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The Co-Movement Between Prices of Wheat and Wheat Products in Fiji: How Has This Fared Under Price Controls and Supply Shocks?

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This study investigates the link between imported wheat prices and price-controlled wheat products in Fiji (2012:01–2022:06), assessing the impact of price controls and the Ukraine-Russia war on market efficiency. Findings reveal that price-controlled products (flour, biscuits, bread) do not align with wheat market conditions, creating market inefficiencies.

I. Introduction

Market inefficiencies created by price controls are well understood (Haucap & Müller, 2012; Nicholson, 1997). Price controls in the form of price ceilings can unnecessarily burden retailers and producers of food items if this policy is insensitive to the cost of producing the goods. In Nicholson's (1997, p. 488) words "... the (price) controls deter long-run supply responses and create welfare losses for both consumers and producers". Nonetheless, these policies continue to be cornerstone policies of developing nations, to make basic goods and services affordable for citizens at the lower income levels. Given the political and indeed the economic welfare importance of the policy, it becomes relevant to investigate how this policy can be made less inefficient. This paper represents an attempt in this direction.

Given that the marginal cost of production, which theoretically determines the price of the good produced is strongly sensitive to the prices of inputs and frictions caused in the market of inputs, it becomes important that price controls become sensitive to market conditions of the inputs. Recent events, such as the COVID-19 pandemic and the Ukraine-Russia war, have created significant supply and supply-chain problems for many commodities, including wheat. Hence, in this study, we test the link between prices of wheat and wheat products. We take the case of Fiji, which imports all its wheat from Australia. Wheat is processed in Fiji into flour or sharp, which is then used to produce other commercial wheat products which are staples in the Fijian diet - these includes bread and breakfast crackers. In this study, we test two things: first, whether there is a link between prices of wheat and price-controlled

wheat products; and second, if there is a link, has this been weakened by the COVID-19 pandemic and the Ukraine-Russian war. To examine if the input and output markets are connected, the study employs cointegration method that allows us to test for any possible long-run equilibrium relationship between prices of wheat and wheat products.

II. Empirical Analysis

A. Data

The study uses monthly data on the prices of wheat and wheat products over the period 2012:01-2022:06. The prices of wheat, namely Australia premium wheat, and price control orders by the regulator on selected wheat products (flour, sharp, biscuit crackers, and bread) which are staples in the Fijian diet, are sourced from the Fijian Competition and Consumer Commission.

The common statistics on the variables (represented in Fiji dollars) are provided in [Table 1](#). The Australian Premium Wheat (APW) price, which is our measure of wheat price, has averaged FJ\$557.60 and has ranged between FJ\$433 to FJ\$993.12 over the last decade. The selected wheat products are all manufactured in Fiji, are staples in the Fijian diet, and are price controlled. Except for biscuit crackers (375g) (*BC_375g*), prices of all other wheat products are less volatile.

To proceed with the Johansen cointegration test, one has to confirm that the variables have a unit root. Using the Augmented Dickey-Fuller (ADF) test, we find that prices of wheat and wheat products, all in their logarithmic form, are non-stationary (see [Table 2](#)).

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Table 1. Descriptive Statistics

Variables	Description	Mean	Median	Maximum	Minimum	Std. Dev.	Jarque-Bera (prob.)	C.V.	Obs.
APW	Australian Premium Wheat (FJD/MT)	557.60	544.71	993.12	433.41	86.17	0.00	15.99	123
BC_375G	Breakfast crackers (375 g)	1.31	1.35	2.05	1.07	0.27	0.00	20.70	126
BC_5KG	Breakfast crackers (5 kg)	25.52	25.35	32.82	22.56	2.42	0.00	9.49	126
BREAD400G	Long loaf bread (400 g)	0.74	0.71	0.94	0.71	0.05	0.00	6.78	126
BREAD600G	medium white bread (600 g)	1.05	1.00	1.61	1.00	0.13	0.00	12.26	126
FLOUR10	Flour (10 kg)	13.42	13.35	16.06	12.36	0.85	0.00	6.31	126
SHARP10	Sharp (10 kg)	13.81	13.71	16.61	12.82	0.91	0.00	6.57	126

This Table reports the common statistics on prices of wheat and selected wheat products over the period 2012-2022. The variables listed in column 1 are described in column 2, followed by selected summary statistics, with the last column noting the number of monthly observations.

Table 2. ADF test

	I(0)	I(1)	
Log(APW)	1.075	0.997	-6.132*
Log(BC_375G)	-1.316	0.621	-11.061*
Log(BC_5KG)	-1.121	0.706	-11.153*
Log(BREAD400)	-1.138	0.699	-11.177*
Log(BREAD600)G	-1.419	0.571	-11.225*
Log(FLOUR10)	-2.135	0.231	-11.046*
Log(SHARP10)	-1.879	0.341	-11.046*

This table presents the ADF test results on the logarithmic form (*Log*) of the prices, denoted with a prefix “*Log*” to the original variables of wheat prices and wheat products. And * denotes statistical significance at the 1% level.

Having established that the variables are $I(1)$, we examine the long run cointegrating relationships between wheat and price-controlled wheat products. To consider the effects of the supply shocks caused by the COVID-19 pandemic and the Ukraine-Russia war, we search for a long run relation between variables under three sample periods: the full sample (2011:01-2022:06); the pre-COVID period (2011:01- 2019:12); and the pre-Ukraine-Russia war period (2011:01 – 2022:01). In essence, the full sample is inclusive of all the supply shocks, while the other two sub-samples exclude the COVID-19 event and the Ukraine-Russia event one at a time. All results are presented in [Table 3](#), across Panels A-C.

The key results are as follows. First, there is a consistent lack of a long run cointegrating relationship between the prices of wheat and most wheat products manufactured in Fiji, across all sample periods, which suggests that price controls may be the key reason for the disconnection. Second, there are some products like flour (10kg) that is cointegrated with wheat for all three samples, suggesting that price control and supply shocks are unable to lead to any misalignment with its costs. Third, *SHARP10* and biscuit crackers (*BC_5K*) only show cointegration with the wheat market in samples without the two supply shock events.

This implies that these events have weakened the link between the wheat market and wheat products.

Given that *FLOUR10* comoves with the wheat market, and since flour is the key input in bread and biscuit crackers, we check whether these co-move with flour in the long run. The results are presented in the last four columns. We notice that only *BC_5KG* has an equilibrium long run relationship with flour and this occurs in the full sample that captures both the supply shocks. The rest of the wheat products fail to respond to price of flour.

III. Concluding Remarks

In this study, we examined the cointegrating relationship between wheat and selected wheat products. We consider the case of Fiji where wheat is imported from Australia, and this is processed locally into flour and sharp and used to produce other wheat products like bread and breakfast crackers. Because these wheat products are staples in the Fijian diet, they are price controlled. The study finds that while the flour (10kg) market is efficient and unaffected by price controls and the supply shocks (namely the COVID-19 pandemic and the Ukraine-Russia war), there are other wheat products where price controls are largely related to the lack of cointegration seen between the wheat

Table 3. Cointegration Results

WHEAT BC_375G			WHEAT BC_5KG		WHEAT Log(BREAD400)		WHEAT Log(BREAD600)		WHEAT Log(FLOUR10)		WHEAT Log(SHARP10)		Log(FLOUR10) LBC_375G		Log(FLOUR10) LBC_5K		Log(FLOUR10) Log(BREAD400)		Log(FLOUR10) Log(BREAD600)		
Panel A. Full sample																					
Trace																					
No. of CE(s)	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
1	6.477	0.639	8.297	0.434	9.523	0.319	9.365	0.333	16.695*	0.033	15.927	0.043	5.188	0.789	9.699	0.305	5.952	0.701	5.872	0.711	
2	0.262	0.609	0.618	0.432	1.006	0.316	0.632	0.427	0.656	0.418	0.859	0.354	0.136	0.712*	0.006	0.940	0.476	0.490	0.143	0.705	
Max-Eigen																					
No. of CE(s)	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
1	6.216	0.586	7.679	0.412	8.518	0.329	8.733	0.309	16.039*	0.026	15.068	0.037	5.052	0.735	9.694	0.233	5.476	0.681	5.728	0.648	
2	0.262	0.609	0.618	0.432	1.006	0.316	0.632	0.427	0.656	0.418	0.859	0.354	0.136	0.712*	0.006	0.940	0.476	0.490	0.143	0.705	
Panel B. Pre-covid period																					
Trace																					
No. of CE(s)	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
1	7.583	0.511	19.867*	0.010	7.190	0.556	9.012	0.364	22.690*	0.004	20.946*	0.007	3.381	0.947	6.505	0.636	4.026	0.901	5.583	0.744	
2	1.348	0.246	6.483*	0.011	1.471	0.225	3.098	0.078	6.020*	0.014	5.432*	0.020	0.402	0.526	0.280	0.597	1.332	0.249	2.272	0.132	
Max-Eigen																					
No. of CE(s)	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
1	6.236	0.583	13.384*	0.069	5.719	0.650	5.914	0.624	16.670*	0.020	15.513*	0.032	2.980	0.948	6.225	0.585	2.694	0.965	3.310	0.924	
2	1.348	0.246	6.483*	0.011	1.471	0.225	3.098	0.078	6.020*	0.014	5.432*	0.020	0.402	0.526	0.280	0.597	1.332	0.249	2.272	0.132	
Panel C. Pre-Ukraine - Russia war																					
Trace																					
No. of CE(s)	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
1	8.685	0.395	26.791*	0.001	9.056	0.360	11.673	0.173	21.319*	0.006	17.793*	0.022	3.643	0.930	7.472	0.524	4.437	0.865	6.422	0.646	
2	1.153	0.283	9.071*	0.003	1.442	0.230	3.685	0.055	6.976*	0.008	5.737*	0.017	0.382	0.537	0.289	0.591	1.434	0.231	2.404	0.121	
Max-Eigen																					
No. of CE(s)	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	
1	7.532	0.428	17.719*	0.014	7.615	0.419	7.988	0.380	14.343*	0.049	12.056	0.109	3.261	0.928	7.183	0.468	3.002	0.947	4.018	0.857	
2	1.153	0.283	9.071*	0.003	1.442	0.230	3.685	0.055	6.976*	0.008	5.737*	0.017	0.382	0.537	0.289	0.591	1.434	0.231	2.404	0.121	

This table documents the cointegration relationships of wheat and selected wheat products (and flour and other wheat products), obtained using the Johansen (1988, 1995) method. The first row captures the pair of series subjected to a long run (cointegration) test. The tests are performed over the full sample (Panel A); the pre-COVID period (Panel B); and the pre-Ukraine-Russia war period (Panel C).

and wheat product market or the long run disconnect of the prices of wheat. Moreover, some products like sharp and breakfast crackers (5kg) show market inefficiencies created by the COVID-19 pandemic and the Ukraine -Russia pandemic.

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