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Skill intensity in manufacturing exports: Do basic, technology-intensive or differentiated exports cause growth in Kuwait?

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Abstract

This study examines the causality between basic, technology-intensive, and differentiated manufacturing exports and economic growth in Kuwait using data from 1970 to 2021 and two augmented production function models: one with natural resource exports (Model 1) and the other without on both sides of the model (Model 2). The Johansen cointegration and the autoregressive distributed lag model (ARDL) bound tests are conducted to examine the long-run relationship between the variables. In addition, the Granger causality test in a vector autoregressive framework (VAR) and the Toda–Yamamoto test are employed to explore the directions of the short- and long-run causality between variables, respectively. The empirical results of Model 1 indicate that neither of the decomposed manufacturing exports directly causes economic growth in the short or long run at any conventional significance level, whereas natural resource exports cause economic growth, basic and technology-intensive manufactured exports in the short-run at the 5% level. Model 2 estimations confirm the absence of direct causality between decomposed manufacturing exports and economic growth, whereas a long-run causality runs from output net of natural resource exports to basic manufactured exports at the 10% level. Both model estimations indicate that all the variables jointly cause economic growth and basic manufactured exports in the short and long run, directly or indirectly through imports, confirming the existence of a circular causation. These findings can serve as the basis for designing specific export–import policies to foster diversification and a sustainable economic growth in line with Kuwait's Vision 2035.

Keywords Causality · Kuwait · Natural resource exports · Manufactured exports

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1 Introduction

The exports–economic growth nexus has constantly been a topic of debate in the development economics literature. Several studies emphasize exports as a key driver of economic growth through increased foreign exchange, investments, technological advancement, and improved import capacity (Balassa 1978; Baharumshah and Rashid 1999; Thangavelu and Rajaguru 2006; Kalaitzi and Chamberlain 2020a, 2021). Export-Led Growth (ELG)[1] has been used as a development strategy for many decades. However, it has not been viable in all countries. This led several studies to examine countries' differences in their export bases and ELG by disaggregating exports, initially, into primary and manufactured exports. Most of these studies indicate that primary export expansion hinders economic growth, whereas increasing manufactured exports fosters it (Gylfason et al. 1999; Bravo-Ortega and Gregorio 2005; Behbudi et al. 2010; Kalaitzi and Cleeve 2018; Kalaitzi and Chamberlain 2020b; Kalaitzi et al. 2022a). This negative impact of primary exports on growth is attributed to dramatic price fluctuations, inelastic demand, and skills not transferable to other sectors. Nonetheless, in some countries, primary exports positively impact economic growth (Khan et al. 1995; Greenaway et. al, 1999; Khalafalla and Webb 2001; Khayati 2019). Other studies shed further light on the exports–economic growth nexus by using disaggregated export data, showing that skill-intensive manufactured exports contribute more to economic growth (Cuaresma and Wörz 2005; Falk 2009; Torayeh 2011; Aditya and Acharyya 2013; Kalaitzi et al. 2022b; Ekanayake et al. 2023).

Which of these relationships is valid in Kuwait, a country heavily reliant on oil? Kuwait holds approximately 6.6% of the world's proven crude oil reserves, ranking fourth and third in crude oil and oil product exports, respectively, among the Organization for Petroleum Exporting Countries (OPEC) (OPEC 2022). Within the GCC region, Kuwait is the country with the least progress in economic diversification during the last years, with Economic Diversification Index (EDI) of 87 in 2015 and 86 in 2022 (Global Economic Diversification, Mohammed Bin Rashid School of Government) (Fig. 1).

From 1970 to 2021, the country's primary export share of total exports of goods decreased from 95.2% to 92.4%, with manufactured exports increasing at an average annual rate of 8.3%, while the average growth rate of gross domestic product (GDP) was approximately 2.1% (United Nations Comtrade Database; World Bank, World Development Indicators).

Regarding the structure of manufactured exports from 1970 to 2021, the share of basic manufactures decreased from 70.2 to 60.8%, whereas those of technology-intensive manufactures and differentiated manufactures increased from 24.3 to 32.7% and from 5.5 to 6.5%, respectively[2] (United Nations Comtrade Database). This raises questions whether (1) the change in the structure of manufactured exports has contributed to Kuwait's economic growth and (2) natural resource exports still

[1] See Giles and Williams (2000a, 2000b) for the Export-Led Growth Hypothesis.

[2] For more details about the structure of basic, technology-intensive and differentiated manufactured exports in 1970 and 2021, see Figure 8 in the Appendix 1.

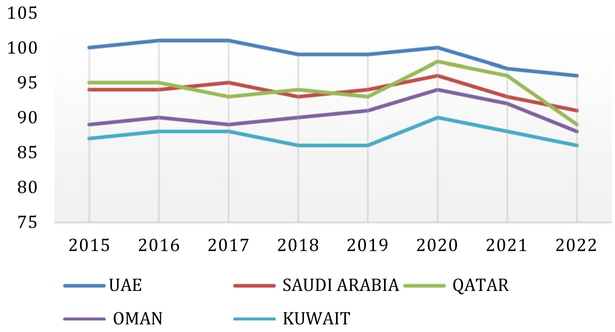


Fig. 1 Global Economic Diversification Index in the GCC region, 2015–2022. *Source*: Global Economic Diversification Index, MBRSG

play an important role in the growth process. In particular, what is the link between natural resource exports, manufactured export components with different technological intensities, and economic growth in Kuwait? What is the direction of causality? The specific objectives of this study are to examine (i) the short- and long-run causality between natural resource exports, decomposed manufactured exports, and economic growth, and (ii) the short- and long-run causality between basic manufacturing, technology-intensive and differentiated manufacturing, and net of natural resource output growth.

To the best of my knowledge, no previous study has examined these relationships using disaggregated manufactured exports with different technological intensities in Kuwait. This study attempts to fill this gap and contribute to designing future sustainability strategies.

Within the Kuwaiti context, six studies have investigated the exports–growth relationship in Kuwait: Al-Yousif (1997), El-Sakka and Al-Mutairi (2000), and Kalaitzi and Chamberlain (2021) use total exports; Merza (2007) uses oil and non-oil exports; and Kalaitzi and Chamberlain (2022) and Kalaitzi et al. (2023) use manufactured exports and the share of manufactured exports in total exports. Al-Yousif (1997) and El-Sakka and Al-Mutairi (2000) found no long-run relationship between exports and economic growth; however, their results related to the impact of exports on growth are divergent. Al-Yousif (1997) showed a positive impact of exports on economic growth in the short-run, whereas El-Sakka and Al-Mutairi (2000) indicated that no short-run causality exists between exports and economic growth. Kalaitzi and Chamberlain (2021), who use total exports, provide evidence of bidirectional causality between exports and economic growth in Kuwait, but only in the short run. By dividing exports into oil and non-oil exports, Merza (2007) shows that bidirectional causality holds for oil exports and growth but not for non-oil exports and growth, where it is unidirectional from the latter to growth. Finally, Kalaitzi and Chamberlain (2022) and Kalaitzi et al. (2023), using manufactured exports and their share in total exports, find that manufactured exports do not directly cause economic growth in either the short or long run.

This study differs from previous ones in that it uses a further disaggregation of manufactured exports. It decomposes manufactures into (a) basic manufactures measured by chemical and manufactured goods; (b) technology-intensive manufactures measured by machinery and transport equipment, and (c) differentiated manufactured exports measured by finished goods (see Appendix 2, Table 8). By filling this gap, this study sheds further light on the exports–growth nexus in Kuwait which can guide in designing specific trade policies to boost diversification and long-run economic growth, in line with Kuwait's Vision 2035.

I use two augmented production functions and annual data over 1970–2021. The first production function is augmented with natural resource exports, basic manufactures, technology-intensive and differentiated manufacturing exports, and imports of goods, whereas the second function excludes natural resource exports from both sides to re-examine the causal link between decomposed manufacturing exports and growth. I conduct three unit root tests to assess the stationary properties of the variables: a) Phillips–Perron, b) Kwiatkowski–Phillips–Schmidt–Shin, and c) modified Augmented Dickey Fuller test with a breakpoint. Thereafter, Johansen cointegration and autoregressive distributed lag model (ARDL) bound tests are performed to examine the existence of cointegrating vector(s). Finally, the directions of short- and long-run causalities between the model variables are investigated using Granger causality test in a vector autoregressive framework (VAR) and Toda–Yamamoto test, respectively.

Empirical results of both models indicate no direct causality from basic, technology-intensive, or differentiated manufactured exports to economic growth in the short or long run, whereas natural resource exports are still vital for diversification and economic growth.

The remainder of this paper is organized as follows: The literature review is presented in Sect. 2; Sect. 3 describes the empirical strategy, and Sects. 4 and 5 present the empirical results and conclusions of this study.

2 Literature review

The role of exports in accelerating economic growth has been examined by several studies in the economic development literature; however, existing evidence is mixed and relates to each country's export structure. Empirical studies on the impact of export product structure on economic growth indicate that natural resource exports can slow down economic growth, while non-resource export expansion can accelerate the growth process (Gylfason et al. 1999; Bravo-Ortega and Gregorio 2005; Behbudi et al. 2010; Aljebrin 2017; Kalaitzi and Cleeve 2018; Kalaitzi and Chamberlain 2020b; Kalaitzi et al. 2022a).

For example, Gylfason et al. (1999) used panel and cross-sectional regression models to investigate the relationship between natural resource abundance and economic growth in 125 countries during 1960–1992. Using the ratio of primary exports to total exports as a proxy for resource abundance, the study showed that natural resource exports negatively affect economic growth. Similarly, Bravo-Ortega and Gregorio (2005) used data for 19 countries during the years 1970–1990 and the ratio of primary exports to GDP to provide evidence that natural resource exports slow down economic growth.

In addition, Behbudi et al. (2010) examined the impact of the relative abundance of natural resource exports on economic growth in 29 petroleum exporting countries using data for the period 1970–2004 and panel data techniques. In particular, the study focused on major petroleum exporters, including Kuwait and other petroleum countries, while the ratio of fuel exports to merchandise exports is used as a proxy for resource abundance. The study showed that natural resources for major petroleum countries were damaging to economic growth, especially in nations with low levels of human capital.

Aljebrin (2017) investigated the effect of non-oil exports on non-oil economic growth in Saudi Arabia during 1988–2014 using an augmented production function, cointegration analysis, and an error correction model approach. In particular, non-oil exports include food products, chemical products, plastic products, electrical exports, base metal exports, and other exports. The study showed that non-oil exports positively affect non-oil economic growth in the short and long run. The study by Kalaitzi and Cleeve (2018) examined the causal effect of primary exports and manufactured exports on economic growth in the United Arab Emirates using data from 1981 to 2012. By applying multivariate time series techniques, the study showed that primary exports did not contribute to economic growth as manufactured exports did in the long run, while there was no short- or long-run causal link between primary exports and economic growth. Kalaitzi and Chamberlain (2020b), using data from the United Arab Emirates during the same years as Kalaitzi and Cleeve (2018) and multivariate time series analysis, demonstrated that fuel and mining exports did not have a causal effect on economic growth, either in the short or long run. In addition, Kalaitzi et al. (2022a), using data for 1981–2017 for the same country and Granger causality in Vector Error Correction framework confirmed that non-primary exports cause economic growth in the short-run.

In contrast to the aforementioned evidence, some studies argued that primary exports could benefit economic growth, as manufactured exports did in some nations, or that manufactured exports did not foster growth (Khan et al. 1995; Greenaway et. al, 1999; Khalafalla and Webb 2001; Khayati 2019). For example, Khan et al. (1995) examined the causality between total export growth and economic growth in Pakistan during 1972–1994. In addition, Khan et al. decomposed total exports into primary and manufactured exports and examined separately the causality between these categories and economic growth. The study confirmed the existence of a long-run two-way relationship among export growth and economic growth and among manufactured exports and economic growth, while a one-way relationship existed among primary exports and growth. As for the direction of causality, bidirectional causality existed between both export categories (primary and manufactured) and growth.

Greenaway et al. (1999) investigated the relationship among aggregate exports and economic growth and explored the role of disaggregated exports such as food, fuels, metals, other primary, textiles, machinery, and other manufactures. Using panel data from 69 countries over the period 1975–1993 and a dynamic model, the study supported a strong positive relationship between exports and growth. As for the effect of disaggregated exports on growth, the study used data from 66 countries during 1980–1990 and showed that countries that specialized in metals, fuels and textiles benefited more from export-led growth than those specialized in machinery, food and other primary products. Khalafalla and Webb (2001) investigated the causal link among aggregate exports, primary, manufactures, and economic growth in Malaysia from 1965 to 1996 and sub-periods 1965–1980 and 1981–1996. Using quarterly data and vector autoregressive models, the study confirmed the validity of the export-led growth (ELG) hypothesis during 1965–1996 and 1965–1980, noting that the impact of primary exports on economic growth was stronger than that of manufactures. However, from 1981–1996, growth causes exports.

Khayati (2019) examined the causality between oil exports, non-oil exports and economic growth in Bahrain during 1977–2005, using an augmented production function. The study confirmed the existence of a long-run relationship between the model variables, noting that both oil and non-oil exports have a positive and significant long-run impact on economic growth; however, the impact of oil exports is greater than that of non-oil exports. In addition, oil exports cause economic growth in the short-run and not non-oil exports.

Other studies assessed the impact of export structure on economic growth, with the majority noting that the skill-intensive components of exports contributed more to economic growth (Ghatak and Price 1997; Wörz 2005; Cuaresma and Wörz 2005; Falk 2009; Torayeh 2011; Aditya and Acharyya 2013; Kalaitzi et al. 2022b; Ekanayake et al. 2023). For example, Ghatak and Price (1997) investigated the causal link among aggregate exports and non-export output in India during 1950–1992, while disaggregated exports were also examined. In particular, exports were disaggregated into primary goods, chemicals, and fuels, manufactures that used precious stones, traditional manufactures, and non-traditional manufactures. Using cointegration and Granger causality tests, Ghatak and Price showed that non-export economic growth caused aggregated exports, which indicated that growth-led exports existed during the period 1950–1992, while in contrast with other countries, imports were not found to be important. At the disaggregate level, non-traditional manufactured exports caused economic growth, while traditional manufactures had a smaller effect that indicated that some components of exports canceled each other out and failed to support the ELG at the aggregate level.

Wörz (2005) examined whether different types of trading activities had different effects on growth, using data from 45 OECD and non-OECD countries during the years 1981–1997. In particular, exports were grouped into low-, medium-, and high-skill manufacturing exports and a generalized method of moments (GMM) estimator was used. For non-OECD countries, low-and medium-skill exports appeared to positively impact economic growth, while in contrast, high-skill-intensive exports had a negative impact. In contrast, for OECD countries, low skill exports did not contribute to growth, while medium and high skill positively affected growth. However, some medium- and high-skill-intensive exports appeared to negatively affect growth in both OECD and non-OECD countries, such as publishing and printing products.

Cuaresma and Wörz (2005) used data from 45 industrialized and developing countries across different geographic regions during 1981–1997 to assess the impact of exports with different technological intensities on economic growth. In particular, exports were disaggregated into non-manufactured exports, low-tech manufactured exports, and high-tech exports. Using a random effects model, this study demonstrated that high-tech exports in developing countries had higher productivity gains relative to low-tech exports, indicating that this category contributed more to economic growth; however, for industrialized countries, the positive productivity differential was not significant.

Similarly, Falk (2009) examined the impact of high-tech exports on economic growth using panel data from 22 OECD countries for the years 1980–2004. Using the GMM estimator and three different equations, Falk found that high-tech exports and business R&D intensity were significant factors for economic growth when entered the equation separately. However, these two variables were found to be insignificant when both entered the growth equation that indicated that a failure to consider the impact of innovation could lead to an overestimation of the role of high-tech exports in the growth process. Moreover, Aditya and Acharyya (2013) investigated the impact of export composition on growth using data for 65 countries during 1965–2005 and GMM models for different sub-samples. Using the ratio of high-technology exports to manufacturing exports as a proxy for export composition, this study confirmed that high-technology exports contributed positively to economic growth, with the relationship becoming stronger when the country's manufacturing exports share in total exports was higher than the global average.

Torayeh (2011) examined the short- and long-run causal link among total and disaggregated manufactured exports and growth in Egypt. In particular, manufactured exports were disaggregated into textiles and clothing, basic and fabricated metal products, chemical products, and food products. Using cointegration analysis and Granger causality tests, Torayeh found that cointegrating relationships existed between disaggregated manufactured exports and economic growth, and total manufactured exports and growth. In the short run, the causality ran from chemical and metal products to economic growth, while the same was confirmed for total manufactured exports. In the long run, bidirectional causality existed among total manufactured exports and growth, as well as among textiles, metals, and food products and growth.

Kalaitzi et al. (2022b) examined the short- and long-run causality among disaggregated manufactured exports and economic growth in the United Arab Emirates during 1981–2019. By disaggregating manufactured exports into chemical products, manufactured goods and miscellaneous articles, and machinery and transport equipment, this study demonstrated that exports of chemicals caused short-run economic growth, while bidirectional causal relationship existed among machinery and transport equipment exports and growth in the short and long run. Finally, the research by Ekanayake et al. (2023) examined the effect of trade openness on economic growth in 223 countries over the period 1962–2019, using ordinary least squares, instrumental variables and two-stage least squares estimation methods. By decomposing traded goods based on the level of technological sophistication, the study found that exports (and imports) of high-tech manufactured goods have a positive and significant impact on economic growth. In addition, Ekanayake et al. noted that trade in high-tech products has permanent growth effects, due to their positive technological externalities through higher R&D productivity.

With regard to Kuwait, the studies by Al-Yousif (1997), El-Sakka and Al-Mutairi (2000) and Kalaitzi and Chamberlain (2021) examined the relationship between total exports and economic growth. In particular, the study by Al-Yousif (1997) investigated the exports-growth in four GCC countries, including Kuwait, over the period 1973–1993, using an augmented production function. The study applied the two-step cointegration test to investigate the existence of a long-run relationship between exports and economic growth and regression analysis to examine the impact of exports on economic growth in the short-run. The results showed that there is no long-run relationship between exports and economic growth, while the impact of exports on economic growth is positive and significant for all the countries, including Kuwait. El-Sakka and Al-Mutairi (2000), using data for Kuwait over the period 1970–1997 confirmed the results of Al-Yousif (1997) regarding the non-existence of a long-run relationship between exports and growth, but indicated that no causality exists between them in the short-run. Kalaitzi and Chamberlain (2021) examined the short-run and long-run causality between exports and economic growth in five GCC countries, including Kuwait, using data over the period 1975–2016 and an augmented production function. The study applied the Granger causality test in a vector error correction framework and the Toda and Yamamoto causality test, and provided evidence that a bi-directional causality exists between exports and economic growth in Kuwait, but only in the short-run.

In addition, the study by Merza (2007) examined the exports-growth nexus in Kuwait, by disaggregating exports into oil and non-oil exports, while Kalaitzi and Chamberlain (2022) and Kalaitzi et al. (2023) by using manufactured exports and their share in total exports, respectively. In particular, Merza (2007), using data for 1970–2004, cointegration and multivariate causality test found that a bi-directional causality holds for oil exports and economic growth, but not for non-oil exports, where a uni-directional causality runs from the latter to growth. The study by Kalaitzi and Chamberlain (2022) examined the effect of manufactured exports on economic growth and how imports reinforce the role of exports in fostering export diversification during the period 1970–2019. The study examined the short-run and long-run causality between manufactured exports and economic growth using the multivariate Granger causality test in a vector autoregressive framework and the Toda and Yamamoto test respectively. The results indicated that manufactured exports do not cause directly economic growth neither in the short or long-run. Finally, the study by Kalaitzi et al. (2023) using the same methodology with Kalaitzi and Chamberlain (2022) and data for 1980–2019 provided evidence that there is no short-run or long-run causality between export diversification and economic growth in Kuwait.

The present study extends the work of Kalaitzi and Chamberlain (2022) and Kalaitzi et al. (2023) by focusing on the causality between manufactured export components with different technological intensities and economic growth.

3 Empirical strategy

This study uses two models to examine whether basic, technology-intensive, and differentiated exports cause economic growth. Model 1 is based on the AK production function, where capital in the equation includes physical, R&D and human capital (Romer 1986; Lucas 1988),[3]and is augmented with natural resource exports, decomposed manufacturing exports, and imports, following precedent studies on the export-led growth nexus[4]. The Model 1 is as follows:

$$Y_t = F\left[\left(K_t\right)\left(RX_t, BMX_t, TMX_t, DMX_t, IM_t, C_t\right)\right] = K_t^{\alpha} RX_t^{\beta} BMX_t^{\gamma} TMX_t^{\delta} DMX_t^{\zeta} IM_t^{\theta} C_t \tag{1}$$

where Y_t is the total output of the Kuwaiti economy at time t, K_t denotes physical capital, R&D capital and human capital in the economy, and RX_t represents natural resource exports. BMX_t denotes basic manufactures[5], while TMX_t and DMX_t represent technology-skill intensive[6] and differentiated manufactured[7] exports, respectively. In addition, IM_t denotes imports of goods, while C_t represents other exogenous factors; the coefficients α, β, γ, δ, ζ and θ are the elasticities of production with respect to K_t, RX_t, BMX_t, TMX_t, DMX_t, and IM_t. Equation (2) is obtained by taking the logarithm of both sides of Eq. (1):

$$LY_t = c + \alpha LK_t + \beta LRX_t + \gamma LBMX_t + \delta LTMX_t + \zeta LDMX_t + \theta LIM_t + \varepsilon_t, \tag{2}$$

c is a constant, α, β, γ, δ, ζ, and θ are the variable coefficients, while ε_t is the error term.

The causal link among decomposed manufacturing exports and growth is re-examined using Model 2, in which the output net of natural resource exports is used ($NY_t = Y_t - RX_t$) on the left-hand side, while natural resource exports are also excluded from the right-hand side of the equation. This allows manufactured export components and output to be isolated by oil price fluctuations. The Model 2 is as follows:

[3] Human capital measures that take human capital quality into account are not available for Kuwait for the examined period.

[4] This study incorporates imports in model, as imports are vital for the export-oriented production and foster technology and knowledge diffusion in the economy (Coe and Helpman 1995; Riezman et al. 1996). As for the inclusion of natural resource exports and manufactured exports components, this study follows Kalaitzi and Cleeve (2018), Kalaitzi et al. (2022b) and Kalaitzi and Chamberlain (2022).

[5] Chemical and related products and manufactured goods.

[6] Machinery and transport equipment.

[7] Miscellaneous manufactured articles (finished goods).

$$NY_t = F\left[\left(K_t\right)\left(BMX_t, TMX_t, DMX_t, IM_t, C_t\right)\right] = K_t^{\alpha} BMX_t^{\gamma} TMX_t^{\delta} DMX_t^{\zeta} IM_t^{\theta} C_t \tag{3}$$

$$LNY_t = c + \alpha LK_t + \gamma LBMX_t + \delta LTMX_t + \zeta LDMX_t + \theta LIM_t + \varepsilon_t \tag{4}$$

c is a constant, α, γ, δ, ζ, and θ are the variable coefficients, while ε_t is the error term.

The empirical analysis uses time series data from 1970 to 2021, obtained from the United Nations Comtrade Database (UNComtrade), the International Monetary Fund (IMF) and the United Nations Statistics Division (UNSD). In particular, the proxies for economic growth and capital, Gross domestic product (Y_t) and gross fixed capital formation (K_t) respectively, are obtained from the International Financial Statistics- IMF and the UNSD. Primary exports (SITC[8] 0, 1, 2, 3, 4, 68 Rev.1) are used as a proxy for natural resource export[9] (RX_t), while chemical and related products (SITC 5, Rev.1) and manufactured goods (SITC 6 minus 68, Rev.1) are used as proxy for basic manufactured exports (BMX_t). In addition, machinery and transport equipment (SITC 7, Rev.1) and miscellaneous manufactured articles (SITC 8, Rev.1) are used as proxies for technology-skills intensive (TMX_t) and differentiated manufactured exports (DMX_t) respectively (see Appendix 2, Table 8). All export categories and imports of goods (IM_t) are taken from the UNComtrade. All variables are expressed in real terms.

The study starts by assessing the stationary properties of the time series. The Phillips-Perron (PP) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests are applied, but as these tests can be biased in the presence of structural breaks, the modified Augmented Dickey Fuller (ADF) test with a breakpoint (ADFBP) is also applied.[10] According to Enders (1995:243), "In performing unit root test, special care must be taken if it is suspected that structural change has occurred", and in the case of Kuwait, oil shocks have occurred during the examined period.

Once the integration order of the time series is determined, the presence of cointegrating vector is investigated by applying the Johansen cointegration test (Johansen 1988). The number of the cointegrating vectors is identified based on the modified trace and maximum eigenvalue statistics following Reinsel and Ahn (1992), while the Pantula principle is applied to determine the deterministic components in the cointegrating vectors. Moreover, the Autoregressive distributed lag (ARDL) bounds test[11] for cointegration (Pesaran et al. 2001) is performed to confirm the Johansen test results.

To investigate the causality among decomposed manufactured exports and economic growth, the Granger causality test (Granger 1969) is performed in a Vector Autoregressive model (VAR) framework (Sims 1980). Providing that the variables

[8] Standard International Trade Classification (SITC), Revision 1.

[9] Natural resource exports (SITC 1, 3, 4) comprise more than 99% of primary exports (SITC 0, 1, 2, 3, 4, 68). For this reason, the term "natural resource exports" is used instead of "primary exports".

[10] The ADFBD test developed by Perron (1989) and Vogelsang and Perron (1998).

[11] Diagnostic tests are conducted to confirm that the ARDL residuals are homoscedastic, normally distributed and uncorrelated. In addition, the stability of the ARDL parameters is examined by conducting the CUSUM and CUSUMQ tests.

are I(1), in the absence of cointegrating vector, an unrestricted VAR Model in first difference (VARD) is estimated:

$$\begin{bmatrix} \Delta LY_t \\ \Delta LK_t \\ \Delta LRX_t \\ \Delta LBMX_t \\ \Delta LTMX_t \\ \Delta LDMX_t \\ \Delta LIM_t \end{bmatrix} = \sum_{j=1}^{p} \beta_{ij} \begin{bmatrix} \Delta LY_{t-j} \\ \Delta LK_{t-j} \\ \Delta LRX_{t-j} \\ \Delta LBMX_{t-j} \\ \Delta LTMX_{t-j} \\ \Delta LDMX_{t-j} \\ \Delta LIM_{t-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \\ \varepsilon_{7t} \end{bmatrix} \tag{5}$$

$$\begin{bmatrix} \Delta LNY_t \\ \Delta LK_t \\ \Delta LBMX_t \\ \Delta LTMX_t \\ \Delta LDMX_t \\ \Delta LIM_t \end{bmatrix} = \sum_{j=1}^{p} \beta_{ij} \begin{bmatrix} \Delta LY_{t-j} \\ \Delta LK_{t-j} \\ \Delta LBMX_{t-j} \\ \Delta LTMX_{t-j} \\ \Delta LDMX_{t-j} \\ \Delta LIM_{t-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix} \tag{6}$$

where Δ is the difference operator; $\sum_{j=1}^{p} \beta_{ij}$ are the regression coefficients of the variables presented in Eqs. 2 and 4, while p is the optimal lag order chosen based on the Schwarz information criterion (SIC).

If cointegrating vector is found, a restricted VAR (vector error correction model-VECM) is estimated, by including in the above equations the error correction term, ECT_{t-1}, derived from the cointegrating vector(s):

$$\begin{bmatrix} \Delta LY_t \\ \Delta LK_t \\ \Delta LRX_t \\ \Delta LBMX_t \\ \Delta LTMX_t \\ \Delta LDMX_t \\ \Delta LIM_t \end{bmatrix} = \sum_{j=1}^{p} \beta_{ij} \begin{bmatrix} \Delta LY_{t-j} \\ \Delta LK_{t-j} \\ \Delta LRX_{t-j} \\ \Delta LBMX_{t-j} \\ \Delta LTMX_{t-j} \\ \Delta LDMX_{t-j} \\ \Delta LIM_{t-j} \end{bmatrix} + \begin{bmatrix} \lambda_y \\ \lambda_k \\ \lambda_{rx} \\ \lambda_{bmx} \\ \lambda_{tmx} \\ \lambda_{dmx} \\ \lambda_{im} \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \\ \varepsilon_{7t} \end{bmatrix} \tag{7}$$

$$\begin{bmatrix} \Delta LNY_t \\ \Delta LK_t \\ \Delta LBMX_t \\ \Delta LTMX_t \\ \Delta LDMX_t \\ \Delta LIM_t \end{bmatrix} = \sum_{j=1}^{p} \beta_{ij} \begin{bmatrix} \Delta LY_{t-j} \\ \Delta LK_{t-j} \\ \Delta LBMX_{t-j} \\ \Delta LTMX_{t-j} \\ \Delta LDMX_{t-j} \\ \Delta LIM_{t-j} \end{bmatrix} + \begin{bmatrix} \lambda_y \\ \lambda_k \\ \lambda_{bmx} \\ \lambda_{tmx} \\ \lambda_{dmx} \\ \lambda_{im} \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix} \tag{8}$$

where $\sum_{j=1}^{p} \beta_{ij}$ are the coefficients of the variables presented in Eqs. 2 and 4, while λ are the coefficients of the error correction terms.

Once the VARD or VECM model has been estimated, and before applying the Granger causality test, diagnostic tests[12] are performed to confirm that the model and each equation is well specified. Moreover, the cumulative sum of recursive residuals (CUSUM) and the CUSUM of squares (CUSUMQ) tests are employed to ascertain the parameter stability of the estimated equations[13] (Brown et. al 1975).

After ascertaining the stability of the model parameters, the Granger causality test is applied using the chi-square statistic. In particular, the direct and indirect causal relationships in the short run are examined by testing the null hypotheses H_0: $\sum_{j=1}^{p} \beta_{ij} = 0$ against the alternative H_0: $\sum_{j=1}^{p} \beta_{ij} \neq 0$.

It should be noted that the Granger causality in VARD only shows the short-run causality among the model variables, while in VECM, where the long-run relatinship(s) are included in the estimates, only the joint long-run causality is indicated. The individual long-run causal links cannot be identified in the multivariate error correction models. For this reason, the study performs the Toda and Yamamoto test (Toda and Yamamoto 1995), which does not require assessing the cointegrating properties of the variables, avoiding the possible pre-test biases, while it can be performed even when cointegration does not exist (Clarke and Mirza 2006; Zapata and Rambaldi 1997). In particular, the Toda and Yamamoto test in this study involves the following models:

$$\begin{bmatrix} LY_t \\ LK_t \\ LRX_t \\ LBMX_t \\ LTMX_t \\ LDMX_t \\ LIM_t \end{bmatrix} = \begin{bmatrix} \alpha_{1t} \\ \alpha_{2t} \\ \alpha_{3t} \\ \alpha_{4t} \\ \alpha_{5t} \\ \alpha_{6t} \\ \alpha_{7t} \end{bmatrix} + \sum_{j=1}^{p+dmax} \beta_{ij} \begin{bmatrix} LY_{t-j} \\ LK_{t-j} \\ LRX_{t-j} \\ LBMX_{t-j} \\ LTMX_{t-j} \\ LDMX_{t-j} \\ LIM_{t-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \\ \varepsilon_{7t} \end{bmatrix} \tag{9}$$

$$\begin{bmatrix} LNY_t \\ LK_t \\ LBMX_t \\ LTMX_t \\ LDMX_t \\ LIM_t \end{bmatrix} = \begin{bmatrix} \alpha_{1t} \\ \alpha_{2t} \\ \alpha_{3t} \\ \alpha_{4t} \\ \alpha_{5t} \\ \alpha_{6t} \end{bmatrix} + \sum_{j=1}^{p+dmax} \beta_{ij} \begin{bmatrix} LNY_{t-j} \\ LK_{t-j} \\ LBMX_{t-j} \\ LTMX_{t-j} \\ LDMX_{t-j} \\ LIM_{t-j} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{bmatrix} \tag{10}$$

[12] In particular, the diagnostic tests include the Breusch-Godfrey LM test for the detection of autocorrelation, the White test for the existence of heteroskedasticity and the AR roots stability test.

[13] The CUSUM and CUSUMQ statistics are plotted with the 5% significance lines for parameter stability and movements inside the significance lines indicate stability during the sample period. If structural instability is present, the structural breaks must be identified and included in the VARD/VECM model.

p is the optimal lag length and dmax is the maximum integration order of the variables. To apply the test, the selected lag length (p) is augmented by the maximum integration order (dmax) and the chi-square test is applied to the first p VAR coefficients. The direct and indirect causal relationships in the long run are examined by testing the null hypotheses H_0: $\sum_{j=1}^{p+dmax} \beta ij = 0$ against the alternative H_0: $\sum_{j=1}^{p+dmax} \beta ij \neq 0$.

4 Empirical results

Table 1 reports the results of the PP, KPSS and ADFBP tests at levels and first differences. The PP test indicates that the null hypothesis of unit root cannot be rejected for all level variables at conventional levels of significance. The KPSS test indicates that the null hypothesis of stationarity can be rejected at 10% level for LRX_t, $LBMX_t$

Table 1 Unit root test results for Models 1 and 2

Variables	PP	KPSS	ADFBP	
Levels				
LY_t	$-2.72^{(a)}\{7\}$	$0.20^{(a)}\{5\}$**	$-4.52^{(a)}[0]$	1973
LNY_t	$-0.06^{(c)}\{13\}$	$0.71^{(b)}\{4\}$**	$-8.39^{(b)}[0]$***	1974
LK_t	$-2.73^{(a)}\{7\}$	$0.22^{(a)}\{5\}$***	$-4.37^{(a)}[0]$	1973
LRX_t	$-2.28^{(b)}\{3\}$	$0.12^{(a)}\{5\}$*	$-3.54^{(a)}[3]$	1986
$LBMX_t$	$-2.51^{(b)}\{3\}$	$0.11^{(a)}\{5\}$*	$-5.43^{(b)}[0]$***	1991
$LTMX_t$	$0.42^{(c)}\{1\}$	$0.17^{(b)}\{5\}$	$-4.45^{(a)}[0]$	2004
$LDMX_t$	$-2.05^{(b)}\{3\}$	$0.14^{(b)}\{5\}$	$-4.28^{(a)}[1]$	2008
LIM_t	$0.62^{(c)}\{5\}$	$0.13^{(a)}\{4\}$*	$-4.10^{(b)}[1]$	2006
1st Differences				
ΔLY_t	$-7.35^{(c)}\{6\}$***	$0.29^{(b)}\{5\}$	$-8.96^{(b)}[0]$***	1974
ΔLNY_t	$-16.77^{(c)}\{16\}$***	$0.20^{(b)}\{13\}$	$-23.24^{(b)}[0]$***	1974
ΔLK_t	$-7.61^{(c)}\{7\}$***	$0.33^{(b)}\{7\}$	$-8.91^{(b)}[0]$***	1974
ΔLRX_t	$-8.20^{(c)}\{1\}$***	$0.07^{(b)}\{1\}$	$11.17^{(b)}[0]$***	1990
$\Delta LBMX_t$	$7.90^{(c)}\{11\}$***	$0.11^{(b)}\{13\}$	$-8.02^{(a)}[7]$***	1991
$\Delta LTMX_t$	$-5.66^{(c)}\{1\}$***	$0.08^{(b)}\{1\}$	$-6.43^{(b)}[0]$***	2000
$\Delta LDMX_t$	$-5.83^{(c)}\{10\}$***	$0.11^{(b)}\{7\}$	$-7.75^{(a)}[1]$***	2002
ΔLIM_t	$-6.52^{(c)}\{6\}$***	$0.05^{(b)}\{5\}$	$-8.12^{(b)}[0]$***	2000

*, **, *** denote the rejection of the null hypothesis at 10%, 5% and 1% respectively. Optimal lags for the ADFBP test are chosen based on SIC and appear in []. Bandwidth in {} uses the Bartlett kernel estimation method. The maximum lag length for the ADFBP test is determined by using $P_{max} = [12*(T/100)^{1/4}]$ (Schwert 1989). The models with (a) constant and trend, (b) constant only, and (c) no constant or trend are used when conducting the ADFBP and PP tests. For the KPSS test, the models (a) and (b) are used. The appropriate model for each series is selected following Dolado et al. process (Dolado et al. 1990) and appears in (). The years refer to the structural breaks (selected by minimizing the Dickey-Fuller t-statistic)

and LIM_t, at 5% for LY_t and LNY_t and at 1% for LK_t. In contrast, $LTMX_t$ *and* $LDMX_t$ are found to be stationary at conventional levels; however, when using the ADFBP test, which considers a structural break, the null hypothesis of unit root cannot be rejected for $LTMX_t$ *and* $LDMX_t$, confirming the PP test results. ADFBP also shows that all level variables are non-stationary, except from LNY_t and $LBMX_t$, which are stationary at the 1% level. However, in both the PP and KPSS results presented earlier, LNY_t and $LBMX_t$ are found to be non-stationary. As for the first differenced variables, the unit root tests confirm that all the model variables are stationary at conventional significance levels, indicating that they are integrated of order one.

After confirming that the variables are non-stationary at level, the Johansen cointegration and the ARDL bound tests are performed to detect cointegration between the variables. Table 2 depicts the cointegrating results for both models. As for model 1, the adjusted trace and max-eigenvalue statistics show that the null hypothesis of no cointegration cannot be rejected at 5% level, indicating absence of cointegration. In contrast, the null hypothesis of no cointegration in model 2 can be rejected at 1% level, confirming that the variables follow a common long-run path. The ARDL results in Table 3, confirm the results derived from the Johansen cointegration. In particular, for model 1, the F-statistic is less than the critical value of lower bounds, confirming the absence of cointegration, while in model 2, the F-statistic is greater than the critical value of upper bounds, confirming that cointegration exists.

As the variables of model 1 are not cointegrated, a VARD is estimated, while a VECM is estimated in the case of model 2, as a cointegrating vector exists. The Granger causality tests are applied and presented in Tables 4 and 5. Table 4 shows that causality runs from resource exports to economic growth at 5% significance level, while the inverse is not true, indicating that a uni-directional causality exists. In contrast, the null hypothesis that basic manufactures do not cause economic growth cannot be rejected at the conventional significance levels. Similarly, the null hypotheses that technology-intensive and differentiated manufactured exports do not cause economic growth cannot be rejected. Moreover, the null hypotheses of non-causality from imports to growth and from growth to imports can be rejected at 1%

Table 2 Johansen cointegration test for Models 1 & 2

	Ho	Trace statistic	Critical value		Maximum eigen-value statistic	Critical value	
			5%	1%		5%	1%
Model 1	r = 0	129.25	134.68	145.40	45.50	47.08	53.12
	r = 1	84.61	103.85	113.42	31.54	40.96	46.75
Model 2	r = 0	115.78***	103.85	113.42	52.97***	40.96	46.75
	r = 1	62.83	76.97	85.34	24.27	34.81	40.29

*** indicates rejection at 1% respectively

Critical values are obtained from MacKinnon et al. (1999). Models 1 and Model 2 include a restricted constant (based on Pantula principle; Pantula 1989). The optimal lag length is chosen based on SIC. The Trace and Maximum Eigenvalue statistics are adjusted following Reinsel and Ahn (1992). The tests are conducted by including three impulse dummy exogenous variables for 1974, 2001 and 2010 as stability tests of the initial estimated models showed evidence of structural instability

Table 3 ARDL Bounds test results for Models 1 & 2

	Ho	Bounds Test Value	Bounds critical value			
		F Statistic	5%		1%	
			I(0)	I(1)	I(0)	I(1)
Model 1	r = 0	2.29(*k* = *6*)	2.55	3.71	3.42	4.88
Model 2	r = 0	11.09 *(k* = *5)*	2.67	3.78	3.59	4.98

The diagnostic tests for Model 1 ARDL(1,2,2,1,0,0,2) indicate that the model is well specified:[LM F(2,30) = 0.24, JB = 0.99, W-het $\chi^2\{17\} = 0.29$]. In addition, the CUSUM and CUSUMQ tests confirm the constancy of the parameters (Appendix 3, Fig. 9). The diagnostic tests for Model 2 ARDL(2,0,0,0,1,0) indicate that the model is well specified:[LM F(2,36) = 0.02, JB = 0.02, W-het $\chi^2\{11\} = 0.21$]. In addition, the CUSUM and CUSUMQ tests confirm the constancy of the parameters (Appendix 3, Fig. 10). The tests are conducted by including three impulse dummy exogenous variables for 1974, 2001 and 2010

Table 4 Granger causality test, Model 1

Source of causality	Dependent variable						
	ΔLY_t	ΔLK_t	ΔLRX_t	$\Delta LBMX_t$	$\Delta LTMX_t$	$\Delta LDMX_t$	ΔLIM_t
ΔLY_t	–	3.53*	0.06	1.00	0.87	0.18	9.08***
ΔLK_t	0.22	–	0.02	0.01	1.77	1.66	0.02
ΔLRX_t	5.17**	5.23**	–	3.94**	4.00**	0.04	1.66
$\Delta LBMX_t$	0.08	0.33	0.01	–	0.82	0.10	0.45
$\Delta LTMX_t$	0.06	1.38	0.00	0.27	–	0.96	2.12
$\Delta LDMX_t$	0.49	0.00	0.01	0.00	0.38	–	0.01
ΔLIM_t	13.34***	1.66	0.55	3.64*	2.68	2.80*	–
ALL	29.41***	11.78*	1.89	16.24**	7.57	7.46	19.12***

***, ** and * show significance at 1%, 5% and 10% respectively ((χ^2df(1) and χ^2df(6)). The lag order for the VARD is selected based on SIC. The diagnostic tests for the VARD indicate that the model is well specified, while the VARD stability is confirmed using the AR Roots test. Three exogenous variables are included in the VARD (years: 1974, 2001 and 2010), as the initial CUSUM and CUSUMQ plots showed structural instability

level, confirming the existence of a bi-directional causal link among imports and economic growth. It should be noted that resource exports cause physical, human and R&D capital at 5% significance level, and basic and technology-intensive manufactures at 5% level. In addition, imports cause basic manufactures and differentiated manufactures at 10% level, while all the variables in model 1 jointly cause economic growth, physical, human and R&D capital, basic manufactured exports and imports at 1%, 10%, 5% and 1% respectively.

Based on the results reported in Table 4, basic, technology-intensive and differentiated manufactures do not cause economic growth (Kalaitzi and Chamberlain 2022; Kalaitzi et. al, 2023), while natural resource exports are still the main cause of economic growth in the short-run (Greenaway et. al, 1999; Khalafalla and Webb 2001;

Merza 2007; Khayati 2019). Moreover, the results show the role of resource exports in financing not only physical and human capital and R&D investments but also the expansion of basic and technology-intensive manufactured exports (Kalaitzi and Cleeve 2018). Also, the results confirm the role of imports in providing raw materials for the basic and differentiated manufacturing production and in transferring technology to the economy (Coe and Helpman 1995; Riezman et al. 1996). At the same time, imports directly cause economic growth, through technological advancement and improved productivity, and in turn, economic growth finances further import expansion (Coe and Helpman 1995; Riezman et al. 1996; Kalaitzi and Cleeve 2018 Kalaitzi and Chamberlain 2022). Therefore, the natural resource exports and imports are vital for diversifying the nation's economy, fulfilling Kuwait's Vision 2035. Figure 2 presents the short-run causal relationships among the variables in model 1.

When examining the causal link among decomposed manufactures and net of resource exports output, the Model 1 results are confirmed. The results of model 2 estimations are reported in Table 5. In particular, basic manufactured exports do not cause economic growth at the conventional significance levels, while the same is valid in the case of technology-intensive and differentiated manufactured exports. In addition, the causality running from imports to basic manufactured exports is also confirmed, as the null hypothesis that imports do not cause basic manufactures is rejected at 5%. At the same time, basic manufactures cause imports at the 10% level, indicating a bi-directional causality between them. Also, all variables jointly cause economic growth and basic manufactured exports, both at 5% level. It should be noted that in model 2, capital, which includes physical, R&D and human capital, cause economic growth at 1% level. This is in contrast with model 1 results of non-causality between capital and growth, indicating the importance of capital for

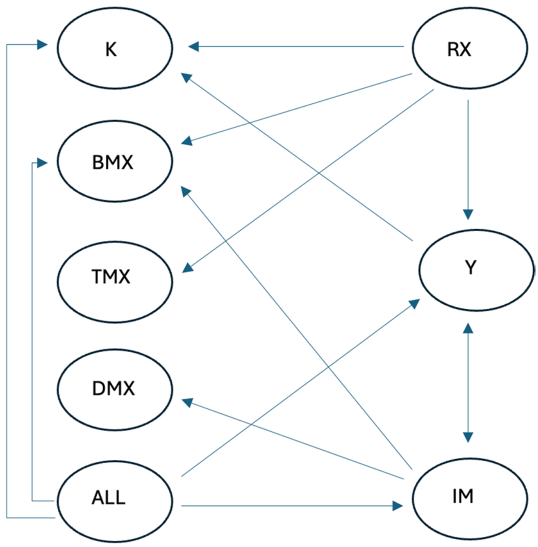


Fig. 2 Short-run causal relationships in Model 1. *Source*: Created by the author for the purpose of this study

Table 5 Granger causality test, Model 2

Source of causality	Dependent variable					
	ΔLNY_t	ΔLK_t	$\Delta LBMX_t$	$\Delta LTMX_t$	$\Delta LDMX_t$	ΔLIM_t
ΔLNY_t	–	0.00	1.05	0.00	2.06	0.00
ΔLK_t	8.81***	–	0.05	0.70	1.62	0.03
$\Delta LBMX_t$	1.25	0.57	–	0.17	0.12	2.79*
$\Delta LTMX_t$	1.73	1.76	0.17	–	0.76	2.45
$\Delta LDMX_t$	0.68	0.28	0.40	0.45	–	0.00
ΔLIM_t	1.71	0.11	5.28**	0.85	0.99	–
ALL	12.81**	4.11	13.02**	2.12	8.30	7.05

***, ** and * show significance at 1%, 5% and 10% respectively ((χ^2df(1) and χ^2df(5)). The lag order for the VECM is selected based on the SIC. The diagnostic tests for the VECM indicate that the model is well specified, while the VECM stability is confirmed using the AR Roots test. Three exogenous variables are included in the VECM (years: 1974, 2001 and 2010), as the initial CUSUM and CUSUMQ plots showed structural instability

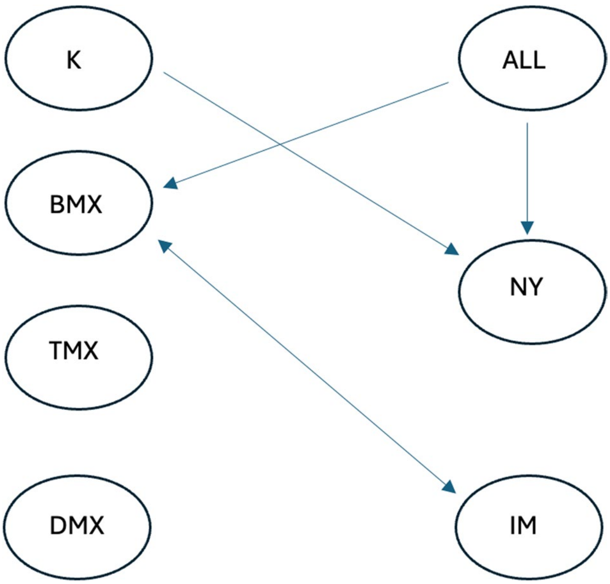


Fig. 3 Short-run causal relationships in Model 2. *Source*: Created by the author for the purpose of this study

manufacturing output (net of resource exports output). Figure 3 presents the short-run causal relationships among the variables in model 2.

After examining the short-run causality between the variables in model 1 and 2, the parameters stability of the estimated equations is assessed. The CUSUM and CUSUMQ statistics and the 5% critical lines are presented in Figs. 4 and 5. As it can be seen, there is no movement outside the 5% significance lines, confirming that the estimated equations are stable, even during periods of oil crisis.

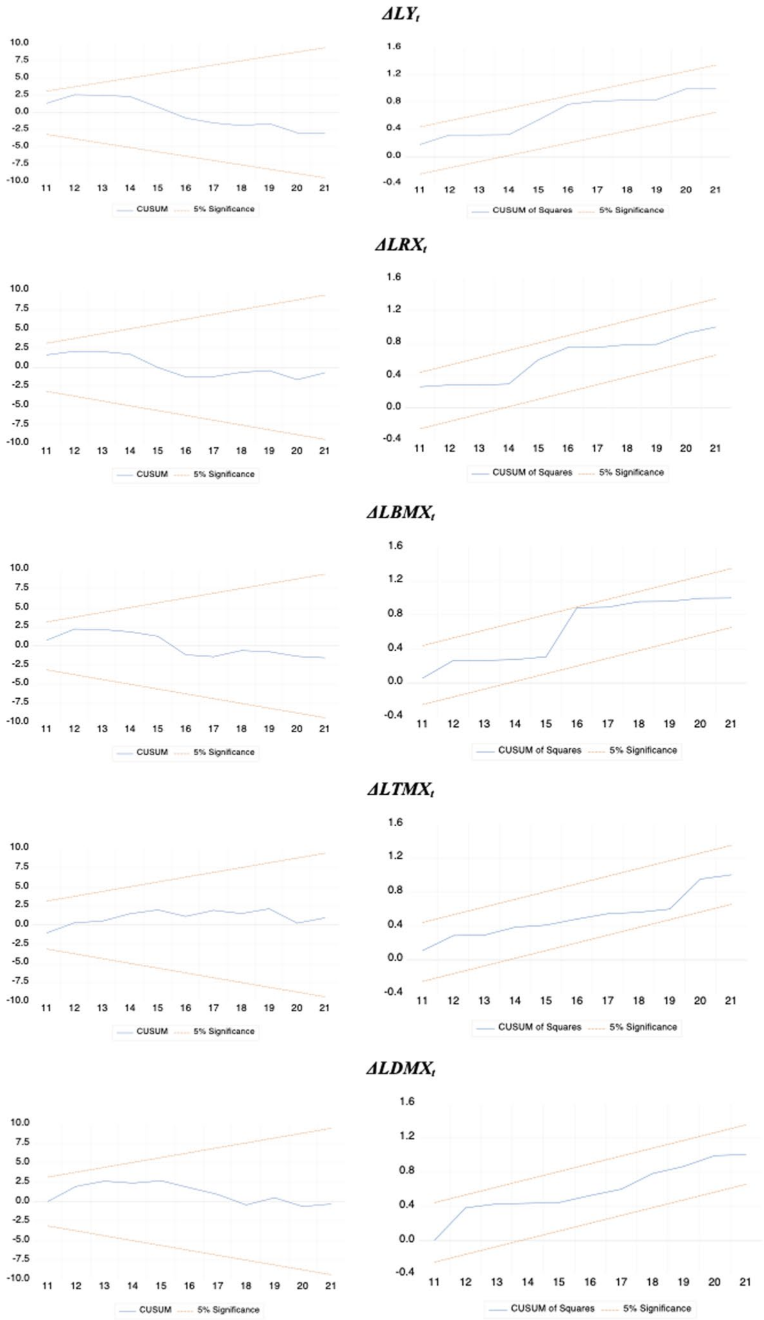


Fig. 4 CUSUM and CUSUMQ plots for the manufactured export components and economic growth equations, Model 1

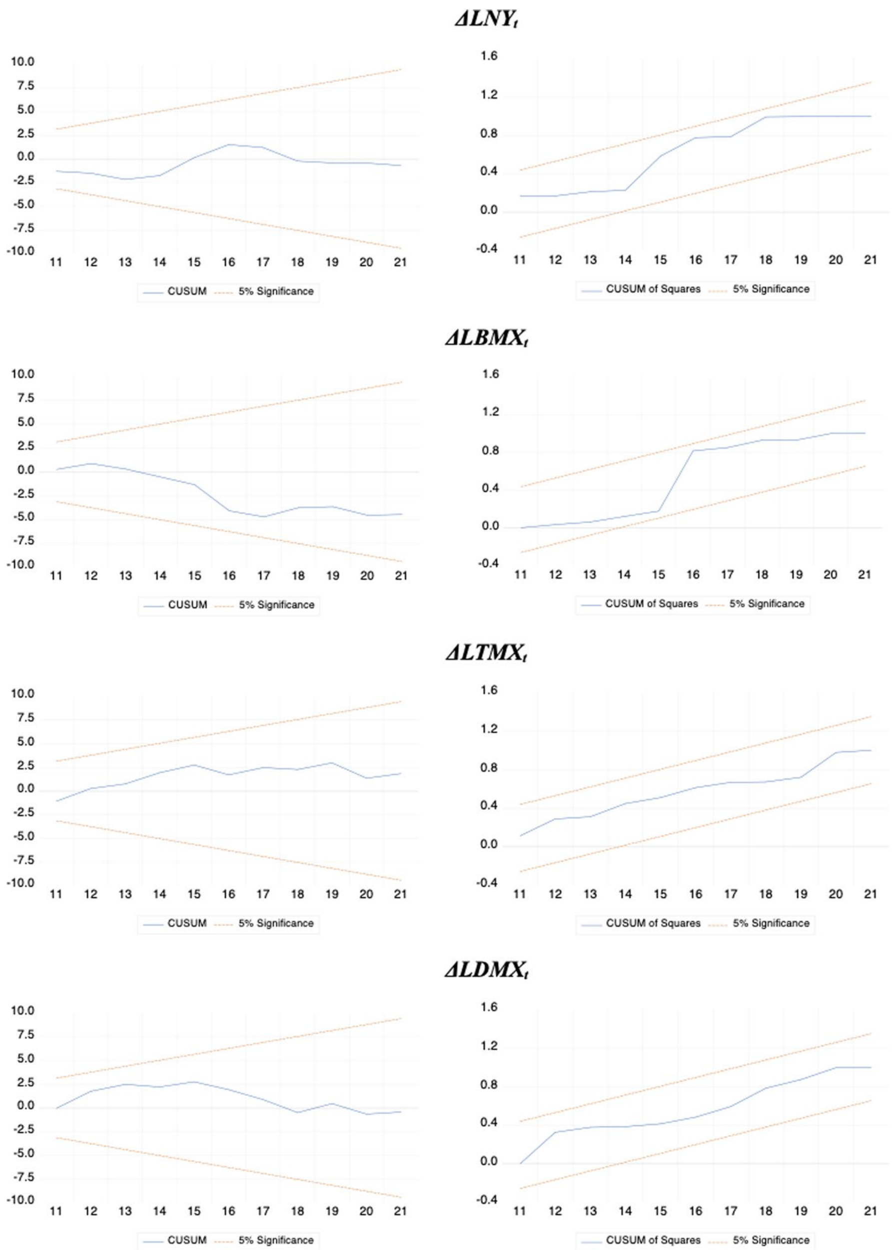


Fig. 5 CUSUM and CUSUMQ plots for the manufactured export components and output net of resource exports, Model 2

As for the long-run causality, the Toda and Yamamoto Granger test based on model 1 shows that natural resource exports do not cause economic growth at any level of significance, indicating that resource exports do not contribute to long-run growth. The same is valid for decomposed manufactured exports. In particular, the null hypothesis that basic manufactures do not Granger cause economic growth cannot be rejected at conventional levels, as well as the null hypothesis of non-causality from technology-intensive and differentiated manufactures to economic growth. Also, the results provide evidence that imports cause economic growth and capital at the 5% level, while technology-intensive manufactures cause basic manufactures at the 10% level. In addition, economic growth causes natural resource exports at 10%, while all variables jointly cause economic growth and basic manufactures in the long run at the 5% and 10% level respectively.

Based on the Model 1 results, basic, technology-intensive and differentiated manufactured exports do not cause economic growth in the long-run; but imports do. In addition, technology transfer and knowledge diffusion through import expansion enhance physical and R&D capital (Coe and Helpman 1995) in the long-run; however, there are no feedback effects to long-run economic growth. In contrast with the short-run causality results, natural resource exports do not cause economic growth in the long- run, as this category of exports is subject to dramatic price fluctuations, inelastic demand, and skills not transferable to other sectors (Kalaitzi and Cleeve 2018; Kalaitzi and Chamberlain 2020b). The results are presented in Table 6, while the long-run causal relationships are presented in Fig. 6.

Moreover, the long-run causal link among decomposed manufactured exports and economic growth is investigated using net of resource exports output as proxy for growth (Table 7). The Toda and Yamamoto test shows that economic growth cause basic manufactured exports at 10% level; however, no evidence exists to support the converse. In particular, the null hypotheses of non-causality from basic, technology-intensive and differentiated manufactured exports to economic growth

Table 6 Toda and Yamamoto test, Model 1

Source of causality	Dependent variable						
	LY_t	LK_t	LRX_t	$LBMX_t$	$LTMX_t$	$LDMX_t$	LIM_t
LY_t	–	2.35	5.14*	0.09	4.36	1.39	3.27
LK_t	0.28	–	0.50	0.47	1.56	2.02	0.35
LRX_t	2.82	4.50	–	3.04	1.77	0.39	1.73
$LBMX_t$	2.74	3.55	0.14	–	0.68	0.20	4.50
$LTMX_t$	2.27	0.81	0.85	5.18*	–	0.38	0.45
$LDMX_t$	0.69	0.39	0.81	1.73	0.25	–	0.13
LIM_t	8.15**	6.51**	1.03	1.00	2.55	0.40	–
ALL	21.24**	14.78	9.88	18.86*	9.37	3.47	11.97

***, ** and * show significance at 1%, 5% and 10% respectively ((χ^2df(2) and χ^2df(12)). The optimal lag order is selected based on the SIC. The diagnostic tests for the VAR(p) show that the model is well specified and stable

Fig. 6 Long-run causal relationships in Model 1. *Source*: Created by the author for the purpose of this study

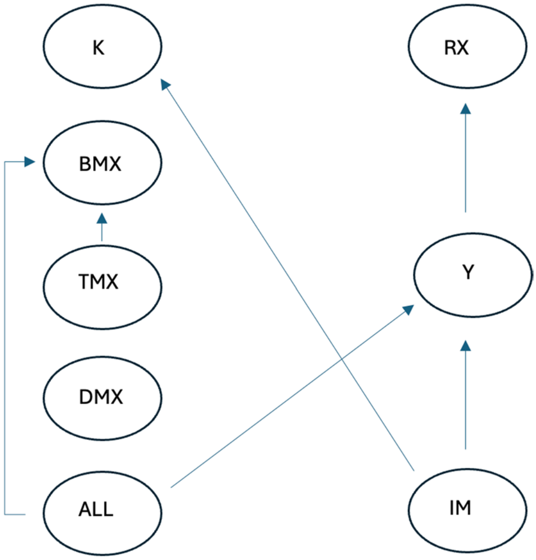


Table 7 Toda and Yamamoto test, Model 2

Source of causality	Dependent variable					
	LNY_t	LK_t	$LBMX_t$	$LTMX_t$	$LDMX_t$	LIM_t
LNY_t	–	0.93	5.65*	4.11	2.54	7.50**
LK_t	0.66	–	1.15	2.13	0.62	4.18
$LBMX_t$	1.03	1.78	–	0.15	0.71	3.02
$LTMX_t$	0.31	0.27	2.32	–	0.16	0.52
$LDMX_t$	3.57	0.16	1.86	0.70	–	0.33
LIM_t	5.71*	2.45	1.78	0.10	0.14	–
ALL	10.22	5.64	17.36*	6.51	6.35	16.15*

***, ** and * show significance at 1%, 5% and 10% respectively ((χ^2df(2) and χ^2df(10)). The optimal lag order is selected based on the SIC. The diagnostic tests for the VAR(p) show that the model is well specified and stable

cannot be rejected at any significance level, confirming the results of model 1. In addition, the test shows that causality runs from imports to economic growth at the 10% level, whereas economic growth causes imports at the 5% level (Coe and Helpman 1995; Riezman et al. 1996; Kalaitzi et al. 2022b, Kalaitzi and Chamberlain 2022). The results also provide evidence that all the variables jointly cause basic manufactures and imports in the long run at the 10% level. It should be noted that excluding the natural resource exports from both sides of the equations, unveiled some progress in export diversification, which has an indirect feedback effect to long-run economic growth via imports. Figure 7 presents the long-run relationships in model 2.

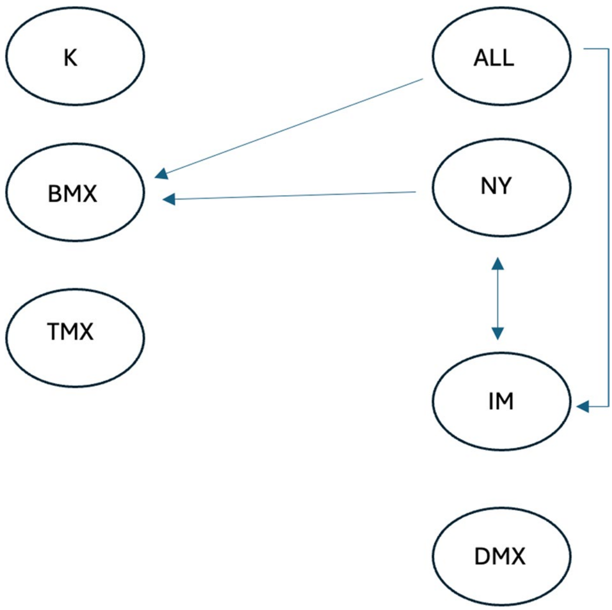


Fig. 7 Long-run relationships in Model 2. *Source*: Created by the author for the purpose of this study

5 Conclusion

This study investigates the causality between basic, technology-intensive and differentiated manufactured exports and economic growth in Kuwait, using two augmented production function models and data from 1970 to 2021. Initially, an augmented AK production function with natural resource exports, decomposed manufacturing exports and imports is used, while in the second model, natural resource exports are excluded to isolate manufactured export components and output by oil price fluctuations.

The short-run causality results show that no direct causality runs from basic, technology-intensive and differentiated manufactures to economic growth, while natural resource exports do cause growth in the short-run, indicating that natural resource exports are still the main source of short-run economic growth. These results are in line with those of Greenaway et al. (1999), Khalafalla and Webb (2001), Merza (2007), Khayati (2019), Kalaitzi and Chamberlain (2022) and Kalaitzi et al. (2023) and in contrast with Ghatak and Price (1997), Wörz (2005), Cuaresma and Wörz (2005), Kalaitzi and Cleeve (2018) and Kalaitzi and Chamberlain (2020b). In addition, there is evidence to confirm that natural resource exports still finance not only the physical infrastructure, human capital and R&D investments but also the expansion of basic and technology-intensive manufactured exports (Kalaitzi and Cleeve 2018). Also, the results show the vital role of imports in providing raw materials for the basic and differentiated manufacturing production and in transferring technology to the economy (Coe and Helpman 1995; Riezman et al. 1996). In parallel, imports directly cause economic growth by fostering technological advancement and improving productivity, and in turn, economic growth finances further import expansion, creating circular causation (Coe and Helpman 1995; Riezman et al. 1996; Kalaitzi and Cleeve 2018; Kalaitzi and Chamberlain 2022). Therefore, the natural resource exports and imports are essential for accelerating the nation's economic diversification, fulfilling Kuwait's Vision 2035. When excluding natural resource exports from both sides of the model, the results confirm that no direct causality exists between basic, technology-intensive and differentiated manufactured exports and economic growth. However, both model 1 and 2 estimations confirm that all the variables jointly cause economic growth and basic manufactured exports in the short-run, indicating a joint bi-directional causality between them.

The long-run causality results show that no direct causal link exists among decomposed manufactured exports and economic growth, which is in line with Kalaitzi and Chamberlain (2022) and Kalaitzi et al. (2023) who find that manufactured exports do not directly cause economic growth in either the short or long run. But, the results are in contrast with other studies which found that skill-intensive exports contribute to economic growth (Ghatak and Price 1997; Wörz 2005; Cuaresma and Wörz 2005; Falk 2009; Torayeh 2011; Aditya and Acharyya 2013; Kalaitzi et al. 2022b; Ekanayake et al. 2023). In addition, technology transfer and knowledge diffusion through import expansion enhance physical and R&D capital (Coe and Helpman 1995) in the long-run; however, there are no feedback effects to long-run economic growth. In contrast with the short-run, natural resource exports do not cause economic growth in the long-run, a result which is consistent with those reported for other countries (Gylfason et al. 1999; Bravo-Ortega and Gregorio 2005; Kalaitzi and Cleeve 2018; Kalaitzi and Chamberlain 2020b). When natural resources are not included in the model, the findings confirm that no direct causality runs from basic, technology-intensive and differentiated manufactured exports to economic growth. However, similarly to the short-run results, both model estimations confirm the existence of a joint bi-directional causality between basic manufactured exports and economic growth, directly or indirectly through imports.

To the first research question whether the change in the structure of manufactured exports has contributed to Kuwait's economic growth, the answer is "not directly", while the answer to the second question whether natural resource exports still play an important role in the growth process is "yes", but in the short-run. Kuwait not only relies on a single commodity that its demand wanes, but at the same time this commodity has a crucial role in the diversification process.

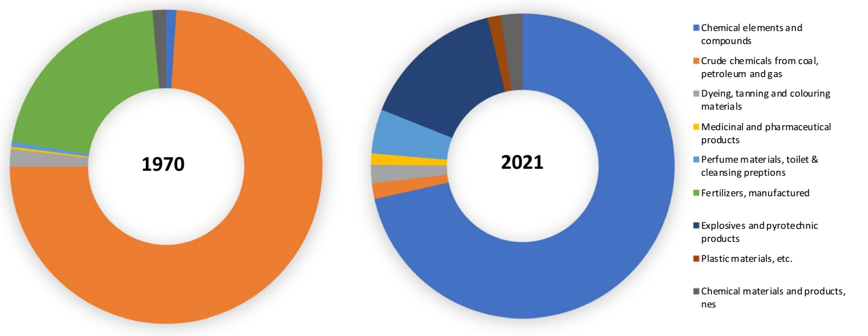
To fulfil the Kuwait's Vision 2035, policy makers should assess the current export and import promotion policies, with the goal to promote basic manufactured exports and imports, contributing to long-run economic growth. Also, as natural resource exports still play an important role in gaining foreign exchange, financing the physical infrastructure and R&D investments, and contributing to the expansion of manufactured exports in the short-run, the transition away from oil requires the implementation of economic policies to sustain the growth process.

Appendix 1

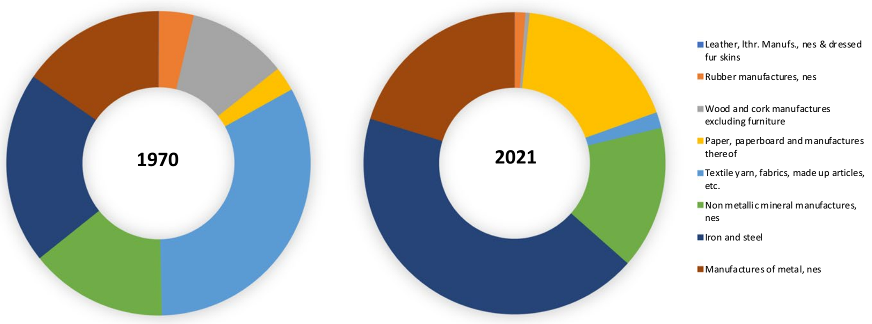
See Fig. 8

(a) Basic manufactures

Chemical & related products (SITC 5)



Manufactured goods (SITC 6)



(b) Technology-intensive manufactures

Machinery and transport equipment (SITC 7)

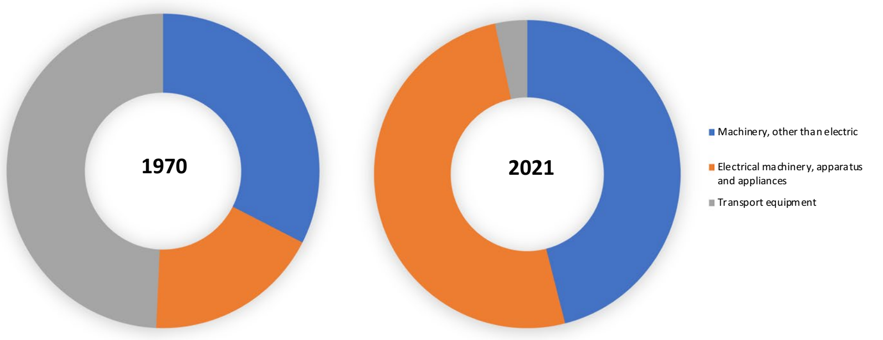


Fig. 8 Structure of sub-categories of manufactured exports. *Source*: Author's calculations using data taken from UNCOMTRADE Database (2021)

(c) Differentiated manufactures

Miscellaneous manufactured articles (finished goods) (SITC 8)

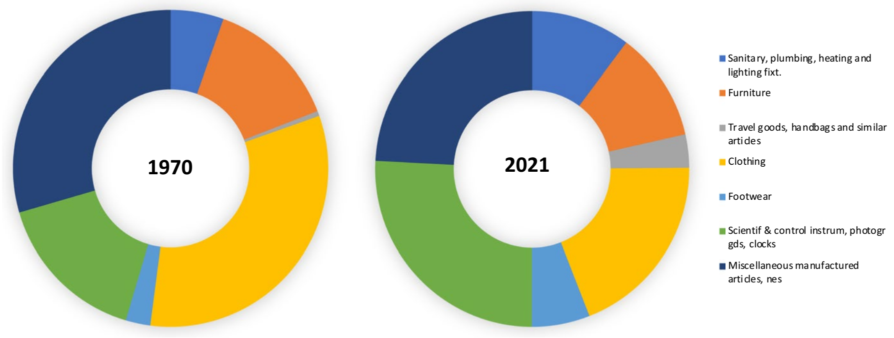


Fig. 8 (continued)

Appendix 2

See Table 8.

Table 8 Categories of exports used in this study. *Source*: UNCOMTRADE Database (2021), Standard International Trade Classification (SITC), Revision 1

	Primary Exports (RX_t)		Basic Manufactures (BMX_t)
0	**Food and live animals**	**5**	**Chemicals**
00	Live animals	51	Chemical elements and compounds
01	Meat and meat preparations	52	Crude chemicals from coal, petroleum and gas
02	Dairy products and eggs	53	Dyeing, tanning and colouring materials
03	Fish and fish preparations	54	Medicinal and pharmaceutical products
04	Cereals and cereal preparations	55	Perfume materials, toilet & cleansing preptions
05	Fruit and vegetables	56	Fertilizers, manufactured
06	Sugar, sugar preparations and honey	57	Explosives and pyrotechnic products
07	Coffee, tea, cocoa, spices & manufacs. Thereof	58	Plastic materials, etc
08	Feed. Stuff for animals excl. Unmilled cereals	59	Chemical materials and products, nes
09	Miscellaneous food preparations	**6**	**Manufact goods classified chiefly by material**
1	**Beverages and tobacco**	61	Leather, lthr. Manufs., nes & dressed fur skins
11	Beverages	62	Rubber manufactures, nes
12	Tobacco and tobacco manufactures	63	Wood and cork manufactures excluding furniture
2	**Crude materials, inedible, except fuels**	64	Paper, paperboard and manufactures thereof
21	Hides, skins and fur skins, undressed	65	Textile yarn, fabrics, made up articles, etc
22	Oil seeds, oil nuts and oil kernels	66	Non metallic mineral manufactures, nes
23	Crude rubber including synthetic and reclaimed	67	Iron and steel
24	Wood, lumber and cork	68	Non ferrous metals
25	Pulp and paper	69	Manufactures of metal, nes
26	Textile fibres, not manufactured, and waste		**Technology-Skill Intensive Manufactures (TMX_t)**
27	Crude fertilizers and crude minerals, nes	**7**	**Machinery and transport equipment**
28	Metalliferous ores and metal scrap	71	Machinery, other than electric
29	Crude animal and vegetable materials, nes	72	Electrical machinery, apparatus and appliances
3	**Mineral fuels, lubricants and related materials**	73	Transport equipment
32	Coal, coke and briquettes		**Differentiated Manufactures (DMX_t)**
33	Petroleum and petroleum products	**8**	**Miscellaneous manufactured articles (finished goods)**
34	Gas, natural and manufactured	81	Sanitary, plumbing, heating and lighting fixt
35	Electric energy	82	Furniture
4	**Animal and vegetable oils and fats**	83	Travel goods, handbags and similar articles
41	Animal oils and fats	84	Clothing
42	Fixed vegetable oils and fats	85	Footwear
43	Animal and vegetable oils and fats, processed	86	Scientif & control instrum, photogr gds, clocks
		89	Miscellaneous manufactured articles, nes

Codes 0–8 (in bold) are the SITC Sections, while the two-digit numerical codes are the SITC Divisions included in this research

Appendix 3

See Figs. 9 and 10.

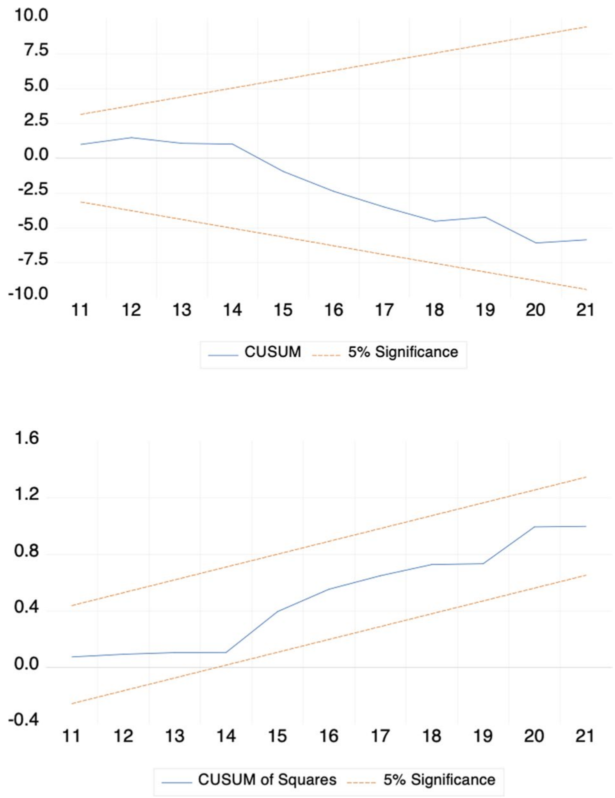


Fig. 9 CUSUM and CUSUMQ plots for the estimated ARDL(1,2,2,1,0,0,2) Model 1

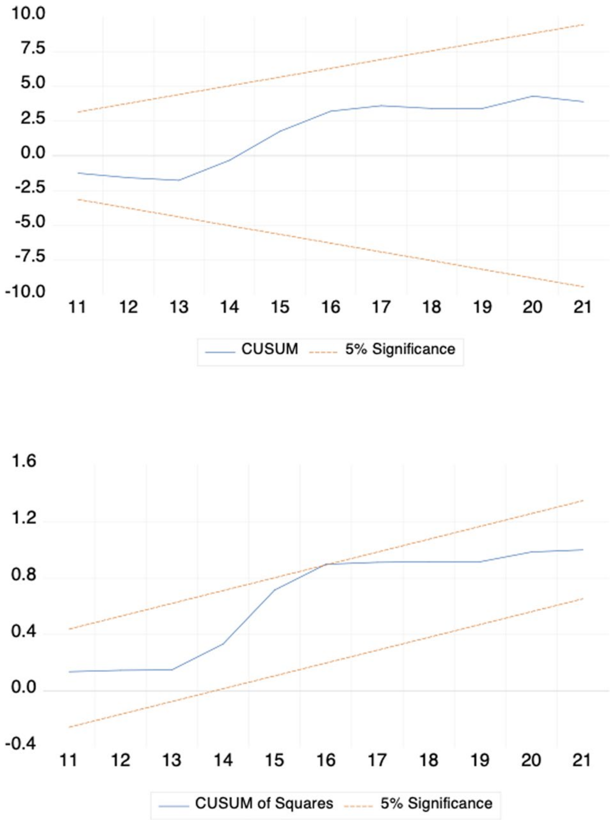


Fig. 10 CUSUM and CUSUMQ plots for the estimated ARDL (2,0,0,0,1,0) Model 2

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Declarations

Conflict of interest The author declares that there is no conflict of interest.

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