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From concentration to expansion: decoding the export diversification-growth nexus in India

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Abstract

Purpose – This study aims to examine the relationship between export diversification and economic growth by diving into Harmonised System (HS) six-digit level of disaggregation which provides greater details regarding the composition of India's export product mix.

Design/methodology/approach – Using data from 1991 to 2023, the study uses Theil index to measure the magnitude of diversification in export basket and employs an Auto Regressive Distributed Lag (ARDL) model to unveil the long run relationship between export diversification and economic growth in India.

Findings – The results provide evidence that export diversification enhances growth both in the short and long run and also acts as a shield against concentration and induced volatility. Further analysis indicates that both human capital and labour force growths are conducive to economic expansion while inflation and FDI has detrimental effects.

Research limitations/implications – The study period starts in 1991 because data on FDI prior to that period is unavailable as the liberalisation of Indian economy formally initiated in 1990–1991. However, the study also brings out the relevance of export diversification as a source of sustainable economic development and the growth promoting as well as risk mitigating character in the context of India. It also calls for policies to enhance human capital and labour force and the means of combating inflation and to best use FDI for economic growth.

Originality/value – The study contributes to the existing knowledge through various ways: First, unlike previous studies which uses Herfindahl–Hirschman Index (HHI) index which is exposed to various limitations, the present study uses Theil index and considered HS six digit level of product classification to account for greater details while measuring diversification. Second, the long run relationship between economic growth and export diversification is modelled using the Auto Regressive Distributed Lag (ARDL) bounds testing approach and effect of export diversification on economic growth is also moderated controlling various economic growth influencing variables such as, gross capital formation, labour force participation, human capital, FDI and inflationary effect.

Keywords Export diversification, Economic growth, Theil index, India, ARDL bounds test, Vertical diversification

Paper type Research paper

Introduction

The development of every economy passes through a complicated and difficult stage in the early phase of development, involving fundamental and structural changes, followed by a sharp switch from agricultural-based production to industrial and manufacturing ones (Hesse, 2008; Rostow, 1991). In this transitional phase, countries typically reallocate their resources to new "avenues" of growth, and expand the range of export basket from the few products to which they were previously confined (Bonaglia and Fukasaku, 2003). It is also

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known as export diversification. Export diversification is particularly a transition from narrow to a wide range of goods to be exported that, according to Zarach and Parteka (2023), reduces the adverse effects of global market fluctuations and builds up capacities for response to economic shocks. However, it is different from export diversion which refers to a shift in trade patterns due to preferential agreements like South Asian Association for Regional Cooperation (SAARC), Brazil, Russia, India, China and South Africa (BRICS) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) – potentially away from more efficient global partners towards member countries, export diversification involves broadening the range of products or markets to reduce dependency and enhance resilience.

The rationale for export diversification is therefore well supported by theoretical frameworks and empirical evidences. Theoretical perspectives, ranging from classical theories to contemporary growth models, emphasise that export diversification leads to sustainable and inclusive economic growth (Audretsch *et al.*, 2021; Chandra, 2022; Roscoe *et al.*, 2020).

In classical trade theories the focus has been on comparative advantage in a small number of goods, while modern literature has stressed the advantage of diversifying export bases. The endogenous growth theory, especially as advocated by Lucas (1988) and Romer (1990), suggests that investment in human capital, innovation and knowledge spillovers, induce continuous growth, particularly when economies move up the export ladder to more complex and higher value-added export products. In this context, diversification is not only an expression of economic complexity but also a determinant of productivity enhancement.

The product cycle theory, originally developed by Vernon (1966), indicates that countries transition from exporting staple products to high-tech products with the process of development. Applied to India, this would suggest that post-liberalization export growth has advanced by moving away from low skill-intensive exports such say, textiles and raw materials, to more capital and knowledge intensive ones such as pharmaceuticals and IT services. Furthermore, structuralist views, as emanating from Prebisch–Singer theses and latterly development economists, suggest that reliance on a limited number of primary products will be accompanied by falling terms of trade and vulnerability. Diversification of exports is, therefore, a policy instrument to overcome the structural constraints within peripheral economic relations.

In the Indian context, these theories become even more important in the wake of the 1991 economic liberalization which transformed the trade, foreign investment and industrial openness sentiments. India has slowly diversified its export structure during the past thirty years, the extent of diversification and its role in the long-run growth model, however, have been under-researched. The gap that this study fills is the existence of a quantitative analysis of the relationship between vertical export diversification and economic growth based on disaggregated export data. Vertical diversification shows the differences between sectors and captures the range of export growth. In the present study, it is measured by "between" or "extensive" component of the Theil index which shows how diversification drives economic growth by highlighting changes among sectors and the overall level of diversification.

Literature review

Export diversification emerges as a key element in the sustainable development policy in recent decades. Theoretical and empirical evidence indicates that diversification of exports leads to greater economic stability, facilitates structural transformation and promotes long-term growth in Low- and Lower-Middle-Income Countries (Cadot *et al.*, 2011; Imbs and Wacziarg, 2003). Bonaglia and Fukasaku (2003) and Hesse (2008) stress the need to move from an agrarian export base to industrial products as a way to decrease the extent of external

vulnerability. The endogenous growth models (Lucas, 1988; Romer, 1990) emphasise that diversification may promote growth through learning-by-doing, innovation and positive externalities. Also, according to product cycle theory, when diversification occurs into high-technology industries, it implies the economy has advanced through growth and matured structurally (Vernon, 1966). These frameworks are also pertinent to interpreting the export performance of India post opening up of its economy in 1991.

Empirical literature is also aligned with the proposed perspectives, which support theoretical frameworks. Almarhubi (2000) discovered in his study on developing countries that export diversification has a positive impact on economic growth. De Ferranti *et al.* (2002) advanced these insights by showing the dimensions through which diversification stabilises export revenues in Latin American countries. Kali *et al.* (2007) and Mania and Rieber (2019) demonstrate the benefits of resilience vis-à-vis volatility, as well as the mechanisms by which diversified exports contribute to the enhancement of economic resilience by stimulating innovation and growth.

Compared with existing literature, the majority of which used the Herfindahl–Hirschman Index (HHI) Index to measure the level of diversification, there are growing criticisms aimed at its weaknesses. Knott and Pasipanodya (2023) argue that HHI misrepresents diversification in broad ranges of exports due to the prominence of one leading export category. A suggested improvement is the Theil index, which also allows for decomposing the diversification into within-group (intensive) and between-group (extensive) components. Cadot *et al.* (2011) showed how the Theil index has the potential to capture contributions from small export lines and thus offer a more refined view of diversification trends.

Despite this progress, a significant gap in the literature highlighted by Sarin *et al.* (2022) is the failure to combine methodological innovation and region-based investigation. In their systematic review of 88 empirical studies, they confirm that the effects of diversification on growth are positive, while they speak in favour of more context-specific analysis, especially in such large emerging economies as the Indian. Sharma (2015) also adds in this direction by showing that diversification towards manufacturing and service exports matters for India's economic growth, but the use of aggregated data and simple statistical devices reduces the thoroughness of her research.

This present study fills these gaps in three important ways. First, it uses the decomposed Theil index at the HS six-digit level, which allows for a more detailed analysis of vertical (inter-sector) diversification. Second, the study applies the ARDL bounds testing method, which is suitable for macroeconomic time series data with mixed orders of integration. Third, the model includes a wide array of control variables like human capital, FDI, inflation, capital formation, labour force participation, thereby strengthening its analytical validity. Additionally, to account for external shocks, a structural dummy variable is introduced for the post-2009 period, capturing the impact of the global financial crisis on economic growth. Although there is evidence in the literature that export diversification matters for growth, our research further contributes to the discourse in an increasingly disaggregated and methodologically rigorous manner using the case of India that has implications for both policy formulation and academic inquiry.

Methodology

Data

The study is based on annual secondary data collected for a period of 33 years from 1991 to 2023. The study period starts in 1991 because data on FDI prior to that period is unavailable as the liberalisation of Indian economy formally initiated in 1990–1991. All variables in the analysis, except for the Theil Index, have been compiled from the World Development

Indicators and their descriptions are given in Appendix 1 Table A1. This ensures that the data used in the study are reliable and consistent and also suitable for robust econometric analysis.

In assessing the impact of export diversification on economic growth, a number of control variables were taken into consideration based on the existing literature (Awad, 2021; Bal *et al.*, 2016; Eggoh and Khan, 2014; Keji, 2021; Maestas *et al.*, 2023; Yimer, 2023). These are: human capital, foreign direct investment, inflation, labour force participation and gross capital formation. To enhance the methodological precision, brief rationale for selection of these variables and the expected direction of their impact are mentioned. The process of economic growth is greatly determined by capital formation. This variable is justified as it stimulates investment, improves productive capacity and, therefore, promotes long term and sustained economic growth that allows people to become economically empowered. The Labour Force Participation indicates the working age population (and the potential human resource) of an economy. A higher proportion of workers to dependent ratio, as complementing to capital formation, generally elevates labour efficiency, speeding up economic output and growth. This, and rightly so, makes the variable more appropriate to include. Just like Human Capital (which is often manifested by its component of education and health) is instrumental in its improvement of productivity. It is measured in this present study as the percentage of the population of 12 years of schooling. A workforce that has been educated will generally lead to better growth through their greater participation in research and development, or their greater ability to adopt new technologies. Foreign Direct Investment (FDI) serves as another critical determinant of growth. While, on the one hand, it brings in new age technologies, management expertise, additional capital to aid industrial growth and create jobs, on the other hand, it can shift out indigenous firms, forcing them to repatriate profits and resulting in environmental degradation. Due to its dual impact, it becomes essential to include it in the analysis of the growth performance of India. Finally, inflation is another important variable that has a direct impact on purchasing power and how businesses make decisions. However, while moderate inflation helps promote demand pull and cost push inflation, increases expenditure and investment to facilitate growth, high or volatile inflation leads to economic instability and discourage long run investment. Thus, by introducing the variable that depicts inflation into the analytical model, impact of the inflation on the economic environment and its growth are examined.

Measuring export diversification by Theil index

The present study uses Theil index to measure export diversification in India by considering all Harmonised System (HS) [1] chapters at the six-digit level of disaggregation. This type of analysis provides a disaggregated view of export diversification that is needed to better understand export flows. Although the Theil index has many desirable properties compared with conventional measures like the Herfindahl–Hirschman Index (HHI), it is not free from drawbacks. Egghe and Rousseau (1991) suggest that the Theil index, along with other entropy-based indices, may not portray the degree of distributional inequality comprehensively in all situations, especially when very skewed resultant distributions are present or outliers of export categories exist. They suggest that the coefficient of variation may be more sensitive to such effects. However, the Theil index is still appropriate for the present study due to its additivity, which permits decomposition of export diversification in within-group (intensive) and between-group (extensive) components. This allows a finer grain perspective of the patterns with which diversification grows across and within export categories, yielding deeper insight into export structural dynamics.

Theil index is particularly useful in this context as it is additively decomposable and satisfies several desirable criteria as a measure of inequality, or specialisation in the present

case, including mean independence, population-size independence and its compliance with the Pigou–Dalton transfer principle [2] which represents the redistributional property whereby the index decreases if export volume is redistributed from a higher-concentration category to a lower-concentration, without reversing their relative ranks (Theil, 1972; Xu, 2020). In the Harmonised System (HS), the exported goods are grouped into mutually exclusive and collectively exhaustive HS chapters or sectors. Following the definitions and methods used by Cadot *et al.* (2011) and Zhang *et al.* (2023), the study calculates the overall, intensive (within component) and extensive (between component) Theil indices. The Theil index estimates the dispersion of export shares in terms of products in the total exports (Theil, 1972). It is given by the following formula:

$$T = \frac{1}{n}\sum_{k=1}^{n}\frac{x_k}{\mu}\ln\left(\frac{x_k}{\mu}\right), \qquad where\ \ \mu = \frac{1}{n}\sum_{k=1}^{n} x_k \tag{1}$$

where n is the number of export lines or HS chapters and x_k stands for export value of product k. The index is directly proportional to the degree of concentration and inversely proportional to the level of diversification (Mania and Rieber, 2019). Generally, the value of Theil index ranges from zero to infinity. More specifically, a relatively high value of the index signifies a greater concentration while a lower level of the index reveals a diversified basket of exports. Theil index T (total Theil) can be decomposed into intensive margin (within-group) and extensive margin (between-group) components which represents horizontal and vertical specialisation, respectively. The between-group component (T^b) of the Theil index measures the inequality due to differences in the value of mean export of each HS chapter. In this regard, T^b denotes the inequality that characterises the variation in the average export volume of the different HS chapter. The within-group component T^w or intensive Theil, on the other hand, captures the inequality within each chapter:

$$T = T^b + T^w \tag{2}$$

The extensive Theil T^b is calculated for each year by the following formula:

$$T^b = \sum_{j=0}^{1}\frac{n_j}{n}\frac{\mu_j}{\mu}\ln\left(\frac{\mu_j}{\mu}\right) \tag{3}$$

Similarly, intensive Theil is estimated using the following:

$$T^w = \sum_{j=0}^{1}\frac{n_j}{n}\frac{\mu_j}{\mu}\left[\frac{1}{n}\sum_{k\in j}\frac{x_k}{\mu_j}ln\left(\frac{x_k}{\mu_j}\right)\right] \tag{4}$$

where, group one $(j = 1)$ corresponds to active export lines and the group zero $(j = 0)$ are inactive lines of export, n_j is the total number of products in each group j or HS chapter, μ_j is the mean value of exports in each group and $\frac{\mu_j}{\mu}$ is the relative mean of exports in each group.

The Theil index compares the share of exports in each HS chapter relative to the total exports, revealing the magnitude of concentration or dispersion across export categories. Thus, the between-component of the Theil index measures India's overall export diversification by quantifying the inequality in export distribution across various HS chapters. Furthermore, it is sensitive to changes in export volumes and can capture shifts in export diversification patterns over time. Therefore, the extensive margin of the Theil index has been chosen in the present study as a measure of export diversification. A higher value of

"between theil" component signifies greater concentration and vice versa. Year wise estimates of "between-theil" are presented in Appendix 2 Table A2.

Empirical analysis

Table 1 presents the results of unit root tests using two methods, namely, Augmented Dickey–Fuller (ADF) test and Phillips–Perron (PP) tests. The presence of stationarity is important in any time series analysis as non-stationary variables indicate that their mean and variance change over time and any analysis based on these variables can produce spurious and biased results (Phillips, 1986). The test results show that GDP per capita is non-stationary at the level as the *p*-values for both the ADF and PP tests are greater than 0.05. However, *p*-values below 0.01 indicate that the variable becomes stationary after taking first difference. The Theil index, which is representative of export diversification, is found to be stationary at the level. The *p*-values for both the ADF and PP tests are below 0.05 demonstrating the stationary nature of that variable. Similarly, Labour Force Participation Rate (LFPR) is found to be stationary at the level. Moreover, Investment, Human Capital, Inflation and FDI are found to be non-stationary at the level with *p*-values exceeding 0.05 according to both the ADF and PP tests. However, like GDP per capita, all these variables become stationary when they are first differenced, as indicated by *p*-values below the 0.01 level. In summary, the unit root test results unveil that while GDP per capita, Gross Capital Formation (GCF), Human Capital and FDI are non-stationary at the level, they become stationary after taking first differencing, making them I(1) variables. The Theil Index, on the other hand, is stationary at the level, indicating that its mean and variance do not change over time.

Testing for co-integration

Given the mixed order of integration of the variables – where some variables are integrated of order one, I(1), while others are stationary at level, I(0), the next step in the analysis is to test for cointegration. Cointegration testing is crucial as it helps in determining whether there exists a long-run equilibrium relationship between export diversification and economic growth which is the primary objective of the present study. The Auto Regressive Distributed Lag (ARDL) bounds testing approach, developed by Pesaran *et al.* (2001), is particularly appropriate for this purpose. The characteristics of the ARDL make it suitable for the present study since the variables in the model include I(0) and I(1) order compared to cointegration techniques that can only involve variables of same order. The ARDL bound testing method involves the estimation of the conditional error correction model (ECM) and testing the

Table 1. Unit root test result

	ADF statistic (*p*-value)		PP statistic (*p*-value)	
Variable	At level	1st difference	At level	1st difference
GDP per capita	−2.67 (0.26)	−5.23 (0.00)***	−2.70 (0.24)	−5.84 (0.00)***
Theil index	−0.82 (0.35)	−4.15 (0.00)***	−1.61 (1.00)	−8.74 (0.00)***
Gross capital formation (GCF)	−0.21 (0.74)	−8.08 (0.00)***	−0.39 (0.79)	−7.82 (0.00)***
Inflation	−3.28 (0.02)**	–	−3.25 (0.03)**	–
Labour force participation rate	2.65 (0.27)	5.85 (0.00)***	2.68 (0.28)	5.69 (0.00)***
Human capital	3.48 (0.99)	−3.82 (0.00)***	−3.84 (0.57)	−3.81 (0.00)***
FDI	−0.94 (0.30)	−6.46 (0.00)***	−0.86 (0.34)	−6.73 (0.00)***

Note(s): *** and ** represent significance at the 1 and 5% levels, respectively
Source(s): Computed by authors' using Eviews 10 software

significance of the lagged level variables. When the computed F-statistic from the bounds test exceeds the upper critical value, it implies the presence of cointegration meaning a long-run relationship between the variables. On the contrary, if the F-statistic value is below the lower critical value, the null hypothesis of no cointegration cannot be rejected which further indicates the absence of cointegration. However, if the F-statistic falls in between the lower and upper bound, then no definite conclusion can be made as to the presence of cointegration out of the data. In the study, the ARDL bounds test is applied to examine whether the export diversification, economic growth, investment, human capital, inflation, labour force participation rate and FDI are cointegrated. Establishing cointegration among these variables suggests that they move parallelly in the long run with little deviations from the equilibrium temporarily. This further validates the hypothesis that export diversification has an endured impact on economic growth as demonstrated by the long-run relationship. Therefore, the specification of the model as an ARDL provides, for analysis, not only the Short-run dynamic relationship by including the lagged variables but also identifies the long-run static relationship between the export diversification and economic growth in India. The ARDL framework are presented in equation (5):

$$\begin{aligned}\Delta lnEG = {} & \beta_0 + \sum_{i=1}^{p}\beta_1\Delta \ln \mathrm{EG}_{t-i} + \sum_{i=1}^{p}\beta_2\Delta \mathrm{TI}_{t-i} + \sum_{i=1}^{p}\beta_3\Delta \mathrm{GCF}_{t-i} + \sum_{i=1}^{p}\beta_4\Delta \mathrm{LFPR}_{t-i} \\ & + \sum_{i=1}^{p}\beta_5\Delta \mathrm{Infla}_{t-i} + \sum_{i=1}^{p}\beta_6\Delta \mathrm{FDI}_{t-i} + \sum_{i=1}^{p}\beta_7\Delta \mathrm{HC}_{t-i} + \gamma_1 \mathrm{EG}_{t-1} + \gamma_2 \mathrm{TI}_{t-1} \\ & + \gamma_3 \mathrm{GCF}_{t-1} + \gamma_4 \mathrm{LFPR}_{t-1} + \gamma_5 \mathrm{Infla}_{t-1} + \gamma_6 \mathrm{FDI}_{t-1} + \gamma_7 \mathrm{HC}_{t-1} + \epsilon_i\end{aligned} \tag{5}$$

The lag length for the ARDL(p) model was determined based on the Akaike Information Criterion (AIC), because AIC proved to be superior to other information criteria as shown in the Monte Carlo experiment by Liew (2006), particularly when the time period under consideration is less than 60 observations. To examine the presence of a long-run relationship, the ARDL Bound Test was performed. The results of the test are presented in Table 2. The calculated F-statistics of the cointegration test are reported along with the corresponding critical values.

Table 2 presents the result of ARDL bound test. The calculated F-statistic for the Theil Index is 17.83 which is more than the upper bound critical value at the five percent level of significance. Therefore, the null hypothesis of no cointegration is rejected, demonstrating the presence of long-run cointegrating relationships among the variables in the model. In the next step, the result of ARDL estimation of long run coefficients is reported in Table 3.

Insights from long run and error correction model

The estimated ARDL model explores the relationship between per capita GDP and several key economic variables, with a particular focus on the Theil index, representing export

Table 2. Bounds tests for the existence of a long-run relationship

			5% critical values	
Dependent variable	Calculated F-statistic	I (0)	I (1)	Conclusion
Theil index	17.83	3.15	4.11	Co-integrated

Source(s): Computed by the authors

Table 3. Result of long run model

Variable	GDP per capita
Theil index	−15.19 (4.97)***
GCF	0.01 (2.50)**
Inflation	−0.01 (3.71)***
LFPR	0.03 (5.26)***
Human capital	0.01 (4.58)***
FDI	−0.04 (−3.41)***
Year > 2009	−0.10 (−2.76)**

Note(s): *** and ** represent 1 and 5% level of significance respectively
Source(s): Computed by the authors' using Eviews 10 software

diversification. While the long run results is presented in Table 3, the result of error correction model is outlined in Table 4. The results indicate that in both the short and long run, export diversification significantly influences per capita GDP. Specifically, in the long run, the Theil index has a strong negative impact on GDP, suggesting that increased export diversification (a lower Theil index) is associated with higher economic growth. This result is consistent with the findings of Clerides *et al.* (1998), Clerides *et al.* (1998) and Hausmann *et al.* (2007), who revealed that having a variety of export portfolios helps mitigate economic recessions and increases growth by ensuring steady inflow of income and building defences against external shocks.

In the long-run, various factors have profound impact on per capita GDP. The impact of Gross Capital Formation has been found to be positive, implying that increased investments in fixed assets ranging from transportation network, machinery and information technology, enhances the capacity of production, leading to economic development. This finding corresponds to the growth theory propounded by Solow (1956), who postulated that investment in capital is the most important determinant of economic growth. The Labour Force Participation Rate (LFPR) has also been found to have a positive impact on GDP which signifies that a larger working age population leads to more productive individuals

Table 4. Error correction result

Variable	ARDL (1,5)
ΔTheil index	3.66 (5.18)***
GCF	0.01 (4.73)**
Inflation	−0.01 (−3.94)***
LFPR	0.03 (5.77)***
Human capital (proxied by secondary enrollment)	0.01 (6.23)***
FDI_netinflows	−0.04 (−3.69)***
Year > 2009	−0.08 (−2.93)***
ECT_{t-1}	−0.33 (−6.33)***
Adjusted R^2	0.73
F	17.83***
J-B (normality)	0.90
χ^2 (heteroscedasticity)	0.64

Note(s): *** and ** represent 1 and 5% level of significance respectively
Source(s): Computed by the authors' using Eviews 10 software

resulting in higher output. Similarly, Human Capital has also been found to contribute positively to long term economic growth by improving the quality of population. These findings are backed by Lucas (1988) and Mankiw *et al*. (1992), who argued that education enhances productivity in a society and recommended human capital as a key pathway to growth. Foreign Direct Investment (FDI), in contrast, has been found to be associated with lower levels of GDP in the long-run. This can be attributed to factors such as profit transfers, excessive reliance on foreign funds as highlighted by Carkovic and Levine (2002). The study has also identified a significant negative relationship between Inflation and GDP which implies that higher inflation levels are adversarial to growth; perhaps when purchasing power is reduced due to higher inflation, more uncertainty is created and investment is discouraged. Azam and Khan (2022) identified threshold levels where growth is negatively affected as long as inflation remains above 12.23% for developing economies and 5.36% for the developed economies and advised the authorities to target these ranges to achieve growth stability. This finding again emphasises the importance of price stability to stimulate a conducive environment for growth in the economy. The Year Indicator post 2009 reveals that capital accumulation has not positively contributed to GDP growth which can be attributed to the changes or shifts in the global environment or internal corporate governance systems. In the case of India, it may simply be because of the global financial crisis of 2008, followed by ill-conceived policies of economic growth. This corroborates Rodrik (1999), who argued that instability in the internal policy and exposure to global markets can sometimes be detrimental.

The estimates of the short run error correction model is shown in Table 4. The resulting ARDL model shows how the different variables react in the short-run to affect per capita GDP.

The Theil index (export diversification) shows both positive and negative effects depending on the lag, indicating that recent changes in export diversification can either boost or hinder economic growth, reflecting the dynamic adjustment process of an economy to changes in its export structure. This corresponds with Hausmann and Rodrik (2003), who pointed out that diversification can only be good when it is considered in the longer run and not in the short run.

Gross Capital Formation (GCF) also promotes economic growth in the short run. This is consistent with the findings of Khanna and Sharma (2021), who argue that capital goods investments in minerals, machinery, infrastructure and other such technologies stimulate economic activity and corresponding productivity. The positive coefficients of the Labour Force Participation Rate (LFPR) and Human Capital (proxied by secondary enrollment) also indicate that human resources play an essential role in stimulating economic growth. Higher LFPR stands for a more active workforce, and greater secondary enrollment signals better human resources, which all means more productivity and more growth.

In line with the long run, inflation was also seen to inhibit growth in the short run, probably due to decreased purchasing power and reduced incentive to invest. On the other hand, Foreign Direct Investment (FDI) shows a negative impact on growth in the short run. This may be attributed to outflows associated with FDI, such as profit repatriation, which might temporarily shrink domestic economic output. Consistent with the long-term results, structural changes post-2009, due to the worldwide economic meltdown, also negatively affect the growth of the Indian economy in the short term.

The negative and statistically significant error correction term (ECT_{t-1}) implies that there is a relatively strong and quick adjustment mechanism which ensures that the economy remains in equilibrium in the long run after suffering shocks in the short run. A high adjusted R^2 value of 0.73 and a significant F-statistic, indicate how well the current study explains the

underlying economic dynamics. Moreover, diagnostic tests indicate that the model follows normality, with the residuals showing a normal distribution (J-B test value = 0.90) and no signs of heteroscedasticity (χ^2 = 0.64). These results confirm the model's specification and emphasise the need to consider export diversification, human capital factors and other economic variables to boost short-term economic growth in India.

Conclusion

The study explored the relationship between export diversification and growth in the case of India for the period 1991–2023. The empirical analysis demonstrated that a decrease in export concentration and an increased variety of exported products play an important role in stabilising the economy and promoting sustainable growth in the long run. Therefore, export diversification and, in particular, vertical diversification at the level of product categories are an important mechanism for structural change and providing resilience to external economic shocks. Error correction model further reveals that along with long run relationship, export diversification is also favourable for economic growth in the short run. However, the mechanisms and pathways through which these effects occur in both periods differs. While the short-term effects may be driven by factors such as increased trade volumes and foreign exchange earnings, the long-term effects are likely to be linked to structural transformations like technological advancement and industry upgrading. Additionally, the empirical analysis also found that gross capital formation, labour force participation rate and human capital have positive effect on GDP which signifies more attention should be given to the development in infrastructure, human capital and skill development. In contrast, inflation and foreign direct investment exhibit negative effects, pointing to the need for carefully balanced economic policies.

However, it should be noted that, in addition to diversification at the product level, geographical diversification is important. Diversifying India's trade in terms of destinations may help reduce dependence on specific trading partners and protect against risks associating with region-specific fluctuations or geopolitical disruptions. For instance, the diversification of Chinese exports during trade tensions with the USA showed the potential of this approach. Unfortunately, it was not possible to analyse the spatial dimension of Indian exports in this study due to data limitations. Therefore, further research could focus on how the mixture of India's trading partners has changed over the years and how it interacts with product diversification. Hence, while export diversification remains a promising tool for stabilising India's economy, implementing diversification will require additional effort.

Based on the research findings, several policy recommendations emerge to support economic growth through export diversification in India. The strong long-run and short-run relationship between export diversification and economic growth, as shown by the Theil index, suggests that trade policy should prioritise expanding the variety and complexity of export products. This can be achieved by promoting high-tech and value-added industries through fiscal incentives, targeted subsidies and enhanced support for micro, small and medium enterprises (MSMEs) to integrate them into global value chains. Additionally, strengthening human capital is vital, as it significantly contributes to economic growth. Increased investment in higher education, vocational training and Science, Technology, Engineering and Mathematics (STEM) disciplines, especially those aligned with export-oriented sectors, would improve the skill base required for diversified growth.

The positive impact of the labour force on growth highlights the need for inclusive labour policies that encourage greater participation, especially among women, youth and rural populations. Policies that formalise informal employment and expand social protection can

help harness the full potential of the labour market. On the other hand, the study finds that Foreign Direct Investment (FDI) currently has a negative impact on growth, likely due to limited domestic linkages or crowding-out effects. To address this, FDI policies should be reoriented to favour sectors that contribute to vertical diversification and technology transfer, with performance-linked conditions such as local sourcing and skills development.

Inflation, which negatively affects growth in the model, needs to be managed through sound macroeconomic policies. Maintaining price stability by using appropriate monetary tools, rationalising public spending and improving supply chains can help preserve export competitiveness. Furthermore, capital formation, though not the central focus of the study, remains a critical enabler of growth. Public investment in infrastructure, logistics and industrial corridors should be enhanced, along with incentives to stimulate private investment in under-diversified sectors. Finally, export diversification also serves as a buffer against external shocks, making institutional support crucial. Strengthening export promotion agencies, expanding credit insurance and improving market intelligence services can help Indian exporters explore new opportunities and mitigate global risks. These integrated policy measures, rooted in empirical evidence, can significantly enhance India's economic growth through a more diversified and resilient export sector.

Limitations and future research opportunities

Although the study offers valuable insights on the linkage between export diversification and India's economic growth, there are a number of limitations that need to be acknowledged. First, the analysis is based on product-level export diversification, without considering or factoring in regional or geographical (market-based) diversification, which may also affect a country's susceptibility to global demand shocks and regional economic collapses. Future research ought to integrate both dimensions to provide a more comprehensive view of export-led growth process.

Second, while the model includes meaningful macroeconomic determinants of growth (gross capital formation, labour force, inflation, foreign direct investment and human capital), there are other important variables that have not been included due to either data limitations or to issues of parsimony in the estimated model. For instance, determinants such as political stability, technological change and good governance can likewise influence growth trajectories as well as the effectiveness of export diversification strategies. Studies such as McKinsey Global Institute (2025) and Sarin *et al.* (2022) have highlighted the importance of these factors in sustaining high growth momentum in the Indian context.

Finally, the ARDL bounds testing method, which is appropriate to handle mixed order of integration but its ability to detect possible non-linearities/threshold effect in the export-growth nexus is questionable.

This provides ample opportunities for future empirical work, especially using panel data, non-linear models or including institutional and global variables to consider the complex nature of export-led growth in the emerging economies including India.

Notes

[1.] The Harmonised System (HS) is an internationally standardised classification system that categorises traded goods into some categories. It allows countries to uniformly classify products at various levels of disaggregation, such as the two-digit, four-digit or six-digit level. This

system facilitates comparing and analysing of global trade by providing a common language for identifying and categorising goods across all countries.

[2.] The Pigou–Dalton Transfer Principle, in the meaning of its inception, states that redistribution of income or resources from a richer people to a poorer one without reversing their relative economic positions will lead to a reduction in overall inequality. However, in terms of present paper, it demonstrates that if export volume from the more concentrated export sector is reallocated to lesser volume sector, the overall specialisation reduces and diversification emerges.

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Appendix 1

Table A1. Description of the variable

Variables	Description	Source
GDP per capita	The annual growth rate of GDP per capita, measured in constant 2015 US dollars	World development indicator (WDI)
Theil index	A measure of export diversification that quantifies the inequality in the values of export distribution across sectors	Computed by authors following the methodology of Cadot *et al.* (2011) and Zhang *et al.* (2023) from the data collected from UN-Comtrade
Gross capital formation (GCF)	The annual growth rate of gross fixed capital formation, which includes land improvements, plant, machinery and equipment purchases, measured in constant 2015 US dollars	World development indicator (WDI)
Inflation	The annual percentage change in the consumer price index (CPI) as a measure of inflation	World development indicator (WDI)
Labour force participation rate	The percentage of the working-age population that is either used or actively looking for work	World development indicator (WDI)
Human capital	The educational attainment of the population measured by the percentage of population with 12 and above years of schooling	World development indicator (WDI)
FDI	The net inflows of foreign direct investment as a percentage of GDP, reflecting the investment	World development indicator (WDI)

Source(s): Authors' own work

Appendix 2

Table A2. Year wise value of export concentration in India

Year	Between Theil
1991	0.087
1992	0.059
1993	0.070
1994	0.045
1995	0.068
1996	0.070
1997	0.066
1998	0.061
1999	0.078
2000	0.097
2001	0.092
2002	0.082
2003	0.078
2004	0.074
2005	0.080
2006	0.071
2007	0.070
2008	0.065
2009	0.057
2010	0.045
2011	0.049
2012	0.066
2013	0.063
2014	0.056
2015	0.050
2016	0.043
2017	0.051
2018	0.048
2019	0.042
2020	0.041
2021	0.048
2022	0.044
2023	0.042

Source(s): Computed by the authors' using data from UN-Comtrade

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