Peer-reviewed research

Public Transport Fares and Domestic Fuel Prices: Are They Cointegrated? The Case of Fiji

Joel Abraham[1], Akeneta Vonoyauyau[1], Vinitesh Kumar[1a]

[1] Fijian Competition and Consumer Commission, Suva, Fiji

Keywords: Fiji, Transportation, Price controls

JEL Classifications: E31 Price Level - Inflation - Deflation, L91 Transportation: General, Q41 Demand and Supply - Prices

https://doi.org/10.46557/001c.129141

Energy RESEARCH LETTERS

Vol. 6, Issue Early View, 2025

In Fiji, the transportation sector is heavily price regulated, through price controls on bus, minibus, and taxi fares, and through price controls on imported fossil fuel, which the transportation sector is fully reliant on. This double price control constitutes a government policy aimed at ensuring transportation affordability. Amid this disposition, we check to see whether transport prices align with fuel prices in the long run. We use comprehensive price control orders authorised by the Fijian Competition and Consumer Commission to test the long run equilibrium relationship between prices of transport and fuel.

I. Introduction

Fiji's transportation system is not unique in the sense that it relies 100% on fossil fuel. However, like most small island development states, the sector relies entirely on imported fossil fuels. Moreover, to make transport affordable for the public, the government-imposed price restrictions on both transport fares (bus and minibus) and on fuels (such as diesel and premix). We refer to this as double price control policy measure. In this note, we test whether the double price controls; that is, controls on the prices of fossil fuel and transportation comove in the long-run (that is, over time). Understanding co-movement is economically important because if they do move together (that is, if they do share a long-run relation with time) it signifies the importance of price regulations (controls). In other words, co-movement of controlled prices would imply that the two price control policies imposed on the transportation sector are synchronous and align with government aims.

The study uses the regulator's (Fiji Competition and Consumer Commission, FCCC) price control data on fares and fuel prices to examine the case of cointegration or long run co-movement of fuel prices and public transport fares in Fiji.

II. Empirical Analysis

A. Data

We use monthly data over varying samples depending on data availability. The first set of data includes the three modes of transportation: bus, minibus, and taxi.[1] Here, the bus fare data covers for all different routes in two of the largest islands of Viti Levu (in total 46 routes) and Vanua Levu (in all 44 routes). Bus fare data are available for the period 2016:01 – 2022:12 and all routes attract two types of bus fares: non-student and student fares. Minibus fare data are more extensive and cover routes across Fiji. In total, 18 routes are covered here over the COVID-19 period 2020:02 – 2022:12. The other set covers fuel products, namely diesel and premix. Their prices are control orders authorised by the FCCC. The public transportation fares and domestic-use fuel prices are sourced from the FCCC. Since bus and minibus fares vary across routes, we employ a panel data analysis, giving us variability across routes and sufficient variation over time.

B. Preliminary data analysis

We begin with the descriptive statistics. For bus on the Viti Levu routes, the mean fare for all the routes (46) is \$10.56, ranging from FJ\$0.68 to FJ\$27.16 over the period 2016-2022. Over the same period, the average fare for the

a Corresponding author: vinitesh.kumar@fccc.gov.fj

1 Taxi is excluded from the study. For the data that is available from FCCC, taxi fares have changed only once over the period 2011:12 to 2022:12. Moreover, there is a lack of cross-sectional difference. The taxi fares only differ between Viti Levu and Vanua Levu (taxi fares in Vanua Levu, Ovalua, Taveuni and Kadavu do not differ), night and day hire and whether, or not, they are night airport taxis.

Vanua Levu routes (44) was $9.53. Average student fare for these routes was FJ$5.27 and FJ$4.59 for Viti Levu and Vanua Levu routes. Minibus fare averaged $7.07 across the 18 routes in Fiji, ranging from FJ$1.50 to FJ$19.00 over the period 2020-2022. In the same period, diesel prices averaged $2.16, slightly higher at $1.86 over the study period 2016-2022.

Next, we conduct the unit root tests to establish that the variables are stationary at the first difference or are non-stationary process. This is a necessary step before conducting the cointegration test. For this, we perform standard panel unit root tests, namely Levin et al. (LLC, 2002) and Im et al. (IPS, 2003). Results presented in Table 1 show that like the diesel price series, general bus fare (Viti Levu and Vanua Levu routes) in log form are non-stationary series. The log of student bus fare in the Vanua Levu has a unit root, but not for the Viti Levu route. The log of minibus fare, in contrast, is stationary. This means that we can conduct the cointegration test for all general bus fare and student bus fare for Vanua Levu and diesel relationship, but not for the minibus fare (or student bus fare for Viti Levu routes) and diesel association.

C. Panel Cointegration analysis: Bus fare and diesel

Next, we examine the cointegration relationships between public transport fares and domestic fuel prices. We use the Pedroni test, which is a panel cointegration test. It examines the stationarity of the residuals based on a series of the *panel and group statistics*, with the former allowing for panel heterogeneity, and the latter assuming homogeneity. Table 2 indicates that the *panel statistics*, derived from averaging individual cointegrating equation, and, therefore, allowing for heterogeneity, have strong evidence of cointegration relationships. This is confirmed by the *group statistics,* derived using cointegrating equation of the mean of the panel. These tests results indicate that bus fare and diesel prices are cointegrated in the long run. This confirms that the policy of price control used in the case of bus fares and diesel are synchronous in the long run.[2]

D. Fixed Effect Regression analysis: Minibus and diesel

Since the panel series on minibus fare are stationary at their level form, we are unable to test for their cointegration relationship with diesel. Thus, here, we estimate a fixed effect model that captures the log of minibus fare as the dependent variable and the first differenced form of diesel price as the independent variable. The model also allows for unobserved fixed effects in the form of cross-sectional fixed effect (to allow for unobserved factors that do not change over time but vary across the different minibus routes) and/or time effects (to allow for unobserved variables that change over time, but not across the minibus routes).

Results presented in Table 3 suggest that there is a negative association between minibus fares and diesel, suggesting that an increase in diesel price actually reduces minibus fares. Nonetheless this association is insignificant at the 5% level. It does seem that the price control on minibus fares and their fuel price is not synchronous. And since this analysis captures the COVID-19 period, it is likely that the supply shocks as well as the economic lockdowns were also distorting this relationship. Future analysis can further verify this statement.

III. Concluding Remarks

This note examined the long run co-movement of the public transport fares and fuel prices. We took the case of Fiji's public transport, mainly because it presents an interesting case of double price control on the sector, that is price controls on both fares and fuel prices. These policies are taken to make transportation affordable for the public. Our hypothesis is that co-movement of controlled prices will imply a synchronous policy action. Our results show that there is synchronous policy action happening in the bus sector but not in the mini-bus sector.

The key implication for FCCC is to reconsider its transport fare price control for mini-bus sector. More engagement with this sub-sector is crucial to bring about fare efficiency.

Submitted: September 28, 2024 AEDT. Accepted: January 28, 2025 AEDT. Published: April 30, 2025 AEDT.

2 We could not perform analysis accounting for the pre-COVID or COVID period because of a lack of variability in fares in these two separate samples.

Table 1. Descriptive statistics and Panel Unit Root

Panel A. Descriptive Statistics							
	Bus fare: 2016:01 – 2022:12					**2020:02 – 2022:12**	
	Viti Levu	Vanua Levu	Student Viti Levu	Student Vanua Levu	DIESEL	MINIBUSF	DIESEL
Mean	10.56	9.53	5.27	4.59	1.86	7.07	2.16
Median	10.53	9.36	5.28	4.46	1.79	4	1.97
Maximum	27.16	26.05	13.58	13.02	3.61	19	3.61
Minimum	0.68	0.68	0.34	0.34	1.24	1.5	1.52
Panels (routes)	46	44	46	44	46	18	18
Observations	3864	3696	3864	3696	3864	630	630
Panel B. Unit Root Tests							
				I(0)		I(1)	
				Stat.	Prob.	Stat.	Prob.
Bus fare: Viti Levu	General	(2016:01 – 2022:12)	LLC	12.751	1.000	-27.790*	0.000
			IPS	8.986	1.000	-31.556*	0.000
Bus fare: Viti Levu	Student	(2016:01 – 2022:12)	LLC	-3.374*	0.000		
			IPS	-5.185*	0.000		
Bus fare: Vanua Levu	General	(2016:01 – 2022:12)	LLC	-0.470	0.319	-56.039*	0.000
			IPS	1.841	0.967	-51.752*	0.000
Bus fare: Vanua Levu	Student	(2016:01 – 2022:12)	LLC	-0.546	0.293	-59.990*	0.000
			IPS	-3.263	0.001	-54.493*	0.000
Minibus	General	(2020:02 – 2022:12)	LLC	-2.172*	0.015		
			IPS	-2.483*	0.007		
Diesel[1]		(2016:01 – 2022:12)	LLC	8.217	1.000	-27.056*	0.000
			IPS	10.009	1.000	-32.063*	0.000
Diesel[2]		(2020:02 – 2022:12)	LLC	-0.047	0.481	-5.009*	0.000
			IPS	0.354	0.638	-5.886*	0.000

Panel A of this table presents the common statistics for bus and minibus fares across Fiji or its two largest Islands, Viti Levu and Vanua Levu. Panel B presents the unit root test results for all variables in their log forms.
[1] Buses run on diesel in Fiji.
[2] Minibuses run on diesel in Fiji.

Table 2. Pedroni test results

	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
	Viti Levu		Vanua Levu		Student Vanua Levu	
Panel v-Statistic	7.5604	0.0000	2.3169	0.0103	11.414	0.000
Panel rho-Statistic	-9.8646	0.0000	-2.7004	0.0035	-7.472	0.000
Panel PP-Statistic	-6.5142	0.0000	-2.4176	0.0078	-4.528	0.000
Panel ADF-Statistic	-12.5032	0.0000	-3.5082	0.0002	-9.901	0.000
Group rho-Statistic	-6.0733	0.0000	0.8041	0.7893	-3.711	0.000
Group PP-Statistic	-5.4377	0.0000	-0.4133	0.3397	-3.012	0.001
Group ADF-Statistic	-12.7421	0.0000	-1.7125	0.0434	-9.399	0.000

This table reports the residual-based Pedroni cointegration test. In total, four panel-based test and three group-based tests are recommended by Pedroni and all seven are reported.

Table 3. Fixed effect model results: Minibus and diesel

Variable	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
C	1.567*	0.000	1.567*	0.000	1.567*	0.000
Diesel	-0.086	0.665	-0.050	0.790	-0.129	0.742
Cross-section fixed	Yes		Yes		No	
Period fixed	Yes		No		Yes	
Adjusted R-squared	0.728		0.741		-0.056	

This table presents the regression results from three versions of the fixed effect model. And * denotes significance at the 1% level.

References

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *J Econom*, *115*(1), 53–74.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *J Econom*, *108*, 1–24. https://doi.org/10.1016/S0304-4076(01)00098-7