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Exchange Rate Pass-Through to Food and Energy Consumer Price Inflation

Abstract

This paper studies exchange rate pass-through to food and energy consumer price inflation and its dependence on the inflation environment using cross-country panel estimation of Phillips curves. It considers a large panel of OECD member and candidate economies with quarterly data from 1994 to 2021. We find that exchange rate pass-through is largest for energy CPI inflation and also significant for food CPI inflation. A 10% depreciation in the exchange rate leads to an increase in energy CPI inflation of around 2 percentage points (pp) at the quarterly horizon and of 4pp at the yearly horizon; it leads to an increase in food CPI inflation of around 0.3pp and 2pp at the quarterly and yearly horizon, respectively. We also find some evidence that exchange rate pass-through to food and energy CPI inflation depends on the inflation environment, with higher inflation leading to larger pass-through.

JEL-Codes: E310, E520, E580, F310.

Keywords: inflation, food prices, energy prices, exchange rates.

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1. Introduction

This paper studies exchange rate pass-through to food and energy CPI inflation, in comparison to core CPI inflation, and its dependence on the inflation environment, using cross-country panel estimation of Phillips curves for a large panel of OECD member and candidate economies from 1994 to 2021 with quarterly data.

There is evidence that exchange rate pass-through to headline CPI inflation has been larger at higher levels of inflation for advanced economies (Engel, 2002; Devereux and Yetman, 2002) and for emerging economies (Jasova et al., 2019; Takhtamanova, 2010).[1] One possible theory with which higher exchange rate pass-through to inflation in a higher inflation environment is consistent is with the menu cost theory of price setting. At higher levels of inflation, exchange rate changes are passed through more quickly and to a larger extent because firms have to adjust prices frequently anyway (see Taylor, 2000). It might also be related with a change in the formation of inflation expectations at higher levels of inflation.

There has been much less literature on exchange rate pass-through to the food and energy CPI inflation subcomponents. Sansone and Justel (2016) studied exchange rate pass-through to food, energy and core CPI inflation in Chile using VAR analysis. They found significant pass-through to energy and core CPI inflation, with the pass-through to energy CPI inflation being larger, but no significant pass-through to food CPI inflation. Rahimov et al. (2017) found evidence of significant exchange rate pass-through to food CPI inflation in Russia and two other CIS economies, also using VAR analysis. Burstein et al. (2005) studied the effects of five large devaluation episodes in five emerging economies on CPI inflation separately for nontradable prices and retail prices of tradables, but did not distinguish the effects separately for food and energy CPI inflation, and also considered import and export prices. The previous literature has studied exchange rate pass-through at the sectoral level mainly to import prices and export prices, rather than to consumer prices, see Campa and Goldberg (2005) and Osbat et al. (2021) for a review. Osbat et al. (2021) recently studied exchange rate pass-through at the sectoral level to import price inflation in the euro area, but not to CPI inflation. Boz et al. (2022) studied exchange rate pass-through to import prices and the role of the trade invoicing currency, confirming findings from earlier research on the globally dominant role of the US dollar in trade invoicing. Amiti et al. (2020) studied the role of currency invoicing of Belgian firms for exchange rate pass-through to export prices.

We add to the literature by studying exchange rate pass-through to the energy and food subcomponents of CPI inflation, in comparison with core CPI inflation, and its dependence on the inflation environment, within a cross-country Phillips curve framework for a large panel of OECD economies.

We choose cross-country panel estimation of Phillips curves based on Jasova et al. (2019, 2020) in order to capture inflation dynamics well. Phillips curves are the standard way to model inflation dynamics in modern monetary policy analysis (Clarida et al., 1999; Smets, 2003; Woodford, 2003; Levin and Moessner, 2005). This approach allows to exploit cross-country variation to avoid the difficulties of identification present for country-specific estimates, as discussed by Reichlin (2018) and Forbes (2019) in the case of the output gap. In this paper we apply this cross-country panel estimation of Phillips curves to quarterly food and energy CPI inflation, based on the approach of Moessner (2022) for annual food and energy CPI inflation.

1 See also Calvo and Reinhart (2002) and Choudhri and Hakura (2006).

We find that exchange rate pass-through is largest for energy CPI inflation, and also significant for food CPI inflation. A 10% depreciation in the exchange rate leads to an increase in energy CPI inflation of around 2pp and 4pp at the quarterly and yearly horizon, respectively; it leads to an increase in food CPI inflation of around 0.3pp and 2pp at the quarterly and yearly horizon, respectively. We also find some evidence that exchange rate pass-through to food and energy CPI inflation depends on the inflation environment, with higher inflation leading to larger pass-through.

The remainder of the paper is organised as follows. Section 2 summarises the data, and Section 3 presents the method and results. Finally, Section 4 concludes.

2. Data

Data on seasonally adjusted headline consumer price indices (CPI) comes from Datastream and national sources. Data on seasonally adjusted food CPI indices, energy CPI indices and core CPI indices are based on data from the OECD, national data and BIS estimations. Core CPI inflation is defined as headline CPI inflation excluding food and energy.

Data on output gaps (as a percentage of potential GDP) was obtained from the OECD, and is linearly interpolated from annual data. Nominal effective exchange rate indices (broad indices, quarterly average) are from the BIS, with an increase reflecting an appreciation of the domestic currency. Bilateral exchange rates against the US dollar are taken from the BIS, in local currency per US dollar (quarterly averages), with an increase indicating a depreciation of the local currency against the US dollar. We use data on professionals' survey-based CPI short-term inflation expectations. These are taken from Consensus Economics surveys for next-year CPI inflation expectations.

We consider the following 36 OECD member and candidate economies: the advanced economies Austria, Australia, Belgium, Canada, Denmark, euro area, Finland, France, Germany, Great Britain, Greece, Ireland, Israel, Italy, Japan, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland and the United States; and the emerging economies Bulgaria, Chile, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Mexico, Poland, Romania, Slovakia, Slovenia and South Korea. The sample period is from 1994Q1 to 2021Q4 at quarterly frequency.

3. Method and results

To study exchange rate pass-through to food, energy, core and headline CPI inflation we estimate the following cross-country Phillips curve based on Jasova *et al* (2019, 2020), using a panel of 36 OECD member and candidate economies:

$$\pi_{it}^{s} = \rho\, \pi_{it-1}^{s} + \phi\ outputgap_{it} - \mu\ \Delta NEER_{it}\ + \beta_t + \alpha_i + \varepsilon_{it.} \qquad (1)$$

where π_{it}^{s} denotes quarter-on-quarter (q/q) seasonally adjusted CPI inflation in percent, calculated from log differences in quarterly seasonally adjusted consumer price indices (CPI) in country i at time t; as CPI inflation rates we consider headline (s=h), energy (s=en), food (s=f) and core CPI inflation (s=c); $outputgap_{it}$ denotes the output gap; and $\Delta NEER_{it}$ is the q/q change in the nominal effective exchange rate in percent, calculated from the log change in the nominal effective exchange rate, with an increase indicating an appreciation of the currency. Finally, α_i are country fixed effects to control for observed and unobserved country heterogeneity, and β_{t} are time fixed effects in order to control for all observed and unobserved variation in common global factors. We use robust standard errors clustered at the country level.

The estimates for equation (1) are shown in Table 1 for energy and food CPI inflation (q/q), in comparison with those for headline and core CPI inflation. Exchange rate pass-through is significant for both energy and food CPI inflation, as well as for core and headline inflation. Exchange rate pass-through is largest for energy CPI inflation, at 0.20, followed by food CPI inflation, at 0.03. This is as would be expected, since energy commodities are often priced in US dollars, eg oil prices, and food commodities are also often priced in US dollars. Exchange rate pass-through to core CPI inflation is lower at 0.02, which is significantly lower than for energy CPI inflation. This implies that a 10% depreciation of the nominal effective exchange rate leads to an increase in energy CPI inflation (q/q) of 2 percentage points (pp), and an increase in food CPI inflation of 0.3pp. This is larger than the resulting increase of 0.2pp for core CPI inflation. The output gap is positive and significant in all cases, confirming that the Phillips curve specification makes sense. The lagged inflation variable is significant in all cases, confirming that the dynamic specification is appropriate.

In order to study exchange rate pass-through to food and energy CPI inflation over a longer horizon of one year, we also estimate the regressions below using local projections based on Jordà (2005),

$$\pi_{it;k}^{s} = \rho\, \pi_{it-1}^{s} + \phi\ outputgap_{it} - \mu\ \Delta NEER_{it} + \beta_t + \alpha_i\ + \varepsilon_{it.} \qquad (2)$$

where $\pi_{\mathrm{it;k}}$ denotes the seasonally adjusted CPI inflation rate at time t over k quarters in country i at time t, calculated from the log-difference between the CPI index at time *t-1+k* and the CPI index at time *t-1*. Here, *k=1* corresponds to the q/q seasonally adjusted inflation rate π_{it} used in equation (1), and *k=4* corresponds to year-on-year (y/y) inflation.

The estimates of equation (2) for food and energy CPI inflation (y/y) are shown in Table 2. Exchange rate pass-through is significant for both energy and food CPI inflation, as well as for core and headline inflation. It is again largest for energy CPI inflation, at 0.38. Exchange rate pass-through to food CPI inflation is smaller than for energy, at 0.23, but larger than for core CPI inflation of 0.08. This implies that a 10% depreciation of the nominal effective exchange rate leads to an increase in energy CPI inflation (y/y) of 3.8pp, and an increase in food CPI inflation (y/y) of 2.3pp. This is larger than the resulting increase of 0.8pp for core CPI inflation. Exchange rate pass-through to energy, food and core CPI inflation is higher at the longer yearly horizon than at the quarterly horizon, consistent with the results of Jasova et al. (2019) for headline inflation. The output gap is positive and significant in all cases, confirming that the Phillips curve specification makes sense also at this longer horizon of one year.

We next study whether exchange rate pass-through to food and energy CPI inflation depends on the inflation environment. We do so by adding an interaction term of exchange rate changes with lagged headline inflation, according to[2]

[2] Inflation is lagged in order to reduce endogeneity issues by ensuring that we do not interact contemporaneous inflation and exchange rate terms. This follows the approach of Jasova et al. (2019) in determining whether the pass-through of exchange rate changes to headline inflation depends on the inflation environment.

$$\pi_{it}^{s} = \rho\, \pi_{it-1}^{s} + \phi\, outputgap_{it} - \mu\, \Delta NEER_{it} - \gamma\, \Delta NEER_{it} \cdot \pi_{it-1}^{h} + \vartheta\, \pi_{it-1}^{h} + \beta_t + \alpha_i + \varepsilon_{it.} \qquad (3)$$

and also add lagged headline inflation as an additive term in the equations for food, energy and core CPI inflation (i.e. we set ϑ equal to zero in the equation for headline inflation, since it is already included as lagged dependent variable in that equation). The results for equation (3) are shown in Table 3 for energy and food CPI inflation (q/q). The coefficient γ on the interaction term is positively significant for food CPI inflation (at 0.029), as well as for core and headline CPI inflation (at 0.019 and 0.025, respectively), but not for energy CPI inflation. The corresponding results for y/y energy and food CPI inflation are shown in Table 4. At the yearly horizon, the interaction term is positively significant for food and energy CPI inflation (at 0.112 and 0.070, respectively), as well as for core and headline CPI inflation (at 0.075 and 0.097, respectively).

For robustness, we also consider an interaction term of exchange rate changes with a four-quarter moving average of headline inflation, $\pi_{it}^{ma} = \frac{1}{4}\sum_{j=0}^{3} \pi_{it-j}^{h}$, lagged two periods, according to

$$\pi_{it}^{s} = \rho\, \pi_{it-1}^{s} + \phi\, outputgap_{it} - \mu\, \Delta NEER_{it} - \gamma\, \Delta NEER_{it} \cdot \pi_{it-2}^{ma} + \kappa\, \pi_{it-2}^{ma} + \beta_t + \alpha_i + \varepsilon_{it.} \qquad (4)$$

The results shown in Appendix Tables A1 and A2 for q/q and y/y energy and food CPI inflation, respectively, are robust to using this moving average of inflation.

We next control for inflation expectations as in New-Keynesian Phillips curves,

$$\pi_{it}^{s} = \theta\, \pi_{it}^{e} + \rho\, \pi_{it-1}^{s} + \phi\, outputgap_{it} - \mu\, \Delta NEER_{it} + \beta_t + \alpha_i + \varepsilon_{it.} \qquad (5)$$

where π_{it}^{e} denotes next-year CPI inflation expectations from Consensus Economics surveys, year-on-year in percent. The results for q/q food and energy CPI inflation are shown in Table 5. Inflation expectations are positively significant in all cases. Their effect is largest for energy CPI inflation, followed by food CPI inflation, headline and core CPI inflation. The results on exchange rate pass-through are robust to including inflation expectations. Exchange rate pass-through is significant for both energy and food CPI inflation, as well as for core and headline inflation. It is again largest for energy CPI inflation, at 0.22. Exchange rate pass-through to food CPI inflation is again smaller than for energy, at 0.03, but larger than for core CPI inflation of 0.02.

We also control for inflation expectations when studying the effects of the inflation environment on exchange rate pass-through, by modifying equation (3) to

$$\pi_{it}^{s} = \theta\, \pi_{it}^{e} + \rho\, \pi_{it-1}^{s} + \phi\, outputgap_{it} - \mu\, \Delta NEER_{it} - \gamma\, \Delta NEER_{it} \cdot \pi_{it-1}^{h} + \vartheta\, \pi_{it-1}^{h} + \beta_t + \alpha_i + \varepsilon_{it.} \qquad (6)$$

The results for food and energy CPI inflation (q/q) are shown in Table 6. We find that the coefficient γ on the interaction term with lagged inflation is positively significant for energy CPI inflation, as well as for core and headline CPI inflation, suggesting that exchange rate pass-through to energy CPI inflation is larger when headline inflation is higher. When controlling for inflation expectations, the coefficient γ on the interaction term of food CPI inflation with lagged inflation is no longer significant.

We also consider changes in bilateral exchange rates against the US dollar, instead of nominal effective exchange rates, since international trade is often invoiced in US dollars, and energy prices and commodity prices are often quoted in US dollars. In the equation below we modify equation (1) by replacing nominal effective exchange rate changes by ΔUSD_{it}, the q/q change in the bilateral exchange rate of the local currency against the US dollar, in percent, calculated from the log change in the bilateral exchange rate of the local currency against the US dollar,[3] with an increase indicating a depreciation of the domestic currency,

$$\pi_{it}^{s} = \rho\,\pi_{it-1}^{s} + \phi\ outputgap_{it} + \mu\,\Delta USD_{it} + \beta_t + \alpha_i + \varepsilon_{it.} \qquad (7)$$

The results are shown in Appendix Table A3. The results are robust to using the US dollar exchange rate instead of the nominal effective exchange rate. This is likely to reflect the globally dominant role of the US dollar in trade invoicing mentioned above (Boz et al., 2022). Exchange rate pass-through is again significant for both energy and food CPI inflation, as well as for core and headline inflation. It is again largest for energy CPI inflation, at 0.21. Exchange rate pass-through to food CPI inflation is again smaller than for energy, at 0.03, but larger than for core CPI inflation of 0.02.

The corresponding results when replacing nominal effective exchange rates by bilateral US dollar exchange rates in equation (3), which includes the interaction term with lagged inflation, are shown in Table A4. The results of equation (3) are also robust to this modification. The results when replacing nominal effective exchange rates by bilateral US dollar exchange rates in equation (5), which includes inflation expectations, are shown in Table A5. The results of equation (5) are also robust to this change.

Finally, the results when replacing nominal effective exchange rates by bilateral US dollar exchange rates in equation (6), which includes inflation expectations as well as the interaction with lagged inflation, are shown in Table A6. The results for the interaction term with lagged inflation of Table 6 are robust to replacing the nominal effective exchange rate by the bilateral US dollar exchange rate.

4 Conclusions

This paper studied exchange rate pass-through to food, energy and core CPI inflation, and its dependence on the inflation environment, using cross-country panel estimation of Phillips curves for a large panel of OECD member and candidate economies from 1994 to 2021 with quarterly data.

We find that exchange rate pass-through is largest for energy CPI inflation, and also significant for food CPI inflation. A 10% depreciation in the exchange rate leads to an increase in energy CPI inflation of around 2pp and 4pp at the quarterly and yearly horizon, respectively; it leads to an increase in food CPI inflation of around 0.3pp and 2pp at the quarterly and yearly horizon, respectively. We also find some evidence that exchange rate pass-through to food and energy CPI inflation depends on the inflation environment, with higher inflation leading to larger pass-through.

[3] For the United States, this variable has a constant value of one.

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Tables

Exhange rate pass-through to CPI inflation (q/q)				Table 1
Dependent variable: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0366***	0.2040***	0.0329***	0.0199**
π^{s}_{it-1}	0.5810***	0.0847***	0.2802***	0.6540***
$outputgap_{it}$	0.0236***	0.0473**	0.0357***	0.0221***
constant	0.4470***	1.0160***	0.6147***	0.3344***
observations	3830	3607	3612	3612
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.594	0.5701	0.302	0.600
R2 between	0.984	0.527	0.910	0.986

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (y/y)				Table 2
Dependent variable: $\pi^{s}_{it;4}$				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.1319***	0.3799***	0.2304***	0.0754***
π^{s}_{it-1}	1.7461***	0.0894	0.5715***	2.1238***
$outputgap_{it}$	0.1200***	0.2286***	0.1540***	0.1133***
constant	2.6427***	3.5794***	3.3849***	2.2177***
observations	3722	3505	3510	3510
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.621	0.6448	0.395	0.644
R2 between	0.961	0.196	0.764	0.969

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): interaction with lagged inflation				**Table 3**
Dep. var: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0127	0.1730***	0.0047	0.0022
$\Delta NEER_{it} * \pi^{h}_{it-1}$	0.0253***	0.0322	0.0286***	0.0190***
π^{h}_{it-1}	0.5638***	0.5602***	0.3663***	0.1725***
π^{s}_{it-1}		0.0082	0.1614***	0.4838***
$outputgap_{it}$	0.0248***	0.0196	0.0225**	0.0226***
constant	0.4064***	0.5590***	0.3714*	0.3266***
observations	3795	3607	3612	3612
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.599	0.5783	0.332	0.615
R2 between	0.975	0.795	0.933	0.987

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (y/y): interaction with lagged inflation				**Table 4**
Dep. var: $\pi^{s}_{it;4}$				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0376***	0.3120***	0.1220***	0.0053
$\Delta NEER_{it} * \pi^{h}_{it-1}$	0.0973***	0.0702*	0.1116***	0.0751***
π^{h}_{it-1}	1.6926***	2.2493***	1.0277***	0.5285***
π^{s}_{it-1}		-0.2314**	0.2290**	1.5833***
$outputgap_{it}$	0.1227***	0.1151**	0.1177***	0.1158***
constant	2.7199***	1.7820***	2.6954***	2.2025***
observations	3722	3505	3510	3510
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.637	0.6661	0.436	0.663
R2 between	0.954	0.787	0.869	0.969

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): with inflation expectations				**Table 5**
Dependent variable: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0341***	0.2206***	0.0251**	0.0169*
π^{s}_{it-1}	0.2000***	0.0569**	0.1627***	0.2445***
π^{e}_{it}	0.2400***	0.3185***	0.2481***	0.2022***
$outputgap_{it}$	0.0148***	0.0158	0.0049	0.0213***
constant	-0.1884**	-0.2341	-0.2575	-0.0863
observations	3341	3214	3219	3225
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.600	0.6168	0.332	0.474
R2 between	0.932	0.420	0.907	0.893

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): interaction with lagged inflation				**Table 6**
Dep. var: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0208**	0.1560***	0.0208	0.0046
$\Delta NEER_{it} * \pi^{h}_{it-1}$	0.0170**	0.0835*	0.0060	0.0161***
π^{h}_{it-1}	0.2104***	-0.0211	0.1594***	0.0739**
π^{s}_{it-1}		0.0658**	0.1335***	0.1945***
π^{e}_{it}	0.2374***	0.3268**	0.2085***	0.1941***
$outputgap_{it}$	0.0146***	0.0155	0.0025	0.0212***
constant	-0.1896**	-0.2604	-0.2229	-0.0775
observations	3341	3214	3219	3225
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.603	0.6192	0.334	0.480
R2 between	0.933	0.440	0.910	0.891

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Appendix Tables

Exhange rate pass-through to CPI inflation (q/q): interaction with moving average of inflation				**Table A1**
Dep. var: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0223**	0.2029***	-0.0029	0.0079
$\Delta NEER_{it} * \pi^{ma}_{it-2}$	0.0158***	0.0010	0.0397***	0.0140***
π^{ma}_{it-2}	0.3153***	0.5806***	0.2615***	0.3159***
π^{s}_{it-1}	0.3685***	0.0590**	0.2231***	0.4112***
$outputgap_{it}$	0.0225***	0.0246	0.0277***	0.0230***
constant	0.3045***	0.4392**	0.3734*	0.2207***
observations	3830	3607	3612	3612
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.637	0.579	0.327	0.646
R2 between	0.986	0.813	0.931	0.985

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (y/y): interaction with moving average of inflation				**Table A2**
Dep. var: $\pi^{s}_{it;4}$				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
$\Delta NEER_{it}$	0.0452***	0.3022***	0.0903***	0.0107
$\Delta NEER_{it} * \pi^{ma}_{it-2}$	0.0953***	0.0863**	0.1551***	0.0746***
π^{ma}_{it-2}	1.2214***	2.0483***	0.8151***	1.2025***
π^{s}_{it-1}	0.8833***	-0.0086	0.3782***	1.1602***
$outputgap_{it}$	0.1183***	0.1474**	0.1301***	0.1192***
constant	2.1419***	1.5080***	2.6281***	1.8062***
observations	3722	3505	3510	3510
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.697	0.6679	0.438	0.711
R2 between	0.968	0.799	0.860	0.968

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): with US dollar				Table A3
Dependent variable: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
ΔUSD_{it}	0.0350***	0.2095***	0.0263***	0.0190**
π^{s}_{it-1}	0.5826***	0.0835***	0.2820***	0.6550***
$outputgap_{it}$	0.0238***	0.0496**	0.0359***	0.0223***
constant	0.4576***	1.2357***	0.6303***	0.3514***
observations	3830	3607	3612	3612
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.594	0.5737	0.300	0.600
R2 between	0.985	0.600	0.915	0.987

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): interaction with lagged inflation				Table A4
Dep. var: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
ΔUSD_{it}	0.0146**	0.1720***	0.0086	0.0034
$\Delta USD_{it} * \pi^{h}_{it-1}$	0.0215***	0.0418	0.0175**	0.0171***
π^{h}_{it-1}	0.5644***	0.5506***	0.3622***	0.1740***
π^{s}_{it-1}		0.0067	0.1671***	0.4760***
$outputgap_{it}$	0.0251***	0.0238	0.0233**	0.0238***
constant	0.4595***	0.7720***	0.3851*	0.3456***
observations	3830	3607	3612	3612
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.606	0.5836	0.328	0.617
R2 between	0.979	0.808	0.931	0.986

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): with US dollar				**Table A5**
Dependent variable: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
ΔUSD_{it}	0.0329***	0.2276***	0.0209**	0.0157*
π^{s}_{it-1}	0.2020***	0.0568**	0.1637***	0.2446***
π^{e}_{it}	0.2411***	0.3308***	0.2490***	0.2030***
$outputgap_{it}$	0.0148***	0.0162	0.0049	0.0213***
constant	-0.1634*	-0.0414	-0.2473	-0.0757
observations	3341	3214	3219	3225
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.601	0.6212	0.331	0.473
R2 between	0.934	0.420	0.908	0.893

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.

Exhange rate pass-through to CPI inflation (q/q): interaction with lagged inflation				**Table A6**
Dep. var: π^{s}_{it}				
	headline CPI	energy CPI	food CPI	core CPI
	I	II	III	IV
ΔUSD_{it}	0.0261***	0.1648***	0.0241**	0.0097
$\Delta USD_{it} * \pi^{h}_{it-1}$	0.0091*	0.0860***	-0.0039	0.0084**
π^{h}_{it-1}	0.2125***	0.0349	0.1509***	0.0728**
π^{s}_{it-1}		0.0612**	0.1348***	0.1934***
π^{e}_{it}	0.2371***	0.3137**	0.2119***	0.1943***
$outputgap_{it}$	0.0149***	0.0183	0.0025	0.0216***
constant	-0.1592*	-0.0221	-0.2134	-0.0618
observations	3341	3214	3219	3225
number of countries	36	34	34	34
time fixed effects	yes	yes	yes	yes
R2 within	0.602	0.6253	0.334	0.477
R2 between	0.934	0.442	0.909	0.890

Note: Fixed effects panel estimation; sample period: 1994Q1-2021Q4. ***/**/* denote statistical significance at 1/5/10% confidence level. Robust standard errors clustered at the country level.