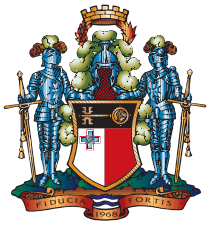

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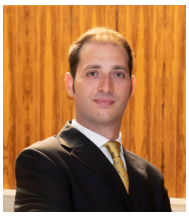
GLOBAL OIL PRICE SWINGS: HAS THEIR EFFECT ON MALTA CHANGED OVER TIME?

Article published in the Research Bulletin 2023, pp. 14-20

GLOBAL OIL PRICE SWINGS: HAS THEIR EFFECT ON MALTA CHANGED OVER TIME?[1]



GERMANO RUISI

This article develops a two-block Structural Vector Autoregression featuring time-varying parameters and stochastic volatility to estimate the changing spill-over of global oil shocks into the Maltese economy during the period January 2008 to March 2022. The model is estimated by using Bayesian methods and focuses on the effect on Maltese output and prices. The results evidence how the periods characterised by the Great Recession and the COVID-19 pandemic are associated with higher inflation responsiveness to oil price shocks. Notwith-standing, the response of energy inflation gradually declines and, as a conse-quence, the medium-term pass-through from international to domestic energy prices decreases from 1% to virtually zero, in response to a shock rising real oil prices by 10%. Finally, the recent surge in global energy prices generated only a short-lived negative response in domestic output, as energy subsidies implemented by the Maltese government attenuated most of the direct negative spillovers.

Introduction

Over the last years, the global economy was hit by several macroeconomic shocks of unusually significant magnitude. Above all, the unexpected outbreak of the COVID-19 pandemic and subsequent economic recovery produced an initial deep contraction and a subsequent robust rebound in world economic activity. Consequently, the falling and the then rising global economic outlook produced large swings in oil prices worldwide, which influenced the speed of economic recovery especially in oil-importing countries.

"The developments on the global oil markets are of high importance to Malta for several reasons. First, Malta is a net-oil importer."

The developments on the global oil markets are of high importance to Malta for several reasons. First, Malta is a net-oil importer and has been historically heavily dependent on the importation of a variety of fossil fuels, to the extent that almost the entirety of its electricity was produced by heavy fuel oil until 2017, and from liquefied natural gas only afterwards. Second, the domestic demand of energy products has been surging because of the last decade of remarkable economic activity. Finally, retail energy prices in Malta (e.g., fuels, gas, electricity, etc.) are administered by the government which, over the decades, has been implementing several different policies that led to a different transmission of global prices into domestic retail ones.

"Second, the domestic demand of energy products has been surging because of the last decade of remarkable economic activity. Finally, retail energy prices in Malta are administered by the government."

The aim of this study is to assess the evolving spillover of global oil shocks into the Maltese economy by means of a two-country vector autoregressive model featuring time-varying parameters and stochastic volatility. The framework will prove useful in taking account of the continuous structural changes that have been taking place in the domestic economy.

[1] I would like to thank Deputy Governor Alexander Demarco, Aaron Grech, Noel Rapa, Brian Micallef, William Gatt Fenech, Massimo Giovannini, Ian Borg and participants in an internal seminar at the Central Bank of Malta for their helpful comments and suggestions. Any remaining errors are my own. The views expressed in this paper are the author's and do not necessarily reflect the views of the Central Bank of Malta.

The model employed aims at gauging the government's response to oil shocks by acknowledging that its energy policies have been different over time. Therefore, it is possible to detect how domestic energy prices have responded to changes in global oil prices and how, consequently, these had a time-varying effect on the four main sub-indices in the consumption bundle: food, non-energy industrial goods, energy, and services.

The main takeaways here highlighted are two. First, Maltese energy inflation response appears to become flatter over time, while the responses of food and services inflation rates appear to be more pronounced in conjunction with the two periods of higher volatility on the global oil markets: the Great Recession and the COVID-19 pandemic. Second, the recessionary effect produced by the identified oil shock appears to be of a longer durationin the 2008-2010 period rather than the 2020-2022 one, with the former characterised by more frequent changes in domestic energy prices in line with international ones.

Methodology

The model builds upon Gatt and Ruisi (2022) by introducing drifting parameters and, as a consequence, it is estimated in a Bayesian fashion and envisages two blocks: a world block and a Maltese one. Furthermore, a small-country assumption is imposed, whereby fluctuations in the world economy can affect Malta but not the other way around. The estimated model, for each $t = 1, \dots, T$, has the following VAR representation:

$$\underbrace{\begin{bmatrix} Y_t^{MT} \\ Y_t^{W} \end{bmatrix}}_{Y_t} = \underbrace{\begin{bmatrix} C_t^{MT} \\ C_t^{W} \end{bmatrix}}_{C_t} + \sum_{l=1}^{L} \underbrace{\begin{bmatrix} B_{l,t}^{MT} & B_{l,t}^{W \to MT} \\ \mathbf{0} & B_{l,t}^{W} \end{bmatrix}}_{B_{l,t}} \underbrace{\begin{bmatrix} Y_{t-l}^{MT} \\ Y_{t-l}^{W} \end{bmatrix}}_{Y_{t-l}} + \underbrace{\begin{bmatrix} U_t^{MT} \\ U_t^{W} \end{bmatrix}}_{U_t} \tag{1}$$

In the model, Y_t^{MT} is a $N^{MT} \times 1$ vector of Maltese variables, Y_t^{W} is a $N^{W} \times 1$ vector of global variables while Y_{t-1}^{MT} and Y_{t-1}^{W} are respectively vectors containing their lagged values. It follows that the total number of variables entering the model N is equal to $N^{MT} + N^{W}$. The vectors C_t^{MT} and C_t^{W} are of dimensions $N^{MT} \times 1$ and $N^{W} \times 1$, respectively and contain the block-specific time-varying intercept coefficients, while each of the time-varying $B_{l,t}$ matrices contains four blocks. More precisely, $B_{l,t}^{MT}$ is a $N^{MT} \times N^{MT}$ block containing the slopes relative to the Maltese variables into the Maltese equations, while $B_{l,t}^{W \to MT}$ contains those relative to the world economy, and has dimension $N^{MT} \times N^{W}$. $B_{l,t}^{W}$ is a $N^{W} \times N^{W}$ block containing the slopes relative to the world variables into the world equations and, finally, $\mathbf{0}$ is a $N^{W} \times N^{MT}$ block of zeros denoting how the Maltese variables do not affect the global ones. Finally, U_t^{MT} and U_t^{W} are $N^{MT} \times 1$ and $N^{W} \times 1$ vectors containing the reduced form errors respectively associated with the Maltese and the world equations. Finally, U_t is a $N \times 1$ vector of reduced form errors with variance assumed to be heteroscedastic. All the intercepts and slope coefficients (C_t and $B_{l,t}$) are assumed to evolve as random walk processes (Cogley and Sargent, 2005; Primiceri, 2005).

The model features ten variables with five for each of the two blocks. The world variables are suitable to represent the global economy, and how oil prices are formed as well as to identify global oil shocks. The world block contains the growth rates of industrial production and overall consumer price index among all the 38 countries in the Organization for Economic Cooperation and Development (OECD). In addition, it contains the growth rates of real Brent oil price and the Baltic dry index (BDI), the latter being a measure of the global cost of shipping. Finally, the world block contains the ratio between the growth rates of real oil price and BDI to sharpen shock identification. The Maltese block is highly stylised and contains variables related to output and inflation. Specifically, it features the Central Bank of Malta's business conditions index (BCI) developed in Ellul (2016) as a measure of output. Moreover, to measure inflation, it features year-on-year growth rates of the four main sub-indices of the harmonised consumer price index: food, non-energy industrial goods, energy, and services.

The data are collected at monthly frequency, and the estimation sample runs from January 1997 to March 2022, thus amounting to 303 monthly observations. As recurrent in time-varying modelling, the overall dataset is split into a training and an effective sample. The training one aims at setting the priors, and stretches from January 1997 to

Table 1
IMPACT RESTRICTIONS TO STRUCTURAL SHOCKS

	OECD IP	OECD CPI	BDI	Real Oil Price	Real Oil Price-BDI Ratio
Global Oil Shock	-	+	?	+	+

Source: Author's calculations.

Note: The entries refer to the impact response of a variable $y_{i,t}$ to a structural shock $v_{j,t}$; + indicates $\partial y_{i,t}/\partial v_{j,t} > 0$, while - indicates $\partial y_{i,t}/\partial v_{j,t} < 0$, and ? indicates that no restriction is imposed on that variable.

December 2007, thus accounting for 131 observations.[2] The effective sample, covers the remaining 171 months, and goes from January 2008 to March 2022. Therefore, it represents the time span in which inference in conducted on, i.e., when time-variation in the spillover of external shocks is estimated. The effective sample is set to start on January 2008, as this date marks the entrance of Malta into the eurozone.

The identification of the global oil shock is reached by means of sign restrictions imposed on impact (Canova and Paustian, 2011; Ruisi, 2022) and is implemented on each month of the effective sample, i.e., from January 2008 till March 2022. The oil shock is assumed to take place in the global economy and, as such, the identification strategy leaves the Maltese responses unrestricted, so as to let the model trace the spillover into the domestic economy.

The identification strategy of the global oil shock outlined in Table 1 aims at capturing a broadly defined oil shock by focusing only on the adverse effect that it causes on the global economy; a depressing effect on output, a rise in overall prices and in real oil, as well as a rise in the real oil/BDI ratio.

Results

This subsection aims at showing the changing transmission of the identified oil shock into the Maltese economy. Figures 1 and 2 depict the time-varying median responses to a one standard deviation shock.

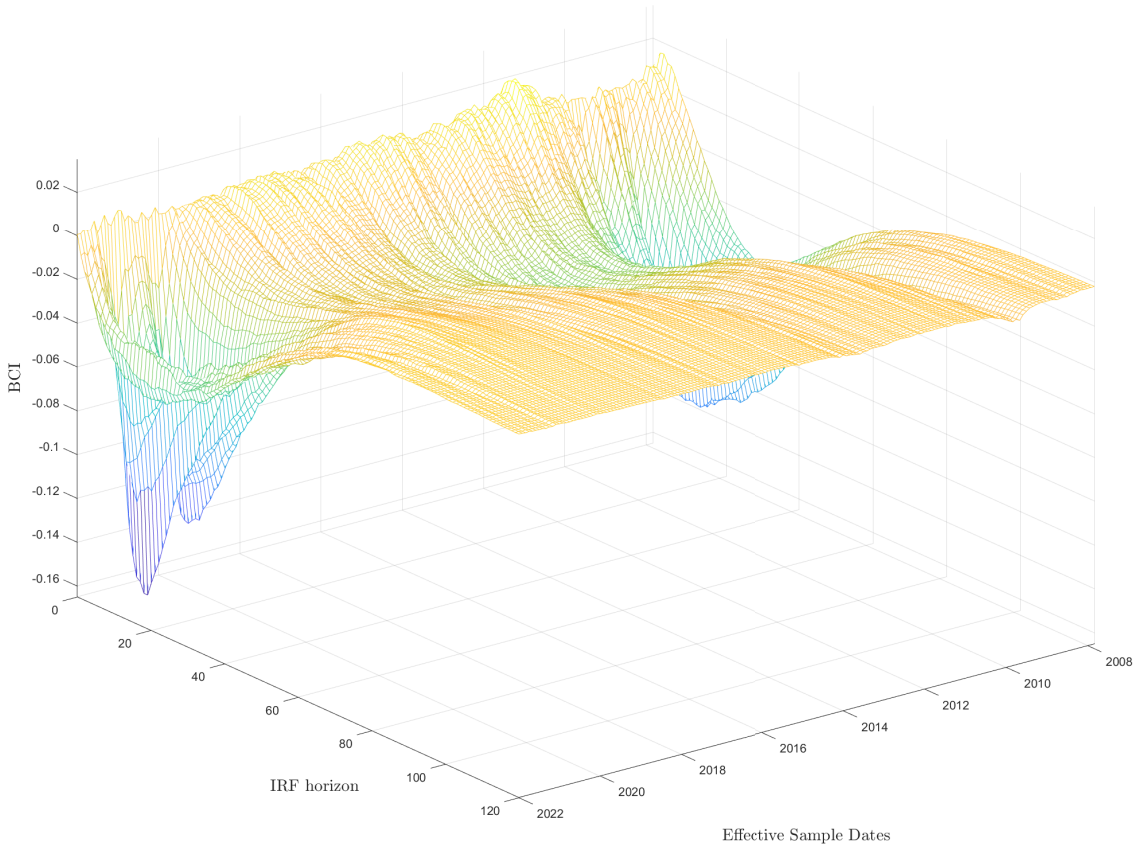
"The experience of 2008-2010 is characterised by more persistent negative responses of the Maltese output when compared with the 2020-2022 period. More precisely, after the Great Recession the median response takes roughly twice as much the time as the pandemic period to go back to zero."

Figure 1 depicts the response of Maltese BCI. Maltese output experiences a downward pressure throughout the 2008-2022 period, but the negative reaction presents two periods of elevated responsiveness; the years following the Great Recession and those following the COVID-19 outbreak. The experience of 2008-2010 is characterised by more persistent negative responses of the Maltese output when compared with the 2020-2022 period. More precisely, after the Great Recession the median response takes roughly twice as much the time as the pandemic period to go back to zero. A possible explanation for this phenomenon is the relatively lower tendency for government to absorb changes in global prices, thus leading to a higher responsiveness of domestic energy prices in response to the identified oil shock during the Great Recession years. Conversely, more recently, the Maltese government has adopted subsidies in order to keep energy prices fixed as of July 2020, thus dampening the negative consequence of surging global energy prices. The months between the two recessionary events are characterised by oil shocks depressing economic activity in a much more contained way.

Figure 2 depicts the responses of the four inflation sub-indices. Except for energy, all the other three show higher responsiveness during and after the Great Recession and the outbreak of the recent pandemic.

[2] The monthly data for the Maltese BCI are available only from January 2000 onwards. For this reason, the data ranging from January 1997 to December 1999 are approximated as the standardised quarterly year-on-year growth rate of the real gross domestic product.

Figure 1
TIME-VARYING RESPONSE OF MALTESE BUSINESS CONDITIONS INDEX TO A ONE-STANDARD DEVIATION GLOBAL OIL SHOCK



Source: Author's calculations.
Notes: The figure shows the median responses to a 1-standard deviation shock. The credible regions are not shown but are available upon request.

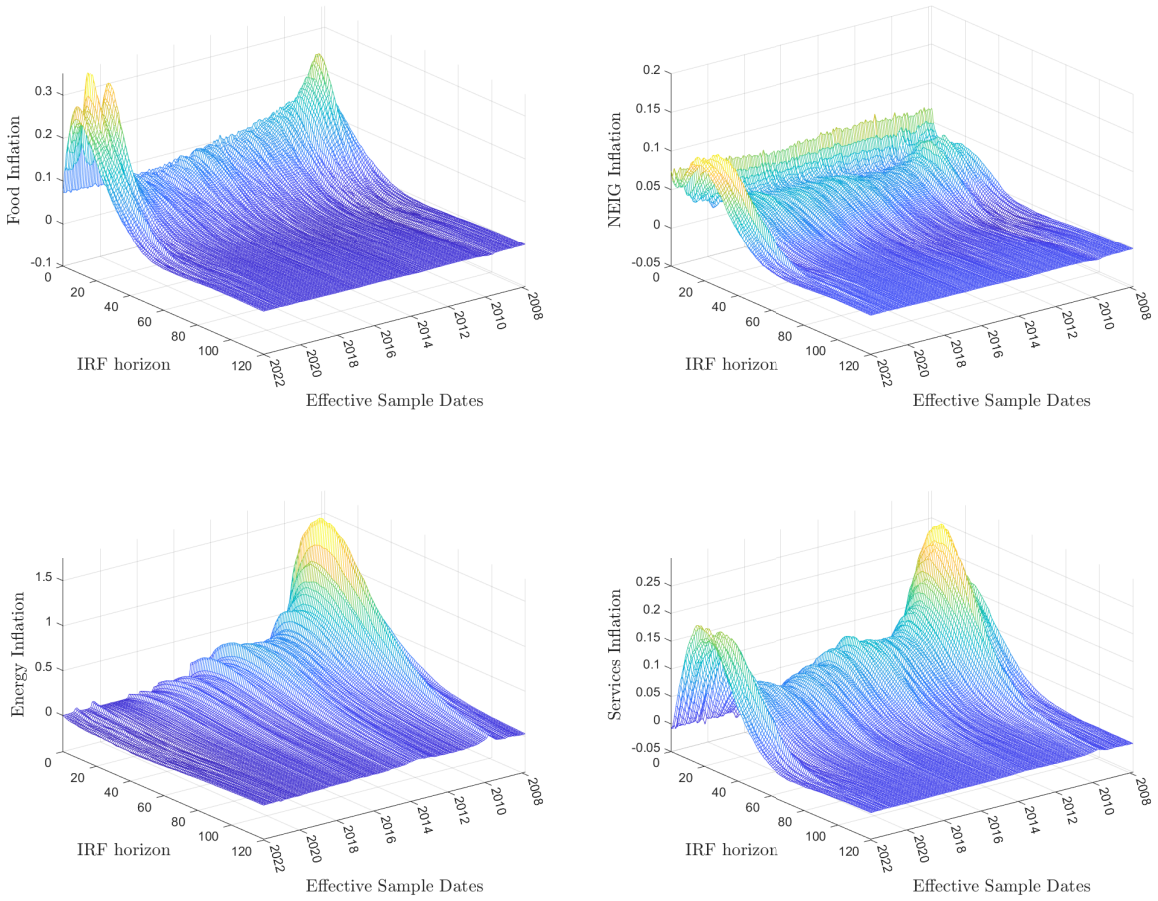
In the case of food, the model detects a more abrupt rise in responsiveness experienced in recent years when compared with the beginning of the effective sample. A possible explanation for this could be due to the high import content of food and how the latter has recently experienced elevated upward pressure.

Non-energy industrial goods have been historically characterised by a similar response throughout the period of analysis. However, a more persistent and hump-shaped response is experienced after the pandemic broke out. This recent and more prompt impact responsiveness could be explained by the fact that most of non-energy industrial goods in Malta are produced outside the national borders and, as such, they are likely to incorporate changes in global energy prices in a relatively quick way.

Impulse responses for domestic energy inflation show a declining response of the latter to oil price shocks. The chart suggests a pure hump-shaped response during the first part of the estimation sample, thus indicating that the transmission from international to domestic energy prices typically took place with a considerable time lag. Conversely, in more recent years, the response gets muter and muter. This result reflects the greater role government has played in smoothing out global oil price disruptions in the last decade.

Finally, results for services inflation exhibit heightened responsiveness to oil price shocks in the previously mentioned two periods: the Great Recession and the pandemic. The peak response of this index of inflation appears

Figure 2
TIME-VARYING RESPONSE OF MALTESE INFLATION SUB-INDICES TO A ONE-STANDARD DEVIATION GLOBAL OIL SHOCK



Source: Author's calculations.

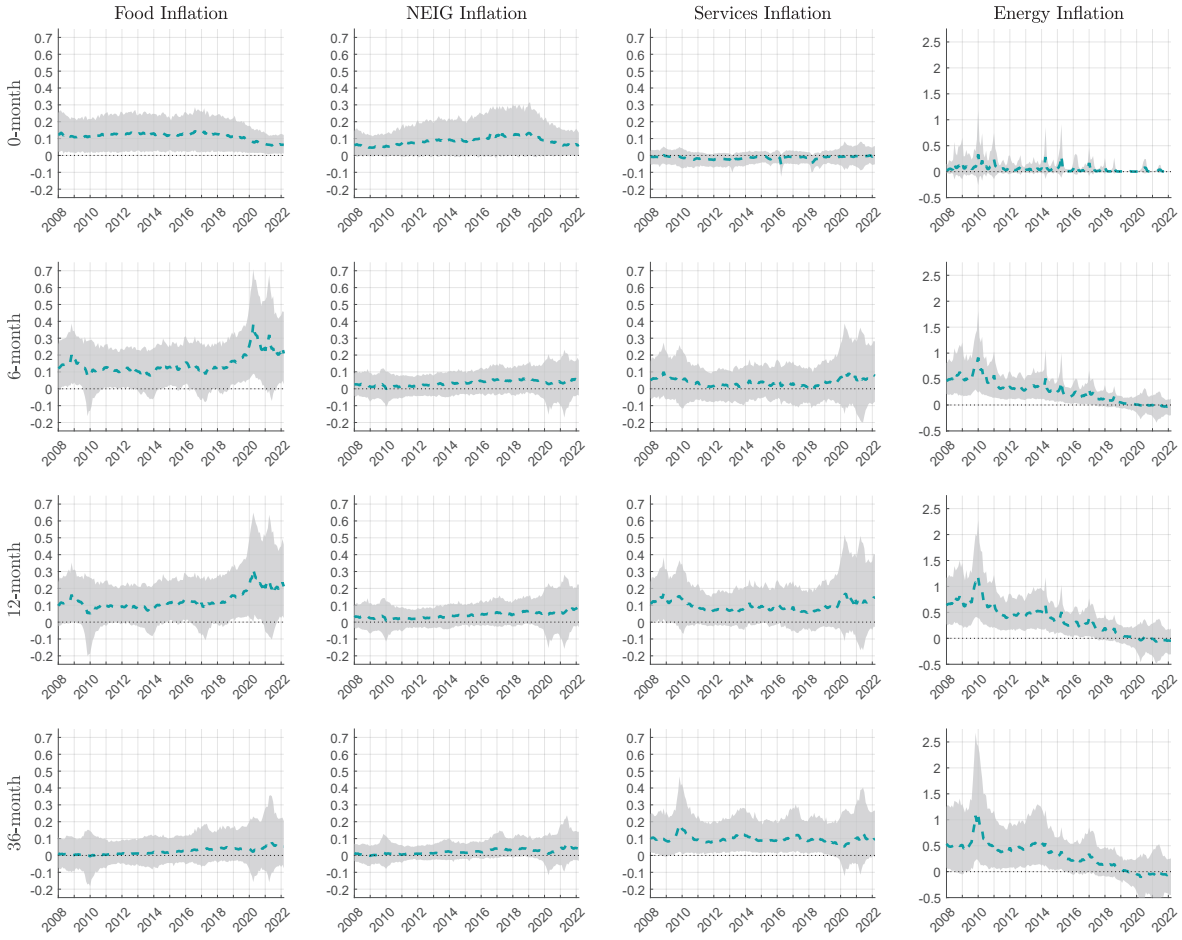
Notes: The figures show the median responses to a 1-standard deviation shock. The credible regions are not shown but are available upon request.

more pronounced in 2010, and probably this can be explained by the indirect effects exerted by more responsive energy prices during the period.

What can the time-varying responses tell us about the pass-through of international energy prices into domestic ones over time? To provide an answer to this question, Figure 3 shows the responses of domestic inflation series to an oil shock normalised to increase real oil price growth by 10% on impact. This is shown for each month going from January 2008 till March 2022, and for a selected number of horizons.

Figure 3 highlights a few interesting results. First, a 10% oil price increase would reflect into an immediate 0.1% upward pressure in food and non-energy industrial goods inflation. Second, the medium term pass-through to non-energy industrial goods declines relatively quickly at longer horizons. The response of food inflation to oil price shocks has traditionally been quite stable across the time horizon, stabilizing to around 0.1% throughout the first year of the shock. On the other hand, more recently (more specifically during and in the aftermath of the COVID-19 pandemic), responses of this inflation sub-index to oil price shocks increase substantially throughout the first year after the shock, with a peak median response of almost 0.4% six months. Conversely, responses of services inflation are more stable across both sample period and response horizon, stabilising at around 0.1% after one to two years.

Figure 3
TIME-VARYING PASS-THROUGH OF A 10% GLOBAL OIL SHOCK INTO MALTESE INFLATION SUB-INDICES



Source: Author's calculations.

Notes: The figure shows the time-varying median response (black dashed line) and the 68% credible region (grey shaded area) to an oil shock normalised to increase real oil price by 10% at a number of selected horizons.

"From 2020 onwards the pass-through has become virtually null thus indicating the absence of domestic energy retail prices changes in response to developments on global markets for energy"

The rightmost column of Figure 3 depicts the pass-through of a 10% oil shock to domestic energy inflation. Independently of the horizon considered, January 2010 is the month associated with the highest pass-through of oil prices to domestic energy inflation. To keep things simple, it is convenient to distinguish four periods: the Great Recession of 2008-2010, a period stretching from 2011 to 2014, the period following the installation of the interconnector in 2015 till 2019 and, finally, the COVID-19 pandemic. The first of the four sees a relatively high pass-through with a 10% oil increase reflecting into an increase of domestic energy inflation in the range of 0.5% and 1%, at horizons stretching 36 months. The second period, instead, sees a pass-through stabilising at 0.5%, while the period spanning 2015 and 2019 is consistent with pass-through estimates becoming gradually smaller, i.e., from 0.5% to virtually 0%. Apart from the installation of the Malta-Sicily interconnector in 2015, this period is characterised by a greater role played by the Government in smoothing out global oil price disruptions, as well as by investment in new powerplants

that led to an increase in domestic energy generation capabilities and more stable local energy pricing policies. Finally, from 2020 onwards the pass-through has become virtually null thus indicating the absence of domestic energy retail prices changes in response to developments on global markets for energy. The latter development follows the Government's policy of keeping energy prices stable throughout the current period characterised by global price disruptions.

Conclusion

This research developed a two-block vector autoregression featuring time-varying parameters and stochastic volatility with the aim of detecting the changing spillover of global oil shocks into the Maltese economy over the period from January 2008 to March 2022.

Time-variation is detected in the responses of the Maltese economy, with special reference to domestic energy prices. Maltese energy inflation has become less responsive to international oil price shocks. Indeed, a 10% rise in real oil price growth translates into an increase in energy inflation of 0.5% to 1% over the medium-term until 2017. Afterwards, the pass-through declines to virtually zero. Contrary to this, the responses of food and services inflation rates appear to be more pronounced in conjunction with two periods of higher volatility on global oil markets: the Great Recession and the COVID-19 pandemic. The other three inflation indices experience a diverse pass-through. A 10% increase in real oil price translates into a 0.1% increase in food and services inflation rates in the medium-term, while, for non-energy industrial goods, this takes place mostly at very short horizons. Interestingly, during the 2020-2022 period, the pass-through to food prices goes up to values in the range of 0.2% to 0.3%. Finally, global oil shocks lead to negative responses of Maltese output. However, the recessionary effect produced appears to be longer lived during the 2008-2010 period than in the 2020-2022 one, the latter characterised by the robust implementation of energy subsidies.

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