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The impact of exchange rate on fisheries production: international evidence from selected countries

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Abstract

One of the most important factors affecting international trade is exchange rate fluctuations. To date, studies that have analyzed the effect of exchange rates have shown that the effect can vary from sector to sector and from country to country. The fact that this relationship has not been extensively studied in the fisheries industry is the motivation for this study. In this regard, the aim of this study is to determine whether changes in the real exchange rates of countries affect their fisheries production levels. Accordingly, we used the causality test developed by Emirmahmutoglu and Kose (2011), which takes into account both cross-sectional dependencies and heterogeneity. The data set used in this study consisted of 27 annual observations from 38 countries from 1990–2016. The results revealed that changes in the real exchange rate affected fisheries production. This situation shows that changes in exchange rates may affect the international demand for fisheries and serve as a source of motivation for producers.

Introduction

The main factors affecting international trade, as defined by many researchers, include inflation, national income, government restrictions, and exchange rates (Madura & Fox, 2007, p. 51). For instance, increased inflation may cause a country to purchase more from foreign countries and decrease exports to other countries due to increasing local prices. When a country's national income increases, its consumption and, thus, the demand for foreign products may increase. Government restrictions may restrict a country's imports and exports. The exchange rate is one of the most influential factors in international trade, as it determines the current price of products in the country relative to other countries, and the price of products in other countries in the current country.

Due to relative prices between countries, exchange rates constitute the mechanism, advantages, and disadvantages of product trade. Some products may not be produced in a country or may be relatively cheaper than in other countries. In this case, countries may consider it more convenient to import some of the products they need. Other products are subject to export based on foreign demand. This relative advantage can differ over time as the value of that country's currency changes. The main factor that determines this situation is the exchange rates. The effect of fluctuations in foreign exchange rates on foreign trade is a subject that is closely monitored and researched.

Like any other sector, changes in exchange rates affect the fisheries and seafood sector due to the foreign trade policies of countries. According to a report published in January 2020 by the Food and Agriculture Organization of the United Nations (FAO), global fish production was approximately 177.8 million tons in 2019 (FAO, 2020). Due to increasing demand, aquaculture is a sector that continues to grow worldwide, and aquaculture production has increased almost 12 times in the last 30 years, with an average annual increase of 8.8%. The seafood sector launched by the United Nations Food and Agriculture Organization (FAO) is a fast and constantly growing food sector. This reveals that it should be included in foreign trade and economics research because it is an important trade subject. In addition, although there is no theoretical consensus for the relationship between exchange rate volatility and foreign trade, the direction and effect of the relationship between foreign trade and exchange rates are not the same in each sector. Thus, it will be useful to investigate how foreign trade between countries or groups of countries is affected by exchange rate volatility, as well as how foreign trade in commodity groups or a particular sector is affected by exchange rate fluctuations.

In this study, we analyzed whether the real exchange rate affected fisheries production levels in 38 countries over a 27-year period. Our main motivation for investigating this relationship was the role of exchange rate fluctuations on the supply and demand of international goods. Currency depreciation in fisheries-producing countries may increase the demand for fish products in those countries, leading to production increases. This possible relationship has been tested in many literature studies for different commodity groups, and significant results have been obtained. In addition, it has been determined that the effect of the exchange rate differs from sector to sector and from country to country. Regarding the trade of fisheries products, in a paper that investigated a single country, we determined that the real exchange rate in Turkey affected its fisheries trade (Açik, Tepe & Kayiran, 2020). We have expanded this to include the maximum optimum timeframe to expand this to a more global perspective. As a result of our research, we have found that the real exchange rate is the determining factor for fisheries production in the 38 countries we examined. It is concluded that the fisheries industry is affected by the exchange rate. As far as the authors know, the lack of any other study examining this issue on a global scale increases the originality of the research.

The rest of the study is organized as follows: the literature on exchange rates and international trade is reviewed in the second section; the method used in the study and its prerequisites are introduced in the third section; information about the data used in the study is presented in the fourth section; the results of the analyses are presented in the fifth section; evaluations are made in the last section.

Literature review

Since the collapse of the Bretton Woods fixed currency system in 1973, increases in exchange rate volatility have had unclear effects on international trade transactions. Theoretically, the increase in volatility may increase risk and decrease commercial activities, but theoretical literature also provides rationales for positive effect or ineffective outcomes (Bahmani-Oskooee & Hegerty, 2007). The exchange rate and the import-export relationship, which form the basis of this research, are based on a simple theory. When a domestic currency depreciates against the exchange rate, and when variables such as quality, marketing, and political balance are considered constant, the prices of goods produced by a country are cheaper, and the demand for that country's goods increases.

Much academic research has been carried out related to exchange rate fluctuations and import-export levels of countries. Yurtoglu (Yurtoglu, 2017) stated that studies examining the interaction between real exchange rate and import-exports differ according to the country studied, the period investigated, and the method used in the research; therefore, there is no consensus in studies examining the relationship between the two variables (Saatcioglu & Karaca, 2004). Therefore, in this section, we only examined selected studies that achieved different results. In the literature on exchange rate and trade relations, two groups of studies may are found: the first group examined the case for a single country, while the second examined the case for a group of countries (including bilateral country relations). In a single-country case study for Malaysia, Wong and Tang (Wong & Tang, 2007) empirically examined the impact of exchange rate fluctuations on the demand for the top 5 electrical exports of the country between 1990 and 2001. As a result of the analysis, foreign income and prices were found to be significant short and long-term determinants of electrical exports, while exchange rate volatility negatively impacted electrical exports. In another country-specific study, Açik et al. (Açik, Tepe & Kayiran, 2020) explored the impact of exchange rate fluctuations on Turkey's export of fishery products by using data from January 2000 to July 2019. They found that real exchange rate shocks significantly affect the foreign trade of fisheries. In the context of bilateral trade, Chen (Chen, 2011) investigated the relationship between China's exchange rate fluctuations and its agricultural exports to Japan. The findings demonstrated that the nominal exchange rates between countries are major determinants of China's agricultural exports. Accordingly, the depreciation of China's exchange rate positively affects exports, and appreciation negatively affects them; however, this relationship may give different results. In a country group study, Asteriou et al. (Asteriou, Masatci & Pilbeam, 2016) investigated the impact of exchange rate volatility on international trade volumes for Mexico, Indonesia, Nigeria, and Turkey (MINT Countries). The results differed in the short term and long term. In the long term, a significant relationship between exchange rate volatility and international trade could not be determined in any country except Turkey. In the short term, significant casualties were determined for export and import volatility for Indonesia and Mexico, and export and import volatility for Nigeria, while no significant relationship was determined for Turkey. By using a sample of 106 countries with data from 2000 to 2011, Vieira and Macdonald (Vieira & Macdonald, 2016) investigated the relationship between the volatility of real effective exchange rate (REER) and exports. The empirical results indicated that REER volatility influenced export levels only when oil-exporting countries were included in the sample. Increased/decreased exchange rate volatility caused a decrease/increase in the export levels.

The impact of exchange rate volatility on exports may also differ according to financial deficiencies. Berman and Berthou (Berman & Berthou, 2009) analyzed the impact of financial factors on countries' exports in response to the depreciation of currency by using quarterly data for 27 developed and developing countries from 1990–2005. The authors argued that the impact of depreciation on exports may be less-positive or even negative for the country with respect to the four financial factors. These factors are the level of firms' borrowing of foreign currency, the level of credit constraints of firms, firms' specialization in industries that require more external capital, and the magnitude of depreciation or devaluation. The last factor provides evidence for the existence of a nonlinear relationship between an exchange rate depreciation and a change in the country's exports. Baum et al. (Baum, Caglayan & Ozkan, 2004) verified this nonlinear relationship between depreciation and export. They used a 13 country dataset of bilateral export data and found a nonlinear relationship depending on the economic activity volatility in the importing country. The impact of exchange rate volatility on trade varied considerably according to the group of country pairs considered. Khosa et al. (Khosa, Botha & Pretorius, 2015) showed that it is also possible for exchange rate volatility to have a negative impact on exports. They investigated emerging economies with high levels of exchange rate volatility and found that exchange rate volatilities had significant negative effects on exports. Many similar studies have reached different results (Šimáková, 2014; Senadza & Diaba, 2017; Sharma & Pal, 2018).

To summarize the general evaluations, three perspectives emerge. The first point of view states that fluctuations in the exchange rates have caused local producers to avoid risk and turn to the local market, which decreases international trade. The second point of view states that fluctuations in the exchange rate will increase motivation by generating extraordinary profit opportunities for producers, which increases international trade. The third point of view states that, with preliminary measures such as hedging, exchange rate fluctuations do not affect international trade, as producers avoid risk (Serenis & Tsounis, 2014). In the mentioned literature studies, it has been observed that this effect can vary from sector to sector and from country to country. A comprehensive study examining whether the exchange rate is effective in the fisheries industry, a sector with high added value, is not available in the literature, as far as the authors know. In this framework, we have expanded the scope of our previous study based on a single country (Açik, Tepe & Kayiran, 2020), and have reconsidered it to cover 38 countries by using panel data analysis. Although it seems like a lack of using production data instead of trade due to the data constraint, production levels do not pose a major obstacle as they also reflect international demand.

Methodology

In this study, since causality analysis was applied with a panel data type, some conditions in the series and models should be tested first. Applying the appropriate causality test according to these tests is important to the reliability and validity of the results. These factors are cross-sectional dependence and heterogeneity.

Considering the close relations between the global economy in terms of both trade and exchange rates, it is important to consider the issues of cross-sectional dependence and slope heterogeneity (Chang et al., 2015); therefore, one of the first conditions to be assessed in panel data is the cross-sectional dependence because it affects which unit root test will be applied, as well as which causality test. In our study, the Lagrange multiplier (LM) test of Breusch and Pagan (Breusch & Pagan, 1980), CD and CD LM test of Pesaran (Pesaran, 2004), and the LM adjusted test of Pesaran et al. (Pesaran, Ullah & Yamagata, 2008) were applied to test cross-sectional dependences in the data and model. General usages of the tests were LM for T > N, CD LM for N > T, CD for both T > N and N > T, and LM adjusted for T > N. If a cross-sectional dependence was found in the series, second-generation unit root tests were applied; otherwise, first-generation unit root tests were applied. The second situation is related to the homogeneities of the variables and the model, and they are tested by Delta tests developed by Pesaran and Yamagata (Pesaran & Yamagata, 2008).

For the causality test, we used the method proposed by Emirmahmutoglu and Kose (Emirmahmutoglu & Kose, 2011) because it can be used both with and without CD, and also takes into account heterogeneity. This method is a bootstrap panel Granger causality method that tests the non-causality hypothesis in heterogeneous panels and uses Fisher (Fisher, 1932) test statistics. Possible cross-sectional dependencies limit the strength and validity of the method due to the limited distribution of Fisher statistics (Xie & Chen, 2014). Emirmahmutoglu and Kose (Emirmahmutoglu & Kose, 2011) overcame this situation by using the bootstrapping technique. Thus, it has become a prominent method for obtaining robust results due to its structure that takes into account possible cross-sectional dependencies (Dogan & Aslan, 2017).

In the method developed by Emirmahmutoglu and Kose (Emirmahmutoglu & Kose, 2011), series do not have to be stationary since it follows a Toda and Yamamoto (Toda & Yamamoto, 1995) process, but the maximum degree of integration must be determined. For this, unit root or stationary tests can be used. We used a bootstrapped Hadri stationarity test, which is the improved version of the Hadri (Hadri, 2000) stationarity, and takes into account cross-sectional dependency and heterogeneity. Since this test is a second-generation stationary test, it can provide robust results by considering possible cross-sectional dependencies.

Data

The sample in this study was formed so that it covered the most countries in a reasonable time interval. Accordingly, a sample consisting of 38 countries and 27 annual observations between 1990 and 2016 for each country was obtained. The data set consisted of 1026 observations. The included countries are, in alphabetical order: Argentina, Bangladesh, Brazil, Cambodia, Canada, Chile, China, Denmark, Ecuador, Egypt, France, Iceland, India, Indonesia, Iran, Islamic Republic, Japan, Korea Republic, Malaysia, Mauritania, Mexico, Morocco, Namibia, New Zealand, Nigeria, Norway, Pakistan, Peru, Philippines, Russian Federation, South Africa, Spain, Sri Lanka, Thailand, Turkey, Uganda, United Kingdom, United States, and Vietnam.

The real effective exchange rate data for the 178 countries published by Bruegel (Bruegel, 2020) was used, and 2007 was used as a reference date for these countries and indexed as 100. In addition, REER 66

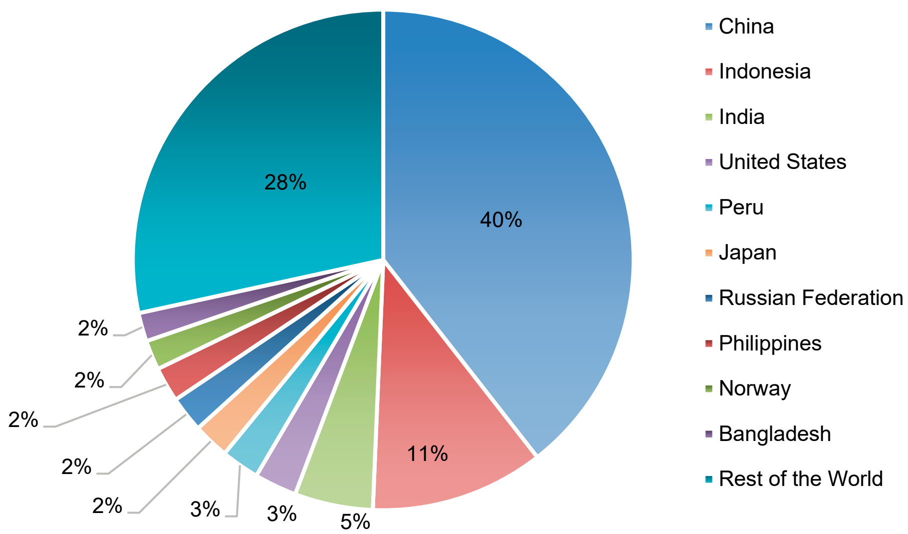

Figure 1. Shares of the Countries in 2016 (World Bank, 2020)

data, which was calculated based on trade with 66 trading partners, was selected. The other variable, total fisheries production, was obtained from World Bank (World Bank, 2020), and its measurement unit is metric tons. General descriptive statistics of the variables are presented in Table 1, individual real exchange rate descriptive statistics are presented in Appendix 1, and individual fisheries production descriptive statistics are presented in Appendix 2. The maximum fisheries production amount is 81,500,000 metric tons, which was realized by China in 2016. The maximum value of the real exchange rate is 1365 and it was observed in Iran in 1992.

Table 1. Descriptive Statistics (Bruegel, 2020; World Bank, 2020)

	Exchange	Fisheries
Mean	106.2071	3 387 585.
Median	100.0000	1 090 517.
Maximum	1 365.358	81 500 000
Minimum	11.30367	53 746.00
Std. Dev.	62.98750	8 444 097.
Skewness	14.67449	6.189695
Kurtosis	258.5383	45.49150
Jarque-Bera	2 828 392.	83 737.71
Probability	0.000000	0.000000
Observations	1026	1026

The countries that are prominent in the production of fisheries are presented in Figure 1 according to the 2016 statistics. China produced 40%, followed by Indonesia with an 11% share. Then comes India with 5%, and the United States and Peru with 3% each.

Findings

Determining cross-sectional dependence and homogeneity is important for selecting which stationarity and causality to use; therefore, first, the Lagrange multiplier (LM) test of Breusch and Pagan (Breusch & Pagan, 1980), CD and CD LM test of Pesaran (Pesaran, 2004), and LM adjusted test of Pesaran et al. (Pesaran, Ullah & Yamagata, 2008) were applied to analyze cross-sectional dependences in the data and model. General usages of the tests were LM for T > N, CD LM for N > T, CD for both T > N and N > T, and LM adjusted for T > N. The results in Table 2 allowed the rejection of the null hypothesis of cross-sectional independence for both variables and model according to LM and CD LM tests. The results of the CD test indicates that the null hypothesis was rejected for both Fisheries and Model, while it is in the rejection line (10%) for the CD test. Considering the results of other dependency tests and the dependencies of global economies in terms of exchange rates, analyses were continued by accepting that there is also a cross-sectional dependence in this variable. The homogeneities of the variables and the model were tested by Delta tests developed by Pesaran and Yamagata (Pesaran & Yamagata, 2008). The results revealed that the null hypothesis of homogeneity could be rejected for all variables and the model, which means the sample is heterogeneous. Accordingly, stationarity and causality tests that take into account cross-sectional dependency and heterogeneity should be applied.

Table 2. Results of the cross-sectional dependence and homogeneity tests

Test	Exchange	Fish	MODEL
LM	1218.19 [0.000]	960.78 [0.000]	4012.323 [0.000]
CD LM	13.740 [0.000]	6.875 [0.000]	88.256 [0.000]
CD	−1.284 [0.100]	−2.354 [0.000]	7.054 [0.000]
LM Adj.	−1.598 [0.945]	−4.952 [1.000]	60.242 [0.000]
Delta	2.791 [0.003]	7.312 [0.000]	16.915 [0.000]
Delta Adj.	2.960 [0.002]	7.756 [0.000]	17.901 [0.000]

In the applied method, the series does not need to be stationary, but the maximum degree of integration should be determined using stationary tests. The bootstrapped Hadri (Hadri, 2000) stationarity test, which takes into account cross-sectional dependency and heterogeneity, was applied. The results of the test applied to the variables are presented in Table 3. While the null hypothesis at the stationary level cannot be rejected for the exchange rate, but it is rejected for fisheries. Looking at the first differences shows that the null hypothesis cannot be rejected for both variables. In this case, the *dmax* value was determined to be 1, since the exchange rate is $I(0)$ and the fisheries is $I(1)$.

After testing the cross-sectional dependence and homogeneity in the series, the test developed by Emirmahmutoglu and Kose (Emirmahmutoglu & Kose, 2011), which is a causality test that takes into account these situations, was selected and applied to the series. This method also eliminates the need for a series to be stationary, and it is sufficient to know the maximum degree of integration. As a result of the stationarity test we applied, we found that the exchange rate was $I(0)$ and fisheries production was $I(1)$. Accordingly, we determined the *dmax* value to be 1, and applied the analysis. The results of the panel causality test are presented in Table 4, and the

Table 3. Unit root test results of the variables

		Level				First Difference			
		Exchange		Fish		Exchange		Fish	
		C	C&T	C	C&T	C	C&T	C	C&T
Panel Z		7.256*	6.530	15.402*	8.762*	−0.276	4.103	1.581	−0.276
Bootstrap C.V.	10%	3.089	5.271	4.525	5.391	2.522	4.799	2.120	2.482
	5%	3.905	5.925	6.129	6.178	3.064	5.197	2.583	3.047
	1%	5.623	7.518	9.327	6.995	3.937	6.070	3.426	4.287

Notes: C refers to Constant, and C&T refers to Constant and Trend. Bartlett long-run variance estimator is used.
* Null hypothesis is rejected.

Table 4. Bivariate Causality Test Results

CID	Country	(1) From REEX to Fisheries			(2) From Fisheries to REEX		
		Lag	Wald	Prob.	Lag	Wald	Prob.
1	Argentina	1.000	1.193	0.275	1.000	0.207	0.649
2	Bangladesh	1.000	0.046	0.830	1.000	0.206	0.650
3	Brazil	1.000	0.885	0.347	1.000	0.554	0.457
4	Cambodia	2.000	0.438	0.803	2.000	0.312	0.856
5	Canada	1.000	0.081	0.776	1.000	0.501	0.479
6	Chile	1.000	5.688	0.017*	1.000	2.167	0.141
7	China	2.000	0.272	0.873	2.000	2.960	0.228
8	Denmark	1.000	0.233	0.630	1.000	0.272	0.602
9	Ecuador	2.000	6.179	0.046*	2.000	5.385	0.068*
10	Egypt, Arab Rep.	2.000	9.536	0.008*	2.000	2.999	0.223
11	France	1.000	4.426	0.035*	1.000	0.056	0.813
12	Iceland	1.000	0.115	0.735	1.000	0.081	0.777
13	India	2.000	2.400	0.301	2.000	4.534	0.104
14	Indonesia	1.000	0.319	0.572	1.000	1.956	0.162
15	Iran, Islamic Rep.	3.000	6.300	0.098*	3.000	0.742	0.863
16	Japan	1.000	1.091	0.296	1.000	0.143	0.705
17	Korea, Rep.	2.000	0.370	0.831	2.000	0.928	0.629
18	Malaysia	1.000	0.687	0.407	1.000	0.089	0.765
19	Mauritania	1.000	0.110	0.740	1.000	0.144	0.704
20	Mexico	1.000	0.491	0.484	1.000	0.378	0.539
21	Morocco	1.000	0.511	0.475	1.000	0.349	0.555
22	Namibia	3.000	3.794	0.285	3.000	3.724	0.293
23	New Zealand	1.000	0.010	0.921	1.000	3.054	0.081*
24	Nigeria	2.000	11.145	0.004*	2.000	1.238	0.538
25	Norway	1.000	0.000	0.987	1.000	0.165	0.685
26	Pakistan	1.000	3.153	0.076*	1.000	0.667	0.414
27	Peru	1.000	10.186	0.001*	1.000	2.283	0.131
28	Philippines	1.000	6.744	0.009*	1.000	0.338	0.561
29	Russian Federation	3.000	9.632	0.022*	3.000	19.328	0.000*
30	South Africa	1.000	0.052	0.819	1.000	1.144	0.285
31	Spain	1.000	1.959	0.162	1.000	3.748	0.053*
32	Sri Lanka	1.000	5.755	0.016*	1.000	0.144	0.705
33	Thailand	2.000	7.055	0.029*	2.000	0.710	0.701
34	Turkey	1.000	0.006	0.939	1.000	0.377	0.539
35	Uganda	2.000	3.176	0.204	2.000	3.046	0.218
36	United Kingdom	1.000	1.607	0.205	1.000	0.004	0.952
37	United States	1.000	0.044	0.835	1.000	0.044	0.835
38	Vietnam	1.000	0.067	0.796	1.000	1.784	0.182
	Panel Fisher		130.383*			87.176	
	Bootstrap C.V. 10%		101.474			102.570	
	5%		108.072			108.684	
	1%		121.511			122.439	

* Null hypothesis is rejected.

null hypothesis of non-causality from real exchange rate to fisheries production was rejected as a panel sample, given the bootstrap critical values. When the results were analyzed individually, the null hypothesis was rejected for Chile, Ecuador, Egypt, France, Iran, Nigeria, Pakistan, Peru, Philippines, the Russian Federation, Sri Lanka, and Thailand. On the other hand, the null hypothesis for non-causality from fisheries production to real exchange rate could not be rejected in the panel sample, while it was rejected in some individual results. These results revealed that the real exchange rate is an important factor for fisheries production.

Discussion and Conclusions

In our research, we applied an analysis based on production statistics because we could not find comprehensive fishery trade statistics for a satisfying number of countries. This practice may be criticized for two situations. First, it can be thought that the response of production to exchange rate changes may be partially limited; however, since our data frequency is annual, it is thought that enough time has passed for production to react. In addition, since we use causality analysis, not instant interactions, the effect of previous periods of exchange rate changes is also taken into account. Secondly, the results obtained can be discussed because a country's own consumption levels are also included in the production data. At this point, this problem can be overcome because the effect of exchange rate fluctuations in the previous period is also considered by the advantage of causality analysis.

The role of the exchange rate on international trade constituted the basis of the research since the value of the exchange rate can affect both the demand of a country for foreign goods and the demand for goods in that country by foreign countries (Madura & Fox, 2007, p. 51). This effect has been examined by many researchers in the literature, and although they differ according to the sector and country groups, several significant results have been obtained. These results bring to mind whether the fisheries sector is significantly affected by exchange rate variations or not. This research question and gap constituted the main motivation of our study.

While applying our analysis, we determined that there was a cross-sectional dependency in both the exchange rate and fisheries production variables in the model. This situation arises from inter-country dependencies, possibly due to economic, geographical, and political reasons. Considering the exchange rate, this is typical for countries as they compete for capital and are directly affected by monetary and fiscal policies of dominant countries around the world. Geographical proximity may cause similar fishery production yields. Also, since every country is competing in the international fisheries industry, it is quite normal that they are affected by each other's prices and production policies. We also reached the conclusion that the sample was heterogeneous. This indicates that the countries in the sample have different characteristics, and a model that takes into account heterogeneity should be used. It is also normal for the countries in the sample to be selected according to the sample size rather than certain similarities (economic, geographical, political, etc.), resulting in a heterogeneous sample. As a result of stationarity analysis, it was determined that real exchange rates are stationary, while fisheries production is not. This shows that shocks in the real exchange rates of countries are not permanent, and they follow a certain average trend. For the fisheries production variable, the shocks are permanent. Factors such as investments in production infrastructures or productivity improvements due to technological developments in production may have caused this permanent shock in production levels.

To examine the effect of real exchange rate on fishery production after preliminary tests, we used the panel Granger causality test proposed by Emirmahmutoglu and Kose (Emirmahmutoglu & Kose, 2011), which takes into account cross-sectional dependencies and unit root status in the variables and model. As a result of our analysis of 38 countries, we concluded that the real exchange rate affected fishery production levels. In our single-country based study (Açik, Tepe & Kayiran, 2020), we also concluded that the real exchange rate affected the fisheries trade. We have made this issue even more comprehensive and reconsidered it to cover the maximum number of countries in the optimum time range. Many studies in the literature have examined other product groups for various countries; however, as far as we know, there is no comprehensive study for fishery products in the literature, which is thought to increase the originality of this study.

In this study, we examined the effect of the exchange rate on international trade through fishery production statistics. If we could have access to the fishery trade data of other countries, we may achieve clearer results. Further studies can enrich the literature by examining the subject in this respect. The issue can also be investigated more systematically for country groups with similar profiles. An analysis that takes into account geographical, economic, and cultural similarities may provide a more systematic method to reveal relationships between variables.

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Appendix 1. Descriptive Statistics for Reel Exchange Rate

	ID	Mean	Median	Max	Min.	St. D.	Skew.	Kurt.	Obs.
1	Argentina	137.49	100.00	222.09	66.63	58.81	0.42	1.39	27
2	Bangladesh	116.89	114.14	160.30	98.34	13.99	1.60	5.77	27
3	Brazil	95.86	98.04	128.04	63.73	18.76	−0.21	1.89	27
4	Cambodia	110.73	109.49	144.28	62.49	16.34	−0.46	4.47	27
5	Canada	89.99	90.07	105.40	74.80	10.27	0.05	1.58	27
6	Chile	100.71	101.93	115.20	83.48	9.06	−0.17	2.03	27
7	China	105.61	102.26	146.61	75.30	16.70	0.79	3.29	27
8	Denmark	97.20	97.51	104.82	90.44	3.34	0.13	2.71	27
9	Ecuador	104.70	105.72	141.41	73.50	15.41	0.18	3.67	27
10	Egypt, Arab Rep.	126.35	129.90	168.18	84.20	25.45	−0.13	1.78	27
11	France	97.29	98.05	102.46	89.58	3.49	−0.61	2.79	27
12	Iceland	82.16	82.01	101.31	63.95	9.61	−0.02	2.53	27
13	India	96.82	92.06	123.87	77.97	13.71	0.51	2.17	27
14	Indonesia	97.86	104.06	115.97	51.17	15.79	−1.25	4.04	27
15	Iran, Islamic Rep.	261.10	137.46	1365.36	84.63	333.62	2.42	7.45	27
16	Japan	125.72	126.97	160.03	94.04	17.55	0.11	2.44	27
17	Korea, Rep.	86.73	87.51	100.00	67.26	8.23	−0.37	2.50	27
18	Malaysia	105.80	104.57	124.09	92.90	9.57	0.51	1.96	27
19	Mauritania	112.83	103.71	168.51	88.63	22.41	1.50	4.23	27
20	Mexico	94.22	96.77	113.28	68.21	10.68	−0.53	3.21	27
21	Morocco	99.68	100.00	107.07	90.31	4.22	−0.60	2.91	27
22	Namibia	96.75	95.59	113.49	81.81	8.19	0.42	2.45	27
23	New Zealand	91.35	92.92	113.49	72.04	11.70	0.10	2.03	27
24	Nigeria	121.62	104.62	301.43	56.47	59.38	1.70	5.32	27
25	Norway	96.05	95.73	103.49	88.86	4.69	−0.03	1.71	27
26	Pakistan	107.40	107.31	132.15	90.88	10.07	0.75	3.33	27
27	Peru	108.95	107.91	122.78	90.08	8.42	0.08	2.49	27
28	Philippines	101.39	100.00	129.99	77.16	14.36	0.22	2.12	27
29	Russian Fed.	82.25	85.22	131.17	11.30	28.29	−0.60	3.06	27
30	South Africa	106.47	106.47	133.03	76.00	15.51	−0.03	2.16	27
31	Spain	94.67	95.77	103.07	83.76	6.14	−0.32	1.65	27
32	Sri Lanka	97.67	95.45	120.19	79.02	11.61	0.31	1.98	27
33	Thailand	100.64	104.90	114.02	84.82	9.51	−0.39	1.79	27
34	Turkey	80.59	80.16	106.75	52.72	15.69	−0.04	1.69	27
35	Uganda	104.87	101.92	131.63	79.06	13.81	0.50	2.46	27
36	United Kingdom	91.37	93.41	101.50	78.70	7.54	−0.22	1.54	27
37	United States	103.20	101.34	120.08	91.96	8.68	0.65	2.16	27
38	Vietnam	104.89	103.34	150.42	59.05	21.75	0.21	3.18	27
	All	106.21	100.00	1365.36	11.30	62.99	14.67	258.54	1026

Appendix 2. Descriptive Statistics for Fisheries Production

	ID	Mean	Median	Max	Min.	St. D.	Skw.	Kurt.	Obs
1	Argentina	937 257.1	931 994	1 390 864	561 157	189 941	0.42	3.07	27
2	Bangladesh	2 115 366	1 998 197	3 878 324	846 144	960 923.2	0.32	1.82	27
3	Brazil	961 249.6	1 003 260	1 331 256	640 295	241 862.8	0.03	1.50	27
4	Cambodia	388 020.3	424 432	802 450	103 254	237 331.3	0.16	1.75	27
5	Canada	1 188 404	1 149 103	1 726 748	945 560	174 839.2	1.29	4.77	27
6	Chile	5 161 954	4 972 652	8 021 446	2 879 355	1 350 433	0.40	2.59	27
7	China	48 714 815	48 200 000	81 500 000	14 700 000	19 105 189	−0.06	2.14	27
8	Denmark	1 247 986	1 133 410	2 043 763	537 375.5	482 505	0.16	1.53	27
9	Ecuador	646 336.7	638 648	1 166 585	343 511	217 745.7	0.67	2.89	27
10	Egypt. Arab Rep.	869 841	865 030	1 706 274	312 952	428 858.3	0.30	1.88	27
11	France	845 368.9	902 400.5	984 874.6	655 646.5	113 121	−0.45	1.60	27
12	Iceland	1 568 175	1 574 166	2 229 112	1 058 740	354 149.3	0.24	1.96	27
13	India	6 696 899	6 074 846	10 800 000	3 879 722	1 950 679	0.53	2.22	27
14	Indonesia	8 805 524	5 927 292	23 200 000	3 243 345	6 213 103	1.26	3.20	27
15	Iran. Islamic Rep.	542 119.1	441 837	1 093 536	269 076	230 230.3	0.98	2.85	27
16	Japan	6 488 829	5 886 827	11 100 000	4 343 257	1 740 509	1.07	3.41	27
17	Korea. Rep.	3 075 700	3 203 623	3 478 501	2 498 788	310 790.6	−0.80	2.22	27
18	Malaysia	1 540 320	1 463 625	2 116 237	980 562.8	347 433.7	0.18	1.79	27
19	Mauritania	205 979.7	165 312	609 754	53 746	147 754.5	0.93	3.15	27
20	Mexico	1 521 644	1 522 989	1 776 349	1 192 966	179 472.7	−0.25	1.92	27
21	Morocco	944 612.3	931 316.6	1 455 247	559 470.1	252 106.2	0.30	2.26	27
22	Namibia	510 625.7	514 129	790 615	209 025	125 211.2	−0.34	3.32	27
23	New Zealand	577 317.9	552 572	741 836.1	380 303	85 253.26	−0.07	2.77	27
24	Nigeria	595 265.7	509 201	1 073 059	255 499	259 375.7	0.51	2.01	27
25	Norway	3 264 226	3 372 900	3 858 236	1 950 525	439 704.2	−1.24	4.49	27
26	Pakistan	588 752	596 091	677 606	479 077	46 455.11	−0.30	2.89	27
27	Peru	7 371 889	7 451 437	12 000 000	3 714 469	21 10 617	0.01	2.47	27
28	Philippines	3 713 440	3 605 597	5 050 190	2 526 370	908 835.1	0.11	1.35	27
29	Russian Fed.	4 370 508	4 390 952	7 658 693	3 063 387	1 023 945	1.64	6.00	27
30	South Africa	636 492.1	616 473	917 685	437 660	120 733.4	0.58	2.71	27
31	Spain	1 277 607	1 260 681	1 570 775	1 074 617	127 469.3	0.49	2.56	27
32	Sri Lanka	332 161.9	301 169.6	564 702.3	183 923	113 193.3	0.88	2.57	27
33	Thailand	3 357 933	3 442 715	4 118 527	2 429 956	481 397.6	−0.29	2.22	27
34	Turkey	590 850.9	603 574	773 193	364 784	89 450.01	−0.78	3.87	27
35	Uganda	349 006.4	264 977	572 219	195 298	137 104.2	0.24	1.28	27
36	United Kingdom	890 627.5	875 533	1 060 640	771 695	82 523.68	0.40	2.02	27
37	United States	5 453 711	5 475 187	6 043 960	4 715 028	310 781.5	−0.37	3.51	27
38	Vietnam	381 433.3	367 909.3	597 599	226 228.2	107 779.2	0.19	1.93	27
	All	3 387 585	1 090 517	81 500 000	53 746	8 444 097	6.19	45.49	1026