Nexus Between Current Account Balance, Price Stability, And Economic Growth in India: An Empirical Analysis

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Abstract:
A prominent theme of structuralist macroeconomics has been the crucial role that the current account imbalance plays in shaping macroeconomic developments in emerging market economies. The persistent current account deficit may cause macroeconomic instability, notably in general price level. The balance of payment crisis in India in the late 1980s and early 1990s is a case in point. The post-COVID macroeconomic development also hinted at the significant role of current account balance. This study seeks to examine the relationship between the current account component of the balance of payments, price stability (captured by the Consumer Price Index) and economic growth (captured by GDP) in the economy in India, from 1996. At the outset, we check how the current account deficit explains the inflationary conditions, and the surplus supports the stability – and their contributions in economic growth. The interdependence is found significant in causality and integration analyses.

Keywords: Balance of Payment, CPI, Current Account Balance, GDP, Granger Causality, Inflation, Johansen Co-integration

I. INTRODUCTION

A prominent theme of structuralist macroeconomics has been the crucial role that the current account imbalance plays in shaping macroeconomic developments in emerging market economies. The persistent current account deficit (CAD) may cause macroeconomic instability, notably in general price level. The Economic Survey 2023[1] also highlighted the challenge of depreciating rupee due to the widening current account deficit, noting various reasons for growing CAD.[2]

The balance of payment crisis in India in the late 1980s and early 1990s is a case in point for the relationship between current account balance, price stability and economic growth. During the middle of 1991, the exchange rate of India experienced a significant adjustment as the value of the rupee began to decline. Although the Reserve Bank of India (RBI) implemented some measures, the foreign reserves were nearly exhausted, and as a result, the Indian government authorized a substantial devaluation.[3] The decisions were taken essentially to offset the pervasive economic and administrative controls and inward orientation of the country, but they lacked an overarching framework to promote competition and efficiency and thus, the resulting macroeconomic distortions could not be averted. In mid-1991, India's exchange rate was subjected to a severe adjustment – an event which began with a slide in the value of the rupee. Later, despite the Reserve Bank of India (RBI) taking partial action, foreign reserves nearly depleted and the Indian government permitted a sharp depreciation of rupee against foreign currencies. After the crisis, the government embarked on an adjustment program featuring macroeconomic stabilization and structural reforms that involved liberalizing the economy, with the help of the International Monetary Fund (IMF).

While officially describing the currency crisis, Indian authorities mentioned the continued current account deficits (CAD) that led to the crisis; exacerbated by problems related to the Middle East crisis; high fiscal deficits; and a loss of confidence in the government.[4]

The oil imports played its part in fuelling the crisis as the CAD increased over Rs 6,000 crore – from Rs. 11,350 crore in 1989-90 to Rs 17,350 crore in 90-91 period. This exponential rise of CAD reflected in fall of foreign exchange reserves, which failed to cover even three months of import costs. The CAD-GDP ratio rose from 2.3 percent to 3.1 percent and the average rate of inflation reached the double digit 10 per cent in 90-91 and 13 per cent in 91-92. The growth rate fell to 6.5 per cent to 5.5 per cent too.[5]

Infamously, the exchange rate crisis came to be called the balance of payments crisis in India, and its impacts across macroeconomic variables are subject of several researches. Since its independence, India has typically run a current account deficit (CAD). This is because as a developing country, India relies on imports – especially commodities like crude oil that reflects on its account.

By definition, the current account can be expressed as the difference between the value of exports of goods and services and the value of imports of goods and services. A deficit then means that the country is importing more goods and services than it is exporting. However, the current account also includes net income (such as interest and dividends) and transfers from abroad (such as foreign aid), which are usually a small fraction of the total. Simply, it is to be noted that a large and persistent CAD is a matter of concern,[6] as is the case with India now. The 2023 Economic Survey noted two shocks – one financial and the other health—which spiked the global commodity and food prices.1 In this backdrop, India recorded a deficit of US$ 36.4 billion (4.4 per cent of GDP) on account of a higher merchandise trade deficit of US$ 83.5 billion and an increase in net investment income outgo, the Survey said.[1]

Research states there is a cyclical pattern of effect which current account balance exerts. A strong economic expansion or growth will lead to growth in imports; and if exports do not rise at the same rate as imports, there will be a current account deficit. Such a deficit has two effects on the price level in a domestic economy: on the one hand, it reduces inflationary pressure by containing some of the excess demand through increased imports. On the other hand, it exacerbates inflationary risks by causing the local currency to depreciate.[6]

For India, a CAD of 2.4-2.8 percent of the GDP is considered sustainable, according to RBI.[7] These figures were subject to formal and informal changes since. While the country saw a rare current account surplus in the financial year 2020-21, it slipped back into deficit in 2021-22. As of Q2 in financial year 2022-23 (July-September, 2022), India's CAD was 4.4 per cent of GDP— highest in nine years.[8] To put things into perspective, the country's retail inflation, which is measured by the Consumer Price Index (CPI), dropped to a three-month low of 6.77 percent in Oct. 2022. CPI in the month of September was 7.41 percent and 7 per cent in August 2022. If current account balance exerts any influence on price level and GDP is the subject of interest of this study.

The objectives of the study are:

1. To identify the ways in which changes in current account balance impacts the general price level and the gross domestic product of the Indian economy.
2. To analyze the pattern in which CAB, price level and gross domestic product are related to each other.

II. MATERIALS AND METHODS

a. Data

The research is based on secondary data published in various official sources. The theoretical base and the motivation of this research are based on the literature published earlier and the research gap, which was discussed in the sections before. The study deals with three variables – Current Account Balance, Consumer Price Index (Base Year/Price 2015=100) and Gross Domestic Product at Current Prices. Data is taken from Q2 of 1996 to Q4 of 2021: a total of 103 observations of each variable. The GDP data is converted into the natural log form for easier analysis. The rest of the variables are taken in their original form.

b. Methodology & Hypothesis

This section explains the use of econometric tools used in this study to analyze in a more systematic way the relationship between current account balance, price stability and economic growth.

Stationarity: Time series data of economic and financial nature exhibit trending behavior or non-stationarity in the mean.[17] It is essential to determine the most appropriate form of trend and unit root tests fit the purpose. Variables used in the study – especially the real GDP – show trends in behavior when faced with shocks, which are also noted in reference studies.[9] A shock is defined as an unexpected change in a variable or in the value of the error terms at a particular time. If the system is stationary, the effect of a shock will gradually decrease; unlike in a non-stationary system, where the effect of a shock is permanent. The unit root is a feature of a time series that makes it non-stationary.

The first hypothesis in this study is to check for the presence of a unit root, indicating the time series is non-stationary. Besides, the number of unit roots contained in the series corresponds to the number of differencing operations required to make the series stationary. The Dickey-Fuller (DF) test was developed and popularized by Dickey and Fuller (1979). The null hypothesis of the DF test is that there is a unit root in an auto-regressive (AR) model. The alternative hypothesis is generally stationarity or trend stationarity but can be different depending on the version of the test being used.

As mentioned earlier, the null hypothesis of DF test is that a unit root is present in a first-order AR model. The first-order AR process captures the first-order autocorrelation as well. If we expect a higher-order autocorrelation in the model, then DF is failed, and white noise assumption of error term will be violated. Therefore, Dicky and Fuller augment the equation with higher-order lags to capture the higher-order autocorrelation, which is known as Augmented Dickey Fuller (ADF) test in the literature of time series.

Causality*:* Next, the study looks to establish causality; particularly the causal relationship between current account balances with the other two variables – which is sought to be fulfilled by Granger Causality Test. Proposed by Clive Granger in 1969[18], the hypothesis test checks for prediction of the future values of a time series using prior values of another time series. According to Granger causality, if a signal X1 "Granger-causes" (or "G-causes") a signal X2, then past values of X1 should contain information that helps predict X2 above and beyond the information contained in past values of X2 alone.

Though it is tempting to find similarity with correlation – which states the existence of a mutual relationship, connection between two or more variables or be associated to occur together not purely on the basis of chance – causality is different.[24] Also referred to as cause and effect, the latter means that there is a logical explanation of the cause of one process on the other, i.e. the cause is partially or totally resposnible for the effect. A process can have many causes and those causes can quantitatively (and sometimes qualitatively) determine the evolution of the effect, from past through the future. Causality cannot exist without a form of correlation; however, any correlation does not mean the existence of causality.

The second hypothesis in this study, thus, deals with establishing causality (Granger causality). In Granger causality, the null hypothesis states that variable X does not Granger-cause variable Y.[24] We fail to reject the null when no lagged values of the variable X are retained, after the application of t-statistic and F-statistic tests. Otherwise, we reject the null hypothesis in favor of the alternative, and we conclude that variable X Granger-cause variable Y. It means that the future values of variable Y are dependent on the present values of variable X. A prerequisite for performing the Granger Causality test is that the data needs to be stationary i.e it should have a constant mean, constant variance, and no seasonal component. We thus transform the non-stationary data to stationary data by differencing it, either first-order or second-order differencing.

Studies by Akcay and Eratas (2011)[11], Dayıoğlu and Aydın (2020)[12] performed causality analyses between the same variables in different countries.

Cointegration*:* In a non-stationary series too, it is interesting to see if a long-run relationship exists. Johansen Cointegration is a systems approach which shows if a linear combination of two non-stationary series may be described stationary. Cointegration occurs when two or more nonstationary time series have a long-run equilibrium; move together in such a way that their linear combination results in a stationary time series and/or share an underlying common stochastic trend.[19] Johansen's test is a way to determine if three or more time series are cointegrated. More specifically, it assesses the validity of a cointegrating relationship, using a maximum likelihood estimates (MLE) approach. It is also used to find the number of relationships and as a tool to estimate those relationships.[20] There are two types of Johansen's test: one uses trace (from linear algebra), the other a maximum eigenvalue approach. This study makes use of a trace method for cointegration. Both forms of the test will determine if cointegration is present.

For Johansen Cointegration, the null hypothesis for both forms of test is that there are no cointegrating equations. The difference is in the alternate hypothesis: the trace test alternate hypothesis is simply that the number of cointegrating relationships is at least one (shown by the number of linear combinations). Rejecting the null hypothesis in this situation is basically stating there is only one combination of the non-stationary variables that gives a stationary process.

If the t-statistic is greater than the critical 5 percent level, then we reject the null hypothesis which states that there is no cointegration. This indicates a situation of cointegration between the variables considered, which will further lead us to the selection of vector error correction model (VECM) over the vector autoregressive model (VAR) for time series analysis. Thus, it essentially becomes a rank test for choosing the appropriate model.

There is always a chance of losing information about the relationship among integrated series in VAR since time series models for VAR are built on stationary series with initial differences to original series. As a result, one option is to differentiate the series to make them stable, although doing so ignores potential long run correlations between the levels, which may be significant. Cointegration is a superior method for determining if the levels of regressions are reliable. The usual approach is to use Johansen's method for testing whether or not cointegration exists. If there is cointegration present, then a vector error correction model (VECM), which combines levels and differences, can be estimated instead of a VAR in level.[21]

VECM Model: If y and x are I(1) and cointegrated, then the system of equations is modified to allow for the cointegrating relationship between the I(1) variables. Introducing the cointegrating relationship leads to a model known as the vector error correction (VEC) model. As long as there is a cointegration relationship between variables, the error correction model can be derived from the autoregressive distributed lag model. And each equation in the VAR model is an autoregressive distributed lag model; therefore, it can be considered that the VEC model is a VAR model with cointegration constraints.

VECM model gives us estimates of short-run behaviour, long-run cointegrating relationship as well as short-run adjustment coefficients. The short-run deviations from long-run equilibrium are corrected and the speed of this correction is shown by the adjustment coefficients, if any.

This study hypothesizes that a falling current balance (or a deficit) will have a negative impact on price level and growth level and vice-versa. Similarly, a surplus will have a positive impact on the said variables and vice-versa. Results of the analysis will be discussed in the following section.

II. RESULTS AND DISCUSSION (SIZE 10 & BOLD, CAPS)

The analysis is done on RStudio and the data is converted into time series. The plot and auto plot for the time series converted from the data shows some sort of distortions through its course. Auto plot shows extreme values in Current Account Balance because CPI and GDP (ln) are in index and natural-log form and distortions are not visible in relation, which the plot figure captures.

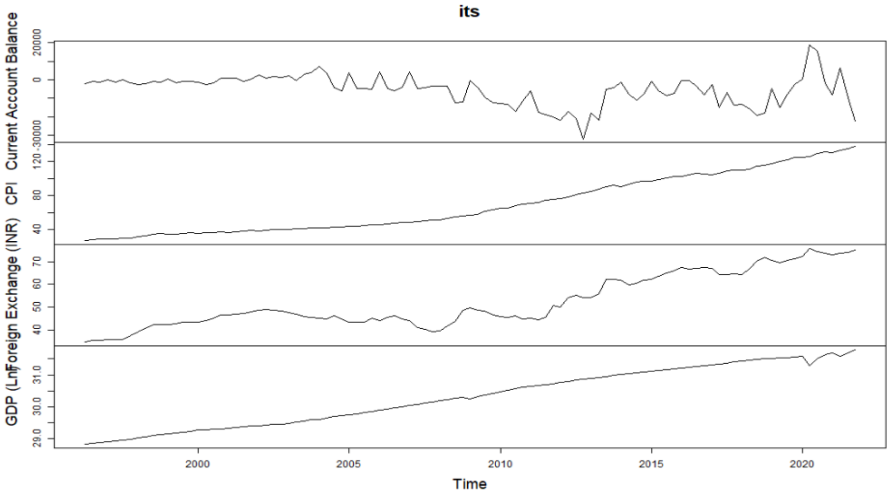

Fig. 1 Plot of the time series

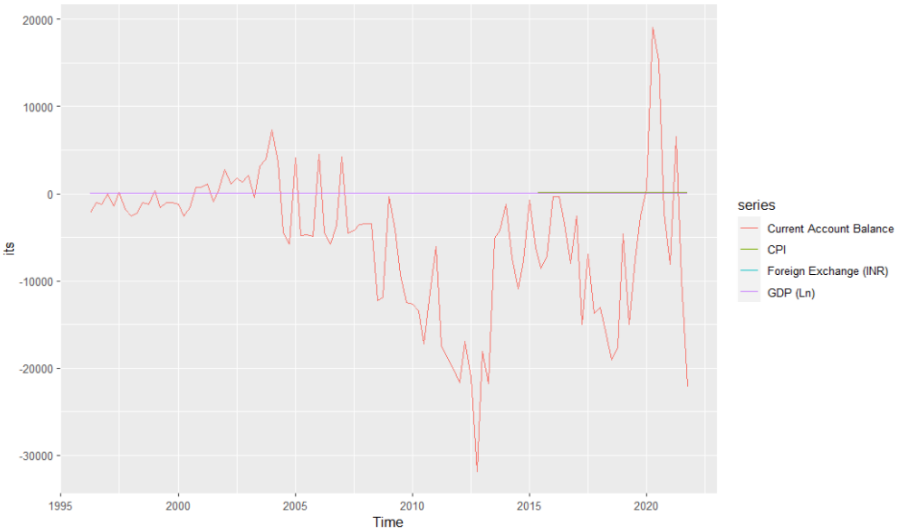

Fig. 2 Auto Plot of the time series

The ADF confirms that the series is non-stationary, and only the second order differencing makes it stationary. This can be ascertained in the plot below.

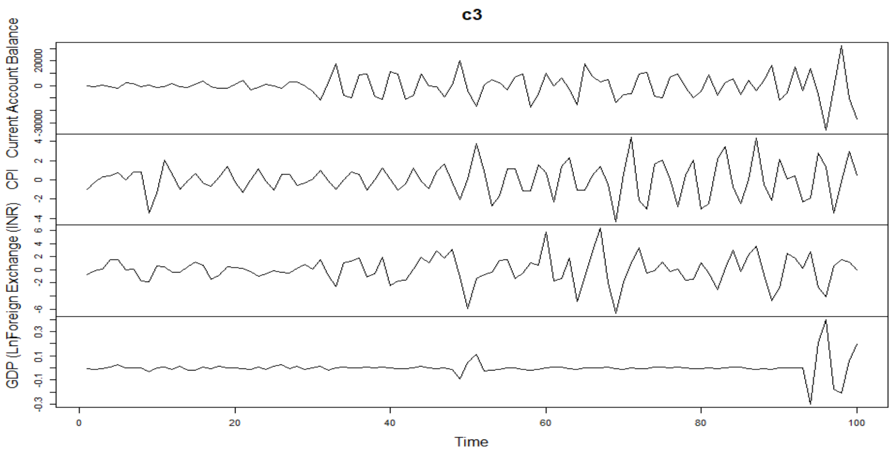

Fig. 3 Plot of time series after second-order differencing

The statistical hypothesis test of Granger causality performed on two select variables each of the stationary time series (converted into data frame) state that changes in Current Account Balance granger causes changes in CPI (price level) and level of GDP in Indian Economy. This is validated by the level of significance lesser than the critical value. However, the inverse is not true – neither changes in CPI or the GDP does not granger cause changes in CAB. This result is not synonymous with the existing literature.

```
> grangertest(`Current Account Balance`~ `CPI`, order=3, data= c3df)
Granger causality test

Model 1: Current Account Balance ~ Lags(Current Account Balance, 1:3) + Lags(CPI, 1:3)
Model 2: Current Account Balance ~ Lags(Current Account Balance, 1:3)
  Res.Df Df      F  Pr(>F)
1     90
2     93 -3 3.5726 0.01708 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> grangertest(`Current Account Balance`~ `GDP (Ln)`, order=3, data= c3df)
Granger causality test

Model 1: Current Account Balance ~ Lags(Current Account Balance, 1:3) + Lags(GDP (Ln), 1:3)
Model 2: Current Account Balance ~ Lags(Current Account Balance, 1:3)
  Res.Df Df     F   Pr(>F)
1     90
2     93 -3 4.551 0.005135 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> grangertest(`CPI`~ `Current Account Balance`, order=3, data= c3df)
Granger causality test

Model 1: CPI ~ Lags(CPI, 1:3) + Lags(Current Account Balance, 1:3)
Model 2: CPI ~ Lags(CPI, 1:3)
  Res.Df Df      F Pr(>F)
1     90
2     93 -3 0.9438  0.423
> grangertest(`GDP (Ln)`~ `Current Account Balance`, order=3, data= c3df)
Granger causality test

Model 1: GDP (Ln) ~ Lags(GDP (Ln), 1:3) + Lags(Current Account Balance, 1:3)
Model 2: GDP (Ln) ~ Lags(GDP (Ln), 1:3)
  Res.Df Df      F Pr(>F)
1     90
2     93 -3 1.3537 0.2621
```

Fig. 4 Results from Granger Causality

Granger Causality is also applied on the crude oil prices, which is heavily traded global commodity impacting the Indian Economy as stated in the Survey, but its effect on Current Account Balance is insignificant.

Also, to examine the popular statistical adage 'Correlation does not imply causation', the correlation plot obtained for the variables show that there is weak correlation between Current Account Balance with both CPI and GDP. There is strong correlation between CPI and GDP, which is well established in literature.

	Current Account Balance	*CPI*	*GDP (Ln)*
Current Account Balance	1		
CPI	-0.311148343	1	
GDP (Ln)	-0.415511334	0.969253771	1

Table 1: Results from Correlation Plot

For the Johansen co-integration procedure, two lags are used and a constant is specified for using a ‘trace’ statistical approach. As standard practice, the 5 percent critical value is used as reference. The r in the table represents the rank and it is known that this is some indication of the number of co-integrating relationships. At r=0, t=480.21 > 53.12 (value at 5 percent level). This means that the null hypothesis, which suggests that r > 0, can be rejected. As such, there is some co-integration present. Similarly, at all levels of r, the t-value is greater than 5 percent level value. Hence, the null hypothesis is rejected at all levels – indicating that co-integration is present at all levels.

```
######################
# Johansen-Procedure #
######################

Test type: trace statistic , without linear trend and constant in cointegration

Eigenvalues (lambda):
[1] 8.719931e-01 7.287557e-01 6.184213e-01 4.380156e-01 8.881784e-16

Values of teststatistic and critical values of test:

          test 10pct  5pct  1pct
r <= 3 |  56.48  7.52  9.24 12.97
r <= 2 | 150.89 17.85 19.96 24.60
r <= 1 | 278.76 32.00 34.91 41.07
r = 0  | 480.21 49.65 53.12 60.16
```

Fig. 4 Results from Johansen Co-integration

Since there are co-integrating relationships present among our variables in time series, the vector error correction model is applied to ascertain the short-term and long-term relationships of CAB with price level and GDP.

```
###Model VECM
#############
Full sample size: 100   End sample size: 97
Number of variables: 2  Number of estimated slope parameters 12
AIC 1776.899    BIC 1810.37     SSR 6642375380
Cointegrating vector (estimated by ML):
   Current.Account.Balance       CPI
r1                       1 -9782.313


                             ECT                   Intercept                Current.Account.Balance -1 CPI -1                     Current.Account.Balance -2
Equation Current.Account.Balance -0.6060(0.1540)*** -238.6531(868.9781)     -0.1200(0.1079)            -4408.8385(924.1262)*** -0.4601(0.0936)***
Equation CPI                     0.0001(1.9e-05)*** 0.0613(0.1092)          -9.7e-05(1.4e-05)***       0.5659(0.1162)***       -7.1e-05(1.2e-05)***
                             CPI -2
Equation Current.Account.Balance -1855.2765(847.8594)*
Equation CPI                     -0.1495(0.1066)
> vecmmodel=VECM(data.frame(`Current Account Balance`,`GDP (Ln)`), lag = 2, r=1, estim="ML")
> summary(vecmmodel)
#############
###Model VECM
#############
Full sample size: 100   End sample size: 97
Number of variables: 2  Number of estimated slope parameters 12
AIC 1163.709    BIC 1197.181    SSR 7612845746
Cointegrating vector (estimated by ML):
   Current.Account.Balance GDP..Ln.
r1                       1  1229094


                             ECT                   Intercept                Current.Account.Balance -1 GDP..Ln. -1
Equation Current.Account.Balance 0.0961(0.0375)*      -64.5749(929.1130)      -0.5340(0.0947)***         -101427.3459(30897.4271)**
Equation GDP..Ln.                -1.9e-06(1.9e-07)*** 0.0010(0.0047)           1.4e-06(4.8e-07)**        1.1301(0.1560)***
                             Current.Account.Balance -2 GDP..Ln. -2
Equation Current.Account.Balance -0.6328(0.0894)***         -28008.3707(23955.1907)
Equation GDP..Ln.                -8.3e-11(4.5e-07)          0.2267(0.1210).
```

Fig. 5 Results from VECM model

We consider the error correction term for the first model – i.e. the effect of Current Account Balance on CPI – to ascertain the long-run relationship between them. The ECT must be negative and significant, as it came out to be, for it to be considered. The value of ECT -0.60 signifies that there is long-run causality/ association between the two variables and any short-run disequilibrium between them will be converted to equilibrium by 60 percent.

As for the short-run, based on the lags considered, CAB's short-run association is derived from its own lagged value from two time periods ago (here, the quarter) and from CPI from two lagged values.

In our second model – i.e. the effect of CAB on GDP – there is no long-run significance as the ECT is positive but significant and hence, the short-run disequilibrium cannot be converted to equilibrium in the long-run. However, in the short-run, there is association of CAB with its own first and second lagged value and GDP in the first lagged value.

IV. CONCLUSION (SIZE 10 &BOLD, CAPS)

The results from casualty, co-integration and error correction econometric methods reveal that Current Account Balance has a direct relationship with the price level measured by CPI, both in short and long run. Its relation with the GDP is found to be significant in the short-run and insignificant in the long-run through the VECM. The reverse was, however, not found to be true.

As suggested earlier, a current account balance deficit reflects a government and an economy that is a net debtor to the rest of the world. This will affect the balance of payment position of a country directly. But indirectly too, the current account balance affects the domestic economy by means of the exchange rate. A country running a large current account deficit is at a risk of seeing the value of the currency fall. If there is insufficient capital flows to finance the deficit, the exchange rate will fall to reflect the imbalance of foreign flows of funds. This reasons both the 1991 BoP crisis and the COVID-induced economic slowdown.

An external debt crisis looms, and the 1991 'Balance of Payment' or 1997 East Asian crisis is bound to occur. Reserve Bank of India in a paper (2003), talks of stability in the current account balance. This supplements the domestic saving targets in achieving higher growth and investment levels.

Interest Conflicts

The author declares that there is no conflict of interest concerning the publishing of this paper. There are also no relevant financial or non-financial competing interests to report.

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