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**Article**

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Journal of Applied Economics

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*Suggested Citation:* Usman, Khalid (2023) : The linkages between trade, financial openness, and economic growth in China: An ARDL-bound test approach, Journal of Applied Economics, ISSN 1667-6726, Taylor & Francis, Abingdon, Vol. 26, Iss. 1, pp. 1-27, <https://doi.org/10.1080/15140326.2023.2258616>

This Version is available at:

<https://hdl.handle.net/10419/314237>

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**To cite this article:** Khalid Usman (2023) The linkages between trade, financial openness, and economic growth in China: an ARDL-bound test approach, Journal of Applied Economics, 26:1, 2258616, DOI: [10.1080/15140326.2023.2258616](https://doi.org/10.1080/15140326.2023.2258616)

**To link to this article:** <https://doi.org/10.1080/15140326.2023.2258616>



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Published online: 18 Sep 2023.



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# The linkages between trade, financial openness, and economic growth in China: an ARDL-bound test approach

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## ABSTRACT

This research examines the linkages between trade, financial openness, and economic growth in China from 1992 to 2021, using Granger causality analysis in the ECM model to identify the trend of a causal relationship between the variables. The results confirm the validity of export-led growth and the supply-leading hypotheses in China. Moreover, China's broad money is output-oriented, and the significance of exports to China's economy is supported by the influence of real income and imports caused by exports. Lastly, the research highlights that domestic credit expansion by the banking industry stimulates global trade growth; however, import changes cause broad money fluctuations. Policymakers can utilize these findings to identify the trend of the growth and development of the trade and financial industry of the economy, as there is substantial proof that a meaningful relationship is occurring between economic growth, trade, and the financial development sectors of the economy.

## ARTICLE HISTORY

Received 12 April 2023

Accepted 9 September 2023

## KEYWORDS

Trade openness; financial development; economic growth; ARDL bound test

## 1. Introduction

The discussion on the capability of financial growth and development to affect economic growth had persisted unanswered amid econometricians. Though scholars (Goldsmith, 1969; King & Levine, 1993; Rajan & Zingales, 1996), among others, had recognized the presence of an optimistic association between both (Shan & Morris, 2002), in contrast, had demonstrated that insignificant association occurs between the variables. Afterward, numerous authors, in addition to (Fry, 1980; Gupta, 1984; Khatkhate, 1972, 1980; McKinnon, 2010; Patrick, 1962, 1966; Shah, 2021; Shaw, 1973; van Wijnbergen, 1982; Van Wijnbergen, 1985), have examined the relations between real income and financial markets. Current research has similarly emphasized this problem (Chang, 2002; Jenkins & Katircioglu, 2010; Mazur & Alexander, 2001). Hence, extensive research studies the nexus between real income, financial markets, and growth. Such work has usually deduced that the financial markets are essential for the economic growth (Masih & Khan, 2011; Waheed & Younus, 2010). Alternatively, few scholars have identified that

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developments in financial markets can cause a decrease in the rate of economic growth, particularly in nations suffering higher inflation (De Gregorio & Guidotti, 1995). Findings on shocks between the financial markets and development have been uncertain. Though confirmed by (Aghion et al., 2005), the financial limitations restrict weak economies from optimizing the technology transfer benefits to encourage a change via the growth rate of global boundaries. Fung (2009) and (Menyah et al., 2014) also developed such a point, perceived that countries with highly evolved financial development consider cultivating quicker and growing trade. Therefore, finance development is both trade-friendly and growth-friendly. Nevertheless, this notwithstanding, a contradictory point of view prevails among scholars emphasizing that trade openness, the financial development, and economic growth evolve independently (Lucas, 1988).

Authors have debated supporting the constructive effect of the financial openness on economic growth (Adams & Opoku, 2015; Assefa & Mollick, 2017; Asteriou & Spanos, 2019; Gui-Diby, 2014; King & Levine, 1993; Pradhan et al., 2018; Stiglitz, 2004a, 2004b). Few studies have claimed that financial openness can unlikely induce economic growth (Edison et al., 2002). Similarly (De Gregorio & Guidotti, 1995), affirmed that finance has an insignificant influence on economic growth. Patrick (1966) suggests two study hypotheses for identifying the causal association between growth and finance: (1) the supply-leading hypothesis that represents growth is finance-oriented, (2) the demand-following hypothesis, wherein the financial markets are output oriented. Other researchers, like (Ryan-Collins et al., 2016) and (Werner, 1997, 2005, 2012, 2013, 2014a, 2014c), show empirical and theoretical contributions to the supply-leading hypothesis. Werner (2005) considers merely experiential contribution to the supply-leading hypothesis because of the persistent small-side principle and disequilibrium, credit markets are rationed by the supply (Jaffee & Russell, 1976; Stiglitz & Weiss, 1981) and the banks generating money supply over the credit expansions (Werner, 2014b, 2014c, 2016). However, consent on experiential studies regarding such theories is absent (Soukhakian, 2007b), for instance, claims that the financial development in Iran is output oriented.

Foreign trade and the financial markets are key supporters of real income (Beck, 2002). Similarly, the interaction between the economic growth and trade openness has been vastly studied with contrasted findings. For example (Jung & Marshall, 1985), and (Yanikkaya, 2003) have pointed out that there is an insignificant association between the economic growth and trade openness (Lee et al., 2004), noted that optimistic interaction occurs between variables. Conversely, examining tri-variable associations between trade, finance, and economic growth requires more consideration, as previous efforts have usually focused on bi-variable associations between trade, finance, and economic growth. Cases comprise (Baldwin, 1989; Beck, 2002; Kletzer & Bardhan, 1987). Some scholars, including (Jenkins & Katircioglu, 2010), as well as (Turan Katircioglu et al., 2007) and (Raghutla & Chittedi, 2020) in Cyprus, have discovered notable tri-variable relationships between trade, finance, and the economic growth in India.

In additional research, conversely, (Soukhakian, 2007a) explores the long-term equilibrium link between financial development, trade, and the economic growth in Japan's economy, which is motivated by financial development. KALIM et al. (2012) approve of the correlative function of foreign direct investment (FDI) in the stock market progress of Pakistan. However, current experiential results have raised tough questions about the theoretical knowledge that the FDI has a striking effect on economic growth (Bermejo

Carbonell & Werner, 2018) because of operating outflows and the banking system: international currency remains overseas the global banking system. In the most incredible scenario, FDI tends to influence growth in inland loans in the local banking system that may be organized without international engagement (Werner, 2016). On the one hand, current work has addressed the plausible interactions between economic growth and the trade openness and economic growth and the financial openness unless attaining consent. Few researchers have claimed that trade openness might drive economic growth (Yanikkaya, 2003). However, this viewpoint has been challenged by several authors (Gries et al., 2009). Researchers' perspectives on the links between economic growth and the financial openness differ.

In contradiction of such background, the current research examines plausible interactions between trade, real income, and the financial development in China, which has a total population of 1.4123 billion and a \$12,556 US per capita income in 2021 (World Bank, 2023). The current research finding is noteworthy for a number of reasons: (1) China has an emerging economy as well as an advanced, civilized, and severely competitive banking industry that drives in China; and (2) analysis of the tri-variable interactions between finance development, trade liberalization, and economic growth are insufficient, as previously explained. Current research findings provide important evidence for the scientific literature and the government (policy makers). As previously stated, it is clear that the debates on the linkage between financial development, the trade liberalization, and economic growth are inconclusive; as a result, findings differ across countries and use different methods and hypothetical models. Nonetheless, the interaction between such concepts is extremely important for policy design and applications. Empirical evidence in light of such associations can help policymakers or governments to decide whether to focus on the financial industry, the trade industry, or both when it comes to obtaining economic growth.

The current research examines the linkages between trade, financial openness, and China's economic growth. The annual data for thirty years from 1992 to 2021 is applied and obtained through the World development indicators. We used ADF and PP methods for the unit root test, and the ARDL-bound technique was employed to check the presence of the long-term correlation. Finally, we used the Granger causality test and the ECMs to identify the trend of a causal relationship between the variables. The findings approved that bivariate ARDL long-term estimates indicate that  $LnEXP$  possesses a negative and noteworthy linkage with  $LnGDP$  at the significance level of 1%. When a country exports more, it has a higher level of growth. Alternatively,  $LnEXP$  positively affects  $LnGDP$  at a 1% significance level in the short term.  $LnBM$  has a significant and positive influence on  $LnGDP$  at the significance level of 1% in the long term; nevertheless,  $LnIMP$  holds a positive and important influence on  $LnGDP$  at a 5% level in the short term. Lastly, our Granger causality results show the two-directional causal link between  $LnGDP$  and  $LnDCPP$ ,  $LnGDP$  to  $LnEXP$ , and bi-directional causality found between  $LnGDP$  and  $LnBM$ ,  $LnDCPP$  and  $LnEXP$ , as well as the  $LnBM$  and  $LnDCPP$ . In addition to the plausibility of the results, uni-directional causality was shown between  $LnGDP$  to  $LnIMP$ ,  $LDCPP$  to  $LnIMP$ ,  $LnBM$  to  $LnIMP$ , and  $LnEXP$  to  $LnBM$ . However, we failed to find any causal relationship between  $LnIMP$  and  $LnEXP$ .

The remainder of the article is structured as follows: Section 2 has based on the empirical literature review, Section 3 shows the data and methodology, Section 4 engages with the findings from investigating the data for the research, and Section 5 shows the conclusion and some recommendations for the government (policymakers).

## 2. Literature Review

Stiglitz (2004a, 2004b) opposes that capital flows do not affect economic growth in developing economies. Capital flows, mainly in the short-term, are related to the enlarged economic instability that attributes mostly to the pro-cycle system of short-term capital flows. Such disagreements stem from the findings of (Quinn & Toyoda, 2008) study, which presented experimental results on the links between capital account liberalization and economic growth for a group of advanced and emerging economies. The research showed that capital account liberalization had an affirmative relationship with economic growth in advanced and developing economies. Likewise (Batuo et al., 2018), postulated that for a group of 41 African economies, financial volatility is certainly connected to financial openness, and consequently, financial openness is growth-improving. Under the points of (Bussière & Fratzscher, 2008; Fratzscher & Bussière, 2004) and (Quinn & Toyoda, 2008), a research of 45 industrial and developing markets recognized the growth-improving influence of financial openness. They emphasized that the growth afterward openness is caused by an investment explosion and the debt inflows and flow in the portfolio.

It was furthermore debated that financial openness causes improved financial deepening (Klein & Olivei, 2008). In this context (Ben Gamra, 2009), in a panel analysis of East Asian economies, presented that the growing influence of financial openness relies on the essence and strength of openness. The researcher concluded that openness is related to sluggish growth outcomes. Additional works have presented the discussion of linking financial openness and trade. Using the time-fixed effect method (Chinn & Ito, 2006), identified that financial openness leads to stock market growth when specific rules are anticipated; however, they emphasized trade openness as a necessary condition for financial openness. Aizenman (2008) argued that trade openness is linked to financial openness; hereafter, the integrity of ensuing financial openness needs profound financial reform. Criticizing the linking of financial openness and trade discussion (Gries et al., 2009), deduced that trade opening fails to seem a significant prerequisite for economic growth. The precise focus has been exercised on the import-export-led growth hypotheses (i.e. (Awokuse, 2007; Fatima et al., 2011; Marin, 1992; Raghutla & Chittedi, 2020; Ramos, 2001; Sato & Fukushima, 2007; Shan & Morris, 2002; Xu, 1996), furthermore, the trade-led growth hypothesis (Deme, 2002; Singer & Gray, 1988). While numerous works have acknowledged the abovementioned hypotheses, there is no unanimity on their results.

The arguments on the trend of causality between the financial development and economic growth have occurred since the 19<sup>th</sup> century. There are two main theories demand-following theory and supply-leading theory (Patrick, 1966; Robinson, 1979; Schumpeter, 2013), that clarify the causal interaction between the financial development and economic growth. It has been suggested that financial openness will pursue economic growth; hence, when the country's economy grows, it produces the latest demands for financial services, and the financial system will grow. Alternatively, the supply-leading concept proposes that financial growth and development endorse economic growth, and therefore, financial growth and development have an optimistic influence on economic growth. The researchers consider that a superior financial system boosts the possibilities of effective invention, stimulating economic growth (Ahmed & Wahid, 2011; Ben Jedidia et al., 2014; Bojanic, 2012; Ductor & Grechyna, 2015; King & Levine, 1993). Lately, the endogenous growth theory has merged through a finance-leading model based on the result that a monetary institution's

characteristics of collection and analysis of information, sharing risk, mobilization of the fund, and exchange reserves stimulate economic growth of an economy (Greenwood & Jovanovic, 1990; Pagano, 1993; Romer, 1986).

As reported by (Levine, 2005), the 4-key mechanisms whereby finance can stimulate economic growth have been identified as (i) pooling savings through risk variation and risk management, (ii) easing exchange via a decrease in operational costs, (iii), by the production of ex-post information on investment opportunities and finally, an increase in investor's enthusiasm to finance new projects with ex-ante observing and business governance, capital allocation will be improved.

The benefits of trade openness can be achieved in the following ways: Firstly, trade openness encourages the effective distribution of resources; secondly, the technological progress and diffusion of knowledge; finally, the motivation of rivalry in local and worldwide markets; and lastly, the return to scale.

The linkage between trade openness and financial liberalization is complimentary. Trade openness attracts foreign direct investment (FDI), facilitating the transfer of technology, managerial skills, and gate to universal supply chains. This is a potential contribution to economic growth, as described by (Borensztein et al., 1998). Correspondingly, financial openness can help trade by providing access to global capital markets that allow firms to finance export-oriented activities or imports of the requisite inputs (Edwards, 1998). Interlinking trade and financial openness can create positive feedback loops, adding to each other's benefits.

The finance and economic growth reasonable hypothesis bases the opinion that no interaction occurs between financial growth and development and the economic growth. The concept claims that although current economic growth had caused by real growth. The financial growth and development is a creation of a historical precursor of fiscal bodies; therefore, no interconnection from both growth and finance or finance and growth happens between these both rivers (Abu-Bader & Abu-Qarn, 2008; Ben Jedidia et al., 2014; Boulila & Trabelsi, 2004; Shan & Morris, 2002).

Kong et al. (2021) investigated the long-term link between trade openness and the economic growth quality subject to exchange rate shifts in China by applying the ARDL method. The authors concluded that a long-term association occurs between trade openness and the economic growth quality; moreover, trade openness has an optimistic influence on long-term and short-term growth quality. They argued that optimistic impact varied across regions and had attributed to the thresholds. Unlike (Eriş & Ulaşan, 2013) outcomes, which employ the Bayesian model averaging method, such streams reviewed the growth trade openness- economic growth interaction. They found no long-run direct link to trade openness and economic growth. Nevertheless (Fetahi-Vehapi et al., 2015), observed the impact of openness on the economic growth of the South East European economies. They discovered that openness's significant optimistic influence on growth depends on the incentive income per capita. They emphasized that openness is helpful to economies with a developed level of incentive per capita income, gross fixed capital formation, and FDI.

The trade openness and the economic growth relationship originated in the neo-classical growth theory. The theory recognized a robust causal relationship between trade the growth on the bases of the result that trade affects the determination of numerous countries to incorporate their local economies along with the globe, which will result in



a boost in import and export, thus growing productivity and specialization (Shahbaz, 2009, 2012; Shahbaz & Rahman, 2012). Anoruo and Ahmad (2000) recognized a two-way causal interaction between trade and growth, whereas (Jung & Marshall, 1985) discovered a uni-directional link between the growth and trade. Compelling a further rapid aspect (Trejos & Barboza, 2015), performed a vibrant assessment of the link between the trade openness and growth output by applying the ECM and OLS methods. They discovered that economies with a growing amount of openness to trade meet growth over the network of advanced productivity related to capital accumulation. In favor, a study about Kenya conducted by (Musila & Yiheyis, 2015), and (Trejos & Barboza, 2015), employing the OLS method, presented that trade openness transforms into growth through a mechanism of cumulative investments and production. Conversely (Arora & Vamvakidis, 2005), displayed that nations capitalize from tradeoffs with comparatively richer nations. Similarly, this is inferred in (Reinhardt et al., 2013), though (Yanikkaya, 2003), establishes no supportive proof.

The discussion on the association between trade liberalization and the economic growth focuses on subjects covering the disparity in the structure of the trade liberalization index; the employ of the cross-country analysis; and the trend of causal interaction between trade and growth (Bojanic, 2012). Such as (Rodrik, 1997), he was perceived that the utmost observations on the connection between trade and growth barely captivate trade regimes and the choices of trade policy, among other things. Also (Dowrick & Golley, 2004), and (Yanikkaya, 2003) emphasized the trend of causal interaction between trade and growth. They perceived that no connection occurs between trade and growth, whereas (Frankel & Romer, 1999; Harrison, 1996; Katircioglu et al., 2022), and (Lucas, 2009) acknowledged the link between trade openness and the economic growth.

Usman and Bashir (2022b) study shows the association between imports and economic growth in China from 2000 to 2021. Based on the Granger causality test findings, the null hypothesis – which proposed that China's import growth rate significantly influences the country's GDP growth rate – was rejected. However, additional research revealed that the import growth rate has an adverse influence on GDP growth. On the other hand, the GDP growth rate initially has a optimistic effect on imports before having a negative one. The findings imply that the Chinese government should prioritize export promotion and domestic production to offset negative effects. The study highlights the significance of imports as an engine of economic growth and the need for smart trade policies to control the impact of imports on economic growth, providing alternative insights into the origin of China's economic growth and its influence on the literature and policymakers' views. Usman and Bashir (2022a) investigated the link between imports and the economic growth in the G7 nations, India and China. Short-term and long-term frequency domain Granger causality tests had used. The findings of this study demonstrated that the two-way causal effect between the economic growth and imports is certified in both the high and low-frequency domains. Most countries' imports and growth indicate both short- and long-term relative.

Sunde et al. (2023) inspected the influence of trade openness, imports, exports, and economic growth of Namibia, utilizing the ARDL co-integration method based on data from 1990 to 2020. The outcomes disclosed an important adverse association between growth and imports; however, trade and exports displayed significant positive linkages with the



growth. Furthermore, imports, exports, and trade openness caused economic growth in the short run. The results of this study indicate that export-led growth and trade liberalization is essential for the economic development of Namibia. Bojanic (2012) studied the link between trade openness, the financial development, and economic growth, employing the ECM, bivariate co-integrated systems, and Granger regression model to examine the data for Bolivians from 1940–2010. The results showed that the long-term equilibrium link occurred between the three. Moreover, it has been perceived that one-way Granger causality exists through financial development and trade to growth. Uddin et al. (2013) applied Cobb–Douglas production amplified by integrating the financial development in Kenya. A simulation-based ARDL bound technique, Gregory and Hansen's structural break co-integration methods, had used to investigate data retrieved from 1970–2011. They perceived an optimistic link between financial development and economic growth in the long term. Their conclusion denies past results of (Odhiambo, 2009), who applied the Granger causality method and noted that the money supply (M2) as a GDP% adversely impacts the growth of a similar country. Odhiambo (2010) confirmed a two-directional causal interaction between the financial development substitute by the money supply ratio to the GDP and the growth of South Africa. Ndako (2010) perceived that the financial development substitute by the stock market turnover as a GDP% does support the short-run economic growth. However, the long-term relationship turns weak with the causality direction from economic growth to financial development.

Ben Jedidia et al. (2014) utilized the ARDL model to investigate the linkage between financial development and the economic growth of Tunisia based on yearly data collected from 1973–2008. The authors denoted that financial growth and development is a major economic development and growth force. Additionally, the research confirmed the presence of a two-way nexus between economic growth and the financial development. For the Egyptian economy (Love & Turk Ariss, 2014), studied the linkage between the financial bodies and the macroeconomic data sourced from 1993 to 2010. They denoted that the presence of an optimistic impact on the capital inflows and the growth expands financial market development. Al-Malkawi et al. (2012) explored the connection between economic growth and the financial development of the UAE based on data from 1974 to 2008. The Authors concluded that an adverse and significant nexus was presented between economic growth and the financial development (M2/GDP). Moreover, the research illustrated the two-way link between the variables. The authors presented that neither the supply-leading hypothesis nor the demand-following hypothesis presents. Conversely, the outcomes from the North African (MENA) and Middle East states vary; for example (Boulila & Trabelsi, 2004), and (Abu-Bader & Abu-Qarn, 2008), demonstrate that there is unclear proof to provide the opinion that the financial development influences growth. Agbloyor et al. (2014) explored the link between economic growth and financial development in some nominated South African countries. They applied panel instrumental indicators and the Generalized Method of Moments (GMM) method to examine data collected from 1990 to 2007. They perceived that private debt flows (PDI), foreign equity portfolio investment (FEPI), and foreign direct investment (FDI) influence economic growth adversely. In contrast, private capital flow (PCF) significantly impacts economic growth. The authors proposed that financial development expressively influenced growth in the long term for the group of 52 middle-income economies. Samargandi et al. (2015) employed PMG estimation methods in a dynamic heterogeneous panel environment to re-check economic growth and

financial development influences from 1980 to 2008. They noted that the long-run shock between both is U-shaped and trivial in the short term. Moreover, the authors recommended that excessive financial growth and development can negatively impact growth. This study found that a constant impact on financial sector growth has been determined by assessing a threshold model.

While trade openness has adjusted into the finance and growth relation analysis (Demetriades & Hook Law, 2006), applied cross-section and panel estimation methods to find a constructive connection between financial development, the trade openness, and economic growth. Their assessment has been strengthened by previous research such as (Beck, 2002; Svaleryd & Vlachos, 2002), and (Rajan & Zingales, 2003). Who perceived that nations with highly advanced financial structures hold a healthier export sector and a good balance of trade (BOT) that encourage economic development and growth. Conversely, the presence of a slightly significant liaison between finance and growth has been confirmed by (Gries et al., 2009) for sixteen Sub-Saharan African (SSA) countries and (Wolde Rufael, 2009) for Kenya, and authors showed that insignificant nexus possess between them. Moreover (Menyah et al., 2014), studied the association between triplets by applying yearly data from 1965 to 2008 for twenty-one African countries (see (Dowrick & Golley, 2004; Yanikkaya, 2003). The authors applied the panel bootstrapped methods to Granger causality. They found that restricted proof occurred to provision the trade-led growth and finance-led growth hypothesis.

Appiah et al. (2023), observe the influence of foreign direct investment (FDI), financial development (FD), and economic growth on improving industrial development for Sub-Saharan African (SSA) nations from 1990–2017. The research discovers that financial development and economic growth improve industrial growth, whereas FDI has an opposing result. Chhabra et al. (2023), investigated the function of trade and institutional quality in determining economic growth in BRICS economies. They found that institutions and trade correlate with short-term economic growth. Kumari et al. (2023), observed the link between trade openness, FDI inflows, and economic growth in India applied data from 1985 to 2018. The research obtained no long-run link among the variables; however, foreign direct investment and economic growth have a bidirectional relationship. Mustafa (2023) explored the causal effects between FD, trade openness, FDI, and economic growth in four South Asian economies from 1990 to 2019, employing the VECM-Granger Causality test. The outcomes propose that all economies must implement policies to encourage more sectoral financial growth and trade openness, accelerate the investment environment, and entice investments to achieve greater economic growth in the long term.

Using the panel FMOLS and DOLS methods (Amna Intisar et al., 2020), studied the influence of trade liberalization and human capital (HC) on economic growth for Asian economies from 1985 to 2017. The results showed that trade and HC positively affect the growth of all sample countries. Cheung and Ljungqvist (2021), examined the association between trade liberalization and economic growth for thirty-one OECD countries. Using the Panel Fixed Effect Model, the results suggested that trade significantly affects all OECD economies' economic growth. They applied VECM (Juliansyah et al., 2022) to explore the influence of Indonesia's exports, imports, investment, and economic growth from 1967 to 2020. They prove that imports, exports, and investments slightly influenced Indonesian economic growth.

Several empirical studies have been carried out in several economies to investigate the link between trade openness and economic growth. The results are often not consistent or contradictory from one methodology to another. As reported by (Chirwa & Odhiambo, 2016; Freund & Bolaky, 2008; Marelli & Signorelli, 2011) and (Frankel & Romer, 2017), trade motivate economic growth. Though, based on (Rigobon & Rodrik, 2005; Vamvakidis, 2002), and (Ulaşan, 2015), trade opposes economic growth. Further research carried out by (Adebayo, 2020; Ajmi et al., 2015; Keho, 2017; Sunde, 2017), and (Tivatyi et al., 2022) similarly backed the export-led growth hypothesis. Kabuga and Abubakar Ismail (2018), identified that trade liberalization motivates the economic growth of twelve emerging Asian countries. Haini and Wei Loon (2021, 2022), endorse these results for OECD and ASEAN countries, where trade encourages economic growth.

### 3. Data collection and methodology

#### 3.1. Data collection and variables

This research examines the nexus between gross domestic product (GDP), broad money, domestic credit, exports, and imports of China. The research investigates thirty years of data for China from 1992 to 2021. The data applied for the present research is the World Development Indicators Database (World Bank, 2023). All the variables utilized in work are given in Table 1.

#### 3.2. Research methodology

Initially, a fundamental arithmetical description analysis of the indicators was executed. It comprises maximum, minimum, mean, median, standard deviation, skewness, and kurtosis stat. Following, the unit root test discovered stationary effects of the series. For this purpose, we used two core unit root tests, like Phillips-Perron (PP) (Phillips, 1991) and Augmented-Dicky-Fuller (ADF) (Dickey & Fuller, 1979). Based on the null hypothesis of PP and ADF, the series possesses a unit root and is non-stationary. If the *t*-statistic is larger than the specified critical value (CV) at a 5% significance level, we must reject the null hypothesis, which shows the stationary variable.

Moreover, the ARDL bound test has applied for co-integration between the indicators. Once the co-integration between the indicators has been discovered, we can proceed with the ARDL model. Current research used the ARDL bound test to co-integration introduced by (Pesaran et al., 2001) and (Narayan & Narayan, 2005) to explore the presence of long-run

**Table 1.** Variables and data source.

<i>Variables</i>	<i>Symbols</i>	<i>Proxy used</i>	<i>Source</i>
Gross domestic product	<i>GDP</i>	Gross domestic product (current US\$)	WDI, 2023
Broad money	<i>BM</i>	Broad money (% of GDP)	WDI, 2023
Exports	<i>EXP</i>	Exports of goods and services (% of GDP)	WDI, 2023
Imports	<i>IMP</i>	Imports of goods and services (% of GDP)	WDI, 2023
Domestic credit to private sector	<i>DCPP</i>	Domestic credit to private sector (% of GDP)	WDI, 2023

WDI World Development Indicators.

stability between the variables. Next, the ARDL framework supposes that the variables should be homogenous at  $I(0)$ ,  $I(1)$ , or a combination of both. If there is a linear amalgamation that is stationary, then these variables are co-integrated. Suppose the variables in question are non-stationary in the same order. In such a scenario, can investigate the co-integrating relationship (for example, the trend of the indicator run together) between the regressand and regressors in the long run both the (Engle & Granger, 2015, 1987, 2001) method, the (Johansen & Juselius, 1990) procedure or the ARDL approach.

Nevertheless, the Engle – Granger and Johansen – Juselius techniques could be applied when the regressand and regressors are homogenous of the same order. In contrast, the ARDL could be used when the regressand and regressors are homogenous of uneven order. Moreover, whether any variable of the analysis is homogenous at  $I(2)$ ; further, the F-test converts unacceptable to adopt the presence of the long-term link between the regressand and regressors. The benefits of the ARDL approaches are as follows:

- (1) It might handle the series possessing diverse co-integration orders, for example,  $I(0)$  and  $I(1)$ .
- (2) Similarly, the trivial sample size delivers consistent outcomes (Wang et al., 2021) and (Zaman et al., 2021)
- (3) The endogenous issue is too resolved by presenting breaks in the analysis (Amin et al., 2020; Wang et al., 2021; Zaman et al., 2021).

The research employs the ECM that amalgamates short-term dynamics fluctuation along long-term equilibrium. The coefficients of ECM incorporate the short-term dynamics along long-term equilibrium besides wasting long-term info and prevent issues, for example, spurious links arising through the unit root (non-stationary) time series data. Hence, an ARDL approach utilized in current research can be presented in such way:

$$GDP_t = f(BM_t + EXP_t + IMP_t + DCPPT_t) \quad (1)$$

The natural logarithmic form of all variables was used in current research to decrease the multi-collinearity and fluctuation in the time series annual data. With the help of natural logarithm to Equation (1), a log-run linear model is listed below:

$$GDP_t = f(BM_t^{\alpha_1} + EXP_t^{\alpha_2} + IMP_t^{\alpha_3} + DCPPT_t^{\alpha_4}) \quad (2)$$

$$\ln GDP_t = \alpha_0 + \alpha_1 BM_t + \alpha_2 \ln EXP_t + \alpha_3 \ln IMP_t + \alpha_4 \ln DCPPT_t + \varepsilon_t \quad (3)$$

The ARDL method for co-integration consists of two steps to estimate the long-term link. The initial stage explores long-term interaction between regressand and regressors by assessing the critical values/bounds. Equation (4) shows the description of the ARDL model given below:

$$\begin{aligned} \Delta \ln GDP_t = & \beta_0 + \sum_{i=1}^m \gamma_{1i} \Delta \ln GDP_{t-i} + \sum_{i=1}^m \gamma_{2i} \Delta \ln BM_{t-i} + \sum_{i=1}^m \gamma_{3i} \Delta \ln EXP_{t-i} \\ & + \sum_{i=1}^m \gamma_{4i} \Delta \ln IMP_{t-i} + \sum_{i=1}^m \gamma_{5i} \Delta \ln DCPPT_{t-i} + \beta_1 \ln GDP_{t-1} + \beta_2 \ln BM_{t-1} \\ & + \beta_3 \ln EXP_{t-1} + \beta_4 \ln IMP_{t-1} + \beta_5 \ln DCPPT_{t-1} + \varepsilon_t \end{aligned} \quad (4)$$

where,  $\beta_0$  denotes the constant, whereas  $\beta_1$  to  $\beta_5$  signifies long-term coefficients,  $i$  means the lag length,  $\Delta$  refers to the 1<sup>st</sup> difference driver,  $\gamma_1$  to  $\gamma_5$  characterize coefficients of the short-term, then  $\varepsilon_t$  indicates error term. The research practices F-test to explore the long-term equilibrium between regressand and regressors. If the calculated F-test value surpasses the upper limit of critical value/bound, thus the null hypothesis is denied, and variables have co-integration. Supposing the calculated F-test value is less than the lower bound critical value, the null hypothesis can not be refused, and variables have no co-integration. Conversely, if the calculated F-test value exists between the upper and the lower bound of the critical value, hence the decision is uncertain. The results indicate the presence of a long-term link between the regressand and regressors according to the critical bounds hypothesis (Pesaran et al., 2001).

### 3.3. Granger causality test

Under Granger's concept of causality, "X causes Y" when and only when past X values help forecast Y variations, whereas "Y causes X" as long as the previous Y values support X's divine fluctuations. The vector autoregression (VAR) model tends to be applied for such conditions. Granger (1988) pointed out that as long as a group of variables is co-integrated, short-term and long-term causality cannot be acquired by the average 1<sup>st</sup> difference VAR model. In the present situation, we should carry out a vector error correction model (VECM) to use the Granger causality analysis. The ECM formula of the ARDL methods is as follows:

$$\begin{aligned} \Delta \ln GDP_t = & \beta_0 + \sum_{i=1}^m \gamma_{1i} \Delta \ln GDP_{t-i} + \sum_{i=1}^m \gamma_{2i} \Delta \ln BM_{t-i} + \sum_{i=1}^m \gamma_{3i} \Delta \ln EXP_{t-i} \\ & + \sum_{i=1}^m \gamma_{4i} \Delta \ln IMP_{t-i} + \sum_{i=1}^m \gamma_{5i} \Delta \ln DCP_{t-i} + \alpha_1 ECT_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

Whereas  $\Delta$  is the 1<sup>st</sup> difference operator and  $\ln$  is the natural logarithm. The residuals  $\varepsilon_t$  are supposed to be normally distributed, and the white noise is a single-period lagged error correction term originating from the co-integrating formula. If variables are not co-integrated, the  $ECT_{t-1}$  variable going to be omitted from that framework. We have done stability and residual diagnostics following the long and short-run calculations. Residual diagnostics were executed via the Breusch-Pagan-Godfrey heteroskedasticity test and Breusch-Godfrey serial correlation LM test introduced by (Baum & Wiggins, 2002; Dufour et al., 2004). Across the LM serial correlation test of (Baum & Wiggins, 2002), as long as the chi-squared  $p$ -value is greater than 0.05, there is no presence of serial correlation; alternatively, statistics is serially connected.

Likewise, for heteroscedasticity, the probability chi-squared value should be greater than 0.05. Suppose the value is lower than 0.05; homoscedasticity occurs (Wang et al., 2021). At the same time, to diagnose the stability, we carried out the cumulative sum of square recursive residuals and the cumulative sum of recursive residuals for structural stability. By the recursive residual plots, "if the blue line is inside the boundaries of the 5% significance level of red lines, then the bounds meet the desires and structural stability survives; if not, the model does not have

structural stability (Zaman et al., 2021). Lastly, this research conducted a causality test based on Granger's theorem and through ECMs to determine the trend of causality interaction between regressors and regressand.

## 4. Empirical findings and discussions

### 4.1. Variables description

The fundamental statistics of the observed variables are shown in Table 2. Based on outcomes, the mean of *LnGDP* is 28.77, though the maximum and minimum are 30.50 and 26.77. The Mean of *LnIMP* is 2.96, and the maximum and the minimum are 3.34 and 2.52, individually. The *LnEXP* possesses a maximum of 3.58, a minimum of 2.48, and a mean of 3.09. The *LnDCPP* and *LnBM* possess the mean, the maximum, and the minimum values as (4.79, 5.22, 4.43) and (5.02, 5.35, 4.49), separately. *LnIMP*, *LnEXP*, and *LnDCPP* are positively skewed (0.15, 0.06, 0.25), whereas *LnGDP* and *LnBM* are negatively skewed (−0.10, −0.54). At the same time, based on the results, the selected variables used in the current research are optimistically kurtosis. Furthermore, the respective *p*-value of the Jarque – Bera (JB) outcome shows that research data have normally distributed.

### 4.2. Stationary findings

The findings of Augmented-Dickey-Fuller (ADF) and the Phillips-Perron (PP) for stationarity of regressors and regressand are given in Table 3. All variables, *LnGDP*, *LnBM*, *LnEXP*, *LnIMP*, and *LnDCPP*, were tested at the level, and 1<sup>st</sup> differences were performed with constant, with trends and constant, and without trends and constant. The findings reveal that *LnGDP*, *LnBM*, and *LnEXP* hold stationary at the *I*(0) level. In contrast, the remaining variables in the series, *LnIMP*, and *LnDCPP*, are not stationary at the *I*(0) difference; however, they possess stationarity at the *I*(1) difference. Therefore, in such a situation, we can move toward the ARDL bound test method.

### 4.3. Findings of ARDL F-Bound test for cointegration

The outcomes of the ARDL F-bound test are shown in Table 4. Subject to the statistics of the bound test (12.80594), it is greater as compared with two critical bounds at the level of 10%, and it is between the 5% lower and upper bounds. The statistics of the bound test imply that there exists a long-run link (covariance/co-integration) between the regressand (dependent) and regressors (independent) variables practiced in the present research.

**Table 2.** Variables description.

Variables	Mean	Med.	Max.	Min.	Std. Dev	Skewness	Kurtosis	JB	p-value
LnGDP	28.77	28.77	30.50	26.77	1.19	−0.10	1.60	2.49	.28
LnIMP	2.96	2.90	3.34	2.52	0.22	0.15	2.08	1.15	.56
LnEXP	3.09	3.02	3.58	2.48	0.26	0.06	2.83	0.05	.97
LnDCPP	4.79	4.77	5.22	4.43	0.22	0.25	2.26	0.99	.60
LnBM	5.02	5.02	5.35	4.49	0.25	−0.54	2.21	2.24	.32

**Table 3.** Stationary findings.

At level	t-stat p-value	LnGDP	LnBM	Ln Exp	Ln Imp	LnDCPP
ADF	With constant	−.15(.93) (0.93)	−1.97 (0.29)	−2.66*(.09) (0.09)	−2.01(.27) (0.27)	−.23 (.92) (0.92)
	With constant and trend	−3.32*(.08) (0.08)	−2.28(.42) (0.42)	−1.54 (0.79)	−1.48(.80) (0.80)	−2.08 (.53) (0.53)
	Without constant and trend	1.98(.98) (0.98)	3.27(.99) (0.99)	0.42 (0.79)	.43(.80) (0.80)	2.22 (.99) (0.99)
PP	With constant	−1.13 (.68)	−3.88*** (0.00)	−2.02(.27) (0.27)	−2.08(.25) (0.25)	.09 (.96) (0.96)
	With constant and trend	−1.26 (.87) (0.87)	−2.18 (.48)	−1.52 (0.79)	−1.57(.77) (0.77)	−2.22 (.45) (0.45)
	Without constant and trend	6.77(1.00) (1.00)	3.27(.99) (0.99)	0.37 (0.78)	.37(.78) (0.78)	3.24 (.99) (0.99)
ADF	With constant	−6.23*** (.00) (0.00)	−4.67*** (0.00)	−5.33*** (.00) (0.00)	−4.00*** (.00) (0.00)	−5.17*** (.00) (0.00)
	With constant and trend	−6.03*** (.00) (0.00)	−5.50*** (.00) (0.00)	−6.26*** (.00) (0.00)	−4.14*** (.01) (0.01)	−5.26*** (.00) (0.00)
	Without constant and trend	−6.35*** (.00) (0.00)	−4.42*** (.00) (0.00)	−5.32*** (.00) (0.00)	−4.05*** (.00) (0.00)	−4.70*** (.00) (0.00)
PP	With constant	−7.30*** (.00) (0.00)	−5.61*** (0.00)	−5.39*** (.00) (0.00)	−4.00*** (.00) (0.00)	−5.27***(.00) (0.00)
	With constant and trend	−8.01*** (.00) (0.00)	−6.25*** (.00) (0.00)	−6.15*** (.00) (0.00)	−4.08*** (.01) (0.01)	−5.41***(.00) (0.00)
	Without constant and trend	−7.09*** (.00) (0.00)	−4.45*** (.00) (0.00)	−5.38*** (.00) (0.00)	−4.05*** (.00) (0.00)	−4.70***(.00) (0.00)
Stationary level		I(0)	I(0)	I(0)	I(1)	I(1)

ADF Augmented-Dickey-Fuller and PP Phillips-Perron, \*, \*\*, \*\*\*, shows significant at the 10%; 5% and 1%.

If the calculated F-test value surpasses the upper limit of critical value/bound, the null hypothesis is denied, and variables have co-integration. Supposing the estimated F-test value is less than the lower bound critical value, the null hypothesis cannot be refused, and variables have no co-integration. On the contrary, the decision is uncertain if the calculated F-test value exists between the critical value's upper and lower bound. The results indicate the presence of a long-term link between the regressand and regressors according to the critical bounds hypothesis (Pesaran et al., 2001).

The ARDL long- and short-term calculations (1, 2, 0, 0, 1) are shown in Table 5. The model was chosen according to the Schwartz Criteria along with the maximum of one lag for the regressand (dependent) and two for regressors (independent), containing constant (unrestricted constant and no trend).

#### 4.4. ARDL estimations findings

The long-term estimates of ARDL show that *LnEXP* possesses a negative and noteworthy correlation with *LnGDP* at the 1% significance level. When a country exports more, it has a higher level of growth. Alternatively, *LnEXP* positively affects *LnGDP* at a 1% level of significance in the short term. This results also support the finding of (Saleem et al., 2020;



**Table 4.** Outcomes of F-bound test.

Test Statistic	Value	K
F-statistic	12.80594	4
Critical bound value		
Significance	I(0) bound	I(1) bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Adebayo, 2020; Ajmi et al., 2015; Al-Kasasbeh et al., 2022; Dahmani et al., 2022; Gries & Redlin, 2012; Jordaan & Eita, 2007; Keho, 2017; Luo & Qu, 2023; Mosikari & Eita, 2020; Saleem et al., 2023, 2020; Sunde, 2017; Tivatyi et al., 2022) and (Öncel et al., 2023), who also affirm that exports contribute positively to economic growth. Moreover, *LnBM* significantly positively influences *LnGDP* at a 1% level of significance in the long term; conversely, *LnIMP* holds a significant positive impact on *LnGDP* significance at 5% in the short term.

The findings of current research are related to the studies of (Beck, 2002; Demetriades & Hook Law, 2006; Gries et al., 2009; Katircioglu et al., 2022; Menyah et al., 2014; Rajan & Zingales, 2003; Svaleryd & Vlachos, 2002) and (Sunde et al., 2023) showing the optimistic association between financial development, the trade openness and the economic growth. It also sustains and strongly inspires the broad money and supports the management to implement productive policies to create the trademark better.

The ECM value represents the adjustment speed from short-term equilibrium to long-term. The coefficient is mathematically meaningful at 1%, and the estimated ECM significant value is also optimistic (Table 5). Therefore, the ECM value in the model shows that short-term variations through the long-term equilibrium correct the path toward long-term equilibrium by 15% every year. The statistically positive and significant indication of the ECM coefficient suggests that slightly short-run disequilibrium between the model indicators will draw or move simultaneously towards the short-term equilibrium. In a nutshell, the findings of this research approve the legitimacy of the trade-led growth hypothesis in the short-term of China's economy, as shown in Table 5.

**Table 5.** ARDL long and short-term estimation findings.

Variable	Coeff.	Std. error	t-stat	p-value
Long-term estimations				
LnEXP	-2.17***	0.83	-2.61	.01
LnDCPP	0.62	1.56	0.39	.69
LnBM	4.69***	1.64	2.85	.01
LnIMP	1.12	1.05	1.07	.29
Short-term estimations				
$\Delta$ LnEXP	0.26***	0.09	2.80	.01
$\Delta$ Ln EXP (-1))	0.16***	0.05	3.23	.00
$\Delta$ Ln(LIMP)	0.25**	0.11	2.22	.03
C	-0.73***	0.09	-7.49	.00
ECT(- 1) conit*	0.15***	0.01	8.80	.00

\*\*\*, \*\*, \* shows the level of significance at 1%; 5%; and 10%.

#### 4.5. Granger causality test results

After confirming the existence of co-integration, it is also meant to carry out a Granger causality analysis to deliver a stronger idea for legislators to develop finance, trade, and economically responsive strategies by comprehending the tendency of causality. Because the indicators are homogeneous, we used Granger causality analysis in the ECM model to identify the tendency of a causal relationship between the regressand and regressors.

A remarkable outcome of the present result, which permits the two-directional causal link between  $LnGDP$  and  $LnDCPP$ ,  $LnGDP$  to  $LnEXP$ , and bi-directional causality we found between  $LnGDP$  and  $LnBM$ ,  $LnDCPP$  and  $LnEXP$ , as well as the  $LnBM$  and  $LnDCPP$ . In addition to the plausibility of the results, uni-directional causality was shown between  $LnGDP$  to  $LnIMP$ ,  $LnDCPP$  to  $LnIMP$ ,  $LnBM$  to  $LnIMP$ , and  $LnEXP$  to  $LnBM$ . Lastly, we failed to find any causal relationship between  $LnIMP$  and  $LnEXP$ . The results of export and GDP relationship supported the finding of (Saleem et al., 2020; Adebayo, 2020; Ajmi et al., 2015; Al-Kasasbeh et al., 2022; Dahmani et al., 2022; Gries & Redlin, 2012; Jordaan & Eita, 2007; Keho, 2017; Luo & Qu, 2023; Mosikari & Eita, 2020; Saleem et al., 2023, 2020; Sunde, 2017; Tivatyi et al., 2022) and (Öncel et al., 2023), who also affirm that exports contribute positively to economic growth. However, the findings of GDP and imports are consistent with the results of (Al-Jafari & Abdulkadim Altaee, 2018) for GCC (Mushtaq et al., 2014), Japan, Indonesia and China (Altaee et al., 2016), for Saudi Arabia.

The results of trade openness and economic growth, as confirmed previous, is similarly evidenced by numerous studies (Brueckner & Lederman, 2015; Chang et al., 2009; Kim & Lin, 2009; Musila & Yiheyis, 2015; Rassekh, 2007).

#### 4.6. Residual diagnostics

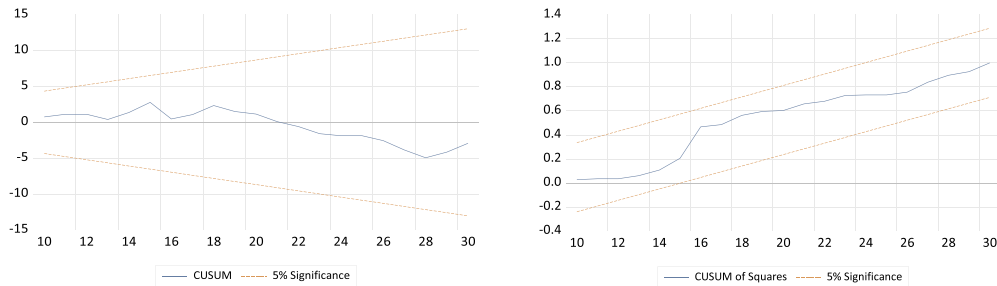
The outcomes of the residual diagnostic are stated in Table 6. For this reason, the Breusch-Godfrey serial correlation LM test has been applied to investigate the serial correlation, and the Breusch-Pagan-Godfrey residual test to investigate heteroskedasticity. The null hypothesis without serial correlation and heteroskedasticity is recognized as possessing a value bigger than 0.05%. The  $p$ -value of related  $F$ -statistics and the chi-squared for both tests were higher than 0.05%, showing the absence of serial correlation and heteroskedasticity issues.

#### 4.7. Stability diagnosis

Finally, to investigate the stability of parameters, CUSUM and CUSUM square tests have been adopted in this research. Figure 1, CUSUM and CUSUM square shows stability as the cumulative sum travels within the critical line. We infer that our model shows no sign of structural instability, and the lines fall close to the 95% critical range. Thus, the critical lines specify that our model is consistent and possibly be used for the significance of the policy. Generally, scholars did not encounter any structured volatility in a given time period using CUSUM and the CUSUM square.

**Table 6.** Serial correlation and heteroscedasticity findings.

Diagnostics	F-stat (p-value)	Obs $\times$ R <sup>2</sup> (p value chi-squared)
Breusch-Godfrey serial correlation LM test	1.009473 (.3852)	2.972324(.2262)
Heteroskedasticity test: Breusch- Pagan-Godfrey	.843195 (.5774)	7.336244 (.5008)

**Figure 1.** CUSUM and CUSUM of square plots.

## 5. Conclusion and policy recommendation

The current research examines the linkages between trade, financial openness, and economic growth of China. Annual data for thirty years from 1992 to 2021 is applied and obtained through the World Bank. The existing research used ADF and PP methods for the unit root test. The ARDL bound technique was used to check the presence of the long-term link, which is additionally expanded for the long- and short-term estimations of nominated variables. Finally, this study conducted a causal test based on Granger's theorem and through the ECMs to identify the trend of a causal relationship between the regressand and regressors.

The findings approved that bivariate ARDL long-term estimates indicate that *LnEXP* possesses a negative and noteworthy linkage with *LnGDP* at the significance level of 1%. When a country exports more, it has a higher level of growth. Alternatively, *LnEXP* positively affects *LnGDP* at a 1% level of significance in the short term. *LnBM* has a significant and positive influence on *LnGDP* at the significance level of 1% in the long term; nevertheless, *LnIMP* holds a positive and important influence on *LnGDP* at a 5% level in the short term.

As shown in Table 7, a remarkable outcome of the present result permits the two-directional causal link between *LnGDP* and *LnDCPP*, *LnGDP* to *LnEXP*, and bi-directional causality found between *LnGDP* and *LnBM*, *LnDCPP* and *LnEXP*, as well as the *LnBM* and *LnDCPP*. In addition to the plausibility of the results, uni-directional causality was shown between *LnGDP* to *LnIMP*, *LDCPP* to *LnIMP*, *LnBM* to *LnIMP*, and *LnEXP* to *LnBM*. Lastly, we failed to find any causal relationship between *LnIMP* and *LnEXP*. As shown in Table 7, a significant conclusion of the present research is that the export-led growth and the supply-leading hypotheses are validated in the Chinese economy. Moreover, China's broad money is output oriented. The real income and imports are both caused by China's exports. This indicates the significance of exports to the Chinese economy. Lastly, the findings similarly demonstrate that the extension of domestic loans induced by the banking

**Table 7.** Granger causality test findings.

Null Hypothesis:	F-Stat	p-value	Conclusion
LnGDP $\rightarrow$ LnIMP	1.73	0.18*	Unidirectional relationship
LnIMP $\rightarrow$ LnGDP	1.46	0.25	
LnGDP $\rightarrow$ LnEXP	2.97	0.02**	
LnEXP $\rightarrow$ LnGDP	2.31	0.01***	bi-directional relationship
LGDP $\rightarrow$ LDCPP	2.19	0.11*	
LnDCPP $\rightarrow$ LnGDP	3.22	0.03**	
LnGDP $\rightarrow$ LnBM	3.68	0.02**	bi-directional relationship
LnBM $\rightarrow$ LnGDP	4.52	0.01**	
LnIMP $\rightarrow$ LnEXP	1.14	0.36	
LnEXP $\rightarrow$ LnIMP	1.03	0.41	No causality
LnDCPP $\rightarrow$ LnIMP	3.20	0.03**	
LnIMP $\rightarrow$ LnDCPP	1.51	0.24	
LnBM $\rightarrow$ LnIMP	2.97	0.04**	Uni-directional relationship
LnIMP $\rightarrow$ LnBM	1.01	0.42	
LnDCPP $\rightarrow$ LnEXP	2.53	0.07*	
LnEXP $\rightarrow$ LnDCPP	2.31	0.09*	bi-directional relationship
LnBM $\rightarrow$ LnEXP	2.81	0.05	
LnEXP $\rightarrow$ LnBM	1.96	0.14*	
LnBM $\rightarrow$ LnDCPP	3.04	0.04**	bi-directional relationship
LnDCPP $\rightarrow$ LnBM	3.84	0.02**	

\*\*\*, \*\*, \* represents significance level at 1%; 5% and 10%.

sector is the stimulus for global trade growth; however, the variation of imports leads to a revolution in broad money in China.

The current research does find a significant uni-directional association between exports and broad money, which is amazing as exports are impacted domestic financial development and, therefore, dependent on domestic financial development instead of international monetary dynamics. The Chinese authorities should consider that domestic credits lead to substantial transformations in income and trade; therefore, this work has evidenced that domestic credit development is the main stimulus for the Chinese economy. This suggests that loan creation in China is the driving force of economic activities and should be supported in China because global trade and the national income will be affected by credit creation.

Therefore, to obtain economic growth, policymakers ought to seek robust financial development with an emphasis on confirming that the banks and the other financial bodies have the capacity and position to deliver the requisite capital to the dynamic division of the economy. The policymakers must also conduct such policies as the domestic credit contributes significantly to economic growth; therefore, policymakers should ascertain that the circulation of the money supply can flow considerably to the private economic sector for productive purposes. In the same way, policymakers can practice transformations in economic growth to identify the trend of the growth and the development of trade and financial sectors of the economy, as there is substantial proof of an important relationship occurring between the economic growth, trade, and financial development sectors of the economy.

It is recommended that Chinese policymakers further emphasize financial growth and trade openness to encourage the country's economic growth. Given its optimistic growth influence, China should concentrate on expanding its financial markets and sustaining the motherland's economic consistency. However, policymakers should focus more on trade openness and conserving economic constancy for frequent economic growth.

This study has specific limitations that need to be acknowledged. The research depends on a proxy of trade liberalization that was not strategically initiated. Future analysis may use trade policy procedures as indicators of trade openness to produce further precise and vigorous outcomes. Second, the focus of the current study is restricted to the Chinese economy. To ameliorate the results, future studies may combine panel data and cross-country analysis, including developed and developing countries. By handling such limitations, future research may deliver additional inclusive and subtle understandings of the association between trade openness, financial liberalization, and economic growth.

The economic growth of a country is also determined by financial sector liberalization, trade, and sectoral development, which could be caused by foreign stakeholders and government. Our study did not consider other crucial variables related to the financial sector, regional disparities, innovation and technological upgrading, environmental considerations, and more. Therefore, future studies must examine aspects that employ diverse methods, such as the VAR Granger model, single and multi-country frequency domain causality test, and so on, to understand the issue further. By integrating other variables and implementing various scientific methods, a novel study can provide a valuable understanding of the association between trade liberalization, financial openness, and economic growth.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Notes on contributor

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