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# Geopolitical deadlock and phosphate shortfall behind the price hike? Evidence from Moroccan commodity markets

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**Electronic supplementary material**

Supplementary Figures S1–S3

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The following script (Figure S1) determines the degree of correlation between the price of Moroccan phosphate and wheat price. A script of vector autoregression (VAR) follows the application of the Kendall tau. Figure S2 shows its first phase. Figure S3 reflects the second phase of VAR to make a clearer picture of the script model.

```
K <-read_excel(file.choose())
x = K$P
y = K$W

result = cor(x, y, method = "kendall")
res = cor.test(x, y, method = "kendall")
print(res)
```

Figure S1. R Script to perform Kendall's tau test

Source: author's own elaboration

```
wheat <- read_excel(file.choose())
phosphate <- read_excel(file.choose())

wheat <- ts(wheat[, 'price'],start = c(1993, 1), end = c(2022, 9), frequency = 12)
phosphate <-ts(phosphate[, 'price'],start = c(1993, 1), end = c(2022, 9), frequency = 12)

var1 <- dynlm(wheat ~ L(phosphate, 1:2),
  start = c(1993, 1),
  end = c(2022, 9))

var2 <- dynlm(phosphate ~ L(wheat, 1:2),
  start = c(1993, 1),
  end = c(2022, 9))

coeftest(var1, vcov. = sandwich)
coeftest(var2, vcov. = sandwich)
```

Figure S2. R Script to perform VAR (vector autoregression)

Source: author's own elaboration

```
summary(VAR_est$varresult$rate1)$adj.r.squared
summary(VAR_est$varresult$rate2)$adj.r.squared

linearHypothesis(var1,
                 hypothesis.matrix = c("L(rate2, 1:2)1", "L(rate2, 1:2)2"),
                 vcov. = sandwich)
linearHypothesis(var2,
                 hypothesis.matrix = c("L(rate1, 1:2)1", "L(rate1, 1:2)2"),
                 vcov. = sandwich)

forecasts <- predict(VAR_est)
forecasts

plot(forecasts, ylab = "price", xlab = "years")
```

Figure S3. Suggests *R*-squared and Granger Causality values, including predictions for ten periods

Source: author's own elaboration