



Exchange rate pass-through to import prices in France: the role of invoicing currencies

The US dollar is widely used in global trade to facilitate international transactions. In France, nearly 60% of France's non-EU imports are invoiced in US dollars every year. Thus, taking account of US dollar invoicing in international transactions can lead to a change in the estimation of exchange rate pass-through to import prices. In particular, the depreciation of the nominal effective exchange rate (NEER) since January 2021 is greater when it is calculated using the weight of invoicing currencies rather than the weight of bilateral trade. In this episode in which the euro has depreciated more against the US dollar than against other currencies, conventional measures of the NEER based on weighting by bilateral trade flows tend to underestimate the pass-through of the exchange rate shock to import prices.

Antoine Berthou, Julia Schmidt
Economic Affairs and International Cooperation Directorate
International Macroeconomics Division

JEL codes
F14, F31,
F41

This article presents the results of research carried out at the Banque de France. The ideas set out in this document reflect the authors' opinions and do not necessarily express the Banque de France's position. Any errors or omissions are the authors' responsibility.

57%

the share of US dollar invoicing in France's imports excluding the EU-27 and the United Kingdom in 2019

15.6%

the share of the United States in France's imports excluding the EU-27 and the United Kingdom in 2019

13.2%

the depreciation of France's nominal effective exchange rate (NEER) between 4 January 2021 and 27 September 2022, when the NEER is constructed using invoicing currency weights

France's nominal effective exchange rate (NEER) since January 2021

(base = 100 at 1 January 2021)



Sources: French customs (currency weights); Bank for International Settlements (exchange rate); authors' calculations.



1 Exchange rate pass-through to import prices

The magnitude of exchange rate pass-through to the prices of goods exported and imported is highly relevant for the implementation of economic policy. In particular, it determines the adjustment of the trade balance and current account balance to external shocks. It also feeds through to inflation, given that consumer prices are in part influenced by the prices of imported goods, and the latter, in turn, are determined *inter alia* by fluctuations in the exchange rate.

Taking account of invoicing currencies is important in analysing this pass-through. When imported goods are priced in the exporter's currency, a depreciation of the importer's exchange rate makes the goods imported more expensive in the local currency. By contrast, when prices are invoiced in the importer's currency, they do not vary over the short term and are referred to as "rigid". In other words, depreciation of the exchange rate does not have much impact on the price of imported goods. Invoicing international transactions in a "vehicle" currency, for example the US dollar – where neither the exporter nor the importer is located in the United States – also alters the pass-through of exchange rate shocks to import prices (see Gopinath and Itskhoki, 2021).

Finally, the composition of invoicing currencies is also relevant if we wish to quantify the effects of exchange rate fluctuations on import prices from a macroeconomic point of view. The US dollar plays a dominant role in international transactions: in the case of France, nearly 60% of imports excluding the EU-27 and the United Kingdom are invoiced in US dollars, whereas on the same basis, the United States accounted for 15.6% of our imports in 2019. Accordingly, movements in the euro exchange rate against the dollar can lead to fluctuations in the price of imported goods, including when they do not come from the United States.

In this article, we look at the period which, since January 2021, has seen a sharp depreciation of the euro against the US dollar (a depreciation of 21.6% at 27 September 2022). Our analysis focuses on the role of invoicing currencies in exchange rate pass-through to France's import prices (excluding the EU). It emerges that taking account of invoicing currencies helps us to better understand this pass-through mechanism, as well as its effects from the point of view of imported inflation.

2 Prevalence of the US dollar in foreign currency invoicing of non-EU imports

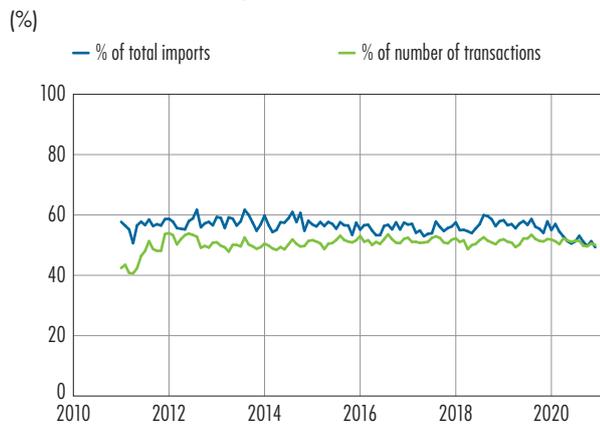
Gopinath (2016) showed that the US dollar is used as the invoicing currency in around 40% of global trade flows, whereas the United States as a trading partner accounts for only about 10% of world trade. This pattern reflects the US dollar's position as the dominant currency: it is used all over the world in transactions that do not directly involve the United States.

In the case of France, the customs data disaggregated by firm, destination and product have also provided the invoicing currency of transactions for non-EU trade since 2011. Around 60% of total imports from non-EU countries (see Chart 1 and Box 1 for the share of non-EU countries in France's imports) are denominated in US dollars. This proportion stands at around 50% if we calculate it as a proportion of the total number of individual transactions (see also Berthou et al., 2022).¹ These figures include oil products, which are chiefly invoiced in dollars. They are very stable over the period in question (2011-20) and do not show any clear indication of a weakening of the US dollar's international role based on France's international transactions (Corsetti et al., 2020, show a similar pattern based on microeconomic data for the United Kingdom).

¹ The choice of invoicing currency also reflects the firm's market power, its size, its integration into international value chains and the characteristics of its market. There is thus great diversity in the invoicing choices of firms depending on their characteristics, both in terms of exports and imports.



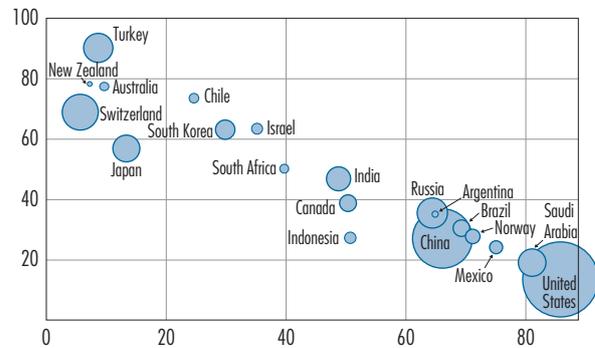
C1 Share of US dollar invoicing in France's non-EU imports



Source: French customs.

C2 Shares of US dollar and euro invoicing in France's non-EU imports in 2019

(%, x-axis: US dollar invoicing; y-axis: euro invoicing)



Source: French customs.

The second trend that emerges when we compare the share of invoicing in US dollars and the geographical origin of imported goods is that the choice of invoicing currency in French non-European Union imports mainly results from a binary choice between the euro and the US dollar. We show in Chart 2 that French firms' imports

from Switzerland and Turkey are mainly priced in euro (around 70% and 90% respectively). Conversely, imports from the United States are principally invoiced in US dollars (over 80%). Amiti et al. (2020) show a similar pattern based on microeconomic data for Belgium.

BOX 1

France's imports of goods: intra- versus extra-European Union

In 2019, 53% of France's imports of goods came from the EU-27 and 46% from the 19 euro area countries (French customs data in 2019, CIF¹). Accordingly, flows of goods from non-EU countries accounted for 47% of France's imports (44% also excluding the United Kingdom). Our study focuses on data on international trade in foreign currencies that cover all of France's trade excluding the EU-27 and the United Kingdom. The quantification exercise presented in the last part of the article relates solely to this geographical area. Using this quantification it is possible to obtain the contribution of fluctuations in non-EU-28 import prices (i.e. excluding the EU-27 and the United Kingdom) to variations in France's import prices across all countries of origin. Taking our quantification again in Section 4 of the article, and using a nominal effective exchange rate (NEER) calculated with invoicing currency weights, the increase in the index of France's prices of imported goods since January 2021 amounts to 3.3% = 44% (share of our imports excluding the EU-27 and the United Kingdom in 2019) × 7.6% (change in import prices excluding the EU-27 and the United Kingdom predicted by the variation in the NEER calculated using invoicing currency weights since January 2021). This quantification in our exercise only takes account of exchange rate fluctuations.

¹ Cost, insurance and freight.



3 Taking account of invoicing currencies in the estimation of exchange rate pass-through to import prices

Our econometric study draws in particular on the work of Chen et al. (2022) who develop an approach that makes it possible to take account of invoicing currencies in the estimation of exchange rate effects on import prices in the United Kingdom. Our strategy is similar and is applied to French data.

French customs data are reported for each firm (f), partner country (j), product (eight-digit combined nomenclature, k), invoicing currency (c), and time period (month, t). A transaction combines all of these dimensions. In terms of notation, the invoicing currency is the euro (€), the partner country's official currency (j), or the official currency of a third country – a vehicle currency (v). We therefore have a currency vector with the possible values $c = \{\text{€}, j, v\}$. In our data, the US dollar constitutes the most prevalent vehicle currency in French transactions.²

We observe for each individual transaction the value (V) and the quantity (Q) that is associated with it. This enables us to calculate a unit value (P), which is the relation between value and quantity:

$$P_{fjckt} = \frac{V_{fjckt}}{Q_{fjckt}}$$

We estimate three econometric models that enable us to identify the strength of the pass-through of exchange rate shocks to import prices using two different exchange rates (see Box 2 for technical details):

- in the first specification (Model 1), we take the bilateral exchange rate between the country of origin and the euro;

- in the second specification (Model 2), we use the exchange rate between the invoicing currency and the euro;

- the third specification (Model 3) is based on the bilateral exchange rate but estimates three coefficients corresponding to three different invoicing scenarios:

- 1) **Producer Currency Pricing (PCP)**, where foreign exporters set their prices in their own currency, for example the Japanese yen for Japanese exports to any country;
- 2) **Local Currency Pricing (LCP)**, where exporters set their prices in the importer's currency (for example, in euro when France is the importer);
- 3) **Vehicle Currency Pricing (VCP)**, where the invoicing currency is the official currency of a third country (for example, the US dollar for Japanese exports to France).

The impact of exchange rate fluctuations on the price of non-EU imports obtained using the three econometric models (cumulative effects over 12 months, over the 2011-20 period) is presented in the table below.

- In Column 1, we report the result of the Model 1 estimate (the standard model for estimating exchange rate effects on import prices) in which we consider the euro exchange rate against the currency of the country of origin. A 10% depreciation in the euro increases import prices in euro by 2.3% after 12 months.
- In Column 2, we present the result of the Model 2 estimate in which we use the euro exchange rate against the invoicing currency: the exchange rate pass-through increases considerably and a 10% depreciation in the euro increases import prices in euro by around 5.8%.

2 By way of comparison, in 2011 the Swiss franc represented 1.3% of invoicing in France's imports, and the Japanese yen 1.0%.



BOX 2

Estimating exchange rate pass-through to import prices

- Model 1: The first specification (Equation 1) is a classical regression of the exchange rate pass-through to import prices (expressed here in euro). The monthly log change in the unit value of imports is regressed on a maximum of $L = 12$ lags of monthly log changes in the exchange rate. The exchange rate ($E_{\epsilon_j,t}$) is the parity between the euro and the currency of the country of origin. An increase in $E_{\epsilon_j,t}$ indicates a depreciation of the euro since 1 January 2021. We obtain 12 exchange rate pass-through coefficients, which enables us to track the short- and long-term impact of exchange rate fluctuations on the unit values of France's non-EU imports. In this specification, we also control for firm fixed effects (f_{jt}), which take account of productivity shocks. The country-product fixed effects (f_{jk}) control for structural factors affecting transactions, such as preferences for products from specific countries. PPI_{jt} is a control vector for changes in the producer price index in the country of origin. u_{fjckt} is the error term in this equation.

$$\Delta \ln P_{fjckt} = \sum_{l=0}^L \beta_l \Delta \ln E_{\epsilon_j,t-l} + PPI_{jt} + f_{jt} + f_{jk} + u_{fjckt} \quad (1)$$

- Model 2: The second version of this equation (Equation 2) is based on the invoicing currency associated with each transaction and not on the currency of the country of origin. This allows us to bring out the dominant role of the US dollar in international transactions. The bilateral exchange rate term is $E_{\epsilon_c,t}$.

$$\Delta \ln P_{fjckt} = \sum_{l=0}^L \beta_l \Delta \ln E_{\epsilon_c,t-l} + PPI_{jt} + f_{jt} + f_{jk} + u_{fjckt} \quad (2)$$

- In the third version of this equation, we use the bilateral exchange rate against the country of origin's currency ($E_{\epsilon_j,t}$). This variable is interacted with three dummy variables corresponding to three types of invoicing.

In Equation (3), for each dummy variable (PCP, LCP and VCP) interacting with the official exchange rate, we obtain a distinct exchange rate pass-through coefficient. As indicated above, the VCP category corresponds to a choice of currency that is neither that of the exporter nor that of the importer, which turns out most frequently to be the US dollar.¹ LCP refers to invoicing in euro, and PCP to invoicing in the official currency of the exporter.

$$\Delta \ln P_{fjckt} = \sum_{l=0}^L \beta_{1l} \Delta \ln E_{\epsilon_j,t-l} \times PCP + \sum_{l=0}^L \beta_{2l} \Delta \ln E_{\epsilon_j,t-l} \times LCP + \sum_{l=0}^L \beta_{3l} \Delta \ln E_{\epsilon_j,t-l} \times VCP + PPI_{jt} + f_{jt} + f_{jk} + u_{fjckt} \quad (3)$$

We then decompose the exchange rate term in this equation interacting with the VCP dummy variable using the exchange rates of the euro and the country of origin's currency against the US dollar: $E_{\epsilon_j,t} = E_{\epsilon_v,t} + E_{v_j,t}$.

¹ When the transaction is priced in dollars and originates from the United States, the indicative variable is coded as "PCP".



- In Columns 3 and 4, we report the results of the Model 3 estimate in which we take the official exchange rate between the euro and the country of origin, with three possible scenarios: producer currency pricing (PCP), local currency pricing (LCP), or pricing in a vehicle currency such as the dollar (VCP). The estimation results indicate that a depreciation of the euro exchange rate leads to an increase in French non-EU import prices in the PCP and VCP scenarios. By contrast, the exchange rate pass-through does not appear significant when the euro is used as the invoicing currency (LCP). This confirms that import prices tend to be rigid, even after 12 months, and little affected or not at all by exchange rate fluctuations when they are denominated in the importer's currency. These results corroborate for France the estimates based on British data by Chen et al. (2022). Boz et al. (2022) also confirm that countries whose imports are denominated more in dollars tend to experience greater pass-through from the dollar exchange rate to their import prices following fluctuations in this exchange rate.

Unit values of imports, long-term effects

	1	2	3	4
$E(\epsilon_i)$	0.230** [0.021]			
$E(\epsilon_c)$		0.578*** [0.000]		
$E(\epsilon_i) \times \text{PCP}$			0.350** [0.038]	0.575*** [0.001]
$E(\epsilon_i) \times \text{LCP}$			0.081 [0.486]	0.183 [0.125]
$E(\epsilon_i) \times \text{VCP}$			0.446*** [0.003]	
$E(\epsilon_v) \times \text{VCP}$				0.860*** [0.000]
$E(v_i) \times \text{VCP}$				0.226 [0.134]
Observations	5,294,519	5,297,071	5,294,519	5,294,519
R ²	0.17	0.17	0.17	0.17
Fixed effect ft	Yes	Yes	Yes	Yes
Fixed effect jk	Yes	Yes	Yes	Yes

Source: Estimation results based on French customs data (extra-EU). Significance levels: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Note: The statistic R² measures the model's explanatory power. Ranging from 0 to 1, it increases with the quality of the fit.

4 Quantification of the exchange rate pass-through to import prices between January 2021 and September 2022

Taking account of the currency composition of imports can, in some circumstances, change our perception of an economy's exposure to exchange rate movements. This is especially the case when the exchange rate of a vehicle currency (like the US dollar) appreciates or depreciates against many other currencies. To illustrate this point, we report in Chart 3 three measures of the exchange rate: i) the nominal effective exchange rate (NEER) of the euro based on the weight of bilateral trade flows with countries excluding the EU-27 and the United Kingdom; ii) a measure of the NEER derived using invoicing currency weights in France's non-EU imports; and lastly iii) the nominal US dollar/euro exchange rate. Whereas the conventional NEER measured using the weight of partner countries has only depreciated slightly since January 2021, the depreciation is more marked with the NEER calculated using invoicing currencies. This can be explained by the fall in the value of the euro against the US dollar over this period, which, combined with the high proportion of US dollar invoicing in French non-EU imports, has contributed to amplifying the depreciation of this NEER. When the NEER is calculated using solely the weight of countries in imports, the role of the US dollar tends to diminish.

C3 France's nominal effective exchange rate (NEER) since January 2021

(base = 100 at 1 January 2021)



Sources: French customs (currency weights); Bank for International Settlements (exchange rate); authors' calculations.



To evaluate how this can alter our measurement of the impact of the euro's depreciation on France's non-EU import prices since January 2021, we set out below three simple exercises to simulate, all other things being equal, the impact of the trade-weighted NEER (weight of countries in imports), the NEER calculated using invoicing currencies and (with certain reasonable assumptions) the US dollar/euro exchange rate, which we weight by the proportion of the US dollar as invoicing currency in France's imports. We combine these exchange rates with the exchange rate elasticities estimated in the different econometric models and that we present in the table above.

- By multiplying the exchange rate pass-through coefficient in Column 1 of the table by the change in the NEER (weighted by country), we obtain an implied inflation for import prices of 1.6%.

$$\Delta \ln \hat{P}_\epsilon = \hat{\beta} \Delta \ln TCEN = 0.230 \times 7.0\% = 1.6\%$$

- By multiplying the coefficients in Column 2 in the table by the change in the NEER calculated using the weight of invoicing currencies, we obtain a comparatively higher estimate of 7.6%.

$$\Delta \ln \hat{P}_\epsilon = \hat{\beta} \Delta \ln TCEN_c = 0.578 \times 13.2\% = 7.6\%$$

- Lastly, we draw on the fact that the choice of invoicing currency is very substantially binary and is divided between the euro (around 40% of French non-EU imports) and the US dollar (around 60%), which suggests invoicing shares close to zero for other currencies. Assuming that exchange rate pass-through to import prices is nil for imports priced in euro (over one year), the implied inflation of non-EU import prices

constitutes the combination of the share of the US dollar in import invoicing (0.6), the coefficient in Column 4 for the dollar as the invoicing currency (0.86) and the euro's depreciation against the dollar since January 2021 (21.6% at 27 September 2022). The implied quantification of 11.1% for the increase in French non-EU import prices is considerably higher than the conventional quantification of 1.6%, which does not take account of the US dollar's predominance in the pricing of France's non-EU imports. This calculation should be taken as an approximation of the reaction of France's non-EU import prices to the depreciation of the euro exchange rate, and does not take account of the (small) weight of other currencies. The effect calculated could be attenuated if the euro depreciated less against the residual currencies.

$$\Delta \ln \hat{P}_\epsilon = s_s \times \hat{\beta} \Delta \ln E_{\epsilon s} = 0.6 \times 0.860 \times 21.6\% = 11.1\%$$

The example above shows that it is important to take account of the invoicing currency when estimating exchange rate pass-through to import prices. However, we would like to point out that these estimates are specific to the period under review (January 2021-September 2022), in which the euro's depreciation was much more marked against the US dollar than against the currencies of France's other trading partners. This explains the significant discrepancy between estimates using the conventional NEER and those that use a NEER based on the weights of invoicing currencies. In other periods, these differences might not be so great and could even be reversed. It nevertheless underscores the need to take account of invoicing currencies in order to properly understand exchange rate pass-through to import prices, as well as its consequences in terms of imported inflation.



References

Amiti (M.), Itskhoki (O.) and Konings (J.) (2020)

“Dominant currencies: how firms choose currency invoicing and why it matters”, *CEPR Discussion Papers*, No. 15339.

Berthou (A.), Horny (G.) and Mésonnier (J.-S.) (2022)

“The real effects of invoicing exports in dollars”, *Journal of International Economics*, Vol. 135, No. 103569, March.

Boz (E.), Casas (C.), Georgiadis (G.), Gopinath (G.), Le Mezo (H.), Mehl (A.) and Nguyen (T.) (2022)

“Patterns of invoicing currency in global trade: new evidence”, *Journal of International Economics*, Vol. 136, No. 103604, May.

Chen (N.), Chung (W.) and Novy (D.) (2022)

“Vehicle currency pricing and exchange rate pass through”, *Journal of the European Economic Association*, Vol. 20, No. 1, February, pp. 312-351.

Corsetti (G.), Crowley (M.) and Han (L.) (2020)

“Invoicing and pricing-to-market: evidence on international pricing by UK exporters”, *Working Papers*, No. 202007, University of Liverpool.

Gopinath (G.) (2016)

The International Price System, Jackson Hole Symposium Proceedings.

Gopinath (G.) and Itskhoki (O.) (2021)

“Dominant currency paradigm: a review”, *NBER Working Papers*, No. 29556.

Published by
Banque de France

Managing Editor
Gilles Vaysset

Editor-in-Chief
Olivier de Bandt

Editor
Nelly Noulin

Translator/English Editor
Translation division

Technical production
Studio Creation
Press and Communication

ISSN 1952-4382

To subscribe to the Banque de France’s publications

<https://publications.banque-france.fr/en>
“Subscription”

