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An Analysis of the Economic Cyclicality of Wakame Exports: Testing the "Lipstick Effect" in the Agri-Food Sector

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Abstract. This study examines the economic cyclicality of wakame (Undaria pinnatifida) exports across six global markets from 2019 to 2024, testing its conformity to the "lipstick effect" phenomenon. Using monthly trade data from the World Bank, we analyze export patterns relative to GDP growth, unemployment, CPI, and per capita income through correlation analysis, recession period comparisons, and panel regression modeling. Results reveal significant regional heterogeneity: Southeast Asia demonstrates weak counter-cyclical tendencies (12.3% export growth during recessions), while Western markets exhibit strong pro-cyclical patterns (21.5-46.7% declines). Regression analysis confirms GDP growth as the strongest positive predictor of exports ($\beta = 1.82$, $p < 0.001$). Crucially, wakame shows limited lipstick effect characteristics, with recession performance substantially differing from lipstick products (+87.2% growth). We attribute cyclical variations to wakame's dual role as cultural staple food in Asia versus luxury good in Western markets. These findings establish boundary conditions for lipstick effect applicability to agricultural commodities and provide region-specific strategies for export resilience.

Keywords: Wakame Exports, Economic Cyclicality, Lipstick Effect, Business Cycles, Agricultural Trade, Export Resilience

1. Introduction

Economic cycles, characterized by alternating periods of expansion and recession, significantly influence consumer behavior and international trade patterns. During economic downturns, consumers typically adjust their spending habits, often reducing expenditures on luxury goods while maintaining or increasing consumption of essential items. However, a fascinating phenomenon known as the "lipstick effect" suggests that certain non-essential, affordable luxury products may experience increased demand during economic contractions. This term, coined during the Great Depression, describes how consumers turn to small indulgences like cosmetics when facing financial constraints, seeking psychological comfort through affordable luxuries [1].

The lipstick effect has been extensively documented in various sectors such as entertainment, cosmetics, and low-cost luxury items. Previous research indicates that during economic uncertainty, products offering emotional satisfaction at relatively low cost often demonstrate counter-cyclical patterns [2]. The lipstick effect describes how consumers may redirect spending toward lower-cost goods

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that provide emotional reassurance during periods of economic downturn [3]. While this phenomenon is well-established for consumer goods like cosmetics and entertainment, its applicability to food products, particularly specialized agricultural exports like wakame, remains underexplored.

Wakame (Undaria pinnatifida), specifically ribbon wakame, represents an important aquatic vegetable with significant nutritional and economic value. China has emerged as the world's largest producer of wakame, with annual production exceeding 320,000 tons, predominantly from coastal regions like Liaoning and Shandong provinces [4]. The industry has developed extensive export networks, with Japan, Korea, Thailand, and increasingly Southeast Asian markets serving as major destinations. Wakame exports have shown remarkable growth in recent years, with 2022 export values reaching $6.56 million for 62,723 tons during January-September [4].

The wakame industry has evolved from raw material exports to diversified processed products, including dried, salted, and instant ready-to-eat items. This product diversification, coupled with wakame's nutritional profile rich in iodine, dietary fiber, and bioactive compounds, positions it uniquely in the food market. The industry's development has been supported by technological advancements in cultivation and processing, though it remains susceptible to various economic and environmental factors [4].

Despite extensive research on wakame's production and export dynamics, limited attention has been paid to how macroeconomic fluctuations affect its trade patterns. Similarly, the potential existence of lipstick-effect-like behavior in specialty food products represents a significant gap in the economic literature. This study addresses these research voids by examining the relationship between macroeconomic indicators and wakame export performance across multiple markets.

This paper specifically investigates whether wakame exhibits pro-cyclical, counter-cyclical, or acyclical characteristics in international markets. By analyzing export data alongside economic indicators including GDP growth, unemployment rates, and consumer price indices, we aim to determine if wakame shares characteristics with lipstick-effect products. The analysis extends to comparing wakame with a lipstick product export data for anonymous Country X, providing a direct contrast between established lipstick-effect products and wakame exports.

The research questions guiding this study are: (1) How do macroeconomic fluctuations affect wakame export volumes across different markets? (2) Does wakame demonstrate characteristics consistent with the lipstick effect? (3) What factors might explain the observed cyclicality patterns in wakame exports?

This analysis contributes to the understanding of how specialized food products respond to economic cycles and provides insights for producers and policymakers in developing strategies resilient to economic fluctuations. The findings offer practical value for export-oriented aquatic product industries navigating variable economic conditions.

2. Methodology

2.1. Data Source

The dataset for this study was obtained from the World Bank's World Development Indicators (WDI) database. It contains monthly economic indicators spanning from January 2019 to December 2024 for six geographic regions:

- Southeast Asia
- Russia
- Europe
- Australia

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– United States
– Region X

The data was provided in Microsoft Excel format (`data.xlsx`) with the following original variables:

– Country/Region
– Year
– Month
– Export Volume (metric tons)
– GDP Growth Rate (%)
– Consumer Price Index (CPI) (%)
– Unemployment Rate (%)
– Per Capita Income (US Dollars)

2.2. Data Preparation and Cleaning

The raw data underwent a comprehensive cleaning and transformation process to ensure its suitability for analysis.

2.2.1. Missing Data Imputation

Since some indicators (GDP Growth, CPI, Unemployment Rate, Per Capita Income) were only available at annual frequencies, we employed linear interpolation to generate monthly estimates. For each variable and country, we calculated the monthly values using the formula:

$$x_m = x_y + \frac{m}{12} \times (x_{y+1} - x_y) \tag{1}$$

where:

– x_m is the interpolated value for month m
– x_y is the known value at year y
– x_{y+1} is the value at year $y + 1$

This method ensures smooth transitions between annual data points and provides consistent monthly values.

2.2.2. Unit Standardization

To improve interpretability and numerical stability in regression analysis, we converted Per Capita Income from US Dollars to ten-thousand US Dollars:

$$\text{Income}_{\text{new}} = \frac{\text{Income}_{\text{USD}}}{10,000} \tag{2}$$

This transformation preserves the relative differences while making coefficients more interpretable.

2.2.3. Quality Control

We implemented Tukey's method for outlier detection using the following criteria:

$$\text{Lower Bound} = Q1 - 1.5 \times \text{IQR} \tag{3}$$

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$$\text{Upper Bound} = Q3 + 1.5 \times \text{IQR} \tag{4}$$

where $Q1$ is the first quartile (25th percentile), $Q3$ is the third quartile (75th percentile), and IQR is the interquartile range. After examination, no significant outliers were identified in the dataset.

2.3. Variable Definitions

The final analytical dataset contains the variables described in Table 1, which have been processed for analysis readiness.

Table 1: Variable Definitions for Analysis

Variable	Description	Units
Export Volume	Total goods exports	Metric tons
GDP Growth	Quarterly year-over-year GDP change	Percentage
CPI	Annual percentage change in consumer prices	Percentage
Unemployment Rate	Percentage of labor force unemployed	Percentage
Per Capita Income	Gross national income per person	10,000 USD

2.4. Descriptive Statistics

Table 2 presents summary statistics for each region, providing an overview of economic conditions across the study period.

2.5. Analytical Methods

Three analytical approaches were employed to examine the relationship between export volumes and economic indicators.

2.5.1. Correlation Analysis

Pearson correlation coefficients were calculated for each region to assess linear relationships between export volume and:

- GDP Growth
- CPI
- Unemployment Rate
- Per Capita Income

The correlation coefficient is defined as:

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}} \tag{5}$$

where x and y represent paired economic indicators.

2.5.2. Recession Period Analysis

To test for the "lipstick effect" in wakame exports, we analyzed export performance during defined economic downturns, focusing on the April 2020-March 2021 recession period. This timeframe was selected as it represented a synchronized global contraction recognized by the World Bank. The core

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Table 2: Regional Descriptive Statistics (2019–2024)

Region	Variable	Mean	Std. Dev.	Range
Southeast Asia	Export Volume	42.15	27.89	(0.00, 88.71)
	GDP Growth	0.12	4.32	(-6.10, 2.70)
	CPI	0.85	2.23	(-0.80, 6.10)
	Unemployment	0.94	0.16	(0.70, 1.25)
	Per Capita Income	0.72	0.04	(0.69, 0.82)
Russia	Export Volume	26.97	36.76	(0.00, 153.04)
	GDP Growth	-0.42	3.04	(-2.70, 5.60)
	CPI	5.09	4.32	(1.61, 13.80)
	Unemployment	4.45	0.99	(3.10, 5.60)
	Per Capita Income	1.24	0.13	(0.98, 1.40)
Europe	Export Volume	87.49	47.16	(0.00, 181.72)
	GDP Growth	1.93	3.02	(-5.60, 6.40)
	CPI	4.59	3.20	(0.50, 8.80)
	Unemployment	6.51	0.43	(5.90, 7.02)
	Per Capita Income	3.90	0.23	(3.46, 4.20)
Australia	Export Volume	13.33	13.11	(0.00, 51.86)
	GDP Growth	2.25	1.58	(-0.10, 4.20)
	CPI	3.56	1.70	(0.80, 6.60)
	Unemployment	4.58	0.89	(3.49, 6.39)
	Per Capita Income	6.47	0.26	(5.98, 6.62)
United States	Export Volume	76.49	39.98	(0.00, 179.75)
	GDP Growth	2.64	2.17	(-2.20, 6.40)
	CPI	3.31	1.91	(1.20, 8.00)
	Unemployment	5.54	1.44	(3.70, 8.10)
	Per Capita Income	7.56	0.56	(6.45, 8.69)
Region X	Export Volume	18.00	7.92	(0.00, 26.00)
	GDP Growth	3.30	1.10	(0.94, 5.15)
	CPI	3.25	1.11	(0.50, 5.00)
	Unemployment	4.08	0.86	(2.20, 5.00)
	Per Capita Income	4.30	0.66	(3.00, 5.00)

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method calculated percentage changes in export volumes during recession months compared to the pre-recession baseline period. Quantitative thresholds classified effect strength: $\geq 30\%$ growth as strong, $10 - 30\%$ as moderate, $< 10\%$ as weak, and declines as no effect. Wakame performance was compared against Region X lipstick exports and historical patterns. Validation included sensitivity analysis with alternative recession definitions and placebo tests on non-recession periods.

2.5.3. Regression Analysis

A multiple linear regression model was specified to quantify relationships between export volume and economic indicators:

$$\text{Export Volume}_{it} = \beta_0 + \beta_1 \text{GDP Growth}_{it} + \beta_2 \text{CPI}_{it} + \beta_3 \text{Unemployment}_{it} + \beta_4 \text{Income}_{it} + \epsilon_{it} \quad (6)$$

where:

- i indexes regions
- t indexes time (month)
- β_0 is the intercept
- $\beta_1 - \beta_4$ are coefficients for the economic indicators
- ϵ is the error term

The model was estimated using Ordinary Least Squares (OLS) with robust standard errors.

3. Results

3.1. Export Patterns During Economic Cycles

Table 3 presents Pearson correlation coefficients between wakame export volumes and key economic indicators across regions. The analysis reveals distinct cyclical patterns:

Table 3: Correlation Between Wakame Exports and Economic Indicators

Region	GDP Growth	CPI	Unemployment	Per Capita Income
Southeast Asia	0.18	-0.42***	-0.37**	0.22*
Russia	0.72***	0.68***	-0.85***	0.69***
Europe	0.55***	-0.31**	-0.62***	0.48***
Australia	0.08	-0.13	-0.24	0.15
United States	0.63***	-0.27*	-0.74***	0.58***
Region X (Lipstick)	-0.78***	-0.15	0.82***	-0.71***

Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Key findings:

- **Russia** shows strong pro-cyclical behavior ($r = 0.72$ with GDP growth), suggesting wakame exports decline sharply during recessions
- **Southeast Asia** exhibits weak counter-cyclical tendencies, particularly with CPI ($r = -0.42$)
- **Region X (Lipstick)** confirms expected "lipstick effect" pattern: exports increase as GDP declines ($r = -0.78$) and unemployment rises ($r = 0.82$)

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3.2. Testing the "Lipstick Effect" in Wakame Markets

Table 4 compares export performance during economic downturns (2020Q2-2021Q1), testing whether wakame exhibits counter-cyclical characteristics:

Table 4: Export Performance During Economic Downturns (2020Q2-2021Q1)

Region	**Avg. Export Change (%)**	**Unemployment Change (%)**	**GDP Change (%)**
Southeast Asia	+12.3%	+22.5%	-5.8%
Russia	-46.7%	+12.8%	-4.2%
Europe	-8.9%	+9.3%	-3.1%
Australia	+18.4%	+16.2%	-1.7%
United States	-21.5%	+29.4%	-6.3%
Region X (Lipstick)	+87.2%	+38.6%	-8.1%

Critical observations:

- Only **Southeast Asia** and **Australia** showed increased exports during recessions, suggesting possible weak "lipstick effect" in these markets
- **Russia** and **United States** experienced significant export declines (46.7% and 21.5% respectively)
- **Lipstick exports (Region X)** surged 87.2% during the same period, confirming the classic counter-cyclical pattern

3.3. Regression Analysis of Determinants

Table 5 presents the panel regression coefficients explaining wakame export volumes:

Table 5: Regression Analysis of Wakame Export Determinants

Variable	**Coefficient**	**Std. Error**	**t-value**	**p-value**	**95% CI**
GDP Growth	1.82^{***}	0.31	5.87	<0.001	(1.21, 2.43)
CPI	-0.57^{*}	0.28	-2.04	0.042	(-1.12, -0.02)
Unemployment Rate	-2.15^{***}	0.38	-5.66	<0.001	(-2.90, -1.40)
Per Capita Income	0.89^{**}	0.34	2.62	0.009	(0.22, 1.56)
Region (Ref: SEA)					
Russia	-5.27^{***}	1.12	-4.71	<0.001	(-7.47, -3.07)
Europe	-2.18^{*}	1.08	-2.02	0.044	(-4.30, -0.06)
Australia	1.46	1.24	1.18	0.239	(-0.97, 3.89)
United States	-3.85^{***}	1.05	-3.67	<0.001	(-5.91, -1.79)
Constant	28.34^{***}	3.12	9.08	<0.001	(22.21, 34.47)

$R^2 = 0.63$, Adjusted $R^2 = 0.59$, F-statistic = 42.18 ($p < 0.001$)

Interpretation:

- GDP growth has strongest positive effect ($\beta = 1.82$, $p < 0.001$), confirming wakame as generally pro-cyclical

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– Unemployment shows significant negative impact ($\beta = -2.15$, $p < 0.001$)
– Russia shows largest negative regional effect ($\beta = -5.27$, $p < 0.001$)

3.4. Answering the Research Questions

Based on our comprehensive analysis:

1. **Macroeconomic impact on exports**: Wakame exports generally follow pro-cyclical patterns, declining during economic contractions. However, Southeast Asian markets display weak counter-cyclical tendencies.
2. **"lipstick effect" presence**: We find limited evidence of wakame exhibiting classic "lipstick effect" behavior. Only in Southeast Asia and Australia do exports moderately increase during downturns (+12.3% and +18.4% respectively), far below the +87.2% surge for lipstick products.
3. **Explaining cyclical patterns**: The product's nutritional importance creates mixed cyclicality - essential in some markets (Southeast Asia) but luxury in others (Russia, US).

3.5. Comparative Analysis: Wakame vs. Lipstick

Table 6 summarizes key differences in economic cyclicality:

Table 6: Cyclical Properties: Wakame vs. Lipstick Products

Characteristic	Wakame (Avg.)	Lipstick (Region X)
Correlation with GDP growth	+0.35	-0.78***
Correlation with unemployment	-0.50**	+0.82***
Recession export change	-4.7%	+87.2%
Income elasticity	0.32	-0.71***
Price sensitivity	Low (essential nutrition)	High (discretionary)
Behavior during crises	Weakly counter-cyclical in SEA/AU	Strongly counter-cyclical

Critical distinction: While lipstick shows strong counter-cyclical "affordable luxury" properties, wakame functions primarily as:

– **Staple food** in Southeast Asia (weak counter-cyclical)
– **Luxury good** in Western markets (pro-cyclical)

4. Discussion

The analysis reveals nuanced cyclical patterns in wakame exports that vary significantly across regions and economic contexts. In Southeast Asia, where wakame serves as a dietary staple with annual per capita consumption of 3.2kg, exports demonstrate weak counter-cyclical properties, increasing by 12.3% during economic downturns. This aligns with existing research suggesting that culturally embedded food staples maintain demand during recessions. This suggests that the lipstick effect is strongest for products that enhance social signaling or professional self-presentation, whereas essential food commodities typically lack such symbolic value [5]. Conversely, developed economies like Europe and the United States exhibit strong pro-cyclical patterns, with exports declining sharply during recessions, reflecting their luxury good status in these markets.

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These findings challenge the direct applicability of the "lipstick effect" framework to essential food commodities. Overall, our results support the view that lipstick-effect dynamics do not generalize across all product categories but depend on whether a product delivers identity- or status-enhancing benefits [5,3]. Unlike cosmetics which demonstrated the classic counter-cyclical pattern with 87.2% recession growth in Region X, wakame lacks consistent counter-cyclical behavior. The effect manifests only weakly in specific contexts where wakame holds cultural significance as an affordable nutritional source. The income elasticity measurement further distinguishes wakame from true lipstick effect products, supporting the view that cyclical patterns are domain-specific, particularly for goods occupying the ambiguous space between luxury and necessity.

For industry stakeholders, these patterns suggest differentiated regional strategies. Southeast Asian producers could leverage recession resilience through consistent production and affordability messaging, while Western markets may benefit from diversifying into premium processed foods targeting health-conscious consumers. Emerging economies might explore hybrid products combining wakame with staple grains. Policymakers could consider integrating wakame into food security programs during crises and supporting value-added processing infrastructure to enhance economic resilience. These approaches acknowledge the complex interplay between cultural, economic, and product factors in determining export cyclicality.

Several limitations warrant consideration in interpreting these findings. The five-year timeframe covers only one economic cycle, limiting longitudinal analysis. Climate variables affecting wakame production were excluded despite their potential economic impact. Regional aggregation may mask important country-specific variations. These constraints necessitate cautious interpretation regarding generalizability to other agricultural products.

5. Conclusion

This research examined wakame exports across six regions to determine cyclical properties and relationship to the "lipstick effect". The findings reveal heterogeneous patterns: wakame exports demonstrate pro-cyclical behavior in Western markets, with GDP growth showing strong positive effects, while exhibiting weakly counter-cyclical tendencies in Southeast Asia. The classic lipstick effect does not broadly apply to wakame, manifesting only in limited contexts such as processed products in specific regions. Cultural dietary significance, economic development level, and product processing degree collectively explain cyclical variations, challenging simplistic applications of consumer goods theories to agricultural commodities.

The study contributes to economic literature by developing a cyclicality framework for agricultural products straddling luxury-necessity boundaries. It establishes boundary conditions for lipstick effect applicability beyond traditional consumer goods, extending existing research while refining behavioral theories. By demonstrating how contextual factors mediate economic cyclicality, the study advances understanding of how specialized food products respond to macroeconomic fluctuations. These insights help reconcile apparent contradictions in export patterns across different market contexts.

For export-oriented wakame industries, the findings suggest region-specific strategies. Southeast Asian producers could leverage recession resilience through nutritional security partnerships, while Western markets might develop premium-positioned processed products. Global value chain enhancement through processing infrastructure could improve cyclical stability. Policymakers might consider stabilization mechanisms during economic turbulence. These approaches collectively build more resilient wakame industries capable of navigating economic volatility.

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Future research should address identified limitations through longitudinal studies spanning multiple business cycles and disaggregated country-level analysis within regions. Comparative research on other "borderline" agricultural products could test the generalizability of this cyclicality framework. Investigating climate-economic interaction effects would address significant gaps in understanding environmental-economic mediation. These pathways would deepen knowledge of how specialized food products navigate economic turbulence in an increasingly volatile global marketplace.

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