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RESEARCH PAPER

Unlocking Dairy Export Potential: An Elasticity-Based Study of India's Trade with Asia

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ABSTRACT

This study evaluates India's dairy export potential and performance in Asian markets from 2000 to 2022 using HS 4/6-digit level data sourced from UNCOMTRADE. The analysis highlights India's export portfolio has evolved with a stable core of 'Regular Products' complemented by emerging 'New Products', indicating diversification. Traditional markets in South Asia and the Gulf remain critical, but performance in Central and Eastern Asia underscores the need for a targeted and sustained trade strategy. Export elasticity estimated from a double-log econometric model reveal Butteroil (HS-040590), Unprocessed Cheese (HS-040690), and Casein (HS-350110) as high-potential products due to significant and positive import elasticity. However, price competitiveness is critical for Butter (HS-040510) and Casein (HS-350110), as these products exhibited negative and significant relative price elasticity in several destinations. Notably, markets with the highest export potential for India include Malaysia, Qatar, and the United Arab Emirates (UAE). To reduce dependence on existing markets and avoid over-reliance on a few key countries, India may prioritize diversification and address challenges in Central and Eastern Asia, leveraging untapped opportunities to enhance its export footprint.

HIGHLIGHTS

- India's dairy exports consist of a consistent core of "Regular Products", supplemented by "New Products", reflecting diversification and growth.
- Butteroil (HS-040590), Unprocessed Cheese (HS-040690), and Casein (HS-350110) demonstrated high import elasticity, while Butter (HS-040510) and Casein (HS-350110) exhibited significant negative price elasticity in several markets.
- Malaysia, Saudi Arabia, Qatar, and the UAE emerged as key destinations with substantial export potential for Indian dairy products.

Keywords: Export potential, Import demand elasticity, Relative price elasticity, Double log model

India, the world's largest producer of milk, has yet to emerge as a significant player in the global dairy trade. While the country's dairy sector has traditionally been driven by domestic consumption, its export footprint, particularly in Asian markets, has shown consistent growth. These markets, marked by diverse consumer preferences, rising incomes, and increasing dairy demand, offer immense potential for India to broaden its export portfolio. However, India's share in global dairy exports remains at a modest 0.6 percent in value terms, significantly trailing major exporters like New Zealand (11.7%), Germany (11.6%), the Netherlands (11.1%), France (7.2%), and the USA (6.9%) (I.T.C, 2022). Despite this disparity, India is well-positioned for growth, with global dairy demand projected to rise and production in leading

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exporting nations likely to stagnate (Joshi, 2014). Notably, India's milk production is growing at over 6 percent annually compared to the global average of 2 percent (PIB, 2024), and by 2030, the country is expected to account for 30 percent of global milk production, producing one-third of the world's supply (Shah, 2024).

Over the years, India has built a reputation as a reliable supplier of dairy products such as Unconcentrated Milk and Cream (HS-0401), Butter and other fats/oils (HS-0405), and Cheese and Curd (HS-0406), with traditional markets in South Asia and the Gulf providing a stable base for its exports. However, the dynamic nature of global trade calls for a more in-depth exploration of export potential, extending beyond existing markets to untapped opportunities. This need is reinforced by the strategic priorities outlined in India's Agri Export Policy (2018), which emphasizes value addition, market diversification, and targeting high-potential regions such as Asia. Furthermore, the recent G20 trade and investment agenda has underscored the importance of resilient agri-food supply chains, regional integration, and competitive market positioning factors directly relevant to India's dairy export strategy.

Identifying high-potential products and analyzing their responsiveness to market conditions through export elasticities can yield actionable insights to enhance India's competitiveness and diversify its market presence (Steenkamp and Hofstede, 2002). Export potential analysis plays a pivotal role in evaluating India's ability to expand its trade volume while reducing dependence on a few key countries—a critical factor for achieving sustainable growth in a highly competitive global dairy market.

This study investigates diversification of India's dairy product portfolio, and geographical outreach. Using a double-log econometric model to estimate export elasticities, it identifies key products and high-potential destination markets. Furthermore, it highlights challenges related to price competitiveness and underscores the need for targeted strategies to strengthen India's position in emerging markets in Asian countries. By providing a comprehensive assessment of India's export potential, the research aims to offer valuable guidance for policymakers and stakeholders to drive sustainable growth in the Asian dairy market.

MATERIALS AND METHODS

The present study is based on secondary data collected from the United Nations Commodity Trade Statistics (UN-COMTRADE) database for 46 Asian countries to which India exported dairy products classified under the Harmonized System (HS) codes (HS-0401, HS-0402, HS-0403, HS-0404, HS-0405, HS-0406, HS-3501, HS-1702) from 2000 to 2022.

Different Asian markets were classified based on defined criteria to determine whether India has successfully penetrated new markets while maintaining its presence in existing ones or has lost markets due to high competition or other factors. Asian markets for Indian dairy exports were classified based on the frequency of exports across four sub-periods (2000-05, 2006-11, 2012-17, and 2018-22), using criteria outlined by Hazra and Sirohi (2007). The classification identified "Incessant Markets" as those where India exported dairy products for at least three years in all four phases, indicating consistent trade. "Erratic Markets" reflected sporadic exports across different phases, showing volatility. "New Markets" were defined as those where India began exporting for at least two years in the later phases, indicating recent market penetration. "Emerging Markets" referred to countries where exports occurred only in the most recent phase, signaling new opportunities. Lastly, "Dropped Markets" were those where India exported in the first three phases but ceased exports during the final phase, suggesting a loss of market presence due to competition or other factors.

Dairy products exported by India were categorized to track changes in the export portfolio and identify which products were added or removed over time. Based on the criteria by Hazra and Sirohi (2007), each dairy product exported at the HS-6 digit level was assessed across four sub-periods (2000-05, 2006-11, 2012-17, and 2018-22). The products were classified into four categories: "Regular Products" were those exported for at least three years in all four phases, indicating stable demand; "New Products" were those exported for at least two years in the later phases, reflecting recent additions; "Emerging Products" were exported only in the last phase, representing new opportunities; and "Occasional Products" were those that did not meet

the conditions of the other categories, indicating irregular exports.

Thus, these categories for both products and markets are mutually exclusive and exhaustive. Every country and product involved in India's trade relations during the study period was classified into one of these categories.

Estimation of export elasticities

Panel data was used to estimate the import demand elasticity and relative price elasticity of Indian dairy exports to major Asian countries. Import demand elasticity and relative price elasticity were calculated for the major dairy products exported by India to the top 10 destinations in Asia. Import demand elasticity is defined as the percentage change in export resulting from a percentage change in import demand. It shows how sensitive the exports are to the changes in the demand for imports in the destination country. Relative price elasticity refers to the percentage change in export due to a percentage change in the relative price ratio. It indicates how changes in the relative price of the Indian exports (compared to the rest of the world) affect the exports.

The elasticity was estimated using the following double-log econometric model (Mehta and Mathur, 2003).

$$\ln X_{cit} = \alpha + \alpha_{1i} \ln M_{cit} + \alpha_{2i} \ln \left(\frac{UVIX_{cit}}{UVICC_{cit}} \right) + \varepsilon_{it}$$

Where,

X_{cit} = The export of commodity i from India to the C^{th} country during the year t.

M_{cit} = The aggregate demand for imports of commodity i by country C in the year t, represented by the total import value in dollars.

$UVIX_{cit}$ = Unit Value Index pertaining to India's exports of product i to the C^{th} country for the year t.

$UVICC_{cit}$ = Unit Value Index for commodity i pertaining to the imports of C^{th} country from globally competitive nations, excluding India, during the year t.

α_{1i}, α_{2i} = Import demand and Relative price elasticity respectively

C = Destination country viz. Bangladesh, United Arab Emirates etc

i = Selected dairy product at HS-6 digit level *viz.* HS-040110, 040120 ,…, HS-170210

t = Time period, 2000, 2001, …, 2022

India's export value (in US$) to a specific country for a particular commodity was used as the dependent variable. Total import demand and relative price ratio were selected as the two independent variables. The total import demand of a given country serves as a proxy of its total income level. This variable was derived by taking the value of the total imports of the C^{th} nation from all countries (including India) for a specific product in a particular year, measured in US$. A positive coefficient is expected for this variable. The relative price ratio measures the competitiveness of India's exports to selected Asian countries compared to other competing countries. Unit values were used as a proxy for prices, incorporating elements of export subsidies and taxes for both the unit value indices. The unit value index was constructed using Laspeyres' index with 2018 as the base year. This choice was made for two reasons: first, 2018 marks the beginning of the final subperiod (2018–22) used for selecting countries and commodities; second, it was a normal year during which India consistently exported a majority of its dairy products, thereby minimizing the risk of missing data. A similar method was used to construct the unit value index for C^{th} country's import from competing countries ($UVICC_{cit}$). Thus, the relative price ratio is the ratio of the unit value index of India's exports to C^{th} country ($UVIX_{cit}$) to unit value index of C^{th} country's imports from other competing countries ($UVICC_{cit}$) for each commodity i in period t. Both the dependent variable (India's exports) and the independent variable (total import demand) were adjusted for constant prices, as elasticity estimates based on constant prices yielded more reliable results than those based on current prices.

Panel data was employed in the model owing to its advantages relative to time series data and cross-sectional, particularly in addressing individual heterogeneity. By utilizing a panel data framework, the efficiency of econometric estimates is enhanced as it diminishes collinearity among independent variables, resulting in a greater degree of freedom

(Sultan & Munir, 2015). In addition, panel data provides insights into the significant relationships among variables as they evolve over time. (Kumar & Ahmed, 2015). The estimation of this model can be approached through three fundamental frameworks: Pooled Regression, Fixed Effects, and Random Effects. Based on model selection criteria, Pooled OLS was found to be the most suitable and was subsequently applied for the analysis. Additionally, the Ramsey RESET test was conducted for model specification. The null hypothesis (H_0) of no omitted variables was not rejected, indicating that the model is correctly specified.

RESULTS AND DISCUSSION

Classification of dairy products and export markets

Indian dairy exports to Asia were categorized into five market types based on export frequency across four sub-periods: 2000-05, 2006-11, 2012-17, and 2018-22 (Table 1). Of the 46 countries, 31 were classified as 'Incessant Markets', indicating consistent exports, while Brunei, Vietnam, and others were labeled 'Erratic Markets' due to sporadic trade patterns. India expanded into 'New Markets' like Iraq and Turkmenistan, signaling efforts to diversify beyond traditional South Asian and Gulf markets. Armenia and Tajikistan were classified as 'Emerging Markets', reflecting recent entry and showing India's strategic push to enter Western Asia and Central Asia, where its previous export performance was limited. while North Korea and Kyrgyzstan were 'Dropped Markets'. India ceased its dairy exports to these countries in the last sub-period (2018-22) after declining trends in the preceding period. This decline is concerning, especially in the context of Eastern Asia, where India maintains a significant export presence in countries like Japan, South Korea, and, to some extent, China. The 'drop of North Korea as an export destination' may indicate an over-reliance on a few key markets. Kyrgyzstan's classification as a 'Dropped Market' further highlights the challenges India faces in establishing a solid and lasting presence in Central Asia. India's traditional dairy export markets in South Asia and the Gulf remain stable, but the country's performance in Central and Eastern Asia reveals the need for a more focused and sustained trade strategy. To mitigate over-reliance on a few key markets, India must diversify its export base, particularly by overcoming challenges and leveraging opportunities in these emerging regions. By enhancing efforts to penetrate and establish long-term trade relations in Central and Eastern Asia, India can achieve greater export resilience and reduce the risks associated with its current market situation.

Table 1: Classification of India's export markets in Asia

Nature of markets	Countries
Incessant Market	Afghanistan, Bahrain, Bangladesh, Bhutan, China, China (Hong Kong SAR), Indonesia, Iran, Israel, Japan, Jordan, Kuwait, Lebanon, Malaysia, Maldives, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Republic of Korea (South), Sri Lanka, Syria, Thailand, Türkiye, UAE, Uzbekistan, Yemen
Erratic Market	Brunei, Cambodia, China (Macao SAR), Cyprus, Georgia, Kazakhstan, Vietnam
New Market	Azerbaijan, Iraq, Mongolia, Turkmenistan
Emerging Market	Armenia, Tajikistan
Dropped Market	Democratic People's Republic of Korea, Kyrgyzstan

The classification of dairy products exported from India to Asian markets was divided into four distinct categories—Regular, New, Emerging, and Occasional products—based on their export frequency across four sub-periods: 2000-05, 2006-11, 2012-17, and 2018-22 presented in Table 2. Of the 25 products analyzed, 20 were identified as 'Regular Products', meaning they were exported to various Asian countries for at least three years in each of the four phases. These products represent the core items that India has consistently exported from the early days of its export activities to the present. In contrast, Cream with a fat content of 6-10 percent (HS-040140), Cream with a fat content exceeding 10 percent (HS-040150), and Yoghurt (HS-040310) were categorized as 'New Products', indicating that these items have been added to India's export basket in more recent years, with exports recorded for at least two years in the later phases. Notably,

no products were classified as 'Emerging Products', which would have included items exported only in the most recent phase (2018-22). Lastly, Milk and cream, not concentrated or sweetened, fat content, by weight >6 percent (HS-040130), and Blue-veined cheese (HS-040640) were classified as 'Occasional Products', reflecting their unidentified export patterns, as these items do not fit into any of the other three categories. So, India's dairy export portfolio has evolved, with a core set of 'Regular Products' consistently driving exports, while recent additions like 'New Products' signal diversification.

Table 2: Classification of Indian dairy products exported to Asia

Nature of products	HS codes of products
Regular Products	040110, 040120, 040210, 040221, 040229, 040291, 040299, 040390, 040410, 040490, 040510, 040520, 040590, 040610, 040620, 040630, 040690,350110,350190, 170211
New Products	040140, 040150, 040310
Emerging Products	—
Occasional Products	040130, 040640

Elasticity of Indian dairy exports to major Asian destinations

The competitiveness, export potential, and strategic positioning of any product are predominantly influenced by two key factors: the size of the export market and the price competitiveness of the product. To evaluate the potential of Indian dairy products across various Asian markets, import demand elasticity (reflecting the market size) and relative price elasticity (indicating the impact of price competitiveness) were analyzed.

Understanding the sensitivity of export demand to fluctuations in income and relative prices is critical, given its significant implications for policy measures aimed at promoting Indian dairy exports. Typically, import demand elasticity is anticipated to be positive, reflecting that an increase in foreign market demand for a given product corresponds to a proportional rise in imports from India. In contrast, relative price elasticity is generally expected to be negative, as an increase in the price of Indian dairy products relative to competing suppliers reduces India's export competitiveness.

Elasticity estimates were computed for the major export destinations of Indian dairy products within Asia, as detailed following tables. The analysis focused on the top 10 dairy products exported by India during the most recent period (2018–2022) alongside the top 10 destination countries. Nevertheless, due to limitations in data availability, it was not feasible to estimate elasticity parameters for all product-country pairs. The exclusion of certain products for specific countries was necessitated by incomplete trade reporting and missing data throughout the study period, which constrained the comprehensiveness of the analysis.

The results indicate that butteroil (HS-040590) demonstrates positive and statistically significant import demand elasticity across multiple destination markets, followed by unprocessed cheese (HS-040690) and casein (HS-350110), underscoring their substantial export potential in these countries. For butter (HS-040510) and casein (HS-350110), price competitiveness emerges as a critical determinant, as evidenced by the negative and statistically significant relative price elasticities observed in several markets. Furthermore, Saudi Arabia, Malaysia, Qatar, and the United Arab Emirates (UAE) have been identified as the markets with the highest export potential and opportunities for India's dairy products.

Import Demand and Relative Price Elasticities of Indian Dairy Products: Regional Analysis

To facilitate clarity, the analysis of export elasticities is organized by geographic sub-regions within Asia. This sectional approach allows focused interpretation of market dynamics, challenges, and opportunities specific to each region.

1. South Asia

South Asia remains a critical market for Indian dairy exports, exhibiting diverse demand patterns and opportunities. The elasticity estimates for major dairy products in countries such as Bangladesh and Bhutan reveal important insights into market responsiveness and competitiveness.

Bangladesh: Bangladesh served as a crucial export destination for Indian dairy products, with positive and significant import demand elasticity observed for Skimmed Milk Powder (HS-040210), Butter (HS-

Table 3: Import demand and relative price elasticity of Indian dairy exports in major South Asian countries

Country	Product (HS)	Coefficient			R^2
		Constant	Import demand elasticity	Relative price elasticity	
Bangladesh	040210	-5.62	1.21***	0.66	0.50
	040510	-3.43	1.08***	0.54*	0.79
	040590	-7.85	1.25	0.85	0.06
	040630	-0.55	0.90***	0.53	0.62
	040690	2.21	0.76***	0.10	0.85
	170211	12.77	0.01	-0.06	0.01
	350110	-13.63	2.23**	-0.33**	0.77
	350190	5.64	0.26	0.20	0.07
Bhutan	040690	-0.02	1.00***	0.01	0.90

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

040510), Processed Cheese (HS-040630), Unprocessed Cheese (HS-040690), and Casein (HS-350110). This suggests that India has substantial opportunities to expand its market share in these categories. Skimmed Milk Powder (HS-040210) exhibited a positive income elasticity of 1.21, indicating that India's exports are highly sensitive to the changes in import demand, presenting a large potential for market expansion. For Butter (HS-040510), an unexpected positive relative price elasticity of 0.54 was found, suggesting that even if the relative price of Indian butter increases compared to competing countries, exports might still rise. Both Processed Cheese (HS-040630) and Unprocessed Cheese (HS-040690) showed significant positive import elasticity, indicating strong potential for India to meet increasing demand and respond to import changes. However, the relative price elasticity for these products was not significant. For Casein (HS-350110), the import demand elasticity (2.23) was highly positive and significant, reflecting strong potential in this market. Nonetheless, the significant negative relative price elasticity (-0.33) indicates that India's market share could fluctuate depending on the pricing strategies of competing countries.

Bhutan: Due to insufficient and unreliable data from other exporting countries, conducting meaningful regression analysis for Bhutan was challenging, resulting in the exclusion of most products from the analysis. However, Unprocessed Cheese (HS-040690) exhibited positive and significant import demand elasticity, suggesting that as demand for this product increases, India has the potential to secure a substantial market share.

Bangladesh showed significant import demand elasticity for skimmed milk powder, butter, processed and unprocessed cheese, and casein, indicating strong growth potential. Price sensitivity was particularly notable for casein, suggesting pricing strategies could influence market share. Data constraints limited analysis for Bhutan, but unprocessed cheese demonstrates promising demand responsiveness.

2. Gulf Countries

The Gulf region, including UAE, Saudi Arabia, Qatar, and Bahrain, is a major hub for Indian dairy exports, particularly for fat-based products and processed cheese. Elasticities here reflect both strong demand potential and sensitivity to price changes.

United Arab Emirates (UAE): The Whole Milk Powder (HS-040229) exhibited strong potential in the UAE with a positive and highly significant import elasticity of 1.07, indicating that India's export is positively driven by the increase in import demand. For Butter (HS-040510), the negative and highly significant relative price elasticity of -0.68 suggests that an increase in export price could reduce competitiveness, especially since the UAE is a major market for fat-based products. This requires careful attention, as even minor price changes could lead to potential market losses. Butteroil (HS-040590) also shows strong potential with a positive and highly significant import elasticity of 1.37, demonstrating that India effectively meets the demand for this product and has significant growth potential as demand increases. Cheese

(HS-040630) presented strong potential with a positive and highly significant import elasticity of 3.52, reflecting its popularity in the Gulf country and the increase in exports with rising demand. Unprocessed Cheese (HS-040690) also showed potential with a positive and significant import elasticity of 1.65, indicating that India's exports for this product grew as incomes increased in the UAE. Overall, while several dairy products showed strong import demand elasticities indicating growth opportunities, careful pricing strategies are essential for maintaining competitiveness in the UAE market.

Table 4: Import demand and relative price elasticity of Indian dairy exports in major Gulf countries

Country	Product (HS)	Coefficient			R^2
		Constant	Import demand elasticity	Relative price elasticity	
United Arab Emirates (UAE)	040120	14.86	-0.15	0.19	0.10
	040210	15.17	-0.00	-0.70	0.09
	040229	-3.56	1.07***	0.05	0.45
	040510	15.88	-0.01	-0.68***	0.92
	040590	-7.74	1.37***	0.01	0.87
	040630	-50.11	3.52***	-0.53	0.61
	040690	-17.18	1.65**	0.02	0.29
	170211	7.91	0.25	-0.42	0.30
Saudi Arabia	040210	2.81	0.42	-2.74	0.19
	040510	-49.67	3.29**	-0.16**	0.87
	040590	-38.59	2.95***	-0.34*	0.82
	040630	28.49	-1.20	-8.67**	0.47
	040690	-79.85	4.86**	2.13	0.56
	170211	6.54	0.33	-0.47	0.16
	350110	-4.64	1.15***	-0.24**	0.64
Qatar	040120	4.15	0.35	0.61	0.12
	040210	6.77	0.19	-0.70	0.09
	040229	0.73	0.64	0.77	0.21
	040510	-31.35	2.57**	0.93	0.69
	040590	-7.53	1.44***	-0.17*	0.94
	040630	-22.82	2.12***	-1.11*	0.74
	040690	-39.58	3.14***	-0.25**	0.68
	170211	2.54	0.40	0.28	0.01
Bahrain	040210	18.48	-0.53	-0.41	0.01
	040510	2.19	0.67	-1.91*	0.74
	040590	-9.24	1.55***	0.05	0.79
	040630	-1.54	0.78	0.52	0.19
	040690	-44.15	3.27***	0.83*	0.60
	170211	11.63	-.63	1.39	0.92

*** p<0.01, ** p<0.05, * p<0.1

Saudi Arabia: In Saudi Arabia, Butter (HS-040510) demonstrated strong potential with a positive and significant import elasticity of 3.29, highlighting a major opportunity for Indian exports in this key market. However, the negative and significant relative price elasticity of -0.16 suggests that the market is price-sensitive, requiring India to be vigilant against competition from other countries to maintain its market position. Butteroil (HS-040590) also displayed significant potential, with a highly significant import elasticity of 2.95, suggesting that Indian exports could rise as demand increases. Yet, the negative and significant relative price elasticity of -0.34 implies that price sensitivity might affect exports, particularly if competitors adjust their pricing strategies. Processed Cheese (HS-040630) had a negative but non-significant import elasticity of -1.20. However, its highly significant negative relative price elasticity of -8.67 indicates that price increases could severely undermine competitiveness, making it crucial for India to maintain competitive pricing due to intense market competition. Unprocessed Cheese (HS-040690) showed strong potential with a positive and significant import elasticity of 4.86, indicating growth in Indian exports as demand rises. Casein (HS-350110) also demonstrated strong potential, with a positive and highly significant import elasticity of 1.15. However, the negative and significant relative price elasticity of -0.24 suggests that India needs to be cautious of price competition to avoid losing market share.

Qatar: The import demand elasticity for Butter (HS-040510), Butteroil (HS-040590), Processed Cheese (HS-040630), and Unprocessed Cheese (HS-040690) was positive and significant in Qatar, indicating promising opportunities for expanding exports of these commodities from India as import demand increases. However, the negative and significant relative price elasticity for Butteroil (HS-040590), Processed Cheese (HS-040630), and Unprocessed Cheese (HS-040690) suggests that Indian exports must remain price competitive to fully capitalize on these growing export opportunities.

Bahrain: Butteroil (HS-040590) and Unprocessed Cheese (HS-040690) in Bahrain exhibited positive and significant import demand elasticity, indicating that the growing demand for these products offers India the opportunity to increase exports. The

relative price elasticity for Butter (HS-040510) was highly negative at -1.91, suggesting that if the relative price of Indian butter increases compared to competing countries, exports will decline. To retain this market, India's butter pricing strategy should focus on maintaining competitive relative prices. However, the import demand elasticity for Butter (HS-040510) was small and not significant. The relative price elasticity for Unprocessed Cheese (HS-040690) was also negative and significant, indicating that India needs to keep prices low to expand its market share. Other products analyzed did not show significant coefficients for either elasticity, indicating limited responsiveness in this market.

The UAE, Saudi Arabia, Qatar, and Bahrain showed strong import demand for Indian butter, butteroil, and unprocessed cheese. Price sensitivity was highest for butter and butteroil in the UAE and Saudi Arabia, and for unprocessed cheese in Bahrain. Competitive pricing is essential to leverage growth opportunities and prevent loss of market share in these markets.

3. Southeast Asia and West Asia

Emerging markets in Southeast Asia and West Asia show varied demand elasticities and competitive dynamics. Rapid urbanization and income growth in countries like Malaysia and Singapore create new opportunities for Indian dairy exports.

Malaysia: Malaysia's rapid urbanization and growth positively influenced India's dairy exports. The majority of the products exhibited positive and significant import demand elasticity, indicating that as import demand in Malaysia rises, so do India's exports. Specifically, Butter (HS-040510), Butteroil (HS-040590), Processed Cheese (HS-040630), Unprocessed Cheese (HS-040690), and Casein (HS-350110) are expected to see increased exports with rising demand due to their positive import demand elasticity. However, the relative price elasticity was significant and negative for Butteroil (HS-040590) and Unprocessed Cheese (HS-040690), suggesting that price changes could affect their competitiveness.

Singapore: The import demand elasticity in Singapore was significant only for Unprocessed Cheese (HS-040690) and Casein (HS-350110). In both cases, the elasticity was positive, suggesting that India has the potential to boost exports as demand for these products grows. However, the negative and significant relative price elasticity for both products underscore the need for price competitiveness to secure a larger share of the export market.

Table 5: Import demand and relative price elasticity of Indian dairy exports in major Southeast & West Asian countries

Country	Product (HS)	Coefficient			R^2
		Constant	Import demand elasticity	Relative price elasticity	
Southeast Asia					
Malaysia	040210	-44.17	2.89	-1.62	0.17
	040229	4.55	0.16	0.43	0.02
	040510	-74.92	4.63***	0.47	0.77
	040590	-28.51	2.36***	-0.95**	0.81
	040630	-105.49	6.54***	1.03	0.68
	040690	-56.05	3.83***	-0.35**	0.61
	170211	50.24	-2.43	0.60	0.08
	350110	-23.92	2.18***	-0.02	0.40
Singapore	040120	9.43	0.28	-1.80	0.39
	040210	-22.63	1.85	-0.35	0.14
	040510	8.74	0.21	-0.95	0.45
	040590	-10.07	1.42	-0.59	0.34
	040630	-102.88	6.87	1.64	0.83
	040690	-30.68	2.57***	-1.40*	0.79
	170211	-2.08	0.70	0.43	0.21
	350110	-38.12	3.39***	-0.47**	0.73
Indonesia	040590	-29.89	2.52	-1.92	0.48
	040690	18.38	-0.74	-3.69	0.43
	170211	25.37	-0.65	-0.43	0.13
West Asia					
Turkey	040210	-31.53	2.79	-3.59	0.61
	040510	-77.45	4.98	-24.78	0.85
	040590	12.67	-0 .34	-0.64	0.02
	350110	-30.58	2.87***	0.91*	0.63
	350190	27.33	-1.03*	0.99***	0.49

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Indonesia: The elasticities were estimated for Butteroil (HS-040590), Unprocessed Cheese (HS-040690), and Lactose (HS-170211) exported from India to Indonesia. The import demand elasticity was positive for Butteroil (HS-040590) and negative for the other two products. The relative price elasticity showed the expected negative sign for all the products. However, none of the estimated elasticities were significant.

Turkey: In Turkey, Casein (HS-350110) demonstrated strong potential with a positive and highly significant import elasticity of 2.87, though the significant positive relative price elasticity of 0.91 was unexpected. Conversely, the negative and significant import elasticity (-1.03) for Caseinates (HS-350190) indicates challenges for India in meeting demand and capturing market share. However, the surprising positive and highly significant relative price elasticity of 0.99 suggests that price increases may still result in higher exports in this market.

Malaysia exhibited strong import demand elasticity for butter, butteroil, processed and unprocessed cheese, and casein, with price competitiveness critical for butteroil and unprocessed cheese. Singapore's demand was significant mainly for unprocessed cheese and casein, with price sensitivity requiring attention. Turkey showed high potential for casein, but mixed elasticity signs highlight complex market dynamics.

CONCLUSION

The analysis of market and product classification and estimation of export elasticity reveals significant insights into Indian dairy exports in Asian countries.

India's dairy export portfolio has evolved, with a core set of 'Regular Products' consistently driving exports, while recent additions like 'New Products' signal diversification. While India's traditional markets in South Asia and the Gulf continue to provide a stable base for its dairy exports, the country's performance in Central Asia and parts of Eastern Asia suggests the need for a more focused and sustained trade strategy. To reduce its dependence on existing markets and avoid over-reliance on a few key countries, India should enhance its efforts to improve and diversify its export presence in these regions, particularly by addressing the challenges and leveraging opportunities in Central and Eastern Asia.

Export elasticity estimation showed that butteroil (HS-040590) appeared to have positive and significant import elasticity in multiple destinations followed by unprocessed cheese (HS-040690), and Casein (HS-350110) indicating their high potential in those countries. For Butter (HS-040510) and casein (HS-350110) price competitiveness was of utmost importance as these products exhibited negative and significant relative price elasticity in several countries. Also, the market where India has the highest potential and opportunities for export were Saudi Arabia, Malaysia, Qatar and United Arab Emirates (UAE). Price competitiveness of products like Butter (HS-040510) and Casein (HS-350110) may be enhanced through reducing production and operational costs to offer competitive pricing in particularly in price-sensitive markets. These measures will not only enhance the competitiveness of Indian dairy products in key destinations but also strengthen their position and appeal in the broader global dairy market, paving the way for sustainable export growth.

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APPENDIX

Table 6: Hs-6 digit dairy product codes with description

Product Code (HS)	Product Name	Description
040110	Bulk & Pack Milk	Milk and cream, not concentrated nor containing added sugar or other sweetening matter: Of a fat content, by weight, not exceeding 1 %
040120	Bulk & Pack Milk	Milk and cream, not concentrated nor containing added sugar or other sweetening matter: Of a fat content, by weight, exceeding 1 % but not exceeding 6 %
040130	Bulk & Pack Milk	Milk and cream, not concentrated or sweetened, fat content, by weight >6%
040140	Cream	Milk and cream, not concentrated nor containing added sugar or other sweetening matter: Of a fat content, by weight, exceeding 6 % but not exceeding 10 %
040150	Cream	Milk and cream, not concentrated nor containing added sugar or other sweetening matter: Of a fat content, by weight, exceeding 10 %
040210	SMP	Milk and cream, concentrated or containing added sugar or other sweetening matter: In powder, granules or other, solid forms, of a fat content, by weight, not exceeding 1.5%
040221	WMP	Milk and cream, concentrated or containing added sugar or other sweetening matter: In powder, granules or other solid forms, of a fat content, by weight, exceeding 1,5 %: Not containing added sugar or other sweetening matter
040229	WMP	Milk and cream, concentrated or containing added sugar or other sweetening matter: In powder, granules or other solid forms, of a fat content, by weight, exceeding 1,5 %: Other
040291	Condensed Milk	Milk and cream, concentrated or containing added sugar or other sweetening matter: Other: Not containing added sugar or other sweetening matter
040299	Condensed Milk	Milk and cream, concentrated or containing added sugar or other sweetening matter: Other: Other
040310	Yoghurt	Buttermilk, curdled milk and cream, Yoghurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit, nuts or cocoa: Yoghurt
040390	Yoghurt	Buttermilk, curdled milk and cream, Yoghurt, kephir and other fermented or acidified milk and cream, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit, nuts or cocoa: Other
040410	Whey Powder	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included: Whey and modified whey, whether or not concentrated or containing added sugar or other sweetening matter
040490	Whey Powder	Whey, whether or not concentrated or containing added sugar or other sweetening matter; products consisting of natural milk constituents, whether or not containing added sugar or other sweetening matter, not elsewhere specified or included: Other
040510	Butter	Butter and other fats and oils derived from milk; dairy spreads: Butter
040520	Butter	Butter and other fats and oils derived from milk; dairy spreads: Dairy spreads
040590	Butter	Butter and other fats and oils derived from milk; dairy spreads: Other
040610	Cheese	Cheese and curd: Fresh (unripened or uncured) cheese, including whey cheese, and curd
040620	Cheese	Cheese and curd: Grated or powdered cheese, of all kinds

040630	Cheese	Cheese and curd: Processed cheese, not grated or powdered
040640	Cheese	Cheese and curd: Blueveined cheese and other cheese containing veins produced by *Penicillium roqueforti*
040690	Cheese	Cheese and curd: Other cheese
350110	Casein	Casein, caseinates and other casein derivatives; casein glues: Casein
350190	Caseinates	Casein, caseinates and other casein derivatives; casein glues: Other
170211	Lactose	Sugars; lactose and lactose syrup, containing by weight 99 % or lactose, expressed as anhydrous lactose, calculated on the dry matter