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Factors influencing the choice of the invoicing currency in international trade: Panel data analysis for 55 countries

JEL Classification: F14; F31; F44; F65

Keywords: *invoicing currency of trade; dominant currency paradigm; dollar; export; inflation; exchange rate*

Abstract

Research background: Most transactions in world trade are invoiced in several international currencies. The changes in the distribution of the great economic powers and the strengthening of the position of developing countries make it necessary to consider the factors determining the choice of trade invoicing currency and to assess the prospects of the dollar as an invoicing currency and the possibility of strengthening the position of developing countries' currencies in this function.

Purpose of the article: The aim of the paper is to assess the factors influencing the choice of invoicing currency for international trade in 2000–2019.

Methods: The analysis of factors influencing the choice of international trade invoicing currency is based on panel data modelling. The study is conducted for a group of 55 countries. It is assumed that the following variables may influence the currency position in the trade invoicing function: the share of the issuer's country in the bilateral trade, inflation and exchange rate.

Findings & value added: The analysis showed that despite the decreasing share of the United States in world trade, the U.S. dollar remains the most important export invoicing currency.

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The main factors influencing the dollar's dominance are the U.S. share of countries' exports, inflation in developing countries, and the exchange rate in advanced economies. The great significance of trade share as a determinant of the position of the trade invoicing currency is an important indication of the strengthening position of developing country currencies, particularly the Chinese yuan. The obtained results confirm, with the use of more complete data, the validity of the dominant currency paradigm and enrich the still underdeveloped analysis in the area of international macroeconomics using panel data analysis.

Introduction

The U.S. dollar has remained the main international currency since World War II. Until the 1970s, its dominance resulted from the privileged position of the dollar in the Bretton Woods system, but even after the introduction of a multi-currency international monetary system, the use of other currencies as international money was incomparably lower than the dollar. Even the introduction of the Single European Currency and the growing role of developing countries, particularly China, in the global economy have not resulted in a significant decline in the use of the U.S. currency. Meanwhile, there has been a slow decline in the U.S. share of world exports over the years. The U.S. share of world exports declined from 12.1% in 2000 to 8.7% in 2019 (a decline of 28.4%), and in world imports from 18.9% to 13.3% in the corresponding years (a decline of 29.6%) (UNCTAD, 2021; see Figure 1). In contrast, the U.S. dollar share in the export invoicing of 55 countries was 45.03% in 2000 and 43.83% in 2019 (Boz *et al.*, 2020b), which is a decrease of only 2.7% (see Figure 2).

Analysis of data on invoicing currency in the global trade indicates that most global trade transactions are invoiced in just a few currencies, most often the U.S. dollar (Boz *et al.*, 2020a, p. 3). The high dollar share is particularly in those countries for which the United States is a key trading partner. The positive relationship between the share of the U.S. dollar in export invoicing and the U.S. share of countries' exports is confirmed by the data presented in Figures 3, 4, and 5. This relationship occurs in both advanced economies and emerging market and developing economies.

These circumstances encourage to consider the factors influencing the choice of the U.S. dollar as an invoicing currency in global trade. Therefore, the objective of the paper is to assess the factors influencing the choice of invoicing currency for international trade in 2000–2019. The empirical research conducted and presented in the following section aims to answer the questions: 1) what factors most influence the choice of dollar as invoic-

ing currency in exports 2) whether changes in the share of bilateral trade influenced the choice of dollar as invoicing currency in exports. The analysis of factors influencing the choice of invoicing currency in exports was conducted using linear regression modelling of panel data.

Existing studies on the factors of trade invoicing currency choice mainly analyse these factors from the perspective of individual countries and companies (microeconomic analyses). However, there is a lack of comprehensive studies that would show the problem from a global perspective and would be within the field of international macroeconomics. Accordingly, the author noted that there is a research gap in examining, on a large sample of countries, the factors that influence the position of the dollar as an export invoicing currency and assessing whether the key determinants of the dollar lie with the U.S. economy or other exporting countries.

The following parts of the paper present a literature review concerning the analysis of factors of invoicing currency choice, then the research method and results of econometric analyses are presented in detail. The paper uses the desk research method, including regression analysis of panel data (a group of 55 countries, period 2000–2019). In the next section, a discussion of the obtained results is presented and the results are compared with the results of other authors' analyses. The last section contains conclusions, limitations of the study and suggestions for future research.

Literature review

Theoretical framework

The world economic literature indicates numerous factors determining the process of currency internationalization and the use of currency for invoicing international trade. Shortly after the collapse of the Bretton Woods dollar-gold system, the problem of the choice of invoicing currency in international trade was studied by Swoboda and McKinnon. Swoboda pointed out such advantages of the currency used in trade as high liquidity and low transaction costs (Swoboda, 1968, p. 21), whereas McKinnon argued, citing the work of S. Grassman, that usually the invoicing of exports of differentiated goods is done in the currency of the producer. In contrast, the exchange of homogeneous goods uses the intermediary currency in which the exchange-traded products are listed (McKinnon, 1979, pp. 74–77). In con-

trast, trade in homogeneous goods uses the vehicle currency in which exchange-traded products are listed (McKinnon, 1979, pp. 74–77). McKinnon's conclusions were also confirmed by considerations by Bacchetta and Wincoop (2005, pp. 295–319), who found that exporters with greater market share and producing differentiated goods are more likely to price in their currencies.

The concept of Swoboda is connected to the dominant-currency paradigm, in which export prices are set in what is known as vehicle currency (Gopinath, 2015; Gopinath *et al.*, 2020, p. 677–719). A key observation on which this paradigm is based is that most global trade transactions are invoiced in just a few currencies — most often the U.S. dollar and sometimes the euro — regardless of which countries the entities involved in the transaction come from (Coeuré, 2019; Beckmann *et al.*, 2020). Network externalities are important. They result from the fact that the more often a currency is used as a medium of exchange, the transaction costs associated with its use are lower and liquidity is higher, so the currency becomes more attractive. This effect can be compared to economies of scale (Cooper, 2000). Network externalities lead to centralization of the international monetary system because they benefit only a few or only one currency (Gaspar, 2004). However, this effect may be limited by the need for risk-reducing diversification. As noted by Cohen (2000), an important feature of the determinants of the position of key currencies is their tendency to change slowly and their long-lasting nature, calling this effect inertia.

Hartmann and Issing (2002) demonstrate the importance of price stability on the domestic market from the point of view of obtaining and maintaining the reserve status of a currency. Galati and Wooldridge (2009, p. 2) as well as Devereux and Shi (2013, pp. 97–133) in theoretical considerations prove that in extreme cases money can lose its position as a reserve currency following a large increase in inflation in the issuer's economy. Thus, macroeconomic stability resulting from economic policy and institutional and legal conditions of the country issuing the currency determines the confidence in the currency.

Eichengreen (1998) and Frankel (2000) in their analysis argue that the stronger the position of a country in the world economy, the more likely other countries are to use the currency of that country in functions related to international trade. It should be noted, however, that the relationship between the share of the issuing country in world production and trade is not proportional to the share of the currency in world foreign exchange

reserves, because there is a lag effect, as exemplified by the persistence of the position of the pound sterling long after Britain lost its dominance in the world economy (early 20th century) or the status of the dollar as the main world currency after the collapse of the Bretton Woods monetary system and the evolution of the Pax Americana order towards a polycentric arrangement with three dominant centers. Moreover, the tradition of settling trade in certain commodities, such as oil, makes the U.S. dollar dominant in this area.

Theoretical considerations show the existence of many stylised facts and the persistence of invoicing currency patterns in global trade, but they also explain that under certain circumstances there are significant changes in these patterns. The theoretical literature emphasizes the role of history, path dependence, and nonlinearities in the choice of a trade invoicing currency. Examples include events such as the episodes of comprehensive institutional integration and establishment of currency unions (Gopinath & Stein, 2021, pp. 783–830; Mukhin, 2022, pp. 650–688).

Empirical studies

In contrast to the relatively rich theoretical literature on trade invoicing currency choice, the empirical literature is quite poor. This poverty of the empirical literature is due to limited data availability (Ito & Chinn, 2014, p. 8). Nevertheless, based on the results of econometric studies devoted to the analysis of factors of choice of invoicing currency obtained, among others, by Bacchetta and Wincoop (2005, pp. 295–319), Goldberg and Tille (2008, pp. 177–192, 2010, pp. 1–26) as well as Kamps (2006, pp. 7–53) a set of most important factors can be identified. These include:

- the country's share in world production and trade and other indicators of its position in the world economy,
- macroeconomic stability and exchange rate stability,
- a country's level of economic development and competitiveness,
- bargaining power of producers and competition among firms,
- degree of diversification of goods,
- currency of purchase of intermediate goods, components, and raw materials, and size of single delivery,
- geographic distance from a major economy,
- development of financial markets,
- network effects.

Empirical studies are dominated by microeconomic analyses devoted to the issue of invoicing currency choice from the perspective of enterprises and using micro-level data sets. They criticise the assumption of a unilateral setting of the invoice currency dominating theoretical considerations (Friberg & Wilander, 2008, pp. 54–69; Takatoshi *et al.*, 2010). The main findings of a study of Swedish companies by Friberg and Wilander (2008, pp. 54–69) indicate that both price and invoice currency are determined by a process of negotiation between the trading partners. In turn, Takatoshi *et al.* (2010), based on data for Japanese firms, pointed to the role of the destination of the firm's final sales and the structure of the firm's supply chain in the invoice currency decision.

Similarly, Amiti *et al.* (2022, pp. 1–59), on the basis of a study of Belgian firms, proved that none of the popular exogenous invoicing paradigms (PCP – the producer currency pricing, LCP – the local currency pricing, DCP – the dominant currency paradigm) explains the analysed situation sufficiently well. The research carried out led to the conclusion that currency invoicing is an active firm-level decision, shaped by the firm's size, exposure to imported inputs, and the currency choices of its competitors, which results in a coexistence of two dominant currencies with endogenous relative prominence (Amity *et al.*, 2022, p. 53). Furthermore, the authors analysed the impact of the choice of invoicing currency on the international transmission of shocks, which results from the differential price response of similar firms that invoice in different currencies.

The same perspective can be seen in the analyses by Corsetti *et al.* (2020, pp. 1–62, 2022, pp. 1–21), who in a study of the UK exporters found that individual firms often use different invoicing currencies to the same destination country of the same product. Moreover, demander-specific features and buyer preferences revealed during negotiations play a large role in determining the currency of individual trade transactions (Corsetti *et al.*, 2020, pp. 1–62). These patterns also persisted in the post-Brexit period, and the authors did not identify significant changes in the relative share of invoicing currencies in response to the shock of the UK leaving the European Union (Corsetti *et al.*, 2022, pp. 1–21).

Among the empirical studies, many are devoted to the dominant currency issue and the use of the US dollar in this role. Faudot and Ponsot (2016, pp. 41–64) analysed the symmetric use of the US dollar by lower developed countries in the function of a dominant vehicle currency and a dominant currency of international debt issuance. Also Liu and Lu (2019,

pp. 21–44) in their study on determinants of invoicing currency confirmed the importance of currency of financing.

On the other hand, Gopinath and Stein (2021, pp. 783–830) worked to explain how the dominant currency maintains its advantage over other currencies. They concluded that the dollar's privileged position is well explained by five stylised facts about invoicing currency, corporate borrowing, banking liabilities, central bank reserves and violations of uncovered interest parity. Moreover, they drew attention to the 'exorbitant privilege' of the US dollar, widely described in the literature.

Recent studies have also focused on an in-depth analysis of the importance of individual factors. An example is the study by Arioldi *et al.* (2022, pp. 1–33). Recent studies have also focused on an in-depth analysis of the importance of individual factors. An example is the study by Arioldi *et al.* (2022, pp. 1–33). By using a novel index of bargaining power, which includes the network dimension of trade, the authors provided evidence that network-related features are important in the choice of invoicing currency. In addition, they found that the effect of trading position outweighs the effect of global sector market shares on the currency denomination of trade (Arioldi *et al.*, 2022, pp. 1–33).

An alternative path for the development of empirical research on the choice of currency for trade invoicing is broad international studies. Such studies require the use of panel data analysis, i.e. cross-country time-series data. The limited availability of comparable data for a large number of countries severely reduced the possibility of conducting this type of analysis. Such data sets were used in analyses by, among others, Kamps (2006), Goldberg and Tille (2008), Ito and Chinn (2014) and Gopinath (2015), but their spatial and temporal coverage was severely limited. The compilation of a large panel data set on trade invoicing by Boz *et al.* (2020a; 2022), covering more than twice the number of countries than the data used by Gopinath (2015) and a longer time series (115 countries since 1990) has made it possible to conduct more accurate analyses giving more reliable conclusions in the area of international macroeconomics.

Therefore, in the analyses of factors affecting the choice of invoicing currency for trade transactions, factors relating to the country of currency issuer are indicated, as well as those relating to other economies or directly related to the currency itself. Empirical studies, although still relatively underdeveloped in this area, do not fully confirm the main theses of theo-

retical considerations, however, pointing to various nuances and specific conditions.

In the further part of the study, based on the analysis of the literature, a set of factors influencing the choice of the dollar as an export invoicing currency was created, which were then verified using methods of econometric analysis. This paper contributes to the growing literature on the determinants of currency invoicing in several ways: it brings new support to the dominant currency paradigm by confirming, using more complete data, that under conditions of relative decline in US economic advantage, the US dollar remains the unrivalled dominant currency; it enriches the still relatively undeveloped research using panel data analysis in the area of invoicing currency choice.

Research method

The empirical part of the paper analyzes the factors influencing the choice of the U.S. dollar as the export invoicing currency. The data on the share of the U.S. dollar in export invoicing comes from the work by Boz *et al.* (2020a, pp. 3–29), who prepared a comprehensive and up-to-date panel data set on trade invoicing trends in major world currencies. The dataset they prepared is publicly available and can be downloaded from the International Monetary Fund website. The dataset used represents the annual shares of U.S. dollar, Euro, national currencies, and other currencies in the invoicing of exports and imports for 102 countries from 1990 to 2019. However, the analysis in this study was conducted for a group of 55 countries, which was determined by data availability (only those countries for which data on the share of the U.S. dollar in invoiced exports for at least 10 years from the period 2000–2019 were available were selected). The group included 34 countries from Europe, 9 from Asia, 5 from Africa, 4 from North America, 2 from South America and 1 from Oceania. The analysis was conducted for the period 2000–2019. These countries accounted for 55.6% of world merchandise exports in 2000 48.9% in 2019, adding the United States to this group, it was 67.7% and 57.5% respectively (UNCTAD, 2021) (see figure 6). However, this group does not include such countries of the top 20 exporters as China, the United States, Hong Kong, Mexico, Canada, Singapore, India, the United Arab Emirates, and Switzerland. These countries were not included due to the lack of data about the share of the USD in the in-

voicing of their exports (the criterion was adopted that data be available for min. (The criterion was that data should be available for at least 10 years out of the 20-year period of analysis). The United States was also excluded, due to the dollar being its national currency (including the United States in this group was 67.7% of world exports in 2000 and 57.5% in 2019, respectively) (UNCTAD, 2021).

The analysis was performed on a group of 55 countries (Model 1). Then, due to the substantive reasons indicating differences between advanced and developing countries, separate modeled were built for two groups of countries: 1) advanced economies — 27 countries (Model 2) and 2) emerging market and developing economies — 28 countries (Model 3).

Based on the conclusions from the literature review as well as the preliminary analysis of statistical data, the following research hypotheses were formulated:

Hypothesis 1: *Trade with the U.S. remains an important factor strengthening the position of the U.S. dollar as an export invoicing currency, despite the declining U.S. share in world trade.*

Hypothesis 2: *High inflation in countries as an indication of financial instability in the economy contributes to the choice of the U.S. dollar as the trade invoicing currency.*

Hypothesis 3: *The key factors in the choice of the U.S. dollar as an export invoicing currency are related to the economic conditions, in particular, there is an increase in the use of the U.S. dollar as an export invoicing currency during global financial and economic crises.*

Based on the substantive rationale provided by the literature review, as well as the researcher's own knowledge and experience, and the availability and comparability of data, a preliminary set of potential explanatory variables that could have influenced the choice of the U.S. dollar for invoicing exports in the countries analyzed was generated. The explanatory variables adopted for the analysis included data on the analyzed economies (share of exports to the United States in total merchandise exports, share of imports from the United States in total merchandise imports, inflation, exchange rate of the national currency against the U.S. dollar, crises) and on the U.S. economy, which is the issuer of the U.S. dollar (changes in gross

domestic product, U.S. share in world merchandise exports and imports, general government gross debt, general government net lending/borrowing, federal debt held by foreign and international investors, current account balance, foreign exchange reserves, inflation). A detailed description of the variables adopted for the analysis along with the sources of statistical data can be found in Table 1.

Then the selection of variables was carried out using statistical criteria, such as their strong correlation with the explained variable, the lack of interdependence of explanatory variables, which means that their mutual correlation coefficients must show values smaller than the correlation coefficients with the explained variable (to verify the strength and direction of the relationship between the explained variable and explanatory variables and between individual explanatory variables Spearman's correlation coefficients were used), high index of own variability of explanatory variables, the condition that none of the explanatory variables is a combination of other independent variables and that the number of observations is greater than the number of independent variables. Descriptive statistics of the variables for the 55-country group are presented in Table 2, for advanced economies in Table 3 and for emerging market and developing economies in Table 4. The correlation matrices are presented in Table 5 (group of 55 countries), Table 6 (advanced economies) and Table 7 (emerging market and developing economies).

Tables 2, 3 and 4 present the following descriptive statistics of the explanatory variables used in the models: number of observations, mean, median, minimum and maximum values, standard deviation, and coefficient of variation. The coefficient of variation is the ratio of standard deviation to the arithmetic mean and allows to identify variables that can be considered quasi-constant and should be eliminated from the model, because due to low variability they do not contribute information about the development of the explained variable. The value of coefficient of variation for quasi-constant variables was assumed to be less than 10%. Based on the data presented in Tables 2, 3 and 4, it can be concluded that there are no reasons to eliminate any of the variables selected for the models (the coefficient of variation for all variables is higher than 10%).

The correct construction of models also required an analysis of explanatory variables for their mutual correlations. Table 5 presents Spearman rank order correlations for all variables selected for Model 1 for the group of 55 countries. Based on the analysis of correlation coefficients, those vari-

ables that are weakly correlated with the explanatory variable were eliminated: US_GDP, US_export, US_import, US_debt, US_deficit, US_external_debt, US_CAB, US_reserves, US_CPI, Crises. In addition, the variable Import_from_US was eliminated due to its higher correlation with another independent variable (Export_to_US) than with the explanatory variable. This selection of variables allowed us to include the following variables in the model: Export_to_US, CPI_C, Exchange_rate. The relationship between the share of U.S. dollar in the exports invoicing in the analyzed countries and the share of exports to the U.S. in the total exports of the countries is characterized by a strong positive correlation (the value of Spearman correlation coefficient is 0.49). Also, the relationship between the share of the U.S. dollar in invoicing exports and the level of inflation in individual countries is characterized by a positive correlation (the value of the Spearman correlation coefficient is 0.30). On the other hand, the relationship between the share of the U.S. dollar in the invoicing of exports and the change in the exchange rate against the U.S. dollar has a negative correlation coefficient of -0.13, which means that the appreciation of the national currency against the U.S. dollar by 1 percentage point is accompanied by a decrease in the share of the dollar in the invoicing of exports of a given country by 0.13 percentage points.

Table 6 presents the Spearman rank order correlations for the group of 27 advanced economies. The variables that are strongly correlated with the explanatory variable that were taken into model 2 are: Export_to_US, CPI_C, Exchange_rate (the variable Import_from_US was eliminated due to a stronger correlation with the variable Export_to_US than with the explanatory variable). There is a strong positive correlation between the share of exports to the United States in total exports and the share of exports invoiced in U.S. dollars. Meanwhile, there is a negative correlation between the inflation rate in the advanced economies and the dollar share in export invoicing, which means that a 1 percentage point increase in inflation is accompanied by a 0.12 percentage point decrease in the dollar share in export invoicing. There is also a negative correlation between the appreciation of the domestic currency against the dollar and the dollar's share in export invoicing (a 1 percentage point appreciation of the domestic currency is accompanied by a 0.48 percentage point decline in the dollar's share in invoicing exports).

Table 7 presents the Spearman rank order correlation coefficients for the group of 28 Emerging market and developing economies. The variables

that are strongly correlated with the explanatory variable that were taken into model 2 are: Export_to_US, CPI_C, (the variable Import_from_US was eliminated due to a stronger correlation with the variable Export_to_US than with the explanatory variable). A positive correlation is found between the share of exports invoiced in U.S. dollars and the share of exports to the U.S. in total exports, and between the share of exports invoiced in U.S. dollars and inflation. That is, a 1 percentage point increase in the share of exports to the U.S. in total exports results in a 0.59 percentage point increase in the dollar share in export invoicing, and a 1 percentage point increase in country inflation is accompanied by a 0.35 percentage point increase in the dollar share in export invoicing.

Further analyses were conducted using the linear regression method for panel data. The advantage of panel data is the possibility to analyze the phenomenon simultaneously in time and in cross-sectional or spatial dimension. The nature of panel data makes it possible to isolate the individual specificity of particular objects and the influence of unobservable variables or effects. The use of panel data also allows for greater heterogeneity, i.e., variation among units of study, provides a greater number of degrees of freedom, and increases estimation efficiency.

The regression equations were created using the following formula:

$$Y_{it} = \alpha_i + \sum_i^n \beta_i X_{it} + v_{it} \quad (1)$$

where:

- Y_{it} explanatory variable, which is the share of the U.S. dollar in export invoicing by country (USD_EX);
- X_{it} explanatory variables: for model 1: Export_to_US, CPI_C, Exchange_rate; for model 2: Export_to_US, CPI_C, Exchange_rate; for model 3: Export_to_US, CPI_C;
- α_i constant;
- β_i coefficients on explanatory variables;
- v_{it} the total random error, consisting of the purely random part ε_{it} and the individual effect u_i relating to the specific i -th unit of the panel, $v_{it} = \varepsilon_{it} + u_i$.

Results

Tables 8–13 present the estimation results of the panel data regression models. The first model verifies whether in the group of 55 analyzed countries the selected factors (exports to the U.S., inflation, exchange rate changes) significantly affect the choice of the U.S. dollar for export invoicing.

ing. In the first step of the analysis a generalised least squares model was built to test the impact of the selected variables on the share of the U.S. dollar in export invoicing. The preliminary form of the regression model was then subjected to a *posteriori* selection procedure. This procedure consists of removing at each step one non-significant process for which the modulus of the parameter significance test statistic (Student's t test) was the smallest, and re-estimating the model until a set of statistically significant processes is obtained (Yum, 2022, p. 1781). On the basis of a *posteriori* selection the variable *Exchange_rate* was removed. In the next step a model was created, which was then subjected to panel diagnostic tests, thanks to which the final selection of the model form and the set of explanatory variables was made (Table 9). Using the Breusch-Pagan test, the hypothesis of the existence of individual effects was verified. The results of the Breusch-Pagan test ordered to reject the null hypothesis in favour of the alternative one ($p\text{-value} < 0.05$), which indicates the necessity of introducing individual effects and the impossibility of applying the classical method of least squares (CLS). In the next step, the selection of the model with individual effects was made using the Hausman test. The time-constant variables test statistic indicates the justified use of panel model estimation with fixed effects. The results of panel model estimation with fixed effects are presented in Table 8.

The estimation results presented in Table 8 indicate that the model is well fitted to the empirical data, R^2 is 97.60%. The estimation results of the model indicate that there is a significant positive effect of reciprocal trade between the analyzed countries and the United States (share of exports to the United States in total exports of the country) on the choice of the U.S. dollar as the unit of account (share of exports invoiced in USD in total exports of the countries). The sign of the coefficient of the variable denoting the share of exports to the U.S. in total exports of countries is positive (the value of the coefficient is 0.206168), which indicates a positive significant ($p < 0.01$) effect of bilateral trade with the U.S. on the choice of the U.S. dollar as the export invoicing currency. That is, a 1 percentage point increase in the share of exports to the U.S. in total exports results in a 0.206168 percentage point increase in the share of the U.S. dollar in invoicing exports (*ceteris paribus*).

The level of inflation in the countries also had a significant impact on the share of U.S. dollar in export invoicing. The sign of the coefficient of the variable denoting inflation is positive (the value of the coefficient is

0.145424), which indicates a positive significant effect of inflation on the choice of the dollar as the currency of export invoicing. This means that a 1 percentage point increase in inflation in the analyzed countries increases the share of the U.S. dollar in export invoicing by 0.145424 percentage points (*ceteris paribus*).

The analysis was then carried out separating two groups of countries: advanced economies (Model 2) and emerging market and developing economies (Model 3). Model 2 verifies whether in the group of 27 advanced economies the selected factors (Export_to_US, CPI_C, Exchange_rate) significantly affect the choice of U.S. dollar for export invoicing. In the first step of the analysis a generalized least squares model was built. Then *a posteriori* selection procedure was carried out, on the basis of which the variable CPI_C was removed as an insignificant factor (worsening the quality of the model). In the next step, a model was created, which was then subjected to panel diagnostic tests, through which the final choice of model form and set of explanatory variables was made (Table 10). Using the Breusch-Pagan test, the hypothesis of the existence of individual effects was verified. The results of the Breusch-Pagan test mandated the rejection of the null hypothesis in favor of the alternative hypothesis (p -value < 0.05), indicating the need for individual effects and the impossibility of using the classical least squares (CLS) method. In the next step, the selection of the model with individual effects was made using the Hausman test. The statistics of the test for the variation of the free expression indicates the justified use of the estimation of the panel model with fixed effects. The results of panel model estimation with fixed effects are presented in Table 10.

The estimation results presented in Table 10 indicate that the model is well fitted to the empirical data, as R^2 is 96.43%. The estimation results of the model indicate that there is a significant negative effect of changes in the exchange rate of domestic currencies against the USD on the choice of the U.S. dollar as the unit of account. The sign of the coefficient of the variable denoting exchange rate changes is negative (the coefficient value is -0.0891596), indicating a negative significant ($p < 0.01$) effect of exchange rate changes on the share of U.S. dollars in export invoicing. That is, a 1 percentage point appreciation of the domestic currency exchange rate causes a 0.0891596 percentage point decline in the U.S. dollar share in export invoicing (*ceteris paribus*). In particular, this seems to be the effect of exchange rate differences: the appreciation of the domestic currency against the USD means a depreciation of the U.S. dollar, i.e. a decrease in

its value, and therefore the value of exports invoiced in USD decreases, which causes a decrease in the share of exports invoiced in USD in total exports. Meanwhile, the *Export_to_US* variable adopted in the model proved to be statistically insignificant ($p > 0.1$).

Based on the analysis of descriptive statistics and Spearman correlations, the following variables were taken into model 3 for emerging market and developing economies: *Export_to_US* and *CPI_C*. Model 3 verifies whether the selected factors (*Export_to_US*, *CPI_C*) significantly affect the choice of U.S. dollar for invoicing exports in the group of 28 emerging market and developing economies. The same research procedure was used as in model 1. The generalized least squares method was used to build the model. *A posteriori* selection procedure did not show the reason of removing any variable. The created model was subjected to panel diagnostic tests, thanks to which the final choice of the model form was made (Table 13). Using the Breusch-Pagan test, the hypothesis of the existence of individual effects was verified. The results of the Breusch-Pagan test mandated the rejection of the null hypothesis in favor of the alternative hypothesis ($p\text{-value} < 0.05$), indicating the necessity of individual effects and the impossibility of using the classical least squares (CLS) method. In the next stage the Hausman test was used to select the model with individual effects. The time-constant variables test statistic indicates that the panel model estimation with fixed effects is justified. The results of panel model estimation with fixed effects are presented in Table 12.

The estimation results presented in Table 12 indicate that the model is well fitted to the empirical data, R^2 is 97.30%. The estimation results of the model indicate a significant positive effect of reciprocal trade between the analyzed countries and the United States (share of exports to the U.S. in the total exports of the country) on the choice of the U.S. dollar as the unit of account (share of exports invoiced in USD in the total exports of the countries). The sign of the coefficient of the *Export_to_US* variable is positive (the value of the coefficient is 0.271566), which indicates a positive significant ($p < 0.05$) effect of reciprocal trade with the United States on the choice of the dollar as the export invoicing currency. That is, a 1 percentage point increase in the share of exports to the U.S. in total exports results in a 0.271566 percentage point increase in the share of the U.S. dollar in invoicing exports (*ceteris paribus*).

The level of inflation in the countries also had a significant impact on the share of the U.S. dollar in export invoicing in emerging market and

developing economies. The sign of the coefficient of the variable denoting inflation is positive (the value of the coefficient is 0.166769), which indicates a positive significant effect of inflation on the choice of the dollar as the currency of export invoicing. This means that a 1 percentage point increase in inflation in the analyzed countries increases the share of the U.S. dollar in export invoicing by 0.166769 percentage points (*ceteris paribus*).

The analyses carried out allow to conclude that the first research hypothesis is confirmed, stating that *trade with the U.S. remains an important factor strengthening the position of the U.S. dollar as an export invoicing currency, despite the declining U.S. share in world trade*. This factor was found to be significant except for advanced economies. In addition, there are differences between advanced economies and emerging market and developing economies in terms of the key factors influencing the choice of the U.S. dollar as the export invoicing currency.

The results of the study also partially confirmed the second research hypothesis that *high inflation in countries as an indication of financial instability in the economy contributes to the choice of the U.S. dollar as the trade invoicing currency*. This factor is important in emerging market and developing economies, while it is not a key factor in advanced economies.

The analyses conducted did not provide evidence to confirm the third hypothesis that *the key factors in the choice of the U.S. dollar as an export invoicing currency are related to the economic conditions, in particular, there is an increase in the use of the U.S. dollar as an export invoicing currency during global financial and economic crises*.

However, it should be kept in mind that a limited set of explanatory variables was adopted for the analysis. The selection of variables was determined by the availability of data for a large number of countries adopted to the model. The choice of other explanatory variables or a change in the form of the model may affect the results obtained.

Discussion

Although the theoretical literature on trade invoicing currency choice factors is rich (from the 1970s onwards, many studies on this topic have been published, among the most recent ones can be pointed out: Coeuré, 2019; Beckmann *et al.*, 2020; Gopinath *et al.*, 2020; Gopinath & Stein, 2021; Mukhin, 2022), the support of theory by empirical research results is not

sufficient, which means there is still a wide research gap in this area. Limitations in the availability of statistical data are a major barrier to carrying out empirical studies, especially using econometric methods. Nevertheless, data compiled in recent years allow such studies to be conducted on an increasing scale. Noteworthy is the comprehensive and up-to-date panel data set on trade invoicing trends in major world currencies developed by Boz *et al.* (2020b) used in this paper. However, these data are also not complete and data for several important economies are missing from this dataset, which is a rather important limitation for the analysis conducted.

Using the above-mentioned data set, the aim of this paper is to test the empirical relevance of various determinants of invoicing currency choice, in particular, macroeconomic factors that have been selected on the basis of the theoretical literature. The results obtained in this paper confirm the conclusions of the work of other authors, which indicate that a key factor determining the positions of the currency in the invoicing of trade transactions is the high share of the issuing country in trade (Eichengreen, 1998; Frankel, 2000; Faudot & Ponsot, 2016). The research conducted in this paper also confirms the paradigm of the dominant currency, which is the US dollar used as the vehicle currency in export settlements. The conclusions of the studies are close to the dominant research trend in the field of international macroeconomics and confirm that most global trade transactions are invoiced in one or only a few currencies: the US dollar and sometimes the euro (Coeuré, 2019; Beckmann *et al.*, 2020; Gopinath & Stein, 2021). Moreover, the results of the analyses confirmed that the share of the US dollar was increasing despite the declining position of the US in world trade. Similar conclusions were reached by the research group of Boz *et al.* (2022). This indicates that in addition to a country's position in world trade, other factors influence the importance of a currency.

The results of the analysis also indicate that factors relating to the stability of the economy may be important, in particular, instability in developing countries increases the share of the dollar as an export invoicing currency, replacing the less stable domestic currency. This would suggest an increase in the use of vehicle currency in the future (Boz *et al.*, 2020a, p. 16). This is also supported by the research of Gopinath *et al.* (2020, pp. 677–719).

However, most studies in the world economic literature focus on the analysis of microeconomic factors, due to the limited availability of detailed cross-sectional and time-series data (panel data). In particular, these studies analyse the relevance of such factors of invoicing currency choice as

the negotiation of trading partners, the structure of the firm's supply chain, the firm's size, exposure to imported inputs, and the currency choices of its competitors as well as demander-specific features (Amiti *et al.*, 2022; Corsetti *et al.*, 2020; Corsetti *et al.*, 2022; Arioldi *et al.*, 2022).

The analyses conducted in this paper, like the study by Boz *et al.* (2022), are based on the same dataset and use panel data regression analysis. However, the paper by Boz *et al.* (2022) the authors focus in particular on the analysis of the exchange rate pass-through effect, while the present paper is devoted to the examination of the significance of macroeconomic factors selected on the basis of theoretical considerations and research results of other authors.

Conclusions

The analysis showed that despite the decreasing share of the United States in world trade, the dollar remains the most important export invoicing currency. The analysis confirmed that the share of the United States in the exports of countries significantly influenced the choice of the U.S. dollar as the invoicing currency for exports. This was especially relevant for emerging market and developing economies, where the level of inflation in the country was also important. Whereas in advanced economies, the exchange rate was the key factor. This may be important for analyzing the transmission mechanism of exchange rate changes on import prices and trade volumes.

Assessing the factors influencing the choice of export invoicing currency can also serve to draw conclusions about the future position of international currencies. The declining share of the United States in world trade is not a factor that will favor the dominant position of the U.S. dollar in the future. However, factors such as stability, confidence and inertia effects are in favor of the dollar. Nonetheless, ongoing changes in the distribution of global economic power and the strengthening of developing countries may provide an important reason for developing countries' currencies to strengthen their position as invoicing currencies. The Chinese yuan seems to have a particularly good chance, especially given the People's Bank of China's plans to introduce Central Bank Digital Currency (CBDC) (Tong & Jiayou, 2021).

The study carried out in this paper contributes to the literature on the currency denomination of trade by suggesting that the dominant currency paradigm is still valid. Furthermore, a distinction is made between factors influencing the choice of invoicing currency depending on the level of economic development of countries. Those features should be included in future theoretical models and used as controls in future empirical research. The analysis can be used as a basis for more detailed and advanced analyses examining the factors that determine the choice of export invoicing currency.

The research findings also have policy implications. They suggest that policymakers who want to support their currency's position in international trade should also pay attention to factors such as macroeconomic stability, price stability as well as the exchange rate, which affects the transmission mechanism of exchange rate changes on import prices and trade volumes. Identifying key factors may be important from the perspective of the changing distribution of global economic power. For now, the dollar is still the number one currency, but the rise of developing countries could change this in the future. One should also keep in mind the numerous initiatives aimed at supporting the position of developing countries' currencies. In particular, such initiatives are carried out by China, which is promoting its yuan, not only by including it in the SDR basket, but recently also supporting the digital yuan initiative, which could become a global medium of exchange (Chorzempa, 2021). This is rather a long-term perspective, as there are political risks associated with the Chinese yuan and its exchange rate is not free. Nevertheless, marketization of the currency and development of the financial market in China could change this situation.

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Annex

Table 1. Variables used in the model and sources of statistical data

Variables	Code	Description	Source	Expected direction of impact
Explained variable				
USD_EX	[1]	The U.S. dollar shares in export invoicing at the country level (in %)	Boz <i>et al.</i> (2020b)	-
Explanatory variables				
Export_to_US	[2]	Share of exports to the United States in total merchandise exports at the country level (in %)	Own calculations based on UNCTAD (2021)	positive
Import_from_US	[3]	Share of imports from the United States in total merchandise imports at the country level (in %)	Own calculations based on UNCTAD (2021)	positive
CPI_C	[4]	Consumer price index, annual average growth rate (in %)	UNCTAD, (2021)	positive
Exchange_rate	[5]	Changes in the exchange rate of the national currency against the U.S. dollar (annual changes, in %). A positive value means appreciation of the domestic currency against the USD, a negative value means depreciation of the domestic currency against the USD.	Own calculations based on UNCTAD (2021)	negative
US_GDP	[6]	Changes in gross domestic product in the United States, constant prices (annual changes, in %)	International Monetary Fund (2020)	positive
US_export	[7]	The United States share in world merchandise exports (in %)	UNCTAD (2021)	positive
US_import	[8]	The United States share in world merchandise imports (in %)	UNCTAD (2021)	positive
US_debt	[9]	The United States general government gross debt (% GDP)	International Monetary Fund (2020)	negative
US_deficit	[10]	The United States general government net lending/borrowing (% GDP)	International Monetary Fund (2020)	negative
US_external_debt	[11]	Federal debt held by foreign and international investors (% GDP)	U.S. Office of Management and Budget and Federal Reserve Bank of St. Louis (2021)	negative
US_CAB	[12]	The United States current account balance (% GDP)	International Monetary Fund (2020)	negative

Table 2. Continued

Variables	Code	Description	Source	Expected direction of impact
US_reserves	[13]	The United States foreign exchange reserves (total reserves excluding gold), (% of world total)	Own calculations based on International Monetary Fund (2021)	positive
US_CPI	[14]	Consumer price index in the United States, annual average growth rate (in %)	UNCTAD (2021)	negative
Crises	[15]	Binary variable: '1' indicates years when there was a global financial crisis and '0' indicates years when there was no crisis.	Author's review	positive

Table 3. Descriptive Statistics: 55 economies

Variable	Valid N	Mean	Median	Minimum	Maximum	Std.Dev.	Coef.Var.
USD_EX	876	44.29	35.13	2.70	100.00	32.37	73.09
Export_to_US	1081	8.47	5.03	0.07	50.40	9.20	108.55
Import_from_US	1081	7.39	3.90	0.46	84.95	9.82	132.95
CPI_C	1080	4.43	2.57	-4.48	101.00	7.61	171.55
Exchange_rate	1078	-1.04	0.00	-67.37	27.84	9.44	-904.14
US_GDP	1100	2.11	2.29	-2.54	4.13	1.43	67.86
US_export	1100	9.01	8.56	7.97	12.12	1.14	12.60
US_import	1100	14.50	13.62	12.28	18.92	2.11	14.53
US_debt	1045	85.72	95.49	53.15	108.68	20.59	24.02
US_deficit	1045	-5.43	-4.56	-13.20	-0.54	3.07	-56.52
US_external_debt	1100	23.59	27.15	9.73	34.50	9.20	38.99
US_CAB	1100	-3.44	-2.91	-5.91	-1.87	1.33	-38.79
US_reserves	1100	1.43	1.16	0.88	2.79	0.65	45.49
US_CPI	1100	2.17	2.20	-0.36	3.84	1.05	48.38
Crises	1100	0.15	0.00	0.00	1.00	0.36	238.16

Table 4. Descriptive Statistics: Advanced Economies (27)

Variable	Valid N	Mean	Median	Minimum	Maximum	Std.Dev.	Coef.Var.
USD_EX	455	30.05	21.20	2.70	89.00	22.96	76.41
Export_to_US	540	7.98	5.31	0.60	40.24	7.35	92.01
Import_from_US	540	5.92	4.46	0.56	23.51	4.62	78.08
CPI_C	540	2.14	1.98	-4.48	15.40	2.00	93.12
Exchange_rate	540	0.49	0.93	-28.87	25.56	8.46	1719.19
US_GDP	540	2.11	2.29	-2.54	4.13	1.43	67.89
US_export	540	9.01	8.56	7.97	12.12	1.14	12.60
US_import	540	14.50	13.62	12.28	18.92	2.11	14.54
US_debt	513	85.72	95.49	53.15	108.68	20.60	24.03

Table 5. Continued

Variable	Valid N	Mean	Median	Minimum	Maximum	Std.Dev.	Coef.Var.
US_deficit	513	-5.43	-4.56	-13.20	-0.54	3.07	-56.55
US_external_debt	540	23.59	27.15	9.73	34.50	9.20	39.01
US_CAB	540	-3.44	-2.91	-5.91	-1.87	1.34	-38.81
US_reserves	540	1.43	1.16	0.88	2.79	0.65	45.51
US_CPI	540	2.17	2.20	-0.36	3.84	1.05	48.40
Crises	540	0.15	0.00	0.00	1.00	0.36	238.27

Table 6. Descriptive Statistics: Emerging market and developing economies (28)

Variable	Valid N	Mean	Median	Minimum	Maximum	Std.Dev.	Coef.Var.
USD_EX	421	59.68	72.75	4.53	100.00	34.00	56.98
Export_to_US	541	8.96	4.21	0.07	50.40	10.72	119.59
Import_from_US	541	8.85	3.29	0.46	84.95	12.94	146.12
CPI_C	540	6.72	4.26	-1.58	101.00	10.07	149.72
Exchange_rate	538	-2.59	0.00	-67.37	27.84	10.10	-390.72
US_GDP	560	2.11	2.29	-2.54	4.13	1.43	67.89
US_export	560	9.01	8.56	7.97	12.12	1.14	12.60
US_import	560	14.50	13.62	12.28	18.92	2.11	14.54
US_debt	532	85.72	95.49	53.15	108.68	20.60	24.03
US_deficit	532	-5.43	-4.56	-13.20	-0.54	3.07	-56.55
US_external_debt	560	23.59	27.15	9.73	34.50	9.20	39.01
US_CAB	560	-3.44	-2.91	-5.91	-1.87	1.34	-38.81
US_reserves	560	1.43	1.16	0.88	2.79	0.65	45.51
US_CPI	560	2.17	2.20	-0.36	3.84	1.05	48.40
Crises	560	0.15	0.00	0.00	1.00	0.36	238.26

Table 7. Spearman Rank Order Correlations for 55 economies

Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
[1]	1.00	0.49	0.44	0.30	-0.13	-0.01	-0.01	-0.02	0.01	0.00	0.02	0.02	-0.02	-0.01	0.02
[2]	0.49	1.00	0.75	-0.01	-0.02	0.08	0.16	0.18	-0.10	0.11	-0.16	-0.10	0.10	0.07	-0.02
[3]	0.44	0.75	1.00	0.03	-0.07	0.02	0.11	0.12	-0.09	0.06	-0.13	-0.06	0.11	0.04	0.03
[4]	0.30	-0.01	0.03	1.00	-0.07	-0.06	-0.12	0.09	-0.29	0.00	-0.25	-0.33	0.12	0.36	0.16
[5]	-0.13	-0.02	-0.07	-0.07	1.00	0.01	-0.22	0.06	-0.25	0.05	-0.18	-0.30	-0.03	0.32	-0.13
[6]	-0.01	0.08	0.02	-0.06	0.01	1.00	0.38	0.38	0.06	0.27	-0.17	-0.18	0.12	0.22	-0.62
[7]	-0.01	0.16	0.11	-0.12	-0.22	0.38	1.00	0.78	-0.17	0.45	-0.49	0.00	0.45	-0.14	-0.11
[8]	-0.02	0.18	0.12	0.09	0.06	0.38	0.78	1.00	-0.61	0.69	-0.84	-0.54	0.37	0.34	-0.04
[9]	0.01	-0.10	-0.09	-0.29	-0.25	0.06	-0.17	-0.61	1.00	-0.42	0.81	0.81	-0.55	-0.42	-0.32
[10]	0.00	0.11	0.06	0.00	0.05	0.27	0.45	0.69	-0.42	1.00	-0.38	-0.31	-0.05	0.22	-0.13
[11]	0.02	-0.16	-0.13	-0.25	-0.18	-0.17	-0.49	-0.84	0.81	-0.38	1.00	0.73	-0.55	-0.49	-0.25
[12]	0.02	-0.10	-0.06	-0.33	-0.30	-0.18	0.00	-0.54	0.81	-0.31	0.73	1.00	-0.31	-0.67	-0.13
[13]	-0.02	0.10	0.11	0.12	-0.03	0.12	0.45	0.37	-0.55	-0.05	-0.55	-0.31	1.00	0.06	0.08
[14]	-0.01	0.07	0.04	0.36	0.32	0.22	-0.14	0.34	-0.42	0.22	-0.49	-0.67	0.06	1.00	0.08
[15]	0.02	-0.02	0.03	0.16	-0.13	-0.62	-0.11	-0.04	-0.32	-0.13	-0.25	-0.13	0.08	0.08	1.00

Note: variables labeled as indicated in Table 1.

Table 8. Spearman Rank Order Correlations: Advanced Economies (27)

Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
[1]	1.00	0.59	0.59	-0.12	-0.48	0.01	0.03	0.01	0.01	0.04	0.01	0.03	-0.01	-0.01	0.00
[2]	0.59	1.00	0.78	-0.15	-0.29	0.08	0.12	0.14	-0.06	0.09	-0.10	-0.06	0.06	0.04	-0.03
[3]	0.59	0.78	1.00	-0.07	-0.34	0.02	0.15	0.15	-0.09	0.07	-0.14	-0.05	0.12	0.03	0.03
[4]	-0.12	-0.15	-0.07	1.00	0.06	-0.08	-0.12	0.18	-0.40	0.01	-0.38	-0.45	0.20	0.53	0.18
[5]	-0.48	-0.29	-0.34	0.06	1.00	-0.13	-0.39	-0.29	-0.01	-0.18	0.16	-0.05	-0.12	0.05	0.09
[6]	0.01	0.08	0.02	-0.08	-0.13	1.00	0.38	0.38	0.06	0.27	-0.17	-0.18	0.12	0.22	-0.62
[7]	0.03	0.12	0.15	-0.12	-0.39	0.38	1.00	0.78	-0.17	0.45	-0.49	0.00	0.45	-0.14	-0.11
[8]	0.01	0.14	0.15	0.18	-0.29	0.38	0.78	1.00	-0.61	0.69	-0.84	-0.54	0.37	0.34	-0.04
[9]	0.01	-0.06	-0.09	-0.40	-0.01	0.06	-0.17	-0.61	1.00	-0.42	0.81	0.81	-0.55	-0.42	-0.32
[10]	0.04	0.09	0.07	0.01	-0.18	0.27	0.45	0.69	-0.42	1.00	-0.38	-0.31	-0.05	0.22	-0.13
[11]	0.01	-0.10	-0.14	-0.38	0.16	-0.17	-0.49	-0.84	0.81	-0.38	1.00	0.73	-0.55	-0.49	-0.25
[12]	0.03	-0.06	-0.05	-0.45	-0.05	-0.18	0.00	-0.54	0.81	-0.31	0.73	1.00	-0.31	-0.67	-0.13
[13]	-0.01	0.06	0.12	0.20	-0.12	0.12	0.45	0.37	-0.55	-0.05	-0.55	-0.31	1.00	0.06	0.08
[14]	-0.01	0.04	0.03	0.53	0.05	0.22	-0.14	0.34	-0.42	0.22	-0.49	-0.67	0.06	1.00	0.08
[15]	0.00	-0.03	0.03	0.18	0.09	-0.62	-0.11	-0.04	-0.32	-0.13	-0.25	-0.13	0.08	0.08	1.00

Note: variables labeled as indicated in Table 1.

Table 9. Spearman Rank Order Correlations: Emerging market and developing economies (28)

Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
[1]	1.00	0.59	0.44	0.35	-0.06	0.00	-0.02	0.01	-0.04	0.01	-0.03	-0.04	0.00	0.04	0.03
[2]	0.59	1.00	0.73	0.11	-0.05	0.10	0.19	0.24	-0.14	0.15	-0.21	-0.14	0.13	0.10	-0.01
[3]	0.44	0.73	1.00	0.15	-0.13	0.01	0.09	0.11	-0.08	0.05	-0.12	-0.06	0.09	0.05	0.04
[4]	0.35	0.11	0.15	1.00	-0.20	-0.05	-0.10	0.09	-0.27	0.02	-0.22	-0.28	0.09	0.29	0.15
[5]	-0.06	-0.05	-0.13	-0.20	1.00	0.04	-0.24	0.03	-0.19	0.02	-0.15	-0.28	-0.07	0.35	-0.12
[6]	0.00	0.10	0.01	-0.05	0.04	1.00	0.38	0.38	0.06	0.27	-0.17	-0.18	0.12	0.22	-0.62
[7]	-0.02	0.19	0.09	-0.10	-0.24	0.38	1.00	0.78	-0.17	0.45	-0.49	0.00	0.45	-0.14	-0.11
[8]	0.01	0.24	0.11	0.09	0.03	0.38	0.78	1.00	-0.61	0.69	-0.84	-0.54	0.37	0.34	-0.04
[9]	-0.04	-0.14	-0.08	-0.27	-0.19	0.06	-0.17	-0.61	1.00	-0.42	0.81	0.81	-0.55	-0.42	-0.32
[10]	0.01	0.15	0.05	0.02	0.02	0.27	0.45	0.69	-0.42	1.00	-0.38	-0.31	-0.05	0.22	-0.13
[11]	-0.03	-0.21	-0.12	-0.22	-0.15	-0.17	-0.49	-0.84	0.81	-0.38	1.00	0.73	-0.55	-0.49	-0.25
[12]	-0.04	-0.14	-0.06	-0.28	-0.28	-0.18	0.00	-0.54	0.81	-0.31	0.73	1.00	-0.31	-0.67	-0.13
[13]	0.00	0.13	0.09	0.09	-0.07	0.12	0.45	0.37	-0.55	-0.05	-0.55	-0.31	1.00	0.06	0.08
[14]	0.04	0.10	0.05	0.29	0.35	0.22	-0.14	0.34	-0.42	0.22	-0.49	-0.67	0.06	1.00	0.08
[15]	0.03	-0.01	0.04	0.15	-0.12	-0.62	-0.11	-0.04	-0.32	-0.13	-0.25	-0.13	0.08	0.08	1.00

Note: variables labeled as indicated in Table 1.

Table 10. MODEL 1. Estimation results of the panel model with fixed effects (FE) using 869 observations (included 55 cross-sectional units, time-series length: minimum 10, maximum 20), dependent variable (Y): USD_EX

Variable	Coefficient	Std. Error	t-ratio	p-value	significance
const	42.0783	0.618366	68.05	<0.0001	***
Export_to_US	0.206168	0.0767900	2.685	0.0074	***
CPI_C	0.145424	0.0405680	3.585	0.0004	***
Mean dependent var		44.24544	S.D. dependent var		32.28119
Sum squared resid		21663.25	S.E. of regression		5.165161
LSDV R-squared		0.976050	Within R-squared		0.026337
LSDV F(57, 811)		590.9287	P-value(F)		0.000000
Log-likelihood		-2630.422	Akaike criterion		5374.845
Schwarz criterion		5646.584	Hannan-Quinn		5478.825
rho		0.703673	Durbin-Watson		0.494146

Note: * p < 0,1; ** p < 0,05; *** p < 0,01

Table 11. Diagnostic tests of the model 1

Test	Test statistic	Interpretation
1 Joint significance of differing group means	F(54, 812) = 395.679 with p-value 0	A low p-value counts against the null hypothesis that the pooled OLS model is adequate, in favor of the fixed effects alternative.
2 Breusch-Pagan test	LM = 4870.93 with p-value = prob(chi-square(1) > 4870.93) = 0	A low p-value counts against the null hypothesis that the pooled OLS model is adequate, in favor of the random effects alternative.
3 Hausman test statistic	H = 53.7137 with p-value = prob(chi-square(2) > 53.7137) = 2.16879e-012	A low p-value counts against the null hypothesis that the random effects model is consistent, in favor of the fixed effects model.

Table 12. MODEL 2. Estimation results of the panel model with fixed effects (FE) for advanced economie using 455 observations (included 27 cross-sectional units, time-series length: minimum 10, maximum 20), dependent variable (Y): USD_EX

Variable	Coefficient	Std. Error	t-ratio	p-value	significance
const	29.4081	0.856113	34.35	<0.0001	***
Export_to_US	0.0921446	0.107739	0.8553	0.3929	
Exchange_rate	-0.0891596	0.0266218	-3.349	0.0009	***
Mean dependent var		30.04885	S.D. dependent var		22.96018
Sum squared resid		8539.866	S.E. of regression		4.477347
LSDV R-squared		0.964318	Within R-squared		0.027238
LSDV F(28, 426)		411.1756	P-value(F)		1.3e-288
Log-likelihood		-1312.693	Akaike criterion		2683.387
Schwarz criterion		2802.875	Hannan-Quinn		2730.460
rho		0.767242	Durbin-Watson		0.386100

Note: * p < 0,1; ** p < 0,05; *** p < 0,01

Table 13. Diagnostic tests of the model 2

Test	Test statistic	Interpretation
1 Joint significance of differing group means	F(26, 426) = 259.595 with p-value 7.36085e-243	A low p-value counts against the null hypothesis that the pooled OLS model is adequate, in favor of the fixed effects alternative.
2 Breusch-Pagan test statistic	LM = 3176.93 with p-value = prob(chi-square(1) > 3176.93) = 0	A low p-value counts against the null hypothesis that the pooled OLS model is adequate, in favor of the random effects alternative.
3 Hausman test statistic	H = 16.2456 with p-value = prob(chi-square(2) > 16.2456) = 0.000296694	A low p-value counts against the null hypothesis that the random effects model is consistent, in favor of the fixed effects model.

Table 14. MODEL 3. Estimation results of the panel model with fixed effects (FE) for emerging market and developing economies using 414 observations (included 28 cross-sectional units, time-series length: minimum 10, maximum 20), dependent variable (Y): USD_EX

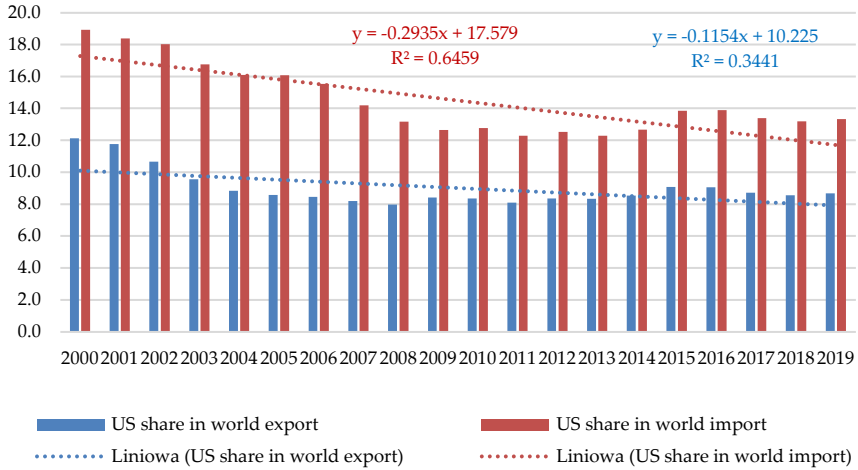
Variable	Coefficient	Std. Error	t-ratio	p-value	significance
const	56.7689	0.884744	64.16	<0.0001	***
Export_to_US	0.271566	0.109122	2.489	0.0132	**
CPI_C	0.166769	0.0477689	3.491	0.0005	***
Mean dependent var		59.84798	S.D. dependent var		33.83123
Sum squared resid		12781.22	S.E. of regression		5.769265
LSDV R-squared		0.972961	Within R-squared		0.051152
LSDV F(57, 811)		476.4772	P-value(F)		2.9e-281
Log-likelihood		-1297.423	Akaike criterion		2654.846
Schwarz criterion		2775.622	Hannan-Quinn		2702.609
rho		0.656660	Durbin-Watson		0.587298

Note: * p < 0,1; ** p < 0,05; *** p < 0,01

Table 15. Diagnostic tests of the model 3

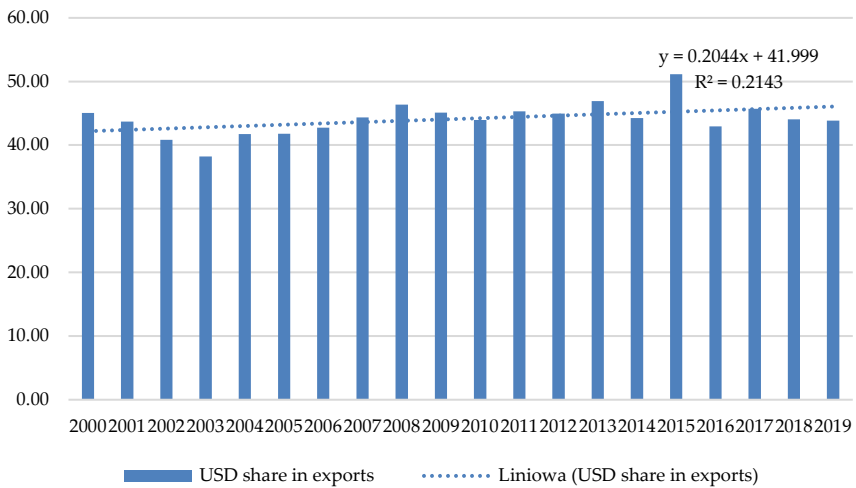
Test	Test statistic	Interpretation
1 Joint significance of differing group means	F(27, 384) = 341.546 with p-value 6.60924e-250	A low p-value counts against the null hypothesis that the pooled OLS model is adequate, in favor of the fixed effects alternative.
2 Breusch-Pagan test statistic	LM = 2466.65 with p-value = prob(chi-square(1) > 2466.65) = 0	A low p-value counts against the null hypothesis that the pooled OLS model is adequate, in favor of the random effects alternative.
3 Hausman test statistic	H = 20.6228 with p-value = prob(chi-square(2) > 20.6228) = 3.3252e-005	A low p-value counts against the null hypothesis that the random effects model is consistent, in favor of the fixed effects model.

Figure 1. U.S. shares in world exports and imports (in %)



Source: own calculations based on UNCTAD (2021).

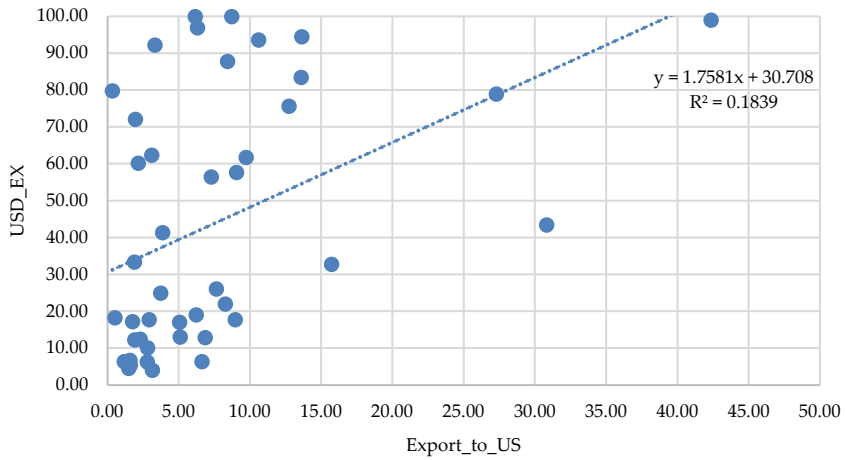
Figure 2. U.S. dollar share of international export invoicing (in %)



Note: the share of exports that are invoiced in U.S. dollars in 55 countries for which invoicing data are available; hence the trade shares shown exclude the exports of several large countries, including China and Mexico.

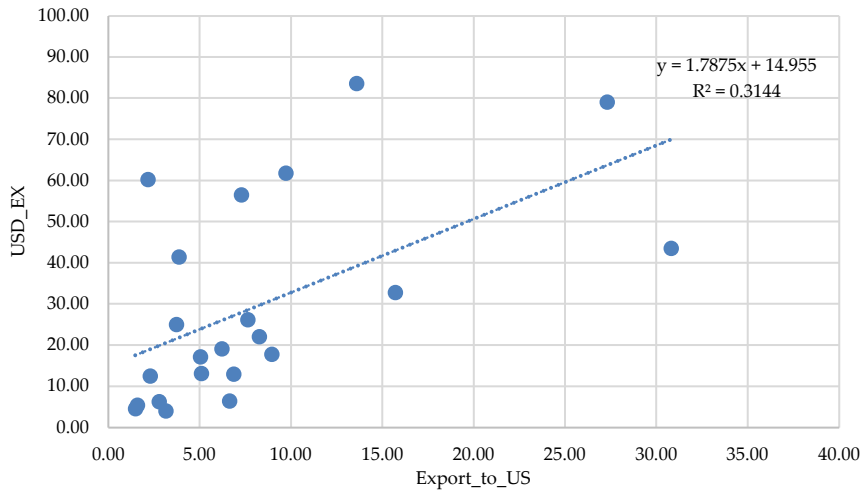
Source: own calculations based on (Boz *et al.*, 2020b)

Figure 3. The relationship between the U.S. dollar share in export invoicing and the U.S. share in exports of 55 countries in 2019 (in %)



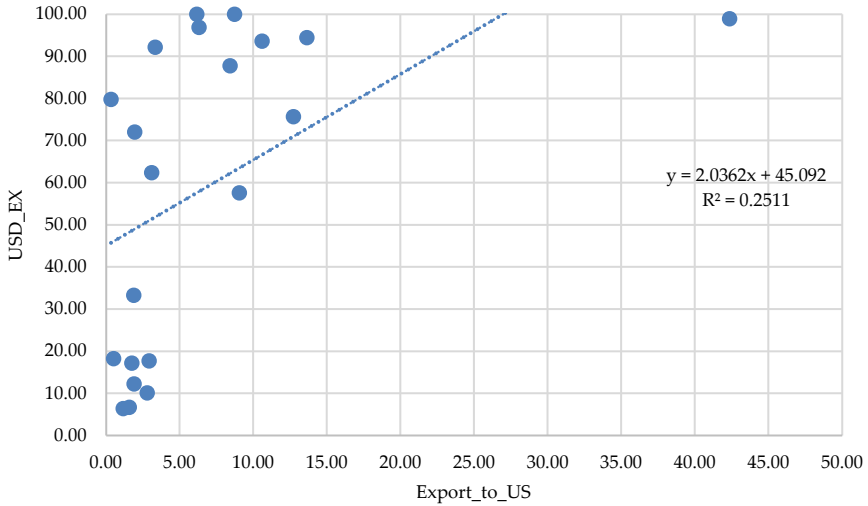
Source: own calculations based on UNCTAD (2021); Boz *et al.* (2020b).

Figure 4. Relationship between U.S. dollar share in export invoicing and U.S. share in exports of 27 advanced economies in 2019 (in %)



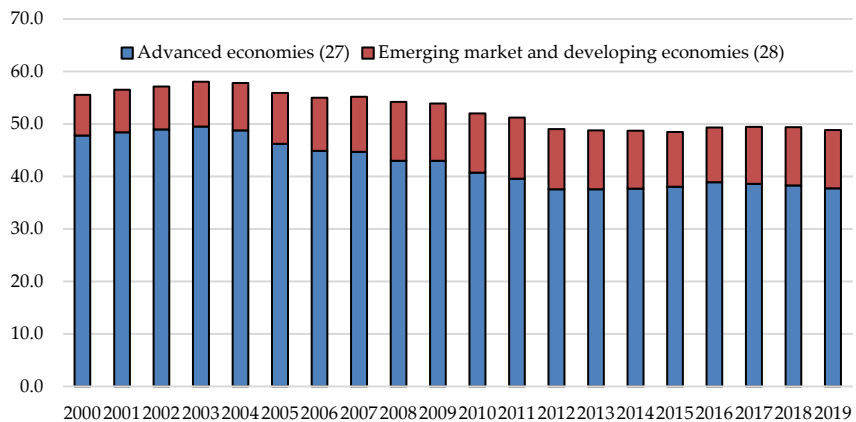
Source: own calculations based on UNCTAD (2021); Boz *et al.* (2020b).

Figure 5. Relationship between U.S. dollar share in export invoicing and the United States share in exports of 28 emerging market and 27 developing economies in 2019 (in %)



Source: own calculations based on UNCTAD (2021); Boz *et al.* (2020b).

Figure 6. Share of the analysed group of 55 countries in world merchandise exports in 2000–2019 with a division into advanced economies and emerging market and developing economies (in %)



Source: own calculations based on UNCTAD (2021).