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## Article

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# Examining the impact of exchange rates on India's manufacturing exports to Ethiopia

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## Abstract

**Purpose** – Since the start of economic liberalization, Asia and Africa have been expanding new corridors for South-South trade. India and Ethiopia are the two fastest-growing economies in this region, and the trade between these countries involves many manufacturing goods. This research empirically examines the determinants of manufacturing exports between India and Ethiopia during the post-reform period. The focus is to analyze the role of the real effective exchange rate (REER) in manufacturing exports from 1994 to 1995 to 2015 to 2016.

**Design/methodology/approach** – The data were gathered from multiple sources, including UN Comtrade, the RBI annual reports, the Annual Survey of Industries (ASI), Centre for Monitoring Indian Economy (CMIE) Ltd, the Office of the Economic Advisor and the Ministry of Commerce, Government of India. The study employs econometric modeling with ordinary least squares regression to evaluate the determinants of India's manufacturing exports to Ethiopia.

**Findings** – Based on statistical and econometric tools, results revealed that the continuous upward trend in Indian manufacturing exports depends mainly on the technology and export prices relative to domestic goods rather than purely external prices indicated through REER. The stability of export growth over time requires more effort to improve the technological efficiency of the manufacturing sector on the supply side.

**Research limitations/implications** – The accuracy and relevance of the findings to current trade dynamics between India and Ethiopia may be limited by the study's timeframe (1994–2015) and data quality.

**Originality/value** – This research is the first to focus on how exchange rates affect India's manufacturing exports to Ethiopia.

**Keywords** Exchange rates, Manufacturing, Exports, India, Ethiopia

**Paper type** Research article

## 1. Introduction

Recently, international trade participants have carefully managed their foreign exchange markets. The reason is the common belief that fluctuations in the exchange rate significantly affect the real and financial sectors of the economy. One of the main tools policymakers use for macroeconomic management to influence trade flows is the central bank's handling of exchange rates. Under a managed floating exchange rate regime, devaluing the domestic currency allows a country to lower its value relative to its trading partners' currencies, thereby increasing trade competitiveness and boosting export performance. Implementing a parallel policy in the manufacturing export sector would be more effective, especially considering the significant spillovers to other sectors and supporting global economic growth. However, the exact relationship between exchange rate movements and trade flows remains unclear in the international financial and trade literature.

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The 1990s became the decade of trade and financial liberalization in the economic history of the developing world. The procedure has strengthened since the World Trade Organization (WTO) was formed in 1994–1995. The trend was more remarkable among the poor-income countries in the Asia and Africa regions. India's exchange rate regime in Asia was more or less fixed before the 1990's. However, as part of the new economic policy of 1991, India has shifted to a new market-oriented exchange rate approach via the deregulations and devaluations witnessed in the years 1992–1993. After all, the Reserve Bank of India (RBI) has primarily maintained a controlled floating regime for the exchange rate. The Indian central bank occasionally steps in to stabilize the nominal exchange rate. During the same period, several African countries experienced similar policy shifts. Among them, Ethiopia has become one of the fastest-growing economies in the world (Mulugeta, 2020). During the last one and a half decades, the Birr experienced substantial devaluation as part of their economic reform program in 1991. Also, a series of financial sector reforms were incorporated with this program and significant moves took place in 1994.

With an average growth rate of 10.6% over the past 15 years, Ethiopia's economy is among the fastest-growing in Africa (World Bank Group, 2016). Based on GDP per capita, Ethiopia grew at the third-fastest rate worldwide from 2000 to 2016, according to estimates from the International Monetary Fund (Mulugeta, 2020). Similarly, India is one of the world's rapidly changing economies and ranks as the eighth-largest in real gross domestic product (GDP) terms according to World Bank (WB) GDP figures (Ergano and Rambabu, 2020). Most African nations are unlikely to compete in manufacturing soon because of a poor business environment (Gelb *et al.*, 2020). Exchange rate fluctuations and their volatility significantly impact global trade and affect the Ethiopian government's ability to promote international commerce through exchange rate regulation, one of its main policy tools (Nguse *et al.*, 2021). Ethiopia faces substantial macroeconomic challenges that hinder economic stability and growth, including high inflation and a shortage of foreign exchange (Oberholzer and Ayele Haylemariam, 2024).

To assess Ethiopia's technological progress, it is important to recognize that, as of mid-2016, the country exported a significant portion of manufactured goods (Whitfield and Staritz, 2021). Ethiopia may take a long time to adopt the most effective strategies and legislative frameworks because it has not yet accumulated enough experience or knowledge in technology transfer (Vrolijk, 2021). Therefore, the growth in foreign exchange reserves and exchange rate volatility significantly affects Ethiopia's import demand, which can influence the availability of technology and innovation inputs (Ali *et al.*, 2024). Between 1994 and 2013, India's exports to Ethiopia increased more than 31 times, reaching a peak of US\$917.4 m. There has been a notable upward trend in the last two years, 2015 and 2016 (US\$808 m in 2016), despite a sharp decrease in 2014. The steady growth of Indian exports could be linked to financial liberalization during the same period in both India and Ethiopia.

Therefore, it is important to analyze how India's Real Effective Exchange Rate (REER) impacts trade with Ethiopia, considering the complexity arising from Ethiopia's economic reforms after 1991 and the country's strong average GDP growth over the past 15 years. Similarly, India's economic development has become increasingly dynamic. The changing economic relationship between the two countries is highlighted by the effects of exchange rates and the challenges related to technology transfer.

In that case, it can be reframed as "In the past, studies on India and Ethiopia have focused on several interesting economic aspects". For example, Dube *et al.* (2018) examined Ethiopia's horticultural sub-sector's export performance. Addis and Zuping (2023) considered Ethiopia's trade relationship with China and India and examined the link between international trade and economic growth. Yet, no particular research has been done on India's REER on Ethiopia's trade. However, the current research uses econometric estimation methods to assess this relationship empirically. This research uses data from India's REER from 1994 to 2016. Particularly focuses on the unique interaction that adds value to originality between the trade dynamics of Ethiopia and India during the post-reform period. Moreover, the research findings could provide new insights into the factors influencing manufacturing exports between India and Ethiopia.

The rest of the article includes: [Section 2](#), which provides the literature review; [Section 3](#), which discusses the methodology and data sources; [Section 4](#), which presents the empirical results and interpretation and [Section 5](#) concludes with policy implications.

## 2. Review of literature

A review of the theoretical and empirical research on the effects of exchange rates on international trade flows is considered important, especially with contemporary updates and an interdisciplinary perspective. The empirical literature, in particular, explores the relationship between exchange rates and India's manufacturing exports in recent periods.

### 2.1 Theoretical insights

The perceived international trade theory states that financial liberalization policies influence a country's trade openness. The central bank can boost a country's international trade by strategically adjusting the exchange rate. One of the earliest and most important ideas for setting exchange rates is the purchasing power parity (PPP) theory. It suggests that, over time, exchange rates can change so that, when priced in a single currency, the same items should cost the same in all countries. The "law of one price" is the basis of PPP theory ([Nagayasu, 2021](#)). Although PPP is widely used, its empirical support is limited, especially in the short and medium term, when exchange rate forecasts often perform no better than a random walk ([Pour and Illichmann, 2022](#); [Prieue, 2017](#)).

On the other hand, to explain deviations from the equilibrium exchange rate, the behavioural equilibrium exchange rate (BEER) model expands on the PPP theory by incorporating other economic factors such as interest rates, GDP per capita, investment freedom, terms of trade and urbanization rate ([Ahmetaj and Bejtja, 2019](#); [Pour and Illichmann, 2022](#)). Based on the interest rate parity (IRP) theory, the expected change in exchange rates between two countries' currencies is equal to the difference in interest rates between them. This ensures there are no arbitrage opportunities. Similar to PPP, IRP has a strong track record, but other macroeconomic factors may prevent it from fully explaining exchange rate changes ([Haque and Brumm, 2008](#)).

One of the most commonly used statistics in open-economy macroeconomics is the real effective exchange rate (REER) ([Patel et al., 2019](#)). When considering inflation, the REER is the weighted average of a nation's currency relative to a basket of other major currencies. It is an important measure for assessing a country's competitiveness internationally ([Sakli et al., 2022](#)). An increase in REER, which indicates a real appreciation, has been found to potentially hinder economic growth by reducing the competitiveness of local products ([Sakli et al., 2022](#)). Several studies have also shown that REER volatility can significantly impact trade balances and foreign direct investment (FDI) flows ([El Rhadbane and El Mouden, 2022](#); [Begović and Kreso, 2017](#)).

Theoretical models suggest that the relationship between exchange rates and trade flows depends on country-specific characteristics, structural factors, levels of institutional stability and the nature of trade specialization. Therefore, it is important to review empirical findings to understand the relationship.

### 2.2 Empirics

Much empirical research has analyzed the effect of exchange rates and trade flows using various econometric techniques and data sources. As such, an attempt is made to provide a brief review at the world level and in two sub-sections of the Indian and African cases.

**2.2.1 World level.** The link between exchange rates and trade flows needs to be clarified in international financial literature. Compared to real wages, labor productivity is significantly and consistently linked to manufacturing performance in African nations. Thus, increasing labor productivity rather than just focusing on raising wages may be more advantageous for industrial competitiveness ([Naidoo and Ndikumana, 2023](#)). Labor-intensive industries are more susceptible to fluctuations in the exchange rate than are less labor-intensive industries. In

contrast to non-labor-intensive companies, labor-intensive companies see a 2.7% increase in exports when the real effective exchange rate declines by 10% (Akdoğan *et al.*, 2023). However, there is no discernible difference in export pricing based on the labor intensity of organizations (Akdoğan *et al.*, 2023).

Ahmadian-Yazdi *et al.* (2025) conducted an investigation into the dynamic transmission of volatility among exchange rates and stock returns in key nations that import and export products. Koppl and Podemska-Mikluch (2025) described how governments, acting as “Big Players,” create undue exchange rate volatility by influencing the market with flexible and unpredictable moves. Such arbitrary actions lead to increased volatility and unpredictability. They also transgress the rule of law concept, which states that everyone, including governments, must abide by the same rules and hinder arbitrary government policy (Koppl and Podemska-Mikluch, 2025). These impacts are further amplified by technological developments that favor skilled labor, and exchange rate changes have a major impact on export dynamics, especially in labor-intensive industries. Aftab *et al.* (2017) conducted a thorough analysis of 62 Malaysian businesses that export to Thailand and 60 Malaysian manufacturing concerns that import from Thailand over the monthly period 2000–2013. They examined how exchange rate fluctuation affects trade flows in a few industries. It should not be assumed that removing exchange rate variability alone will significantly increase trade.

During the 1980s, technology benefited skilled labor, increasing the productivity gap between skilled and unskilled workers. This trend is especially prominent in entities that heavily rely on manufacturing (Mallick and Sousa, 2017). Based on relative demand levels, Güven (2025) examined the trade between resource-rich and resource-poor countries in a two-sector dynamic setting where manufacturing and harvesting activities put pressure on the country’s renewable resources within a South-South trade model. Even when the resource-poor country exports “cleaner” goods, it may still face environmental and welfare losses at the expanded steady-state equilibrium (Güven, 2025).

The effects of temporary REER shocks on production, productivity and employment are long-lasting in more open industrial sectors. Accordingly, labor productivity in manufacturing may be significantly affected by REER changes (Campbell, 2020). Depending on the type of commodities exported, REER has different but important impacts on growth and exports. When it comes to growth, overvaluation of REER typically results in more harmful effects than undervaluation (Blecker, 2023). However, while the opposite is true for upper-middle-income countries, in high-income nations, the REER tends to depreciate as productivity rises, thereby enhancing trade competitiveness (Vogiazas *et al.*, 2019). Countries with high productivity and complex economies are less vulnerable to REER fluctuations. By improving and adjusting their output, these nations can reduce their dependence on price competition (Magacho *et al.*, 2022). Nonetheless, a competitive REER benefits manufacturing industries and is associated with a more complex and diverse production system (Pereira and Missio, 2022). This indicates that fostering structural change and diversification through a competitive REER can increase demand for manufacturing.

**2.2.2 Empirical studies in India and Africa.** Increased volatility in REER discourages exports at the subnational level. Since state competitiveness, not REER levels, is more important for success in exports, policy should concentrate on enhancing supply-side elements like logistics (Tan *et al.*, 2019). Following the implementation of free-floating exchange rate regimes, there is evidence that REER for India and the other Brazil, Russia, India, China, South Africa, Saudi Arabia, Egypt, United Arab Emirates, Ethiopia, Indonesia and Iran (BRIICS) nations is convergent to equilibrium values (Giannellis and Koukouritakis, 2018). Currency misalignments decrease as a result of this convergence. International reserves and REER in India are causally related, suggesting that controlling forex reserves is essential for preserving stable exchange rates (Tiwari and Kyophilavong, 2017). Wondemu and Potts (2016) analyzed the effects of real exchange rate shifts on Tanzania’s and Ethiopia’s export performances and found that real exchange rate policy variations account for these export performance discrepancies. They concluded that the appreciation of the exchange rate negatively impacts export performance and that exports in both nations are highly responsive to changes in the REER.

That impact is also possible through a detrimental appreciation rather than a depreciation. This suggests that REER volatility could potentially enhance export activities. [Ayele \(2022\)](#) observed a significant mismatch in the Real Effective Exchange Rate (REER) across East African countries, where appreciation was linked to better terms of trade and higher net foreign assets, while depreciation was associated with a larger money supply and increased trade openness. In the long run, REER misalignment negatively affects GDP per capita. However, short-term effects vary by country: Kenya experiences development promotion while Ethiopia faces growth challenges ([Ayele, 2022](#)). Increases in government spending, productivity and remittances cause REER to rise in Ethiopia, whereas more trade openness and actual investment tend to lower it ([Ayele, 2023](#)). Consequently, different instances of REER misalignment occur across the region ([Ayele, 2023](#)). In many East African countries, a decline in the actual exchange rate benefits the trade balance. After exchange rate liberalization, the trade balance's elasticity relative to the actual exchange rate remains elastic ([Hunegnaw and Kim, 2017](#)). During the Global Financial Crisis and the COVID-19 pandemic, the REER market integration among Southern African Development Community (SADC) nations decreased, indicating a reduction in co-integration ([Mulenga et al., 2024](#)). This highlights the need for improved crisis management strategies in currency markets.

Previous studies in the field of price and non-price factors are summarized in [Table 1](#). These studies are compared for India and Ethiopia, focusing on productivity of labor (LP), relative export price (REP), exchange rate (ER), technological capability (TEC), demand for manufacturing (DM) and other factors.

The empirical studies reviewed in this section suggest that the result is somewhat mixed. The exact relationship between exchange rates and trade flows is complex and requires further empirical studies and analysis. Hence, this study has the following research questions (RQs):

- RQ1. How does the exchange rate (ER) affect India's manufacturing exports to Ethiopia?
- RQ2. What is the role of relative export price (REP) in India's exports to Ethiopia?
- RQ3. How does labor productivity (LP) influence Indian manufacturing exports to Ethiopia?
- RQ4. How does technological capability (TEC) impact export growth to Ethiopia?
- RQ5. How does Ethiopia's demand for manufacturing (DM) affect India's exports?

Based on this empirical background, the study hypothesizes that the fundamental exchange rate shifts should considerably impact manufacturing exports from India to Ethiopia.

In the following section, methodology and data sources, we provide the basic econometric estimation model and data sources used in this study.

### 3. Methodology and data sources

#### 3.1 Econometric methodology

Initially, the time-series features of the data were analyzed before modeling the relationships and dynamic causality between independent variables (DM, ER, REP, LP and TEC) and the dependent variable EXM. Time series data's potential to record trends, seasonal patterns and structural changes over time makes it essential for examining the determinants of manufacturing exports between India and Ethiopia during the post-reform period. This type of data, composed of sequences of data points gathered at successive time periods, enables comprehensive analysis and forecasting ([Entezami and Entezami, 2021](#)). Understanding future patterns through the analysis of historical data is crucial for strategic planning and decision-making ([Buachum et al., 2016](#)). Augmented Dickey–Fuller unit root tests were performed to determine whether the time series was stationary or nonstationary. [Granger and Newbold \(1974\)](#) state that using nonstationary variables might produce spurious findings resulting in incorrect conclusions. Because misleading results often show a high  $R^2$ , an overly

**Table 1.** Determinants of manufacturing exports between India and Ethiopia

No.	Ref	Geographical area of research		Price factors (economic perspective)			Non-price factors (technological perspective)	Non-price factors (demand perspective)	Other perspective
		India	Ethiopia	Productivity of labor (LP)	Relative export price (REP)	Exchange rate (ER)	Technological capability (TEC)	Demand for manufacturing (DM)	
1	<a href="#">Shaker (2025)</a>	x	–	–	–	–	–	–	Trade facilitation's effect on bilateral trade intensity
2	<a href="#">Raju (2024)</a>	x	–	–	–	–	x	x	Highlights firm heterogeneity, R&D intensity, policy implications for technology upgradation
3	<a href="#">Vashisht (2023)</a>	x	–	–	–	x	–	x	Trade impact on wage disparity
4	<a href="#">Ali (2023)</a>	–	x	x	–	x	–	–	Capital, exports, imports, foreign technology transfer
5	<a href="#">Arora (2023)</a>	x	–	–	–	–	x	x	G20 Troika context, India's leadership opportunity, forward/backward linkages in global value chain (GVC) vary by tech level
6	<a href="#">Abebe (2022)</a>	–	x	–	–	–	–	–	Synergies and tensions between trade and environmental law
7	<a href="#">Kar (2021)</a>	x	x	x	–	x	–	–	Focus on manufacturing
8	<a href="#">Benkovskis and Wörz (2016)</a>	x	x	–	x	x	–	–	Highlights non-price factors such as role of quality, taste, competitor dynamics
9	<a href="#">Bhatt (2008)</a>	x	x	x	x	x	–	–	Effects on price Vs. profitability
10	<a href="#">Gupta et al. (2022)</a>	x	–	–	–	–	x	–	Absorptive capacities to determine FDI's growth impact
11	<a href="#">Nguse et al. (2021)</a>	–	x	–	x	x	–	–	Trade-env links and Exchange rate effect
12	<a href="#">Whitfield et al. (2020)</a>	–	x	–	–	–	x	x	Introduced new framework on how firms build capabilities in GVCs
13	<a href="#">Staritz and Whitfield (2019)</a>	–	x	–	–	–	–	x	Economic transformation via manufacturing and export focus

**Source(s):** Authors' computation

significant t-ratio and no relationships between variables in the proposed framework, the series must be stationary (Iqbal *et al.*, 2013). Therefore, this study employs the augmented Dickey–Fuller (ADF) unit root test to assess the degree of integration of variables.

Since export flows depend on various demand and supply factors, this research utilized an ordinary least squares (OLS) regression model that includes several potential determinants as control variables. OLS regression is a common method for estimating the parameters of a linear model. For example, OLS has been effectively used in studies on Indian pharmaceutical and manufacturing exports to Australia to identify significant correlations between factors such as R&D spending and capital goods imports (Rijesh, 2021). While considering a different approach, generalized least squares (GLS) can provide unbiased estimators that minimize variance, but it is computationally intensive and may not offer meaningful accuracy gains in cases with stationary errors (Lee and Lund, 2012). Therefore, OLS is well-suited for time series analysis due to its simplicity and ease of interpretation (Akbulgic and Akinci, 2009). In our framework, we incorporate both demand and supply side factors, represented by Ethiopian demand for manufacturing (DM), the relative export price of India (REP), labor productivity in Indian manufacturing (LP) and India’s domestic technological capability (TEC), proxied by research and development expenditure (R&D). The model is specified as follows:

$$EXM_t = f(D_{M,ER}, REP, LP, TEC) \quad (1)$$

EXM stands for manufacturing export and “*t*” denotes time, covering 1994–2015. The econometric model is specified in equation (2).

$$\ln EXM_t^{IN} = \beta_0 + \beta_1 \ln DM_t^{ET} + \beta_2 \ln ER_t + \beta_3 \ln REP_t + \beta_4 \ln LP_t + \beta_5 \ln TEC_t + U_t \quad (2)$$

where all variables are in natural log (Ln); EXM is India’s total manufacturing export value to Ethiopia and DM is Ethiopian (ET) demand for manufacturing goods, measured by all countries’ exports of manufacturing goods to Ethiopia, excluding India. ER and REP are the exchange rate and relative price, respectively. ER is expressed in terms of India’s real effective exchange rate (REER), weighted by a bilateral 36-country annual average, where an increase indicates the appreciation of the Indian rupee. REP is the relative export price, calculated as the ratio of India’s manufacturing export unit value to the Wholesale Price Index (WPI) of the domestic manufacturing sector. TEC represents technology, and *U* is the error term without contemporary correlation. The R&D index acts as a proxy for technology in the Indian manufacturing sector. The common term “*t*” serves as a suffix for the period.

Since the coefficients are in log form, the coefficients of the parameters  $\beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$  have an elasticity interpretation. As per economic theory, expect  $\beta_1 > 0, \beta_2 < 0, \beta_3 > 0, \beta_4 > 0$  and  $\beta_5 > 0$ . Based on the annual time series data, the ordinary least squares (OLS) estimation technique for the regression analysis was used to estimate the impact of the exchange rate on India’s manufacturing exports to Ethiopia. The power of the explanatory variables in explaining the variability in the dependent variable is identified with the help of the  $R^2$  test.

### 3.2 Data sources and variable constructions

This study offers various quantitative statistics on the determinants of manufacturing exports. The analysis uses data on Indian manufacturing exports to Ethiopia from 1994 to 1995 to 2015–2016, covering the period of WTO formation and ongoing liberalization, especially regarding exchange rate management by the RBI. According to the Standard International Trade Classification (SITC, version 3), the manufacturing sector includes 57 categories at the two-digit level and 956 categories at the four-digit level. Data on Indian manufacturing exports and exports from all countries to Ethiopia were compiled from UN Comtrade and accessed via WITS software. For information on key characteristics of the Indian manufacturing sector, we used various annual reports of the RBI, including the Handbook of Statistics on Indian Economy, particularly the 2017 edition. Industrial characteristics such as value-added, total employment, depreciation

and others are gathered from the Annual Survey of Industries (ASI), formerly published by the Central Statistical Organization (CSO), now merged into the National Statistical Office (NSO). Historical data are sourced from the 2015–2016 report. R&D expenditure statistics are compiled from the company database PROWESS IQ of the Centre for Monitoring Indian Economy (CMIE) Ltd., with the overall figure derived from firm-level reports on R&D spending in current and capital accounts. Price data for domestic manufacturing were obtained through WPI from the Office of the Economic Advisor, Ministry of Commerce, and Government of India. Export sector price series are based on the Unit Value Index (UVI) of exports, sourced from the Handbook of Statistics on the Indian Economy (RBI). The exchange rate (ER) variable is represented by the Real Effective Exchange Rate (REER), calculated using a weighted bilateral 36-country annual average from various annual reports of the RBI.

Demand and supply-side factors have shaped the preferred econometric model for Indian manufacturing exports. Brief descriptions of variables are provided here.

### (1) Productivity of labor (LP)

One of the key supply-side factors influencing Indian manufacturing exports (EXM) is labor productivity (LP), which indicates production efficiency. The calculation of LP follows the method of [Rijesh \(2019\)](#), which is the ratio of a volume measure of output (value added) to a measure of input use (total persons engaged). The formula is as follows:

$$LP_t = \frac{Q_t^{VA}/L_t}{Q_{Base\ Year}^{VA}/L_{Base\ Year}} * 100 \quad (3)$$

$Q_t^{VA}$  is the value-added volume index in year  $t$ , and  $L_t$  is labor proxied by the total person engaged in year  $t$ .  $t$  denotes time. The volume index of the value-added formula is given as;

$$Q_t^{VA} = \frac{VA_t/P_t}{VA_{Base\ Year}/P_{Base\ Year}} * 100 \quad (4)$$

Here,  $VA_t$  is the value added in the current year and  $P_t$  is the value added deflator in the current year. The nominal VA was converted to real values using the appropriate WPI, base 2004–2005 = 100.

### (2) Relative export price (REP)

The relative export price of manufacture (i.e. export price close to domestic prices) is derived by the ratio between the unit value index (UVI) of exports and the WPI of the manufacturing sector. By selecting the sectoral unit value of exports, we have compiled the unit value index of manufacturing exports. Since different series of UVI were available for the study period, that is, for the period 1994–1999 (base year 1978–1979 = 100) and 1999–2015 (base year 1999–2000 = 100), we use the splicing method to find a typical base year. The WPI was also spliced to form a single series with base year 2011–2012 = 100 from different base years. They are 1994–2007 (base year 1993–1994 = 100), 2007–2011 (base year 2004–2005 = 100) and 2011–2015 (base year 2011–2012 = 100).

### (3) Exchange rate (ER)

The exchange rate is the relative price of our goods compared to foreign goods and services, which reflects the price competitiveness of our commodities globally. Our study focuses on the REER, where an increase signifies an appreciation of the Indian rupee. Although there are different types of exchange rates, we selected the 36-currency bilateral export-weighted index (annual average for the financial year) for our empirical analysis. We found that other REER series were available for the study period with different base years, such as 1994–2004 (base

year 1993–1994 = 100) and 2004–2015 (base year 2004–2005 = 100). Therefore, we chose the series with the same weights and spliced them to the base year 2004–2005 = 100.

(4) Technological capability (TEC)

Recent endogenous growth theories emphasize the importance of knowledge and technology in determining a country’s long-term growth. Theoretical models suggest that technology plays a key role in boosting manufacturing exports, especially for developing countries like India. In this study, we aim to capture the nature of technological capability in manufacturing using R&D expenditure as an input proxy for technology. The nominal R&D expenditure is converted into a real series by deflating the reported nominal value of R&D expenditure reported in the company database (PROWESS IQ) with the price index of capital goods (WPI), base 2004–2005 = 100.

(5) Ethiopia’s demand for manufacturing (DM)

Domestic demand for manufacturing products in Ethiopia is a key demand-side factor influencing Indian manufacturing exports in our model. It can be determined using the formula;

$$DM_t^{ET} = \text{Ln} ( WEXM_t^{ET} - EXM_t^{IN} ) \tag{5}$$

$DM_t^{ET}$  is the value of Ethiopian domestic demand for manufacture at year  $t$ ,  $WEXM_t^{ET}$  is all countries’ export value of manufacture at year  $t$  and  $EXM_t^{IN}$  is the value of Indian export of manufacture to Ethiopia. The aggregate values of manufacturing sectors are compiled from the broad manufacturing sector 57 at the two-digit sectoral level and 956 at the four-digit group level of the Standard International Trade Classification (SITC revision 3).

**4. Analysis and findings**

The data used in this research consists of time series economic variables. Their serial correlation and stationarity properties were carefully examined. The Durbin–Watson test was applied in this research to determine if the error term had a serial correlation. In the current research, the Durbin–Watson d-statistic shows a value of 1.13. [Yazdanfar et al. \(2014\)](#) state that the Durbin–Watson statistics, when less than or close to 2, validate the model’s overall best fit and validity. The methodology stipulates that, as a significant number of economic variables are often nonstationary, one must apply each variable to a unit root test to ascertain its stationarity properties employing the Phillips–Perron (PP) and Augmented Dickey–Fuller tests (ADF) ([Atsu et al., 2014](#)). To determine whether or not the variables being considered are stationary or nonstationary, see [Table 2](#). ADF test results for the current study variables (such as lnEXM, lnLP, lnREP, lnER, lnTEC and lnDM) suggest that non-stationarity exists within the dataset since ADF statistics are between 1 and 5% critical values. A high value indicating non-significance and non-stationarity can be seen in the resultant  $p$ -values for each variable.

**Table 2.** ADF test results

Variable	ADF statistics	Level		$p$ -value	Lag length	ADF statistics	First difference		$p$ -value
		1%	5%				1%	5%	
lnEXM	−1.555	−4.380	−3.600	0.8094	1	−0.243	−2.567	−1.740	0.4055
lnLP	−1.993	−4.380	−3.600	0.6052	1	−0.881	−2.567	−1.740	0.1954
lnREP	−2.073	−4.380	−3.600	0.5612	1	0.214	−2.567	−1.333	0.5836
lnER	−2.955	−4.380	−3.600	0.145	1	−1.100	−2.567	−1.740	0.1433
lnTEC	−2.170	−4.380	−3.600	0.507	1	−0.928	−2.567	−1.740	0.1832
lnDM	−2.390	−4.380	−3.600	0.385	1	0.450	−2.567	−1.740	0.6708

**Note(s):** \*Indicates significance at the 1% level

**Source(s):** Authors’ computation

Thus, it is suggested that the variables under analysis – lnEXM, lnLP, lnREP, lnER, lnTEC and lnDM – are probably nonstationary time series data.

#### 4.1 Descriptive statistics

To study the effects of the exchange rate on manufacturing exports between India and Ethiopia, equations (2) and their variables are estimated using the ordinary least-squares method. Annual time series data of selected variables from the post-reform period 1994–95 to 2015–16 have been used. In previous studies, the negative impact of a real effective exchange rate on manufacturing exports has not been consistently found. We conducted various robustness checks in our analysis to verify our strong results. The summary statistics of the variables used in the analysis are presented in Table 3.

Among all variables, India's manufacturing export shows the highest variance, while the lowest variance is observed with the exchange rate. On average, the R&D expenditure has the highest value, while the exchange rate has the lowest value, similar to the variation result discussed earlier. The results of our econometric estimation are explicit in Table 4. As can be observed from the table, the base result is Model 1, and the robustness of the empirical result is evaluated in terms of alternative models 2 and 3. The alternative model is based on different measures of REER, which are explained in the note in Table 4.

**Table 3.** Summary statistics OLS estimation (observations from 1994 to 1995 to 2015 to 2016)

Variable	Mean	SD.	Min	Max	Observations
<i>LnER</i>	4.64	0.0542	4.56	4.75	22
<i>LnREP</i>	4.15	0.333	3.70	4.72	22
<i>LnLP</i>	4.59	0.342	4.02	5.08	22
<i>lnRD</i>	10.7	0.842	9.43	12.1	22
<i>lnEXM</i>	4.81	1.05	3.36	6.63	22
<i>lnDM</i>	7.49	0.784	6.50	8.86	22

**Note(s):** (1) ER, exchange rate; REP, relative export price; LP, labor productivity; RD, a proxy for technology; DM, Overall demand for manufacture of Ethiopia and (2) all variables are in natural log(Ln). (3) EXM, the manufacturing export of India, is the dependent variable

**Source(s):** Authors' computation

**Table 4.** OLS estimation results of manufacturing export model

<i>Explanatory Variables</i>	(1)	(2)	(3)
<i>LnER</i>	0.510 (1.501)	2.159** (0.761)	0.020** (0.007)
<i>LnREP</i>	2.242* (1.083)	2.731** (1.058)	2.715** (1.058)
<i>LnLP</i>	-1.872** (0.737)	-2.967** (1.062)	-2.963** (1.073)
<i>LnRD</i>	0.826*** (0.224)	0.980*** (0.254)	0.989*** (0.256)
<i>LnDM</i>	0.227 (0.441)	0.282 (0.360)	0.278 (0.360)
<i>Constant</i>	-8.829 (6.096)	-5.513*** (0.822)	-5.528*** (0.825)
<i>R</i> <sup>2</sup>	0.925	0.930	0.929
Number of Observations	22	21	21

**Note(s):** (1) All variables are in natural log format except for the exchange rate in columns 2 and 3; column 2 shows the exchange rate in log differences and column 3 shows average differences. (2) Figures in parentheses are the Standard Errors of the corresponding variables. (3)\*significant at 0.01 level for a two-tailed test, 0.05 level for a two-tailed test and \*\*\*significant at 0.1 level for a two-tailed test. (4) ER, exchange rate; REP, relative export price; LP, labor productivity; RD, proxy for technology; DM, Overall demand for the manufacture of Ethiopia and Ln, natural log

**Source(s):** Authors' computation

Overall, the analysis shows that our explanatory variable is explained by more than 90% by the model based on the R-squared test. Regarding our control variable, the econometric result reveals the technological coefficient's significant and positive role, as predicted by the new endogenous growth theories. The value of 5 indicates that about a one percent increase in R&D expenditure leads to an approximately equal percentage increase in our manufacturing export performance, which is striking. The relative export price is found to have a significant impact, as the coefficient is positive and statistically significant across various models. This implies that higher export prices relative to domestic market prices provide a positive incentive for manufacturers to export globally. The 3 indicates that a one percent increase in the relative cost of exports results in an increase in manufacturing exports between 2.2 and 2.7%, which is significant at the 5% level. The Ethiopian demand is found to have a positive impact, although the coefficient is not statistically significant in any of the estimated models. Surprisingly, the study found a significant adverse effect on production efficiency, measured through labor productivity.

As this study hypothesizes, the main interest in this article is in the result concerning the exchange rate coefficient ( $\beta_2$ ). In contrast to the theoretical prediction, the study finds that the coefficient is positive and statistically significant, especially in models 2 and 3. This implies that a rise in REER (appreciation of the Indian rupee) does not preclude Ethiopians from demanding Indian manufacturing. The trend analysis shows that the Indian REER from 1994 to 1995 to 2015 to 2016 shows an appreciating trend with an estimated standard deviation of 0.05 (Table 3). However, during this period, Indian exports have also expanded, which indicates that more than the relative price competitiveness, there are other non-price factors such as technology, the relative export price to the domestic market, and the external demand conditions that shape aggregate manufacturing exports. A recent study by Veeramani (2008) also found a similar empirical relationship and argued that the actual growth rates of exports could have been more significant had the REER not appreciated during this period. As such, the estimated results are at variance with the more extensive theoretical and empirical results found in the literature that depreciation positively boosts exports.

Based on empirical findings, it can be argued that the increasing trend in Indian REER after the reform period does not fully explain the relationship. This result aligns with several studies, including Dellas and Zilberfarb (1993), McKenzie (1999) and Tenreyro (2007). The authors of Bahmani and Hegerty's 2007 study concluded that the effect of exchange rate variability on commerce is neither entirely significant nor unidirectional. The connection may vary depending on the market and the time frame examined, indicating a need for more detailed disaggregated trade data for further research. Mallik (2005) argues that the observed relationship between exchange rate movements and exports does not necessarily help predict the impact of exchange rates on export performance based on a post-reform case study of India.

## 5. Conclusion

Since the WTO was established, emerging countries in Asia and Africa have experienced significant progress in trade and financial liberalization. Research has shown considerable interest in the impact of exchange rates on export performance in these developing regions. In this context, the present study empirically examines the role of the exchange rate on manufacturing export performance from India to Ethiopia, two thriving economies in these areas. The study utilized the OLS regression method on time series data from 1994 to 1995 to 2015 to 2016. It finds that a consistent upward trend in Indian manufacturing exports mainly depends on technology and export prices relative to the domestic market, rather than external prices indicated by REER. Instead of relying solely on exchange rate management, there is a need to invest more in improving product quality and competitiveness through non-price factors, especially technological inputs. Similar to our empirical findings, several recent studies have noted a positive relationship between REER and exports. As Veeramani (2008) suggests, artificial depreciation comes with costs such as higher inflation and interest rates;

while the benefit of increased export revenues appears modest, export policies should focus on other initiatives that promote long-term export growth.

Authors argue that supply-side factors like technology and relative export prices are more important for India's manufacturing exports to Ethiopia. As manufacturing products evolve from less technology-intensive to more technologically and skill-intensive items, the competitive performance of our exports depends on investment in technology assets and capabilities. Additionally, the positive spillover effects of technology, as explained in new endogenous growth theories, could boost overall economic growth. Participating in international trade with less technologically advanced African regions offers Indian exporters a better opportunity to improve their comparative advantage, mainly through non-price factors. The more favorable price incentives compared to the large domestic market further motivate Indian manufacturing producers to trade with the Ethiopian economy.

This research presents policy implications for asymmetric real exchange rate economies that differ from those with symmetric real exchange rates. Through the export of manufactured goods, the real exchange rate could be used as a policy variable to impact the economy. To secure competitiveness in the manufacturing sector and sustainable export growth between India and Ethiopia, governments and policymakers must consider various policy measures to advance technological capabilities, provide government support to manufacturing businesses and ensure technological advancement.

To conclude, the present study raises concerns about large policy decisions aimed at boosting export performance through a managed floating exchange rate regime. The empirical evidence suggests that a new approach for the export market should focus on technology and product innovations. Maintaining stable Indian export growth over time requires greater effort on the supply side of the manufacturing sector. However, future research should analyze the impact of REER on manufacturing exports using disaggregated data over longer periods. Since the current data lack detailed information on different aspects of technology and related factors, subsequent studies and methodologies should investigate these areas thoroughly. The relevance and accuracy of the findings to current trade dynamics between India and Ethiopia may be limited by the study's timeframe (1994–2015). Some important elements might have been omitted, as the analysis only included time series data from 1994 to 1995 to 2015 to 2016. Data quality issues related to technology and pricing variations could affect the validity and generalizability of the results. Moreover, using OLS regression might oversimplify the dynamics by ignoring endogeneity and potential biases from omitted variables. Future research could expand the geographic scope beyond India and Ethiopia. It is also recommended that this study examine the real exchange rate after the COVID-19 pandemic or compare data from before and after the pandemic to analyze its effects on manufacturing exports.

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