Normalized Revealed Comparative Advantage and Destination-Specific Competitiveness of Major Pineapple Exporting Countries

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Introduction:

- Production and trade in fresh fruits and vegetables have grown faster than trade in other agri-food commodities.
  - discoveries of previously unknown nutritional values and their health benefits;
  - Growing health concerns of aging population, particularly in developed countries
  - Population growth and rising income worldwide

- Export of tropical fruits has become an important source of income and food security

- Harnessing the full potential of the new source of income remains challenging as fresh fruit and vegetable exports are often subject to stringent sanitary and phytosanitary requirements.
  - While the market for fresh fruits is growing, not all producing and/exporting countries have been able to capitalize on this potential
  - Golden Opportunities and Surmountable Challenges

Introduction

- Due to changes in health concerns and SPS measures, there is a growing interest in trade in fruits and vegetables in the New Millennium.

  - Focused on TBs & NTBs, trade duration and determinants to specific destinations
    - Boansi et al. 2014; Peterson et al. 2018

  - Few examined competitiveness of fruits and vegetables from a particular source to selected destinations
    - Fu et al. 2021; Lapina et al. 2020; Kousar et al. 2019; Avila-Arce and Gonzalez-Milan, 2012
    - Balassa's Revealed Comparative Advantage (BRCA) and DRC analysis
    - The results are mixed but informative

Introduction:

- Pineapple is one of top three tropical fruits traded internationally. Production has been growing rapidly in all countries producing pineapple. But only 12% of total production has been exported over the last two decades.
- Focus on pineapple export in this study
  - What are leading pineapple producing and exporting countries?
  - What are top export destinations of fresh pineapples?
  - What is the competitive position of major pineapple exporting countries from each continent?
  - What factors influence changes in export competitiveness of these countries?

- A global scan and descriptive analysis is performed to address the first two questions.
- A modified Normalized Revealed Comparative Advantage (NRCA) is used to measure destination specific comparative advantage using monthly data from 1999 to 2019 to address the second question.
- Finally, a gravity model is estimated to determine the factors influencing changes in comparative advantage over time.
- Comparative advantage and competitiveness are used interchangeably in this study.

Issues with Definition:

- Thanks to David Ricardo, the definition of CA is widely received
  - The definition of Competitiveness is ?
  - It is still tentative, not widely received and can invite controversy.

- Amid the continuing unease, a consensus sems to be emerging on which indicators can be used to measure competitiveness
  - If it is a performance indicator of a sector in a country relative to the same sector in another country, focus on trade success
  - If it is perceived to be process, focus on cost and nonprice leadership.

- The primary focus is to investigate how well the major pineapple exporting countries have performed, we focus on a trade-based measure of competitiveness.

Measurement of International Competitiveness

$$BRCAj^{i} = \frac{\left(\frac{Ej^{i}}{E^{i}}\right)}{\left(\frac{E_{j}}{E}\right)}$$

- E_j^i denotes i's export of commodity j; E_j denotes total export of commodity j by all countries,
- E^i denotes i's export of all commodities and
- E denotes export of all commodities by all countries
- BRCA index compares country i's market share in the j^{th} commodity export market relative to its market share in the world export market.

Normalized Revealed Comparative Advantage (NRCA)

$$NRCA_j^i = \left({}^{E_j^i}/_{E}\right) - \left({}^{E^i E_j}/_{EE}\right)$$

Where E_j^i denotes the exports of commodity j from country i to the rest of the world,

E^i denotes country i's total exports,

E_j denotes the total exports of commodity j in the world,

E denotes the total exports in the world.

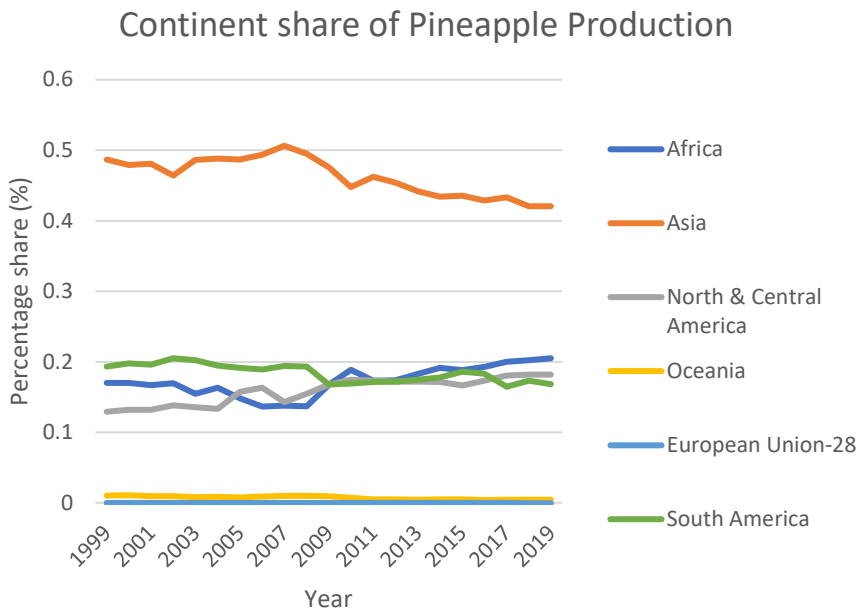
Distribution: Symmetric

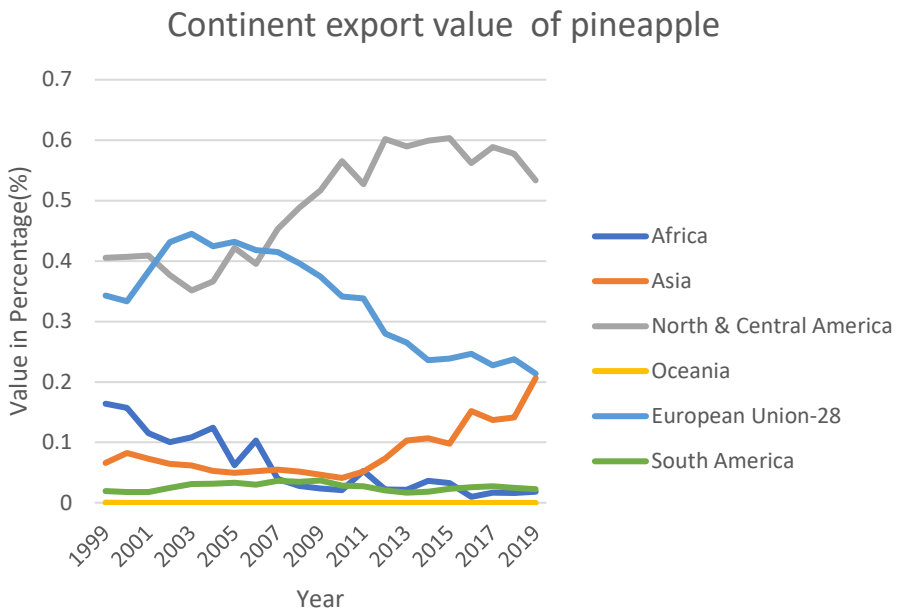
Threshold value: 0

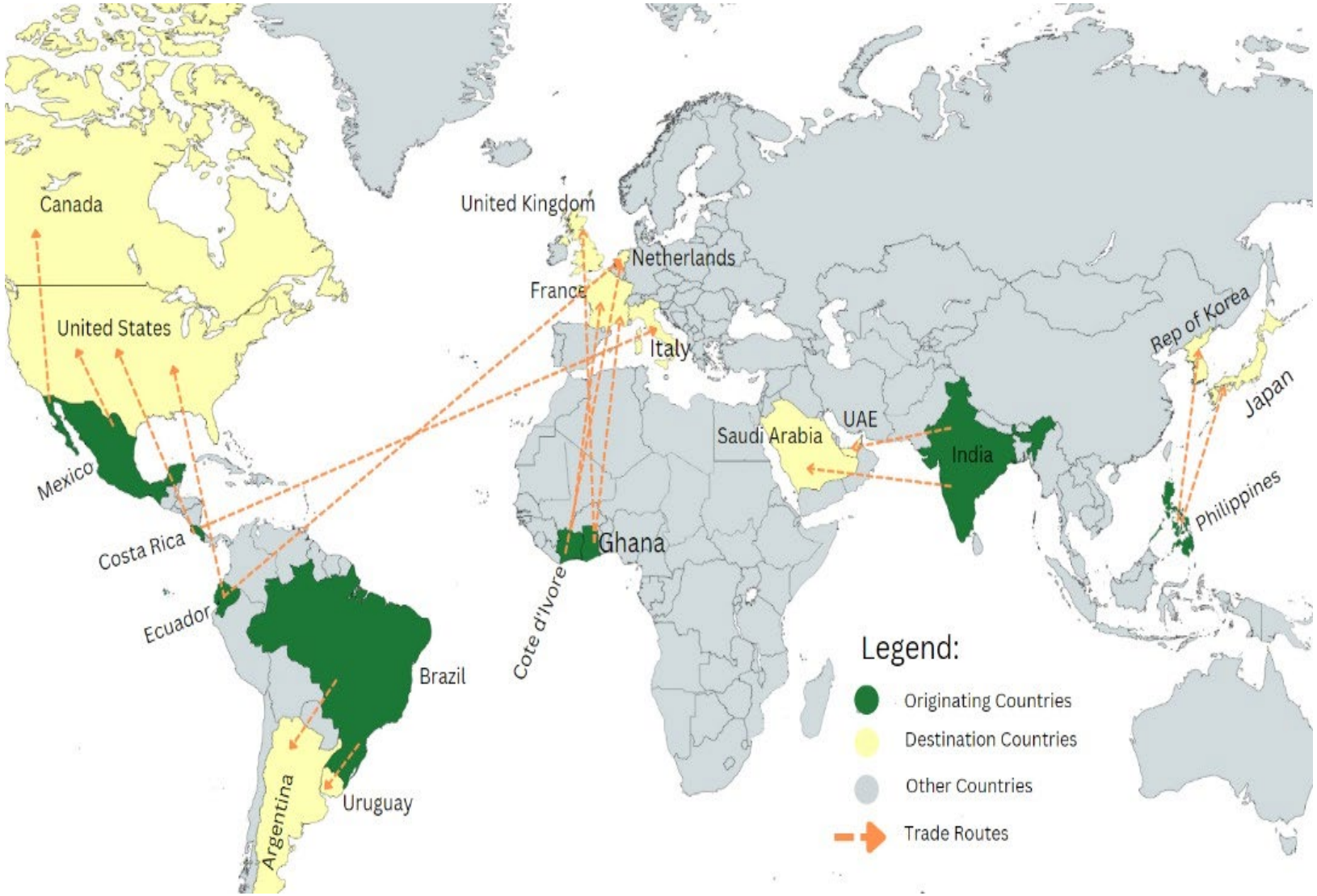
Normalized Revealed Comparative Advantage (NRCA)

- NRCA index begins with the comparative-advantage-neutral point. Thus, if the comparative-advantage-neutral condition of country i's export of commodity j is denoted by
- $\ddot{E}_j^i = E^i E_j / E$. If E_i^j denotes country i's export of commodity j to rest of the world; difference between these two can be written as:
- $\Delta E_i^j = E_i^j - \ddot{E}_j^i = E_i^j - E^i E_j / E$, Normalize this difference by total world exports E to obtain,
- $NRCA_j^i = \frac{E_i^j}{E} - \frac{E^i E_j}{EE}$
- $NRCA_j^i$ index measures the degree to which exports of commodity j from country i deviates from its comparative-advantage-neutral point with respect to the world export market.
- Thus, if $NRCA_j^i$ >0, it indicates that exports of commodity j from country i is higher than its comparative-advantage neutral value.

Share of Pineapple Production & Export






Canada
United States
Mexico
Costa Rica
Ecuador
Brazil
Argentina
Uruguay
United Kingdom
Netherlands
France
Italy
Cote d'ivore
Ghana
Saudi Arabia
UAE
India
Rep of Korea
Japan
Philippines
Legend:
Originating Countries
Destination Countries
Other Countries
Trade Routes

Source and Destination Countries:

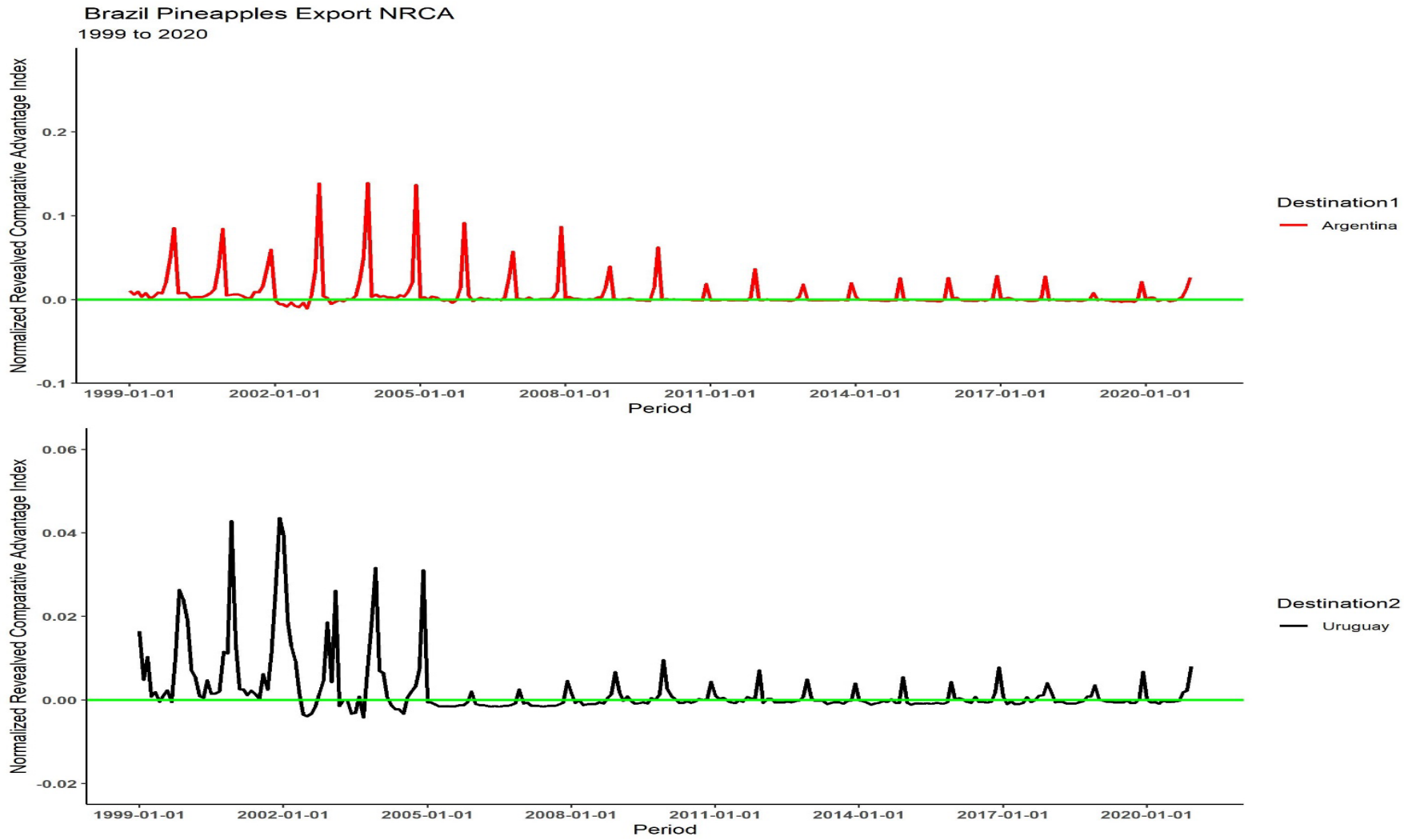
Pineapple		
Continent	**Exporting Countries**	**Specific Export Destinations**
Africa	Côte d'Ivoire	● France ● Netherlands
Africa	Ghana	● France ● United Kingdom
Asia	India	● United Arab Emirates ● Saudi Arabia
Asia	Philippines	● Japan ● Republic of Korea
Latin-America &the Caribbean	Costa Rica	● Italy ● United States
Latin-America &the Caribbean	Mexico	● Canada, ● United States
South America	Brazil	● Uruguay, ● Argentina
South America	Ecuador	● Netherlands, ● United States

Results of Export Competitiveness

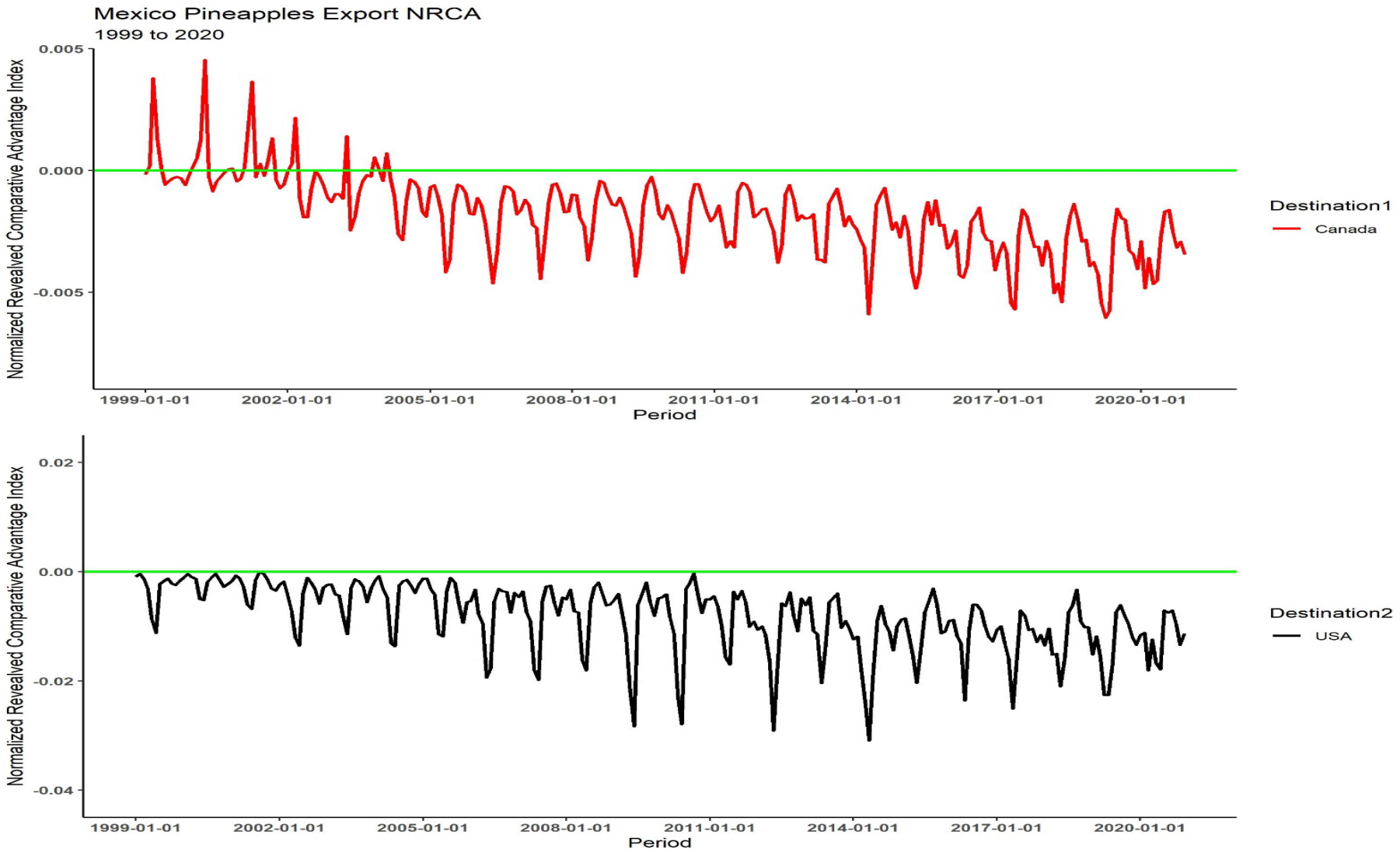
Average NRCA values for Selected Years:

Source	Destination	1999-2002	2005	2008	2011	2014	2017	2020
Brazil	● Argentina	0.0141	0.0145	0.0074	0.0033	0.0036	0.0018	0.0012
Brazil	● Uruguay	0.0086	0.0032	-0.0004	0.0007	0.0001	0.0002	0.0004
Costa Rica	● USA	0.0208	0.0247	0.0355	0.0321	0.0335	0.0284	0.0258
Costa Rica	● Italy	0.0134	0.0159	0.0208	0.0218	0.0282	0.0314	0.0318
Côte d'Ivoire	● France	0.0250	0.0160	0.0045	0.0025	0.0011	0.0012	0.0009
Côte d'Ivoire	● Netherlands	0.0009	0.0004	0.0002	0.0006	0.0001	0.0002	0.0001
Ecuador	● USA	-0.0396	0.0285	0.0200	-0.0024	-0.0925	-0.1130	-0.1113
Ecuador	● Netherlands	0.0000	0.0007	0.0006	0.0006	-0.0001	0.0001	0.0006
Ghana	● France	0.0675	0.0047	0.0030	0.0014	0.0013	0.0010	0.0006
Ghana	● UK	0.0007	0.0010	0.0024	0.0024	0.0020	0.0007	0.0005
India	● Saudi Arabia	0.0001	0.0001	0.0000	-0.0003	-0.0006	-0.0005	-0.0005
India	● UAE	-0.0003	-0.0026	-0.0145	-0.0004	-0.0033	-0.0023	-0.0026
Mexico	● Canada	0.0001	-0.0011	-0.0018	-0.0018	-0.0022	-0.0030	-0.0034
Mexico	● USA	-0.0031	-0.0045	-0.0074	-0.0085	-0.0151	-0.0078	-0.0123
Philippines	● Japan	0.0045	0.0050	0.0057	0.0004	0.0073	0.0067	0.0149
Philippines	● Rep. of Korea	0.0004	-0.0011	-0.0024	-0.0035	0.0143	0.0189	0.0153

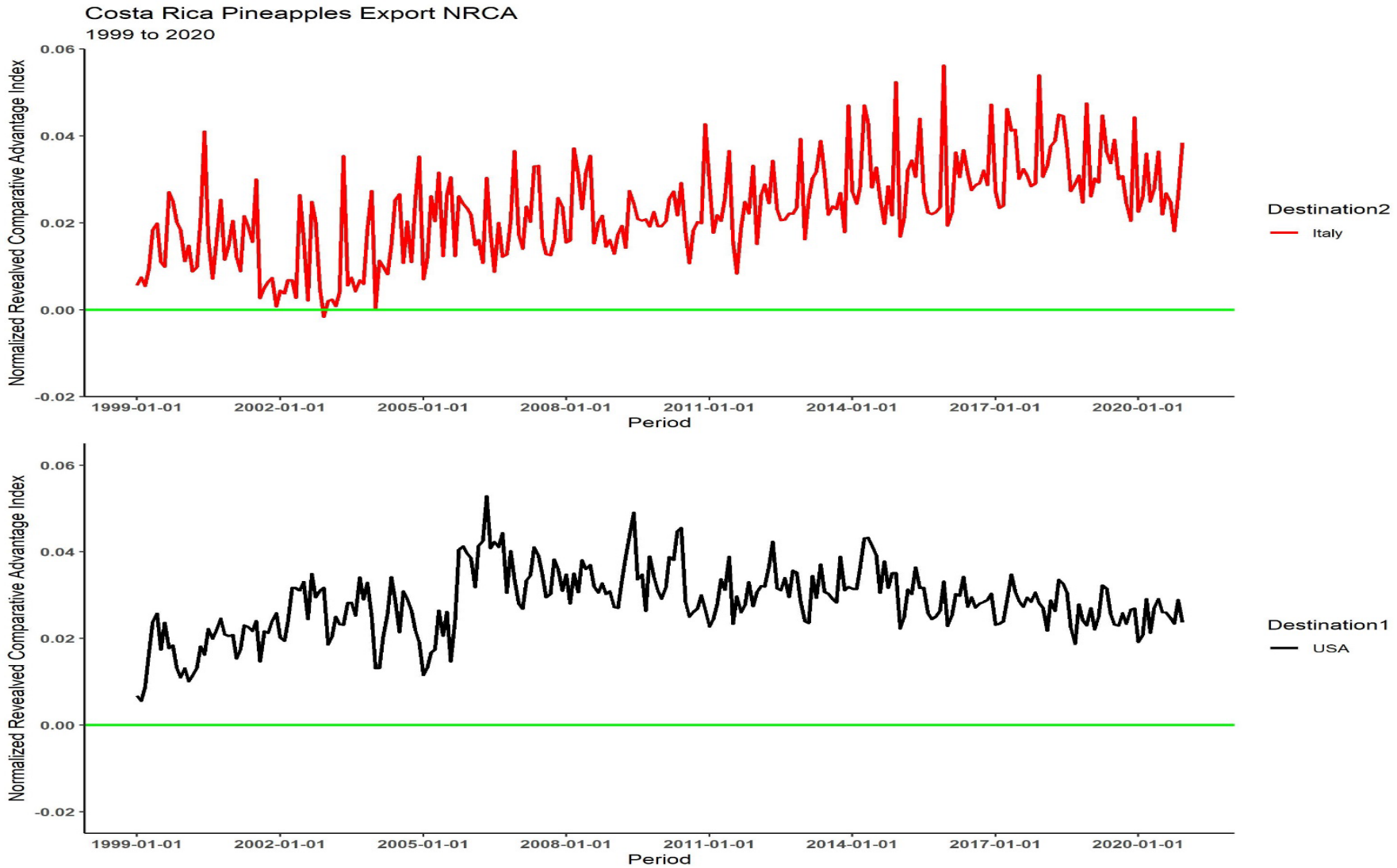
Evolution of NRCA Values:



Evolution of NRCA Values:



Evolution of NRCA Values:



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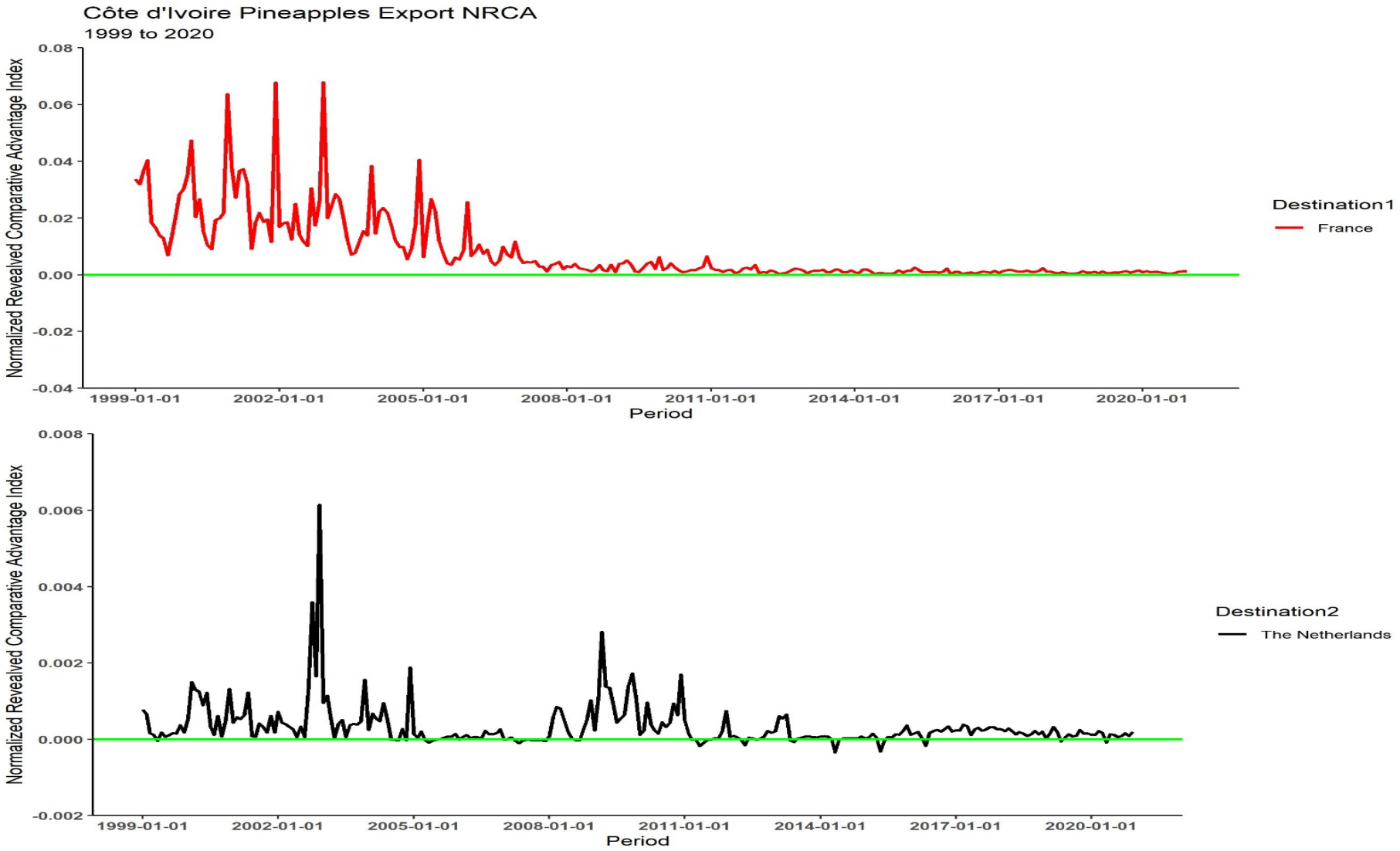
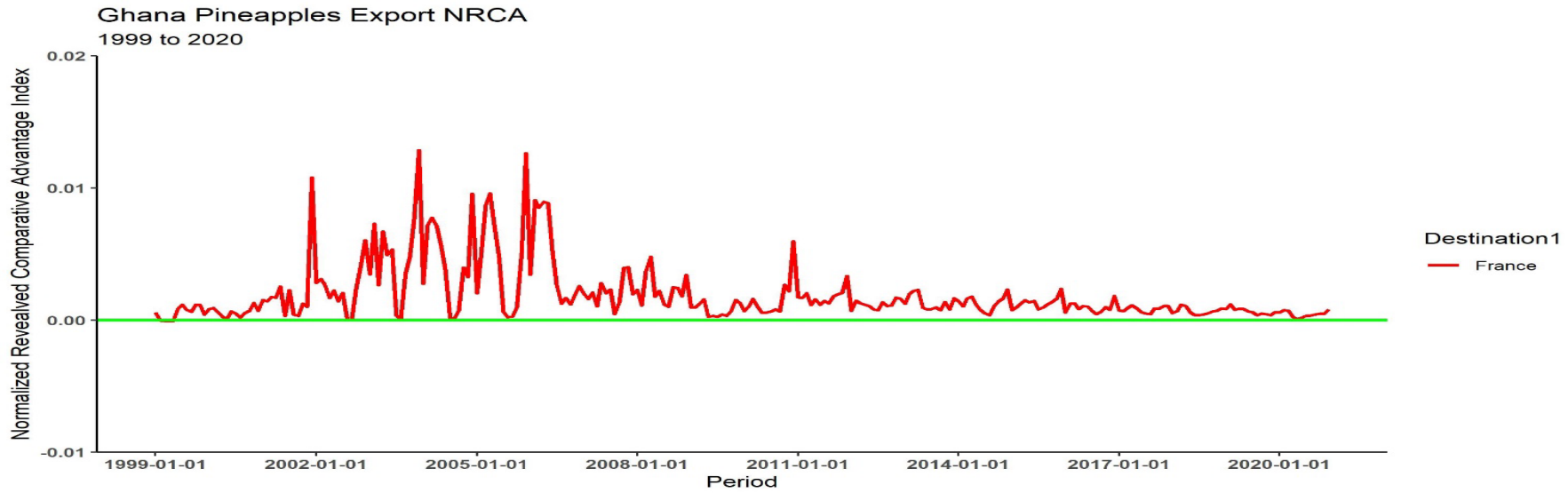
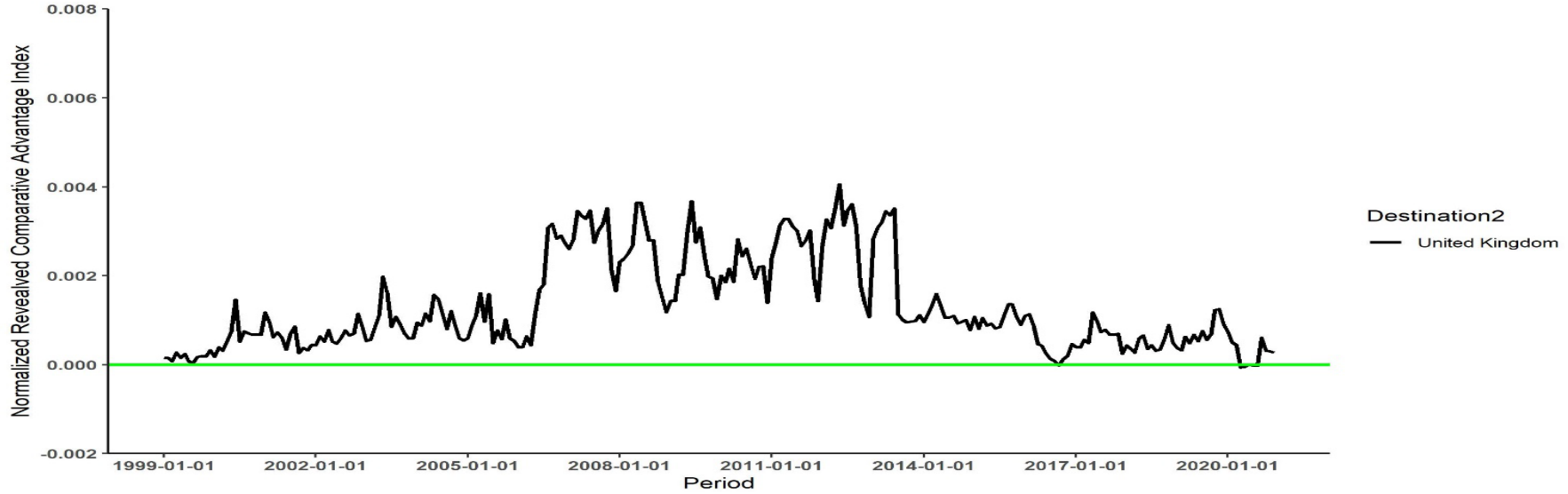
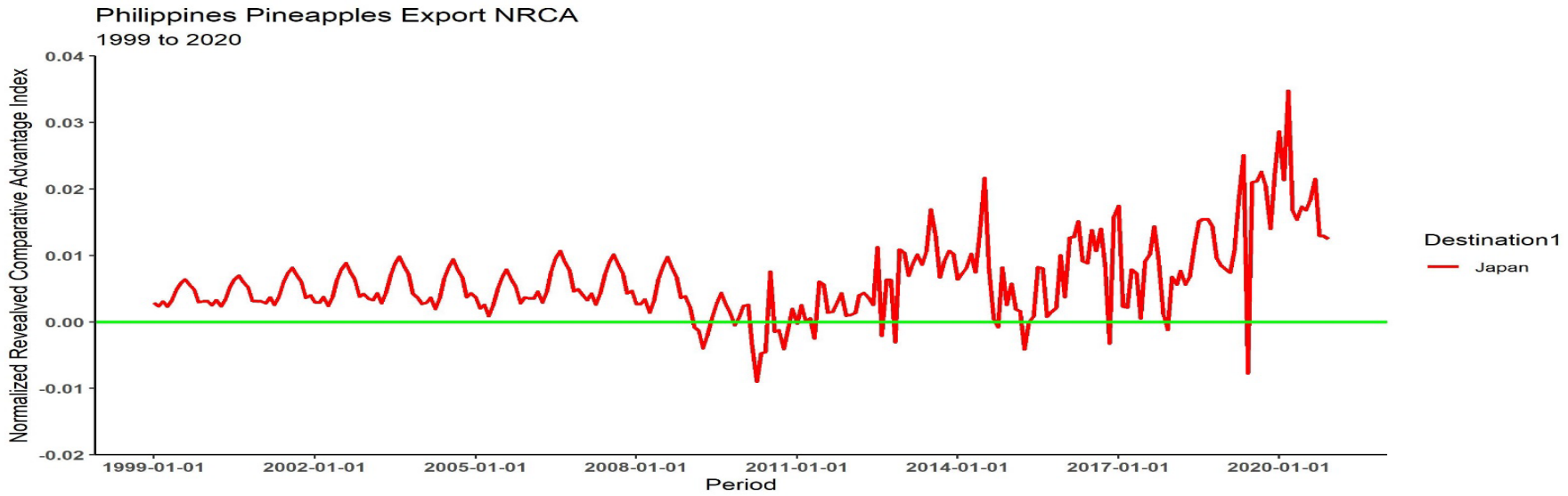


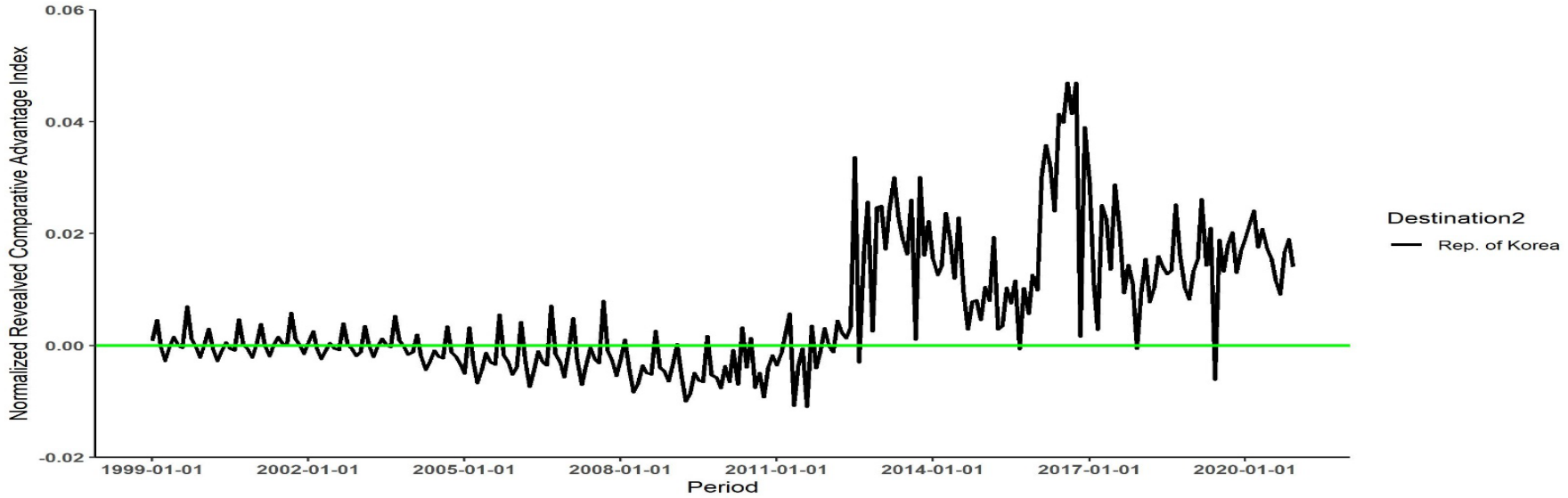
Evolution of NRCA Values:





Evolution of NRCA Values:





The Gravity Model:

The log-linear version can be specified as:

- $lnNRCA_j^i = \alpha_0 + \beta_1\, ln\, GDP_i + \beta_2\, ln\, GDP_j + \beta_3 ln\, GDPPCi + \beta_4 ln\, GDPPCj + \beta_5\, ln\, Dist_{ij} + \beta_6\ \text{Contig}_{ij} + \beta_7 lang_{ij} + \beta_8 Comcol_{ij} + \beta_9 FTA_{ij} + \beta_{10}\text{logXR}t_{ijt} + \beta_{11} logPX_{ij} + \beta_{12} lnTariff_{ij} + \beta_{13} lnImmig_{ij} + \theta_t + \mathcal{E}_{ijt}$

We used the following Poisson Pseudo Max Likelihood (PPML) model in this research:

$$lnNRCA_{jt}^i = \exp\big[\alpha_0 + \beta_1\, ln\, GDP_i + \beta_2\, ln\, GDP_j + \beta_3 \ln GDPPCi + \beta_4 \ln GDPPCj + \beta_5\, ln\, Dist_{ij} + \beta_6\ \text{Contig}_{ij} + \beta_7 lang_{ij} + \beta_8 Comcol_{ij} + \beta_9 FTA_{ij} + \beta_{10}\text{logXR}t_{ijt} + \beta_{11} logPX_{ij} + \beta_{12}\, lnTariff_{ij} + \beta_{13} lnImmig_{ij} + \theta_t\big] + \mathcal{E}_{ijt}$$

Definition and Sources of Gravity Variables:

Description of Data and Relevant Source			
Variable	**Unit**	**Series**	**Sources**
Export Value	$1000 USD	Monthly	UN COMTRADE
Import Value	$1000 USD	Monthly	USDA, EUROSTAT, STATSCAN
GDP of Exporter (Origin)	$1000 USD	Quarterly	OECD (2022)
GDP of Importer (Destination)	$1000 USD	Quarterly	OECD (2022)
GDP/C of Exporter (Origin)	$1000 USD	Quarterly	OECD (2022)/CEPII (2020)
GDP/C of Importer (Destination)	$1000 USD	Quarterly	OECD (2022)/CEPII (2020)
Distance	Kilometers	Constant	CEPII (2020)
Contiguity	Binary	Zero/One	CEPII (2020)
Common language	Binary	Zero/One	CEPII (2020)
Colonial ties	Binary	Zero/One	CEPII (2020)
RTA	Binary	Zero/One	CEPII (2020)
Migration	Population size	Annual	United Nations (2019)
Exchange Rate	Domestic Currency per USD	Monthly	USDA
Tariff	Simple Average rate	Annual	UNCTAD-TRAINS
Price	Per unit USD	Monthly	Author's Calculation

Gravity Results:

VARIABLES	(OLS) BRA-ARG	(OLS) BRA-URG	(OLS) COS-US	(OLS) COS-ITA
Price	0.00192	-0.00141	0.0201***	0.0109***
	(0.00251)	(0.00105)	(0.00169)	(0.00347)
Exchange rate	0.00283	0.0156	0.0310***	0.0361***
	(0.00263)	(0.0106)	(0.00558)	(0.00996)
Tariff	-0.000309	6.84e-05	-	-0.000158
	(0.000392)	(0.000130)		(0.000238)
Immigration	-0.0158	-0.0201	-0.0599***	-0.0464***
	(0.0181)	(0.0140)	(0.0216)	(0.00982)
GDP Origin	0.0113	0.0124**	0.0205**	0.0449***
	(0.0108)	(0.00602)	(0.00803)	(0.0148)
GDP Destination	0.0116	-0.00504	0.0339*	-0.0222
	(0.0247)	(0.00405)	(0.0191)	(0.0136)
GDP per capita O.	-0.0147	-0.00753	-0.0124	-0.0142
	(0.0121)	(0.00545)	(0.00807)	(0.0152)
GDP per capita D.	-0.0185	-0.000827	-0.0720***	0.00378
	(0.0282)	(0.00856)	(0.0204)	(0.0114)
Constant	-0.0202	0.141	0.133	0.0143
	(0.245)	(0.158)	(0.293)	(0.125)
Observations	230	263	264	264
R-squared	0.673	0.525	0.743	0.635
F-Statistics	9.16	5.64	24.28	50.48

Gravity Results:

VARIABLES	(OLS) GHA-FRA	(OLS) GHA-UK	(OLS) PHI-JPN	(OLS) PHI-KOR
Price	0.00261***	0.00106***	0.00852***	0.0133***
	(0.000360)	(0.000105)	(0.00217)	(0.00133)
Exchange rate	-0.000226	-0.00333***	-0.00935**	0.0238**
	(0.000385)	(0.000311)	(0.00366)	(0.0102)
Tariff	-5.66e-05**	5.13e-05***	0.000732	-
	(2.69e-05)	(8.78e-06)	(0.000520)	
Immigration	-0.0167***	0.00800***	0.0173***	0.0170***
	(0.00447)	(0.00149)	(0.00567)	(0.00505)
GDP Origin	0.00256*	-0.000321	-0.0152**	0.0108
	(0.00146)	(0.000731)	(0.00646)	(0.0131)
GDP Destination	0.000915	0.00273***	-0.00206	-0.00511
	(0.00223)	(0.000990)	(0.00402)	(0.0110)
GDP per capita O.	-6.67e-05	-0.00157***	0.0126*	0.00608
	(0.00130)	(0.000502)	(0.00713)	(0.0113)
GDP per capita D.	-0.00329	0.00267***	-0.000188	-0.0364***
	(0.00289)	(0.00101)	(0.000618)	(0.0114)
Constant	0.119**	-0.130***	-0.0198	-0.0221
	(0.0495)	(0.0196)	(0.0931)	(0.125)
Observations	259	263	263	263
R-squared	0.618	0.665	0.573	0.653
F-Statistics	9.93	31.08	18.19	30.64

Gravity Results:

VARIABLES	(PPML) AMERICA	(PPML) ASIA	(PPML) EUROPE
Price	-0.0047*	0.0053***	-0.0009***
	(0.0026)	(0.0006)	(0.0003)
Exchange rate	0.0077***	-0.0044*	0.0025***
	(0.0006)	(0.0023)	(0.0002)
Tariff	-0.0015***	0.0003***	-0.0001
	(0.0003)	(0.0001)	(0.0001)
Immigration	-0.0147***	0.0129***	0.0052***
	(0.0010)	(0.0020)	(0.0010)
Distance	-0.0151	0.0344	0.0329***
	(0.0098)	(0.0321)	(0.0027)
GDP Origin	0.0115***	-0.0139***	0.0025***
	(0.0007)	(0.0038)	(0.0005)
GDP Destination	0.0185***	-0.0123***	0.0047***
	(0.0013)	(0.0023)	(0.0009)
GDP per capita Origin	-0.0424***	0.0220***	-0.0032***
	(0.0040)	(0.0054)	(0.0007)
GDP per capita Destination	-0.0061	-0.0009	-0.0183***
	(0.0038)	(0.0011)	(0.0013)
Contiguity	0.0200***	-	-
	(0.0050)		
RTA	0.0322***	-0.0061***	0.0003
	(0.0028)	(0.0013)	(0.0005)
Common Language	-	-	-0.0218***
			(0.0035)
Colonial ties	-	0.0009	0.0065***
		(0.0093)	(0.0011)
Constant	-0.0553	-0.1107	-0.3503***
	(0.0691)	(0.2899)	(0.0326)
Observations	1,539	1,052	1,501
R-squared	0.4399	0.4736	0.6265

Key Findings

• Latin American and Caribbean countries enjoyed the highest comparative advantage followed by African, South American and Asian exporters.

• Most pineapple exporting countries enjoyed comparative advantage, the performance vary significantly across countries and over time

• Costa Rica is the most competitive pineapple exporting country in the world and Mexico appears to be the least

• Effects of GDP is positive and significant for exporters to Europe and America; the results are different for countries exporting to Asian destinations. Income effects is positive, but wealth effect is negative

• Effects of:

(i) distance (ii) price, (iii) exchange rate, (iv) immigration, (v) FTA, (vi) colonial ties, (vii) common official language

Concluding Remarks

• NRCA values in this study revealed that most exporters of fresh pineapple enjoyed comparative advantage in specific export destinations. Exceptions include

>Ecuadorian export to the United States,

>Mexican exports to both Canada and the United States and

>Indian exports to Saudi Arabia

• Countries exporting fresh pineapple to developed countries enjoyed higher comparative advantage compared to exports to other destinations

• Likely that the Covid-19 pandemic has affected the competitiveness of most tropical countries in Africa, Asia, and South America; SPS measures and a transparent compliance protocol

• Infrastructure development to facilitate storage and transportation

• Climate change is an important issue

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Thank you!

Any questions or comments?

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