The effect of the Covid-19 pandemic on tourism in Africa

Mudida, Robert and Gil-Alana, Luis

Central Bank of Kenya, University of Navarra and University Francisco Vitoria

31 December 2024

THE EFFECT OF THE COVID-19 PANDEMIC ON TOURISM IN AFRICA

Robert Mudida, Central Bank of Kenya, Research Department

and

Luis A. Gil-Alana, Navarra Center for International Development, Pamplona, Universidad de Navarra and Universidad Francisco Vitoria, Madrid

ABSTRACT

This article focuses on the effect of the Covid-19 pandemic on tourism in several African countries located in Eastern and Southern Africa, focusing on five, namely, Burundi, Eswatini, Kenya, Mauritius and Seychelles which are important tourism destinations in Africa. For this purpose, fractional integration methods are used, which are very convenient to analyze the effects of shocks. Our results indicate that if we use data ending at December 2019, the series are mean reverting and the degree of persistence moves from low values in Mauritius and Seychelles to the highest value in Eswatini. However, if we included data referring to the Covid-19 period a substantial increase in the degree of persistence is observed, and the hypothesis of a unit root cannot be rejected for Eswatini or Mauritius with the original data and neither for Burundi or Seychelles with the log-transformed data. This implies that these economies need to increase their economic diversification to reduce excessive reliance on tourism where shocks tend to persist. Thus, only Kenya still displays a degree of mean reversion behavior and the development of innovative tourism products in Kenya can make tourism an even more important pillar of the economy.

JEL Classification: CO1; C22; Z30

Keywords: COVID-19; tourism; Africa; fractional integration

Corresponding author: Professor Robert Mudida, Central Bank of Kenya, Research Department, P.O. Box 60000-00200, Nairobi, Kenya. Email: mudidar@centralbank.go.ke

The views expressed herein are those of the authors and should not be attributed to the Central Bank of Kenya. Prof. Luis A. Gil-Alana gratefully acknowledges financial support from the MINEIC-AEI-FEDER ECO2017-85503-R project from 'Ministerio de Economía, Industria y Competitividad' (MINEIC), `Agencia Estatal de Investigación' (AEI) Spain and `Fondo Europeo de Desarrollo Regional' (FEDER).

1. Introduction

Tourism in Africa is a critical sector that makes up an average of 8% of GDP. In a number of African economies, tourism represents vital economic diversification to the service sector and thereby reducing over-reliance on the agricultural sector. Tourism makes a vital contribution to real sector production and employment. Additional jobs are created by the sector in construction, furniture, transport, capital equipment, telecommunications and financial services. Furthermore, there is indirect demand creation by tourists in agriculture, fisheries, food processing and light manufacturing such as textiles and handicrafts. (World Bank, 2013a). The sector, has important linkages with the rest of the economy. In some island economies in Africa, such as the Seychelles, the contribution of tourism is close to 40% of GDP. With the outbreak of the Covid-19 pandemic in early 2020, tourism numbers declined substantially in many African states. This was because of partial or complete lockdown measures in many African states and also because of the restriction of international travel (Mudida, 2021). The International Monetary Fund (IMF) in its April 2021 Regional Economic Outlook for Sub-Saharan Africa expects that despite a more buoyant external environment, sub-Saharan African will be the world's slowest growing region in 2021. Whereas the recovery in advanced economies has been driven largely by the high level of policy support, for countries in sub-Saharan Africa this is generally not an option and many have entered the second wave of the pandemic with depleted fiscal and monetary buffers. In Africa, however, with limited purchasing power and few options, most countries have found themselves at the end of the vaccine queue, and will instead be struggling to cover essential frontline workers with scarce vaccines (International Monetary Fund, 2021). We investigate the impact of tourism on several African states, particularly those where tourism is a vital sector. The focus of the analysis, covering several regions of Africa, is on Seychelles, Mauritius, Kenya, Burundi and Eswatini where tourism plays a critical role in the economy.

2. A short review of the literature

Several studies have already been done regarding the impact of the COVID-19 pandemic in distinct regions of the world. Lee and Chen (2020) consider the impact of COVID-19 on travel and leisure industry returns in 65 countries. They utilise daily data from December 2019 to May 2020 and apply a quantile regression model. Their findings reveal that the change rate in COVID-19 deaths exerts greater adverse effects at on tourism returns at majority quantiles that does the number of confirmed cases with the latter on negatively influencing the lowest return quantiles. The study also finds a positive correlation between the government response stringency index and returns

Abbas et al. (2021) in their study contend that the tourism and leisure industry has been the hardest hit by the COVID-19 pandemic experiencing a considerable reduction of 2.86 trillion US dollars amounting to a 50% revenue loss. The study considers the direct impact of COVID-19 and provides recommendations of the revival of the tourism industry.

Ugur and Akbiyik (2020) apply text mining methods to reactions of travelers during COVID-19. They obtain approximately 75,000 comments from the Trip Advisor Forums and 23,515 cases from the US, Europe and Asia forums between December 30 2019 and March 15, 2020. Their results reveal that the sector of tourism is heavily affected by the pandemic leading to travelers' delays and cancellations of trips almost the same day as the spread of the news concerning crises. They emphasize the importance of travel insurance integrated into travel packages.

Foo et al. (2020) study the consequences of the Covid-19 pandemic on Malaysia. The pandemic was found to have a high impact on tourism in Malaysia especially in the airline and hotel businesses. The stimulus packages offered by the Malaysian government to ensure the sustainability of the tourism sector are also discussed. Bakar and Rosbi (2020) also analyze the effects of Covid-19 on tourism. The research calculates the effect of Covid-19 on the tourism sector globally using supply curve and demand curve analysis. Baum and Hai (2020) consider a review of current events through a human rights perspective. Their findings reveal that participation rights in the tourism sector especially in North America, Asia and Europe were greatly affected.

Gil-Alana and Poza (2020) examine the impact of the pandemic on the tourism sector in Spain. They used a long range dependence model based on fractional integration. Using daily data from five equity markets their results indicate that the current coronavirus crisis has increased the degree of dependence/persistence in the data, moving in some cases the series from mean reversion to lack of it. Thus, shocks that were transitory before the crisis are now permanent, requiring strong policy measures to recover their long-term projections. In a previous study Alana, Mudida and Perez de Gracia (2014) considered persistence, long memory and seasonality characteristics in Kenya's tourism industry. This study, however, was done well before the COVID-19 pandemic and thus did not capture the pandemic's effects. In addition, it focused on the Kenyan economy and not a broader selection of African countries.

Sigala (2020) conducts a review of literature on the transformational impact of tourism on COVID-19. The paper considers how the transformational opportunity provided by the pandemic.

It identifies the critical issues that researchers should challenge to shape the research agenda. The effects on and perspectives of major tourism stakeholders are assessed during the response, recovery and reset stages.

. No study so far, however, has focused on Africa and used fractional integration methods to assess the impact of COVID-19. These methods are more general than those used in the above mentioned studies.

3. The Data

Monthly data for tourism arrivals is obtained from January 2013 for all five African economies. The data is obtained from various statistical bureaus of the different countries. For Eswatini, the data was obtained from the Official Tourism Website of the Kingdom of Eswatini; for Burundi the data was obtained from the Bank of the Republic of Burundi; for Seychelles the data was obtained from the National Bureau of Statistics of Seychelles; for Kenya the data was obtained from the National Bureau of Statistics of Kenya. The ending dates are May 2020 for Burundi; October 2020 for Kenya and November 2020 for Eswatini, Mauritius and Seychelles. (See Table 1).

FIGURE 1 AND TABLE 1 ABOUT HERE

All African five countries considered show a steep decline in tourism arrivals as a consequence of the Covid-19 pandemic. A critical issue analyzed in this paper is whether the tourism series are mean-reverting or not as this indicates the likely persistence of the shock arising from the pandemic.

4. Methodology

We use techniques based on long memory and fractional differentiation. This seems to be appropriate, especially when we are looking at the effect of shocks in time series data. The classical approach to determine if shocks are transitory or permanent is by looking at unit root tests, determining if the series are nonstationary, and in that case producing permanent shocks, or if they are stationary with the shocks presenting transitory effects. Standard unit root methods are ADF (Dickey and Fuller, 1979), PP (Phillips and Perron, 1988); KPSS (Kwiatkowski et al., 1996); ERS (Elliot et al., 1996); NP (Ng and Perron, 2001) and many others. All these methods, however, simply focus on integer degrees of differentiation, i.e, 0 if the series is stationary, and 1 if it isnonstationary. Fractional integration allows any real value d for the order of integration, and is therefore more flexible than the above mentioned approaches. Moreover, many authors have found the above-mentioned unit root methods to have low power if the Data Generating Process (DGP) displays fractionally integration (Diebold and Rudebusch, 1991; Hassler and Wolters, 1994; etc.). In this context of I(d) models, if d is a value smaller than 1, the series displays mean reversion with the effect of the shocks tending to disappear in the long run; on the other hand, if d ≥ 1 the shocks will have a permanent nature, persisting forever.

In the next section we employ the following model,

$$y_t = \beta_0 + \beta_1 t + x_t; \qquad (1 - L)^d x_t = u_t, \qquad t = 1, 2, \ldots, \qquad (1)$$

where y_t refers to the time series that we observe (i.e, monthly tourism arrivals) and β_0 and β_1 are unknown coefficients referring respectively to an intercept and a (linear) time trend; in addition, d is another parameter to be estimated from the data, assuming then that x_t is I(d) or integrated of order d, where d is a real value; finally, given the monthly structure of the data, we suppose that u_t follows a monthly seasonal autoregression of order 1, i.e.,

$$u_t = \phi u_{t-12} + \varepsilon_t; \qquad t = 1, 2, \ldots, \tag{2}$$

where ε_t is a white noise process.

The estimation is conducted via a frequency domain version of the Whittle function and uses a Lagrange Multiplier (LM) test procedure (Robinson, 1994) that is particularly convenient for our purposes.

5. Findings and Discussion

We start this empirical section by looking at the results with data ending at December 2019. In doing so, we may have an idea about the structure of the data and its statistical properties prior to the COVID-19 pandemic.

Tables 2 and 3 refers to the original data while Tables 4 and 5 concern the logged transformed values. In Tables 2 and 4 we report the values of the estimates of d in equation (1) and its associated confidence intervals under the three classical assumptions in relation with the deterministic components. Thus, in column 2 we present the values of d supposing that there are no terms, i.e., β_0 and β_1 are equal to zero a priori in (1): in column 3, an intercept is permitted, i.e., only β_1 is assumed to be zero a priori; finally, in column 4 both parameters, β_0 and β_1 are estimated from the data along with d and ρ (the seasonal AR coefficient).

Starting with the original data, the first noticeable issue in Table 2 is that the time trend component is insignificant for Burundi, Eswatini and Kenya but significant for Mauritius and Seychelles. Table 3 displays the estimated coefficients. Focusing first on the estimated values of d, we observe that for the five countries, the estimates of d are within the interval (0, 1) supporting thus the hypothesis fractional integration. The lowest values are obtained for Seychelles (0.29) and Mauritius (0.30); it is slightly higher for Burundi (0.50) and Kenya (0.52) and much higher for

Eswatini (0.80). Thus, there seems to be some heterogeneity in the level of persistence across countries. Moreover, the time trend is found to be positive for the two countries with a significant coefficient, Mauritius and Seychelles, and also these two countries display the highest levels of persistence. This can be explained by the fact that the tourism sector is much more critical to the economy in Mauritius and Seychelles as shown by its contribution to GDP and shocks tend to have much more persistent effects. In both Mauritius and Seychelles, tourism contributes respectively about 30% and 50% to GDP respectively; 28% and 60% to total employment respectively, and 34% and 35% to export receipts respectively (Makochekanwa, 2013). The contribution to the GDP in Seychelles is even higher, rising to 60.8% when factoring in indirect and inducted impacts (World Bank, 2013b). Mauritius was once regarded as an extreme case of a monoculture economy, relying very predominantly on the export of sugar. Mauritius is now a reputed exporter of non-traditional goods such as (textiles) and services (tourism) but tourism still continues to make a critical contribution to the economy (Durbarry, 2004).

TABLES 2 AND 3 ABOUT HERE

Tables 4 and 5 refer to the logged transformed data. Though quantitatively different, qualitatively they are very similar to those based on the original data, though now the null hypothesis of d = 1 cannot be rejected for Eswatini. The time trends are again required only for Mauritius and Seychelles and these two countries display the highest levels of seasonality.

TABLES 4 AND 5 ABOUT HERE

According to the results for the pre-COVID period, we can conclude by saying that there is a different speed of adjustment of shocks taking longer to recover in the case of Eswatini compared with Mauritius or Seychelles.

Next, we repeat the experiment but this time incorporating the available data for the year 2020 and thus, potentially being influenced by Covid-19 pandemic. Starting once more with the original data, in Tables 6 and 7, we notice that the two significant trends have now disappeared and the estimates of d are much higher than those observed in Tables 2 and 3. In fact, the I(1) hypothesis, previously rejected in the five countries, cannot be rejected now for Eswatini and Mauritius; for the remaining three countries, the values of d are now larger than before: 073 for Burundi, 0.79 for Kenya and 0.84 for Seychelles. Also, the seasonal coefficient shows a slight decrease in Mauritius and Seychelles.

TABLES 6 - 9 ABOUT HERE

Looking at the log-transformed data (Tables 8 and 9) the time trend has also disappeared in Mauritius and Seychelles. The values of the integration order d are even higher than in the previous cases, and the null of a unit root cannot be rejected now for Seychelles (0.81), Eswatini (0.93), Mauritius (0.93) or Burundi (0.99), and mean reversion (i.e., significant evidence of d < 1) is observed in Kenya with d equal to 0.56. The results of mean reversion in the case of Kenya's tourism series are consistent with an earlier study of Kenya' tourism series by Gil-Alana, Mudida and Perez de Gracia (2014) implying that shocks are expected to be transitory and to decline quickly. This can be justified by the more diversified nature of the economy in Kenya, compared to Burundi, Seychelles, Mauritius and Eswatini. Tourism is an important sector in Kenya but the contribution to GDP in Kenya is dominated by other service sub-sectors such as financial services and ICT. In Kenya, the contribution of travel and tourism to GDP in 2019 was 8.8 %, the same as the previous year and much lower than Seychelles and Mauritius. Shocks such as COVID-19, therefore have less of an impact in the long-term and the Kenyan economy recovers faster.

TABLE 10 ABOUT HERE

Table 10 display a summary in relation with the degree of f persistence. We observe an increase in the estimated values of d in all cases, moving from I(d; d < 1) to I(1) behavior in two countries with the original data (Eswatini and Mauritius) and in four with the log-transformed data (Burundi, Eswatini, Mauritius and Seychelles).

6. Conclusions

In this paper, we have put our attention to the effect of the Covid-19 pandemic on tourism on several African countries, focusing on five countries, namely, Burundi, Eswatini, Kenya, Mauritius and Seychelles, which are all located in Eastern and Southern Africa and which are important tourism destinations. Based on this goal, we have employed fractional integration, which is a particularly suitable technique for the analysis of the effects of shocks. Our results indicate that if we use data ending at December 2019, the series are mean reverting and the degree of persistence moves from low values in Mauritius and Seychelles to the highest value in Eswatini. However, if we included data referring to the Covid-19 period we observe a substantial increase in the degree of persistence, and the hypothesis of I(1) behaviour cannot be rejected for Eswatini and Mauritius with the original data and also for Burundi and Seychelles with the log-transformed. Thus, only Kenya still displays a degree of mean reversion behavior. This requires some policy action since it implies that the economies of Burundi, Eswatini, Mauritius and Seychelles need to continue to focus on economic diversification and to reduce excessive dependence on the tourism sector given the greater persistence of tourism related shocks in these economies. Lower sectoral diversification in our study and greater dependence on the tourist sector is associated with greater persistence of the adverse effects of Covid-19 on tourism. Stronger monetary, fiscal and tourism sector incentive policy measures also need to be taken in Burundi, Eswatini, Mauritius and Seychelles to enable their recovery owing to the higher degree of persistence of Covid-19 shocks in these African economies. The Kenyan economy, on the other hand, is better able to cope with tourism related shocks as mean reversion indicates that the economy rebounds quickly from shocks such as Covid-19. However, even the Kenyan economy needs to continue to develop innovative tourism products to increase tourism numbers. Mean reversion in the Kenyan economy implies that it is easier to build a firm foundation for the tourist sector which can become an even more critical and stable pillar for the economy.

References

Abbas, J, Mubeen, R., Iorember, P.T, Raza, S and Mamirkulova, G (2021),“Exploring the impact of COVID-19 on tourism: transformational potential and implications for a sustainable recovery of the travel and leisure industry, *Current Research in Behavioral Sciences* 2, November, 100033.

Bakar A.N. and Rosbi, S. (2020) Effect of Coronavirus Disease to Tourism Industry*”* *International Journal of Advanced Engineering Research* 7, 4, 189-193.

Baum, T. and N.T.T. Hai (2020), Hospitality, Tourism, Human Rights and the impact of COVID-19, *International Journal of Contemporary Hospitality Management*, 32 (7), 2397-2407.

Dickey, D.A and W.A. Fuller, (1979) Distributions of the Estimators for Autoregressive Time Series with a Unit Root, *Journal of American Statistical Association*, 74(366), 427-481.

Diebold, F.X. and G. Rudebusch (1991), On the power of Dickey-Fuller tests against fractional alternatives, Economics Letters 35,155-160.

Durbarry, R. (2004), Tourism and Economic Growth: The Case of Mauritius, *Tourism Economics* 10, 4, 389–401.

Elliot, G., T.J. Rothenberg and J.H. Stock, (1996) Efficient Tests for an Autoregressive Unit Root, *Econometrica*, 64, 813-836.

Foo, L.P., M.Y. Chin, K.L. Tan and K.T. Phuah (2020) “The impact of COVID-19 on tourism industry in Malaysia”, *Current Issues in Tourism*, DOI: 10.1080/13683500.2020.1777951.

Gil-Alana, L.A. and C. Poza, (2020), The Impact of Covid-19 on the Spanish Tourism Sector *Tourism Economics*, doi.org/10.1177/1354816620959914.

Gil-Alana, L.A., R. Mudida, and F. Perez de Gracia, (2014), Persistence, Long Memory and Seasonality in Kenyan Tourism Series, *Annals of Tourism Research* 46, 89–101.

Hassler, U. and J. Wolters (1994), On the power of unit root test against fractional alternatives, Economics Letters 45, 1-5.

International Monetary Fund (2021), *Regional Economic Outlook: sub-Saharan Africa: Navigating a long Pandemic*.

Kwiatkowski D, P.C.D Phillips, P. Schmidt and Y. Shin (1992) Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?, Journal of Econometrics 54, 159–178.

Lee C.-C. and M.-P. Chen (2020) The Impact of COVID-19 on the travel and leisure industry returns: Some International Evidence *Tourism Economics*, November, doi.org/10.1177/1354816620971981.

Makochekanwa, A. (2013), An analysis of tourism contribution to economic growth in SADC Countries, *Botswana Journal of Economics* 11(15), 42-56.

Mudida, R.(2021), *An Emerging Africa in the Age of Globalisation*, London; Routledge.

Ng, S., and P. Perron (2001). Lag Length Selection and the Construction of Unit Root Tests with Good Size and Power, Econometrica, 69, 1519-1554.

Phillips, P.C.B. and Perron, P. (1988) 'Testing for a unit root in time series regression', *Biometrika* 75, 2, 335–346.

Robinson, P.M., (1994), Efficient tests of nonstationary hypotheses, Journal of the American Statistical Association 89, 1420-1437.

Sigala M. (2020), "Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research," *Journal of Business Research* 117, *117*(C), 312-321.

Ugur, N.G. and A. Akbiyik, (2020) "Impacts of COVID-19 on Global Tourism Industry: A Cross-Regional Comparison", *Tourism Management Perspectives*, *36*, 100744.

World Bank (2013a), *Tourism in Africa: Harnessing Tourism for Growth and Improved Livelihoods*, Washington DC.

World Bank (2013b), *Seychelles Tourism Sector Review: Sustaining Growth in a Successful Tourism Destination*. Washington, DC.

Figure 1: Time series plots

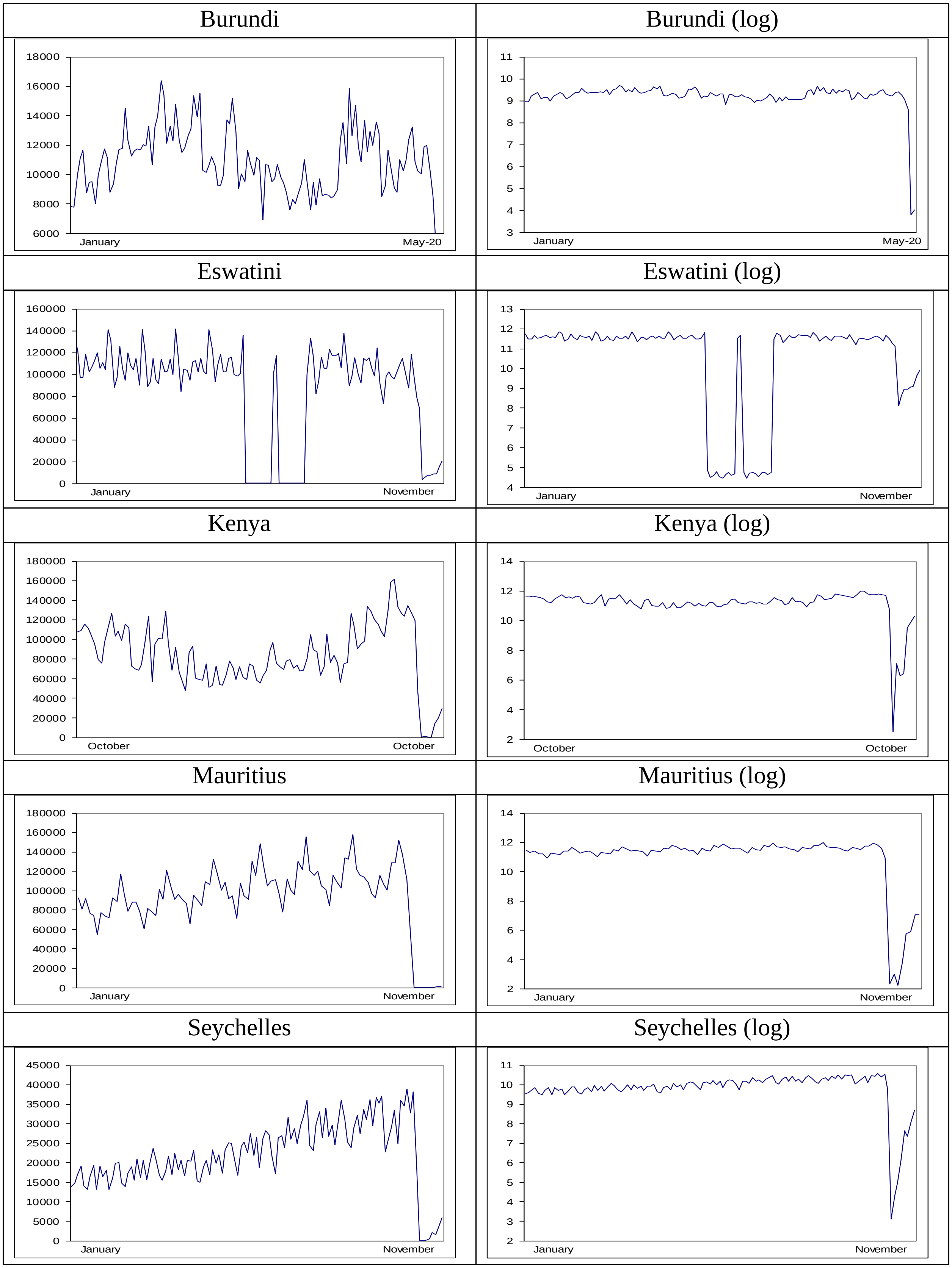

Table 1: Time series under examination

Country	Starting date	Ending date	N. of observations
BURUNDI	January 2010	May 2020	125
ESWATINI	January 2010	November 2020	131
KENYA	October 2011	October 2020	109
MAURITIUS	January 2013	November 2020	95
SEYCHELLES	January 2011	November 2020	119

Table 2: Estimation of the order of integration, d: Data ending at December 2019

Country	No terms	An intercept	An intercept and a linear time trend
BURUNDI	0.72 (0.60, 0.87)	**0.50 (0.38, 0.66)**	0.51 (0.39, 0.67)
ESWATINI	0.83 (0.71, 1.00)	**0.80 (0.69, 0.95)**	0.80 (0.69, 0.95)
KENYA	0.70 (0.56, 0.89)	**0.52 (0.46, 0.69)**	0.51 (0.40, 0.68)
MAURITIUS	0.86 (0.68, 1.08)	0.46 (0.41, 0.53)	**0.30 (0.16, 0.51)**
SEYCHELLES	0.66 (0.47, 0.83)	0.46 (0.41, 0.53)	**0.29 (0.16, 0.46)**

The values appearing in bold indicate the significant model according to the deterministic components. The values in parenthesis are the confidence bands at the 95% level.

Table 3: Estimated coefficient values from the selected models in Table 2

Country	d	Intercept (t-value)	Time trend (t-value)	Seas.
BURUNDI	0.50 (0.38, 0.66)	9853.362 (9.71)	---	0.321
ESWATINI	0.80 (0.69, 0.95)	119054.32 (4.81)	---	0.623
KENYA	0.52 (0.46, 0.69)	100682.75 (9.15)	---	0.384
MAURITIUS	0.30 (0.16, 0.51)	79850.71 (10.04)	541.35 (3.43)	0.939
SEYCHELLES	0.29 (0.16, 0.46)	14023.75 (8.22)	178.26 (6.78)	0.830

Table 4: Estimation of the order of integration, d: Data ending at December 2019 (logged values)

Country	No terms	An intercept	An intercept and a linear time trend
BURUNDI	0.98 (0.86, 1.13)	**0.50 (0.38, 0.68)**	0.52 (0.39, 0.69)
ESWATINI	0.98 (0.81, 1.12)	**0.93 (0.80, 1.12)**	0.93 (0.80, 1.12)
KENYA	0.96 (0.83, 1.13)	**0.49 (0.38, 0.65)**	0.48 (0.37, 0.64)
MAURITIUS	0.95 (0.82, 1.14)	0.46 (0.42, 0.52)	**0.19 (0.08, 0.35)**
SEYCHELLES	0.97 (0.84, 1.13)	0.48 (0.43, 0.54)	**0.30 (0.18, 0.46)**

The values appearing in bold indicate the significant model according to the deterministic components. The values in parenthesis are the confidence bands at the 95% level.

Table 5: Estimated coefficient values from the selected models in Table 4

Country	d	Intercept (t-value)	Time trend (t-value)	Seas.
BURUNDI	0.50 (0.38, 0.68)	9.168 (97.86)	---	0.306
ESWATINI	0.93 (0.80, 1.12)	11.713 (9.34)	---	0.504
KENYA	0.49 (0.38, 0.65)	11.483 (97.28)	---	0.317
MAURITIUS	0.19 (0.08, 0.35)	11.283 (189.65)	0.00542 (4.65)	0.953
SEYCHELLES	0.30 (0.18, 0.46)	9.606 (128.41)	0.00770 (6.65)	0.852

Table 6: Estimation of the order of integration, d: Data including Covid-19 pandemia

Country	No terms	An intercept	An intercept and a linear time trend
BURUNDI	0.71 (0.58, 0.87)	**0.73 (0.59, 0.90)**	0.73 (0.59, 0.90)
ESWATINI	0.89 (0.77, 1.04)	**0.86 (0.75, 1.01)**	0.86 (0.74, 1.01)
KENYA	0.87 (0.72, 1.07)	**0.79 (0.67, 0.97)**	0.79 (0.66, 0.97)
MAURITIUS	0.97 (0.84, 1.14)	**1.03 (0.91, 1.21)**	1.04 (0.91, 1.22)
SEYCHELLES	0.89 (0.77, 1.04)	**0.84 (0.73, 0.99)**	0.84 (0.73, 0.98)

The values appearing in bold indicate the significant model according to the deterministic components. The values in parenthesis are the confidence bands at the 95% level.

Table 7: Estimated coefficient values from the selected models in Table 6

Country	d	Intercept (t-value)	Time trend (t-value)	Seas.
BURUNDI	0.73 (0.59, 0.90)	8447.299 (5.26)	---	0.288
ESWATINI	0.86 (0.75, 1.01)	120598.26 (4.76)	---	0.603
KENYA	0.79 (0.67, 0.97)	105855.64 (5.81)	---	0.266
MAURITIUS	1.03 (0.91, 1.21)	93333.812 (4.81)	---	0.814
SEYCHELLES	0.84 (0.73, 0.99)	14263.565 (2.87)	---	0.664

Table 8: Estimation of the order of integration, d: Data including Covid-19 pandemia (logged values)

Country	No terms	An intercept	An intercept and a linear time trend
BURUNDI	0.80 (0.67, 0.97)	**0.99 (0.82, 1.16)**	0.99 (0.83, 1.16)
ESWATINI	0.96 (0.84, 1.13)	**0.93 (0.80, 1.11)**	0.93 (0.79, 1.11)
KENYA	0.89 (0.77, 1.06)	**0.56 (0.43, 0.74)**	0.55 (0.41, 0.73)
MAURITIUS	0.98 (0.84, 1.17)	**0.93 (0.77, 1.15)**	0.92 (0.76, 1.15)
SEYCHELLES	0.99 (0.85, 1.17)	**0.81 (0.64, 1.03)**	0.80 (0.63, 1.03)

The values appearing in bold indicate the significant model according to the deterministic components. The values in parenthesis are the confidence bands at the 95% level.

Table 9: Estimated coefficient values from the selected models in Table 8 (logged values)

Country	d	Intercept (t-value)	Time trend (t-value)	Seas.
BURUNDI	0.99 (0.82, 1.16)	8.966 (19.55)	---	0.135
ESWATINI	0.93 (0.80, 1.11)	11.712 (9.52)	---	0.490
KENYA	0.56 (0.43, 0.74)	11.349 (17.89)	---	0.040
MAURITIUS	0.93 (0.77, 1.15)	11.420 (12.07)	---	0.214
SEYCHELLES	0.81 (0.64, 1.03)	9.562 (14.72)	---	0.225

Table 10: Summary results: Estimates of d before and with Covid-19

Country	Original data		Logged values	
	Before Covid-19	With Covid-19	Before Covid-19	With Covid-19
BURUNDI	0.50 (0.38, 0.66)	0.73 (0.59, 0.90)	0.50 (0.38, 0.68)	**0.99* (0.82, 1.16)**
ESWATINI	0.80 (0.69, 0.95)	**0.86* (0.75, 1.01)**	**0.93* (0.80, 1.12)**	**0.93* (0.80, 1.11)**
KENYA	0.52 (0.46, 0.69)	0.79 (0.67, 0.97)	0.49 (0.38, 0.65)	0.56 (0.43, 0.74)
MAURITIUS	0.30 (0.16, 0.51)	**1.03* (0.91, 1.21)**	0.19 (0.08, 0.35)	**0.93* (0.77, 1.15)**
SEYCHELLES	0.29 (0.16, 0.46)	0.84 (0.73, 0.99)	0.30 (0.18, 0.46)	**0.81* (0.64, 1.03)**

* and in bold, the non-rejection values of the unit root hypothesis.