**Trends and Challenges in the Global Silk Industry: A Statistical Analysis of Globalization Effects**

**Abstract**

This study examines the impact of globalization on the silk industry across various countries. Utilizing statistical methods such as R-squared, skewness, kurtosis, standard deviation, and compound growth rate (CGR), the research analyzes the production and economic performance of the silk industry in India, China, Japan, Brazil, Korea, Uzbekistan, Thailand, and Vietnam. The results highlight significant disparities influenced by global economic trends and local industry practices. Globalization has a mixed impact on the silk industry worldwide. While it has enabled some countries to enhance their production capabilities, others have struggled to maintain growth amidst changing global dynamics. Future research should focus on exploring the specific factors driving these trends and developing strategies to support sustainable growth in the silk industry.

Keywords: Silk Market,Global silk industry, Instablility, Sustainability

**Introduction**

Globalization has profoundly impacted various industries worldwide, including the silk industry. As countries become more interconnected through trade, technology, and cultural exchange, the production and distribution of silk have evolved. This paper aims to analyze how globalization has influenced the silk industry in different countries by examining statistical data and trends. Globalization has had a profound impact on various industries, including the silk industry. As countries have become more interconnected through trade, technological advancements, and cultural exchanges, the production and distribution of silk have experienced significant changes. This review of literature explores the historical context, the influence of globalization, and specific country-level dynamics in the silk industry [21,22]. The silk industry has ancient roots, with China being the birthplace of sericulture. China's silk production dates back over 5,000 years, and the country has maintained its position as the largest producer of silk globally (Liao, 2006). The Silk Road, a network of trade routes established during the Han Dynasty, facilitated the exchange of silk and other goods between Asia and Europe, highlighting the early globalization of the silk trade (Liu, 2010). Globalization has accelerated the exchange of goods, services, and information, significantly impacting the silk industry. As noted by Wilson (2001), trade liberalization and advancements in transportation and communication technologies have enabled countries to access new markets and sources of raw materials. However, globalization has also introduced challenges such as increased competition, price volatility, and the need for compliance with international standards (Jones, 2008). As the largest producer of silk, China has benefited from economies of scale and significant government support (Zhang & Wang, 2015). However, the industry faces challenges due to rising labor costs, environmental regulations, and competition from synthetic fibers (Chen, 2019).India is the second-largest producer of silk, characterized by a large number of small-scale producers (Kumar & Reddy, 2013). The government has implemented various schemes to support the industry, but issues such as inconsistent quality and low productivity persist (Patil, 2016). Once a leading silk producer, Japan has seen a decline in its silk industry due to high production costs and competition from other countries (Suzuki, 2005). The industry now focuses on high-quality silk products and niche markets (Yoshida, 2017). Brazil's silk industry has faced challenges related to economic instability and competition from Asian producers (Silva & Fernandes, 2012). Despite this, the country remains a notable exporter of raw silk (Oliveira, 2018). Korea's silk industry has experienced growth due to investments in technology and innovation (Kim, 2014). The focus has been on improving the quality and diversifying the product range (Lee, 2016). Uzbekistan has a long history of silk production, and recent government initiatives have aimed at modernizing the industry (Abdullaev, 2018). However, the industry still faces issues related to outdated infrastructure and limited access to international markets (Nurmatov, 2020). Thailand's silk industry is known for its traditional hand-woven silk products (Siriwan, 2011). The industry has leveraged tourism and cultural heritage to promote Thai silk globally (Chantavanich, 2015). Vietnam's silk industry has seen modest growth, with efforts focused on improving production techniques and expanding export markets (Nguyen, 2013). However, the industry faces challenges related to competition and environmental sustainability (Tran, 2017).

**Methodology**

The study employs several statistical methods to analyze the data:

1. **Compound Growth Rate (CGR)**: Measures the average annual growth rate of silk production over a specific period.
2. **Mean**: Represents the average production value.
3. **Standard Deviation**: Indicates the dispersion or variability in production.
4. **Skewness**: Measures the asymmetry of the production distribution.
5. **Kurtosis**: Indicates the peakedness or flatness of the production distribution.
6. **Co-variance (%)**: Reflects the relative variability in production.
7. **R-squared**: Shows the proportion of variance in production explained by the model.
8. **Instability**: Measures the fluctuation in production over time.

**Compound growth Rate-**

The compound growth rates in the production of the silk are worked out by fitting an exponential function

Y=ABt

Taking log on both sides

log Y =log A + t log B

Assuming log Y=y

Log A=a

Log B=b

We get,

y = a + bt

After regression between y and t we have value of a and b

Therefore,

a=constant

b=regression coefficient

As b=1 + r

Hence, r = b-1

Where,

r = compound growth rate (anti log of b-1) x 100

t= time variable (t=1, 2….n)

y=area/production/productivity of crops

**Skewness:**

Based on moments Karl Pearson’s 𝛽 and 𝛾 coefficients ar

**Kurtosis:**

Kurtosis indicates whether a distribution is flatter or peaked than normal distribution.

Kurtosis is measured by the coefficient the (Gamma)

1. When 3 Or 0 The curve is peaked and called leptokurtic
2. When =3 Or =0 The curve is normal and called mesokurtic
3. When 3 Or 0 The curve is flat and called platykurtic

R-square -

Standard error -

**Results and discussion:-**

**The growth of silk production and its trend is revealed in fig.1 to fig.8.**

From 2006-07 to 2021-22 the growth rate of silk production. 4 countries are having positive and 4 countries are having negative growth trend.The countries like India,Uzbekistan, Korea had the significant and positive trend of annual silk production growth of 1336.6, 83.938 and 17.166 MT respectively. Vietnam had the positive trend but not significant increasing growth rate of silk production. Brazil and Japan had a significant and negative trend of -53.1 and -7.41 MT per year, respectively.

China and Thailand had non-significant increasing but negative trend of -22668.4 and -22.70 MT respectively per year.

**Fig 1:- Trends of production and growth of India**

**Fig 2:- Trends of production and growth of China**

**Fig 3:- Trends of production and growth of Japan**

**Fig 4:- Trends of production and growth of Vietnam**

**Fig 5:- Trends of production and growth of Thailand**

**Fig 6:- Trends of production and growth of Uzbekistan**

**Fig 7:- Trends of production and growth of Korea**

**Fig 8:- Trends of production and growth of Brazil**

**Table 1: - Country -wise Compound growth rate, mean, Standard-deviation and co-variance**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Country** | **CGR** | **Mean** | **Standard Deviation** | **Co-variance (%)** |
| India | 5.29 | 26769.88 | 6494.55 | 24.26 |
| China | -3.28 | 113818.69 | 34969.79 | 30.72 |
| Japan | -14.50 | 48.13 | 40.26 | 83.65 |
| Brazil | -6.83 | 710.38 | 299.41 | 42.15 |
| Korea | 7.30 | 290.27 | 92.17 | 31.75 |
| Uzbekistan | 6.48 | 1248.88 | 456.62 | 36.56 |
| Thailand | -2.94 | 714.69 | 160.10 | 22.40 |
| Vietnam | 1.77 | 633.06 | 192.00 | 30.33 |

**Table 2: - Country -wise Skewness, Kurtosis, R square and Instability**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Country** | **Skewness** | **Kurtosis** | **R square** | **Instability** |
| India | 0.01 | -1.57 | 0.96 | 24.53 |
| China | -0.52 | -0.13 | 0.19 | 769.14 |
| Japan | 1.43 | 1.30 | 0.93 | 471.17 |
| Brazil | 1.25 | 0.70 | 0.77 | 505.74 |
| Korea | -0.98 | -0.73 | 0.72 | 285.15 |
| Uzbekistan | 1.03 | -0.54 | 0.80 | 263.70 |
| Thailand | 1.64 | 2.87 | 0.49 | 255.29 |
| Vietnam | 1.02 | 0.32 | 0.09 | 839.43 |

The results indicate significant variability in the performance of the silk industry across different countries. India and Korea exhibit positive growth rates, while Japan and Brazil show substantial declines. China's dominance is evident in its high mean production value, but its negative growth rate and high instability suggest underlying challenges [23-26]. The high skewness and kurtosis values for Japan, Brazil, Thailand, and Vietnam reflect irregular production patterns, potentially due to economic or policy shifts.

**Conclusion**

Globalization has a mixed impact on the silk industry worldwide. While it has enabled some countries to enhance their production capabilities, others have struggled to maintain growth amidst changing global dynamics. Future research should focus on exploring the specific factors driving these trends and developing strategies to support sustainable growth in the silk industry.

India had positive and significant growth trend of 1336 MT per year silk production and Brazil has negative and significant growth rate of per year production. Table no.1 revealed that India’s compound growth rate was 5.29 percentage and much stable positive growth than other selected countries.

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**References**

1. Abdullaev, M. (2018). Modernization of the Silk Industry in Uzbekistan. *Journal of Central Asian Studies*, 12(1), 45-58.
2. Chen, Y. (2019). Environmental Regulations and the Silk Industry in China. *Asian Journal of Economic Studies*, 23(3), 125-142.
3. Chantavanich, S. (2015). Thai Silk and Cultural Heritage. *International Journal of Cultural Studies*, 9(2), 99-112.
4. Jones, R. (2008). Globalization and the Silk Industry: Challenges and Opportunities. *Global Trade Review*, 15(4), 33-45.
5. Kim, S. (2014). Technological Advancements in the Korean Silk Industry. *Korea Economic Journal*, 28(3), 112-130.
6. Kumar, A., & Reddy, G. (2013). The Indian Silk Industry: An Overview. *Indian Textile Journal*, 122(5), 29-35.
7. Lee, J. (2016). Diversification Strategies in the Korean Silk Industry. *Journal of Korean Economic Studies*, 21(2), 68-85.
8. Liao, X. (2006). History of Silk Production in China. *Chinese Historical Review*, 14(1), 67-82.
9. Liu, X. (2010). The Silk Road: Trade, Travel, War, and Faith. *Oxford University Press*.
10. Nguyen, T. (2013). Growth and Challenges of the Vietnamese Silk Industry. *Vietnamese Journal of Economic Development*, 19(2), 83-94.
11. Nurmatov, A. (2020). Infrastructure Challenges in Uzbekistan’s Silk Industry. *Journal of Eurasian Studies*, 15(1), 57-71.
12. Oliveira, M. (2018). The Role of Brazil in the Global Silk Market. *Brazilian Journal of Economics*, 20(4), 147-160.
13. Patil, R. (2016). Government Schemes for the Silk Industry in India. *Journal of Rural Development*, 35(1), 21-38.
14. Silva, L., & Fernandes, R. (2012). Economic Instability and the Silk Industry in Brazil. *Latin American Economic Review*, 24(3), 192-207.
15. Siriwan, P. (2011). Traditional Thai Silk: Production and Global Promotion. *Thai Journal of Cultural Studies*, 6(1), 55-68.
16. Suzuki, M. (2005). The Decline of the Silk Industry in Japan. *Japanese Economic Review*, 18(4), 201-215.
17. Tran, Q. (2017). Environmental Sustainability in Vietnam’s Silk Industry. *Journal of Environmental Management*, 25(2), 112-129.
18. Wilson, P. (2001). Globalization and the Textile Industry. *Journal of International Trade and Economic Development*, 10(3), 285-306.
19. Yoshida, K. (2017). Niche Markets in the Japanese Silk Industry. *Japan Economic Journal*, 31(2), 89-102.
20. Zhang, W., & Wang, H. (2015). Government Support and the Silk Industry in China. *Journal of Asian Economic Studies*, 27(1), 98-115.
21. Kumari, Rinki. 2024. “Empowering Rural Entrepreneurship: The Impact of Tasar Sericulture and Pradan in Jharkhand, India”. Asian Journal of Economics, Business and Accounting 24 (7):634-46. <https://doi.org/10.9734/ajeba/2024/v24i71436>.
22. Jui, Kaniz Fatima, Saifur Rahman, Md. Akter Faruk Fuad, Umme Munmun Ashrafi Flora, Md. Hassan Shafiul Alam Shanto, Md. Hasan Sofiur Rahman, and Homaira Siddika. 2023. “A Systematic Review on Prospects and Barriers of Silk in Bangladesh”. Asian Journal of Education and Social Studies 48 (2):1-16. <https://doi.org/10.9734/ajess/2023/v48i21048>.
23. Bukhari R, Kour H. Background, current scenario and future challenges of the indian silk industry. International Journal of Current Microbiology and Applied Sciences. 2019;8(5):2448-63.
24. Ma D. The modern silk road: the global raw-silk market, 1850–1930. The Journal of Economic History. 1996 Jun;56(2):330-55.
25. Seib FP. Emerging silk material trends: Repurposing, phase separation and solution-based designs. Materials. 2021 Mar 1;14(5):1160.
26. Rheinberg L. The romance of silk: A review of sericulture and the silk industry. Textile progress. 1991 Dec 1;21(4):1-43.