+58.9	55.2	316.2	-261.0	-202.1	22.6
2013	184.6	381.3	125.9	80.1	+45.8	58.8	301.2	-242.4	-196.7	18.9
2014	200.8	391.3	139.0	87.7	+51.3	61.8	303.6	-241.8	-190.5	21.2
2015	218.0	372.2	146.9	89.0	+57.9	71.1	283.2	-212.1	-154.2	27.3
2016	225.7	410.6	155.4	91.1	+64.4	70.2	319.5	-249.3	-184.9	25.8
2017	248.8	438.1	179.4	105.5	+73.9	69.5	332.6	-263.1	-189.2	28.1
2018	275.4	481.4	199.1	121.5	+77.6	76.3	359.9	-283.6	-206.0	27.4
2019	284.5	491.0	205.0	125.6	+79.4	79.5	365.3	-285.9	-206.5	27.8
2020	263.1	422.9	193.0	108.6	+84.3	70.1	314.2	-244.1	-159.8	34.5
2021	329.4	528.6	243.0	138.8	+104.2	86.4	389.8	-303.4	-199.2	34.4
2022	428.6	737.4	321.6	202.4	+119.2	107.0	535.0	-428.0	-308.8	27.9
2023	430.2	715.8	323.2	198.5	+124.7	107.0	517.3	-410.3	-285.5	30.4
2024	456.3	761.3	344.7	212.6	+132.1	111.6	548.7	-437.0	-304.9	30.2
2025	470.0	822.3	358.5	222.1	+136.3	111.6	600.2	-488.6	-352.3	27.9

Source: authors' calculations based on Office des Changes merchandise trade data. X: exports; M: imports; R: exports of compensating products under inward processing; I: imports under inward processing. (1): balance of inward processing operations; (2): ordinary exports; (3): imports for home use; (4): balance outside inward processing; (5): trade balance, equal to (1) + (4). Coverage: share of the deficit outside inward processing covered by the balance of inward processing operations.