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EXCHANGE RATE PASS-THROUGH TO CONSUMER PRICES IN MALTA

BOX 3: EXCHANGE RATE PASS-THROUGH TO CONSUMER PRICES IN MALTA[1]

Exchange rate pass-through (ERPT) refers to the extent to which exchange rate changes are reflected in the price levels of goods and services in an economy. This relationship is important from both theoretical and policy perspectives. Theoretically, incomplete ERPT estimates might indicate deviations in relative purchasing power parity (PPP) with implications on firm market power and on the efficiency of allocation of commodities across economies. ERPT may also play an important policy role through interactions with monetary policy. Strong exchange rate fluctuations that are substantially reflected in prices may require counteracting policy interventions to maintain price stability. On the contrary, monetary policy responses to inflationary shocks which are unrelated to exchange rate movements may result in adjustments to the NEER, which in turn further acts to drive price levels towards policy targets.

Exchange rate movements are transmitted to consumer prices through three main channels (Colavecchio and Rubene, 2020).[2] Changes in exchange rates directly impact prices of imported final consumer goods. They also impact the prices of any imported intermediate products used as inputs in domestic production processes, thus indirectly affecting final consumer prices. Similarly, exchange rates also affect the price competitiveness of domestic commodities in international markets, which in turn impacts domestic output levels and consequently domestic prices.

The extent to which exchange rates move consumer prices – the magnitude of ERPT – depends on a number of factors. Greater openness to imports, a higher proportion of imports priced in foreign currencies and lower integration in global value chains are associated with higher pass-through (Ortega and Osbat, 2020).[3] Market power of both importers and exporters tends to be negatively related to the extent of ERPT (Özyurt, 2016).[4] Moreover, ERPT is commonly observed to be non-linear, with appreciations commonly leading to weaker transmission to prices than depreciations, whilst sizeable exchange rate shocks typically found to impact prices to a greater degree than smaller changes.[5]

In this respect, one could a *priori* expect ERPT in the Maltese economy to be considerable. Malta's economy is highly trade-intensive and mostly characterised by firms which are small by international standards. As of 2019, Malta's total imports of goods and services as a share of GDP was one of the highest in the euro area whilst its share of extra-euro area

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[2] Colavecchio, R. and Rubene, I. (2020). Non-linear exchange rate pass-through to euro area inflation: a local projection approach. Working Paper Series 2362, European Central Bank.

[3] Ortega, E. and Osbat, C. (2020). Exchange rate pass-through in the euro area and EU countries. Occasional Paper Series 241, European Central Bank.

[4] Ozyurt, S. (2016). Has the exchange rate pass through recently declined in the euro area? Working Paper Series 1955, European Central Bank.

[5] See, amongst others, Bussière, M. (2007). Exchange rate pass-through to trade prices: The role of non-linearities and asymmetries. Working Paper Series 822, European Central Bank; and Delatte, A. L. and López-Villavicencio, A. (2012). Asymmetric exchange rate pass-through: Evidence from major countries. *Journal of Macroeconomics*, 34(3):833–844.

imports as a proportion of GDP was the second-highest in the currency area. Nevertheless, these could be mitigated by the fact that approximately half of all extra-euro-area imports of goods in the Maltese economy are invoiced in euro, again one of the highest proportions in the euro area.

ERPT estimates for the Maltese economy appear only in two studies; in their cross-country comparisons, Colavecchio and Rubene (2020) and Ortega and Osbat (2020) find that estimates of ERPT to consumer prices in Malta are in line with euro area economies, peaking at around 0.1 after 1 year.[6] However, it is important to note that both these papers make use of data spanning from 1999 to 2017, a period which encompasses the adoption of the euro.[7] We estimate ERPT to consumer prices in the Maltese economy, employing a robust methodology which allows for the presence of non-linearities in transmission and using data from 2008 onwards, thus avoiding breaks in Malta's effective exchange rate relating to the adoption of the single currency.[8]

Model and data

We employ a local projections (LP) model largely based on that of Colavecchio and Rubene (2020). Local projections (Jordà, 2005) can be used to estimate impulse response functions of variables of interest over chosen forecast horizons.[9] In the present case, we estimate the proportional impact of a change in Malta's NEER on several consumer price indices and sub-indices at successively longer forecast intervals.[10] After estimating the ERPT to all price indices, we augment our model with a state-dependent variable to test for size and sign non-linearities in ERPT to overall consumer prices.

We estimate our model using quarterly data from 2008Q1 to 2021Q2. Our reference exchange rate variable is the NEER on the import side as sourced from the Eurosystem Macroeconomic Projection Database.[11] This is rebased in terms of foreign currency per euro; hence, an increase in the NEER represents an appreciation of the euro, such that a *priori* our ERPT coefficients are expected to be negative. The foreign prices variable is an index of extra-euro area competitors' prices on the import side defined in 'national currency', that is, excluding exchange rate movements, obtained from the same Eurosystem database. As our baseline consumer price level, we use the HICP for all goods and services, but also compute estimates of ERPT to several other HICP indices and sub-indices. All consumer price indices are sourced from Eurostat. We use an internal estimate of the

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[6] A coefficient of 0.1 after one year signifies that a 1% adjustment in exchange rates would be estimated to result in a 0.1% change in prices a year after the shock, or else that the change in prices at the chosen forecast horizon is equal to 10% of the exchange rate adjustment that triggered it.

[7] The adoption of the euro and consequently of a floating exchange rate regime led to a clear break in the variability of the exchange rate series. Encompassing such volatility within a longer sample would be expected to impact the reliability of results.

[8] This article builds upon work published in a recent working paper; see Abela, G. and Rapa, N. (2021). A study on the exchange rate pass-through to consumer prices in Malta. Working Paper 05/2021, Central Bank of Malta. Estimates presented in the paper are based on data up to Q4 of 2019. For the purposes of this article, we re-estimate identical models with data series extended until Q2 of 2021.

[9]   Jordà, Ó. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review*, 95(1):161-182.

[10] For a given change in the NEER between time periods $t-1$ and t, we estimate the proportional impact of the change on price levels at successive forecast horizons ranging from 0 to 7 quarters. Thus in total we provide ERPT results for a maximum of two years after the initial shock.

[11] This NEER index is an arithmetic single-weighted EER with weights reflecting the importance each country of the 36 countries taken in consideration in the Maltese import basket.

output gap (measured as the percentage difference between actual and potential output) as our baseline measure of slack in the domestic economy. For our sensitivity analysis we also use the share of migrants in Malta's labour force and the unemployment gap, both of which are estimated internally, as well as the price of Brent crude oil, sourced from the Eurosystem Macroeconomic Projection Database.[12]

Results

We first estimate linear ERPT to overall or headline HICP prices. The estimates are statistically significant on impact and increase progressively up to an absolute value of 0.24, or 24%, one year after the shock. This implies that a 1% fluctuation in the NEER will approximately lead to a 0.24% change in the headline HICP index at its maximum. However, the estimated coefficient diminishes slightly thereafter and is no longer statistically significant at the conventional 5% level after five quarters, as seen in Chart 1.

Separately analysing the impact of exchange rate changes on goods and services prices, our results show that pass-through to goods prices is significantly larger than that to services prices (see Chart 2). With one exception, ERPT to goods prices is statistically significant at all forecast horizons except on impact. The pass-through a year after the shock surpasses 40% and remains significant after eight quarters, though the uncertainty associated with the estimates tends to increase notably at longer horizons. ERPT to services prices is, to the contrary, insignificant throughout. These results are in line

Chart 1
ERPT TO HEADLINE HICP
(change in price index relative to exchange rate adjustment; forecast horizon in quarters)
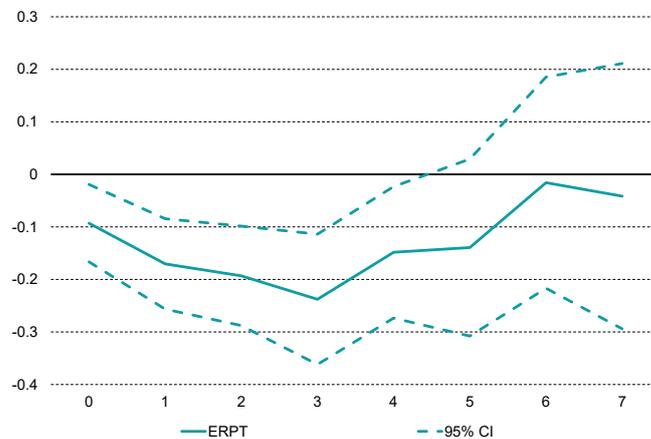
Source: Authors' calculations.

Chart 2
ERPT TO GOODS AND SERVICES PRICES
(change in price index relative to exchange rate adjustment; forecast horizon in quarters)
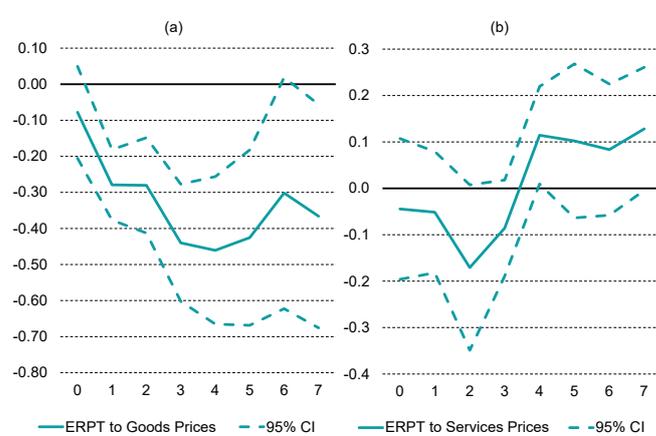
Source: Authors' calculations.

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[12]   HICP indices as well as the index of foreign prices and oil prices are seasonally adjusted using the Census X12 procedure.

with expectations given that the import content of services consumption is much lower than that for goods.

We also estimate pass-through to core inflation (i.e., HICP excluding energy and HICP excluding energy and food), finding markedly weaker results when compared to the specification using overall or headline HICP, as shown in Chart 3. This could suggest that our initial finding is somewhat driven by the behaviour of pass-through to energy and food prices. To investigate this, we decompose the goods sub-index into industrial goods and food. ERPT to food prices is statistically significant and considerably high from the one-quarter forecast horizon onwards.[13] Results for industrial goods prices are statistically insignificant on impact before

Chart 3
ERPT TO CORE INFLATION
(change in price index relative to exchange rate adjustment; forecast horizon in quarters)
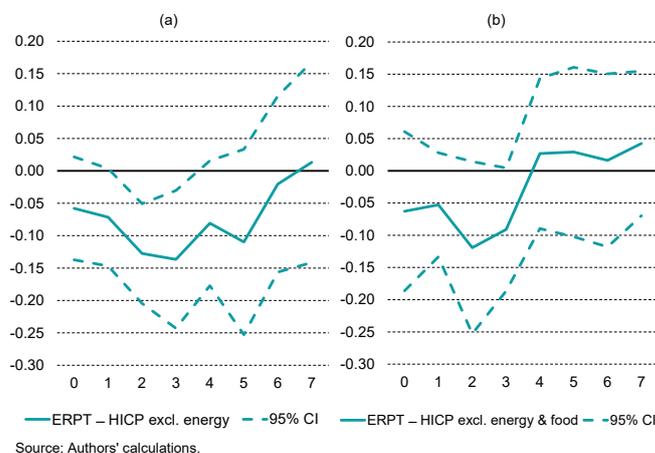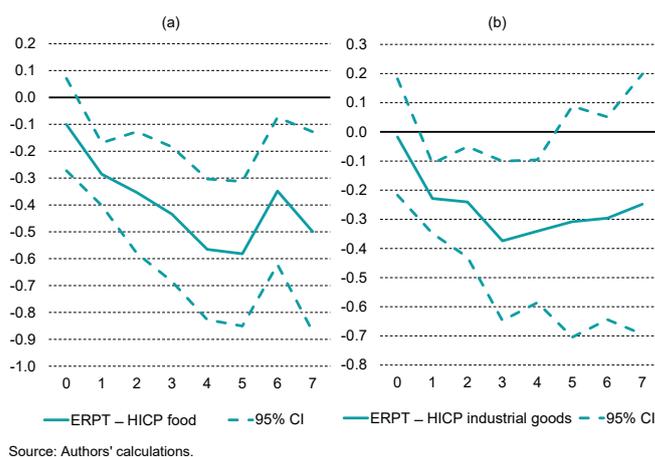

Source: Authors' calculations.

Chart 4
ERPT TO HICP GOODS INDEX SUBCOMPONENTS
(change in price index relative to exchange rate adjustment; forecast horizon in quarters)

Source: Authors' calculations.

turning significantly negative between the first and fourth quarter after the shock (see Chart 4). In turn, this is wholly driven by developments in the energy subcomponent, with no significant ERPT being found for non-energy industrial goods prices at any forecast horizon.[14]

Results in Chart 5 show that higher pass-through is observed in episodes of exchange rate depreciation relative to appreciations and that large exchange rate changes are passed through to a greater extent than relatively small changes. Both these results are in line with much of the literature. The ERPT coefficient for appreciations is statistically insignificant at all horizons, while that for depreciation episodes is statistically significant one quarter after impact, one year after the shock, and again beyond six quarters after impact. Similarly, no significant ERPT is found for small changes at all projected horizons, while large changes

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[13]   This result is not sensitive to controlling for international food prices.
[14]   The reader is kindly referred to Abela and Rapa (2021) for HICP energy and NEIG ERPT estimates.

show a relatively stable pass-through which is significant up to the five-quarter forecast horizon.

Our results are robust to a series of sensitivity tests which modify and augment, using separate regressions, the controls for domestic and foreign price pressures. We also test for the robustness in our estimation of the LP models by employing an alternative lag-selection algorithm. This exercise

Chart 5
ERPT ALLOWING FOR SIGN AND SIZE NON-LINEARITIES
(change in price index relative to exchange rate adjustment; forecast horizon in quarters)

Source: Authors' calculations.

yields a result which is very close to the baseline estimates, including in the case of ERPT to goods and services prices. Results are also robust to different definitions of what constitutes a 'large' change in the exchange rate index.
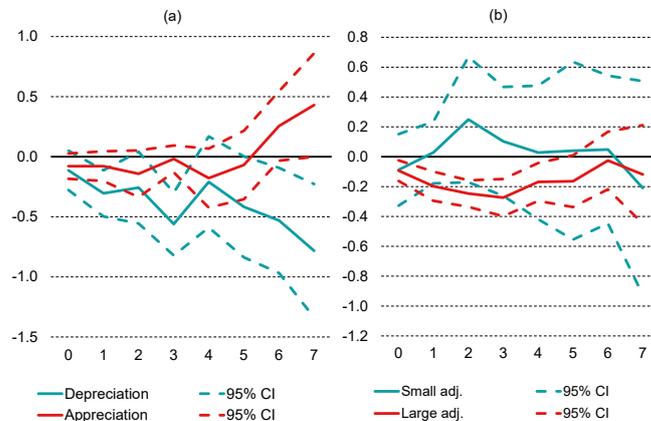
Conclusion

ERPT is a key metric which has several uses, including in forecasting inflation and as an input to monetary policy decisions. In this study, we use LP methods to estimate linear and non-linear ERPT to consumer prices in Malta post-euro adoption. We find that ERPT to overall consumer prices exceeds 20% in the short term, subsequently tapering off after a year. This result is driven by pass-through to goods prices, which in turn results from the considerable responsiveness of energy and food prices to exchange rate fluctuations. Allowing for non-linearities demonstrates that it is mainly episodes of depreciation and changes of a relatively larger magnitude that are transmitted into consumer price inflation. Sensitivity tests show that our results are fairly robust to changes in the model, particularly at shorter horizons. Our results are also mostly consistent with theory and with the empirical literature for euro area countries. This work therefore provides an initial set of reduced-form ERPT estimates for the Maltese economy using a robust methodology and accounting for changes in the monetary regime, potentially serving as a benchmark for the calibration and estimation of macroeconomic models of the Maltese economy.