WHAT DRIVES INVOICING CURRENCY CHOICES?

A COUNTRY-LEVEL STUDY OF INVOICING IN INTERNATIONAL TRADE

Bachelor's thesis written by Theo Sjögreen Gleisner.

Supervised by Thomas Fischer.

Department of Economics, Lund University School of Economics and Management.

August 2022.

CONTENTS

Abstract

This paper examines the effects of key macroeconomic and trade variables on invoicing currency patterns. Departing from common model assumptions of complete local currency pricing or partner country pricing, the existing analytical and empirical literature suggests a range of macroeconomic and strategic determinants of internationally trading actors' currency usage. Using panel data on trade invoicing currency spanning 24 countries from 2010 to 2016, I examine the effects of key economic variables on export invoicing currency choices on a country level. My main analysis consists of linear panel regressions with subsequent coefficient tests, where yearly country-level data on euro, dollar, and home currency invoicing shares is used along with data on inflation, economy size, trade openness, and US as well as euro area prominence as trade partners. I find evidence that higher inflation is associated with less home currency invoicing and more US dollar invoicing; that higher trade openness is associated with less home currency invoicing and more invoicing in the US dollar and the euro; and that the US and the euro area's prominence as export destinations positively affects invoicing shares in their respective currencies.

1. INTRODUCTION

Macroeconomic models involving the exchange rate typically rely on exogenously assumed invoicing currencies in trade. In the original Mundell-Fleming frameworks created in the early 60's, producer currency pricing was assumed, meaning exports were assumed to be invoiced in the exporting partner's currency. Today, it is more common to assume local currency pricing, i.e. invoicing in the importing country's currency. However, research on currency choices in international trade shows that for a large share of trade, neither of these assumptions hold true. In particular, the common practice of international invoicing in neither of the trading countries' home currency, but instead in a third, internationalized currency, has become a topic of interest for economic research, since world trade is dominated by a small set of currencies.

Most prominently, the dollar is used globally as such a "vehicle currency", which contributes to its status as a global dominant currency in bank funding, reserve holdings and corporate borrowing, among other things. It does however face competition regionally and globally from currencies such as the euro, which is often regarded as an example of a regional dominant currency. This latter term – dominant currencies – is one that has arisen in the analytical literature in attempts to explain observations of international markets, industries or value chains converging around certain currencies.

As the question of currency usage in trade carries great economic and political significance, uncovering the driving forces behind international invoicing currency patterns has increasingly become a topic for economic research. Such research has typically been conducted at the level of firms' invoicing choices, often focusing on trading firms in a particular country. In this paper, I instead take a country-level approach to examine determinants of currency choices, exploring the effects of key economic variables on invoicing patterns, to further a broad understanding of the international price system.

Using panel data from Boz et al (2020), examining yearly data from 2010 to 2016 on a set of 24 countries, I study the impact of inflation, trade openness, economy size, and trade flows on invoicing currency shares with respect to home currency, the dollar, and the euro. Although

data is available for both export invoicing and import invoicing, the statistical analysis and discussion in this paper will focus on export invoicing.

Among other things, my findings indicate that inflation has a negative impact on home currency invoicing and a positive impact on US dollar invoicing; that a higher degree of trade openness has a negative impact on home currency invoicing and a positive impact on dollar as well as euro invoicing; and that the prominence of the US or the euro area as trade partners have a positive impact on the use of their respective currencies.

I will now briefly outline the structure of this paper.

In section 2, I present a literature review of the works that have inspired and served as background to this one. Section 2.1 focuses on the analytical literature, describing attempts from the economic research community to model and theorize on the driving forces and implications of currency use in trade. Section 2.2 focuses on the empirical literature, describing researchers' exploration of different determinants of currency choice. Section 2.3 presents some stylized facts on currency use in world trade, retrieved from Boz et al (2020).

In section 3, I utilize arguments and findings presented in section 2 to formulate hypotheses on currency choices that can then be passed on to empirical scrutiny. Section 4 discusses the data used in my analysis and the collection process.

In section 5.1, some initial statistical analysis of the material is carried out. This includes a correlation matrix for the selection of explanatory variables, some basic visualization of the data, and Spearman rank correlations for explanatory variables vis á vis importing and exporting currency shares of the euro, the dollar, and the home currency of each country.

For the regression analysis (section 5.2 and 5.3), I restrict the analysis to export invoicing patterns, testing the hypotheses created in section 3. Section 5.2 presents my findings on home currency use, and section 5.3 presents my findings on dollar and euro use. In section 5.4, an overview of the main regression outputs is summarized and presented as tables.

In section 6, the results from section 5 are condensed into a discussion comparing them to my hypotheses and drawing conclusions. Finally, in section 7, some considerations for future research are presented along with some reflection on the limitations of this study.

2.1. REVIEW OF THE THEORETICAL LITERATURE

A common starting point for theories on invoicing currency choices is that of exchange rate risk and the asymmetric way in which it affects trade partners based on invoicing currency under the assumption of price stickiness. For example, Donnenfield and Zilcha (1991) set up a sequential model with an exporting firm that sells a homogenous product in both domestic and foreign markets. The exporting firm first selects output and then prices. The exchange rate, which is here treated as a stochastic variable, subsequently becomes known, at which point orders arrive and shipments are made. The authors compare a scenario where prices are set in the importer's currency to one where prices are set in the exporter's currency and draw conclusions about the conditions under which the respective strategies become dominant. Under importer currency pricing, exchange rate changes do not affect the demanded quantity in the importing country as the price is determined in the first stage; thus, exporters can plan for a quantity of exports given the price they set abroad. Here, the exporter's revenue fully absorbs exchange rate appreciation or depreciation. On the contrary, if prices are set abroad in the exporter's currency, the demanded export quantity is contingent upon the realization of the exchange rate. Here, the precommitment to prices before knowing the exchange rate is important; as the total output is also selected in the first time period, the firm cannot be sure that it will satisfy both foreign and domestic demand. In the model this is interpreted as the firm serving foreign markets first.

From this model, the authors then draw conclusions about which strategy will become dominant. They argue that exporting in the importer's currency will be the dominant strategy, and argue that it yields higher profits, larger output and lower prices relative to the scenario with exporter currency pricing, which is a result driven by the precommitment to prices before

sales are made. They also argue that an increased exchange rate risk will lead to a higher share of importer currency pricing.

Donnenfield and Haug (2002) expand on the model with the possibility of using a vehicle currency. They argue that this is a less desirable option than using either importer or exporter currency pricing, as this leads to larger fluctuations in the effective exchange rate.

This style of reasoning about invoicing currency choices, which places emphasis on preferences on exchange rate pass-through into prices and demand, is employed in a large part of the analytical literature. Beyond this, however, economists have theorized about other determinants of currency choice. Amiti, Itskhoki and Konings (2021) build on a theoretical framework similar to that of Donnenfield and Zilcha (1991) and extend it to allow for strategic complementarities in invoicing currency choice. They argue that firms' marginal costs and desired markups stable in producer currency favor producer currency pricing, while marginal costs and markups that respond to exchange rates favor the use of foreign currencies. For example, importing intermediate inputs in dollars favors the use of dollars in exports; in other words, there is linkage between import currency and export currency.

Amiti, Iskhoki and Konings also formulate a model to consider a number of other possible determinants of currency choice. These include cases where a currency is considered costly to adopt, which can, for example, stem from macroeconomic country-level risk (such as risk of depreciation or unexpected inflation). Their model also allows for the need of firms to adopt the same invoicing currency across many destinations for exports or where using different currencies in different locations is costly. This allows for currency linkages not only between imports and exports, but also between exports to different destination countries.

A variety of other determinants of invoicing currency choice have been explored in the theoretical literature, of which some examples will be presented now. Baccetta and van Windcoop (2005) present a theoretical framework whereby they show that the larger an exporting country's market share in foreign industry, the more likely it is that trade is invoiced in the exporter's currency. Magee and Rao (1980) hypothesize that traders prefer to invoice in the currencies of low-inflation countries. Matsuyama, Kiyotaki and Matsui (1993) show

analytically that the high degree of economic integration of the European Union has a positive effect on invoicing in the currencies of the union, and argue that participation in an economic union makes it more likely to use currencies of that union. These and other results are presented as a series of hypotheses in Ligthart and da Silva (2007).

2.2. REVIEW OF THE EMPIRICAL LITERATURE

The empirical body of literature on invoicing currency choice has grown greatly from the 1990s and onwards. Earlier works include Grassman (1976), who studied Swedish and Danish invoicing currency choices and concluded that exports tended to be invoiced in the exporter's currency (producer currency pricing). Grassman found little evidence of large-scale internationalization of the dollar for invoicing purposes, as vehicle-currency pricing overall played a subordinate role compared to producer currency pricing or consumer currency pricing in trade. Later studies have generally come to a different conclusion, reflecting the fact that vehicle currency pricing has become far more common; as for Grassman's study in particular, Friberg (1993) compared current Swedish invoicing currency data at the time to the data used by Grassman, concluding that dollar use had almost doubled, that vehicle currency pricing had become far more common and that invoicing in SEK had fallen sharply, casting doubt on the Grassman rule.

The empirical literature on invoicing currency choices mainly uses a firm-level approach, analyzing pricing currency as a firm-level choice with determinants based in the characteristics of the firm, of the goods they export or import, of the sector it operates in and of its competition.

Ito et al (2013) examine Japanese firms' invoicing choices using questionnaire data from Japanese export firms. They conclude, among other things, that invoicing choice depends on whether it is intra-firm trade or arms-length trade, where intra-firm trade implies a higher use of destination currency pricing; that a high world market share in a given product predicts a higher share of exporter currency pricing; and that regional Japanese production subsidiaries in Asia tend to choose US dollar invoicing as long as they export finished goods to countries outside the region.

Crowley, Han & Son (2020) study UK extra-EU trade, and conclude that firms with more years of export experience use a larger variety of invoicing currencies, and that the share of firms that invoice more than half of their extra-EU exports increases in the firm's tenure as an exporter and experience with invoicing in dollars. They find evidence of strategic complementarities in currency choice, such that UK exporters are more likely to use dollars if more UK competitors use dollars. Likewise, they find that firms entering a new destination are more likely to adopt dollars if they have previously used dollars more in their existing export. Furthermore, they find that the currency denomination of imported inputs have a significant role in determining export currency, such that a higher share of imports invoiced in dollars is associated with a higher share of exports invoiced in dollars.

Goldberg & Tille (2009) analyze a data set of Canadian import transactions and come to a number of findings about firms' currency choices. Exporters in industries where demand is more price-sensitive tend to coalesce more around a single currency, whether that be the Canadian dollar or the US dollar. Exporters from countries with more volatile exchange rates use their home currency to a lesser degree. Exporters in industries with heavier reliance on US dollar-priced inputs (such as oil) are more likely to invoice in US dollars. Canadian imports from countries with a high market share in the given industry are priced in that country's home currency to a higher degree.

Furthermore, they find evidence of influence from macroeconomic variables, both on country level and over time. Exports from countries with currency pegs to the US dollar are more likely to be invoiced in US dollars, while producer currency pricing is stronger among Eurozone exporters. They find that all exporters use producer currency pricing to a higher degree in industries with a larger presence of Eurozone exporters and use vehicle currency pricing to a larger degree when Chinese exporters have a large presence.

Ligthart and da Silva (2007) analyze panel data of invoicing in Dutch goods trade covering 1987-1998. They find that the share of exporter currency pricing falls if demand in the foreign export market falls. They further find that a more developed banking sector and a larger share in world trade of the partner country predicts a lower share of invoicing in the Dutch currency. A higher

expected rate of inflation in the partner country increases the share of invoicing in Dutch currency. A higher share of vehicle currency use is related to depth of foreign exchange markets and share in world trade of the partner country, as well as whether the partner country is part of the EU.

Donnenfield and Haug (2002) examine invoicing currencies in exports to the US from 1996 to 1998 on country level. They find that the share in world trade and the relative size of a country (measured in GNP) have no significant impact on invoicing currency choices. They do, however, find that closeness to the US and exchange rate risk have a positive and significant impact on invoicing in dollars.

Amiti, Itskhoki and Koning (2020) examine a range of determinants of currency choice using a data set for Belgian firms. First, they study firm-level determinants and find that firms using a larger share of extra-euro area intermediate inputs and have a larger destination sales share among Belgian competitors are more likely to invoice in currencies other than the euro. They also find that import-intensive firms are more likely to adopt non-euros in their export transactions only if imports are themselves priced in non-euros. They then move on to study strategic complementarities in currency choice. They find a large and statistically significant coefficient on competitor currency choice, suggesting that firms adopt the same export currencies as their competitors in the same export location. Additionally, they examine a few more potential determinants of invoicing currency choice. They find evidence that firms tend to prefer using the same currency over different export markets, suggesting that there are costs associated with using several currencies. Another finding of importance to this paper is that of vehicle currency use and FDI flows: the authors use inward and outward FDI variables to proxy for the firm's integration with global value chains, and find that both correlate positively with the use of the dollar in exports.

2.3. STYLIZED FACTS ABOUT CURRENCY USE IN WORLD TRADE

The analysis carried out below draws to a large extent on data provided by Boz et al (2020), compiled for the IMF working paper *Patterns in Invoicing Currency in Global Trade.* Here, some

stylized facts about currency use in international trade are presented that also serve as an appropriate backdrop for my analysis.

First, the use of the dollar far exceeds the US share in world commodities and services markets. For most of their examined countries, the share of exports going to the US is much smaller than the share of exports invoiced in dollars, speaking to the dominant status of the US dollar globally. The euro does not have the same status, with the share of exports denominated in euros being similar to the share of exports going to euro area countries; however, non-euro area European countries, as well as some African countries, use the euro for invoicing more than just their exports to the euro area, speaking to a regionally dominant status of the euro.

Second, some trends in invoicing currency patterns are worth noting. US dollar invoicing shares have remained quite stable over time. For the most part, this result also holds at the regional and country-group level. Euro invoicing shares are also stable overall, with the exception of a sharp increase in non-euro area European countries.

However, the authors also note that the number of countries whose share of dollar-invoiced exports has increased is significantly smaller than the number of countries whose dollar invoicing share has decreased. For the euro, the opposite tendency is observed, with euro invoicing having increased in more countries than it has decreased in, mainly due to a pronounced rise in the euro's prominence throughout the euro area's immediate neighborhood.

3. THEORY & HYPOTHESES

The literature on invoicing currency choices gives support for a range of macroeconomic variables that warrant exploration. Broadly speaking, the literature highlights two types of considerations on the part of exporting and importing actors that influence currency choice. First, there are the considerations regarding what could be described as properties of the currencies themselves. For example, exporters and importers may use currency choices to hedge against exchange rate fluctuations and may base their currency choices on the stability of the currency's purchasing power.

The other strand of literature emphasizes complementarities in currency use and properties of the importing or exporting actors that may influence their currency choice. For example, there may be complementarities in currency choice such that traders wish to use the same currency across multiple export or import partners, or such that they wish to import and export in the same currency (which in turn creates an impetus for value chains to be homogenized with respect to currency use); there may be complementarities such that traders wish to use the same currency as their competitors, or other firms in the region (industry-wide or regional homogenization of currency use). To the same rough category of driving forces, factors such as an actor's previous experience of using a given currency could be added; the theme here is that of fixed costs associated with the use of additional currencies.

In order to conduct exploratory research on country level, I select some of the variables that the theoretical literature discusses. As previous economic thinking on the topic has mainly been conducted on firm level, I present some informal reasoning below for each of the variables I select, and construct hypotheses around how they might affect the share of a country's use of home currency, use of the euro, and use of the dollar.

Inflation in home currency prices. According to the "Bilson-Magee" hypothesis, as outlined in Ligthart and da Silva (2007), says that traders (including importers) in high-inflation countries prefer to invoice in the currencies of low-inflation countries. More specifically, they argue that a high inflation *risk* entails a higher propensity for traders to start quoting prices in either the partner country's currency (if inflation in the partner country is low) or in a third currency, as the variability of the value of contracts denominated in home currency increases. I hypothesize that the level of inflation has a generally negative impact on home currency invoicing and a positive impact on vehicle currency invoicing, as more rapidly shifting price levels lead to the currency becoming less attractive to traders, assuming that currency stability is generally preferable when negotiating forward-looking contracts.

Hypothesis 1. Economies with a higher (lower) rate of domestic price inflation use a lower (higher) share of home currency invoicing and a higher (lower) share of dollar and/or euro

invoicing in international trade.

Trade openness of the country. In line with Ligthart and da Silva (2007) and Amiti, Itskhoki and Koning (2020), I reason that a close integration with the international economy generates firm-level and country-level experience and institutional accommodation of the use of currencies other than home currency. As such, trade openness should predict a greater use of currencies other than home currency. Furthermore, if trading firms use a large share of internationally imported intermediary goods and services, or generate revenue to a large degree through exports to other countries, this may promote complementarities in currency choice such that they are more likely to adopt currencies that dominate the value chains and industries they are part of.

Hypothesis 2. Countries with a higher (lower) degree of trade openness use a lower (higher) share of home currency invoicing and a higher (lower) share of dollar and/or euro invoicing in international trade.

Size of the economy. I reason that a larger economy could lead to domestic markets being able to provide a larger share of intermediary inputs that trading firms use, and that a larger demand-side economy could make firms more oriented towards domestic markets. This would promote the use of home currency, promoting complementarities in currency use such that firms become more prone to use the home currency in foreign markets as well.

Ligthart and da Silva (2007), among others, have argued that a larger share in world trade could lead to a higher degree of home currency invoicing in trade. I reason that a larger economy, as measured by GDP, could also be viewed as an indicator of a larger share in world trade.

Hypothesis 3. Larger (smaller) economies use a higher (lower) share of home currency invoicing and a lower (higher) share of dollar and/or euro invoicing in international trade.

Trade flows. In general, a foreign economy having a prominent position as a trade partner should lead to that same economy's currency assuming a higher share of the home country's total invoicing. This could happen for a variety of reasons. If trade with country X increases and substitutes to some degree for trade with country Y, then the use of the home currency of country X will overtake some share of the use of country Y's currency, so long as not all trade is denominated in our home country currency or a third country's currency. This effect, in turn, could be amplified by strategic complementarities in invoicing currency choice. Among previous studies that have emphasized trade flows as a determinant of invoicing currency choice is Baccetta and van Windcoop (2005).

Additionally, trade flows may to a degree proxy for other variables that affect invoicing currency patterns, such as geographical location (which was found by Donnenfield and Haug (2002) to affect invoicing currency choices).

Hypothesis 4. Economies with a higher (lower) US share of trade invoice international transactions to a higher (lower) degree in US dollars and to a lower (higher) degree in home currency.

Hypothesis 5. Economies with a higher (lower) euro area share of trade invoice international transactions to a higher (lower) degree in euros and to a lower (higher) degree in home currency.

As mentioned in the introduction, the statistical analysis and subsequent discussion will focus on export invoicing data.

4. DATA SOURCES & DATA COLLECTION PROCESS

Regarding invoicing currencies in international trade, the main source of data for this paper is the tables compiled by Boz et al. (2020) for the paper Patterns in Invoicing Currency in Global Trade (an IMF working paper). This is the largest compilation of invoicing currency data to date,

covering 102 countries from 1990 to 2020. It provides invoicing shares for the euro, the dollar, home currency, and an "other currencies" category, and accounts this for imports and exports separately. The data collection process used by Boz et al. (2020) relies on a variety of government agencies and data collecting entities. For the EU, the data comes from data collection processes carried out by the ECB. For non-EU countries the data collection relies on a combination of sources publicly available on the internet and requested data from national authorities that collect it.

The data provided in Boz et al. (2020) has the issue of being unbalanced with respect to time coverage in different countries; whereas some countries have data from the 1990s and on to the late 2010s, some only have data for a few consecutive years, and for many pairs of countries the time series coverage does not overlap at all. From the tables provided by Boz et al. (2020), I extracted the countries where data is available in multiple categories for five or more consecutive years. Here, I exclude countries that do not have their own home currency (mainly the euro area countries), or that for other reasons do not have any data on home currency invoicing shares. All in all, this leaves me with 29 countries to construct a panel from, spanning 432 observations in total. As we will see below, however, the number of available observations decreases considerably due to the unbalanced nature of the data when I attempt to create a panel suitable for regression analysis.

I then compiled data on a number of variables of interest, including economy size, trade openness, inflation and trade flows. In order to operationalize economy size I use the logarithm of GDP, and in order to operationalize trade openness I use the export share of total GDP. I operationalize trade flows by using data on the share of a given country's total exports that go to the US and the euro area respectively.

For data on GDP as well as exports and imports as share of GDP, I have used Penn World Tables (2019). The GDP measure I use is expenditure-side real GDP at chained PPPs (in mil. 2017US$). For inflation data, I have used The World Bank's database World Development Indicators data on GDP deflator inflation (World Bank, 2022). For data on import and export shares to and from the US and the Euro area respectively, I have used UNCTADstat's trade structure data (UNCTAD,

2021). They provide merchandise trade matrices from 1995 to 2020 in United States dollars. Trade flows (i.e. the euro area and the US share as trade partner for each country) have been computed as the US and euro area's respective shares of the relevant country's total trade with the world, separated into export and import.

In creating a panel of data suitable for running regressions, the main challenge has been to find a trade-off between including as many observations as possible in the panel, while keeping it sufficiently balanced for regression analysis. In practical terms, this means finding a series of years that includes as many consecutive years as possible and where data is available for as many countries as possible, while retaining a sufficiently balanced structure. The time series I decided on was 2010 to 2016. Here, data is available for 24 different countries, although the coverage is not complete for all countries. On the import side, this provides 147 observations to carry out the analysis with. On the export side, the panel provides 152 observations for home currency export share, 154 observations for the euro export share, and 155 observations for the US dollar export share.

The countries present in my analysis are: Australia, Argentina, Chile, Iceland, Indonesia, Israel, Japan, Kazakhstan, Malaysia, Mongolia, Morocco, New Zealand, Norway, Paraguay, Russia, Serbia, South Korea, Thailand, Turkey, Ukraine, Bosnia & Herzegovina, Botswana, Colombia, and Switzerland. One benefit of this set of countries is that it is varied with respect to size, geographic location and degree of economic development, thus constituting a good cross-section of types of economies around the world. Tables of the data I have compiled on these countries are found in Appendix D.

5.1. RESULTS PT. 1: STATISTICAL OVERVIEW AND DESCRIPTIVE STATISTICS

First, I create a series of box plots depicting export invoicing shares for each year to visualize time-dependent variance in the data material. Although some time variation is present, the shares are quite stable throughout the examined time range. In general, the data presents high invoicing shares for the US dollar and low invoicing shares for home currency and the euro.

Depicted below are the box plots for home currency; for its dollar and euro counterparts, see Appendix A. The lack of time-dependent variance among observations, especially when examining home currency invoicing shares, raises the question of whether time-dependence should be included in the regression models that will be presented in the sections below; for more on this, see section 5.2 and 5.3.

Next, I plot the same invoicing shares, but now visualizing the country-dependent variance. Here, I am mainly looking to discern whether observations are clustered by country, which appears to be the case. Depicted below is the plot for home currency; see Appendix A for dollar and euro plots.

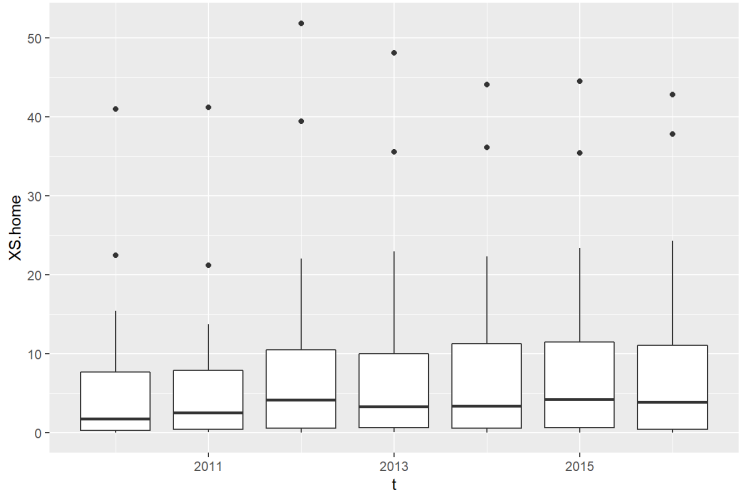

Figure 1. Box plots of home currency invoicing shares over time. For dollar and euro counterparts, see Appendix A.

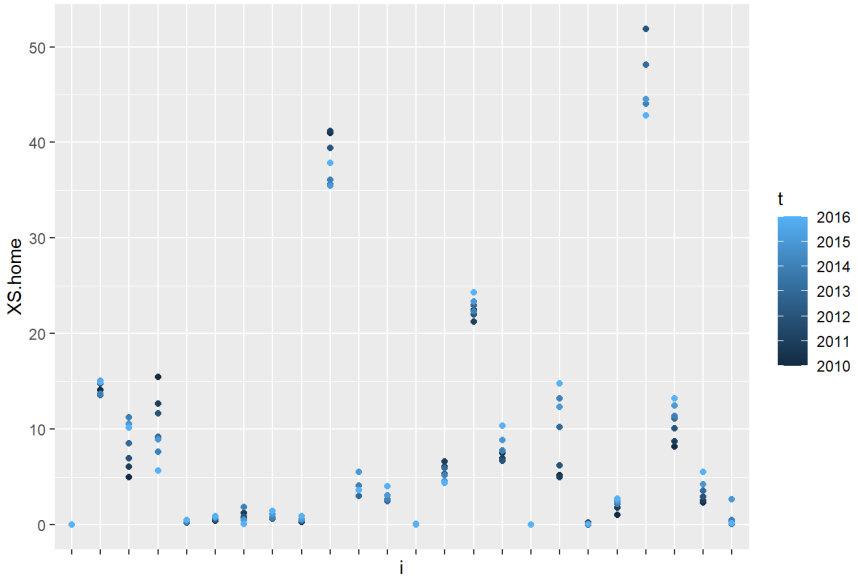

Figure 2. Box plots of home currency invoicing shares by country. For dollar and euro counterparts, see Appendix A.

I compute a correlation matrix for all the explanatory variables that will be used in the analysis, in order to check for multicollinearity in the model. Here, as well as moving forward, the notation is as follows: the variable g denotes economy size as measured by the logarithm of GDP; p denotes GDP deflator inflation; o denotes trade openness as measured by the total export share of GDP; EURx denotes the share of the country's GDP going to the euro area; and USx denotes the share of exports going to the US.

Variable:	g	p	o	EURx	USx
g	1	0.02892	-0.175	-0.3674	0.28862
p	0.02892	1	-0.36079	-0.12629	-0.2217
o	-0.175	-0.36079	1	0.152599	0.026115
EURx	-0.3674	-0.12629	0.152599	1	-0.32148
USx	0.28862	-0.2217	0.026115	-0.32148	1

Matrix 1. Correlation coefficients between the explanatory variables. Also presented in Appendix B.

Correlations roughly range between 0.29 and -0.37. Notably, there seems to be correlation between economy size (g) and the trade flows variables (EURx and USx), where the larger economies in the data set have a higher share of exports going to the US and a lower share of exports going to the euro area. There also appears to be a negative correlation between trade openness and inflation. I take the multicollinearity that is present to be sufficiently low to not render the regression outputs below obsolete.

In order to gain further visual oversight of the material that will be used in regression analysis below, I plot each of the dependent variables (i.e. the invoicing shares) with each of the explanatory variables (those presented above). This first visualization of the material gives cause for concern about heteroskedasticity in the residuals as I run the regressions. Presented below is the scatter plot for home currency export share and economy size, as an example of how these plots look. Here, the countries in the data set are color coded, and we see clear grouping by country. The full set of scatter plots is presented in Appendix A.

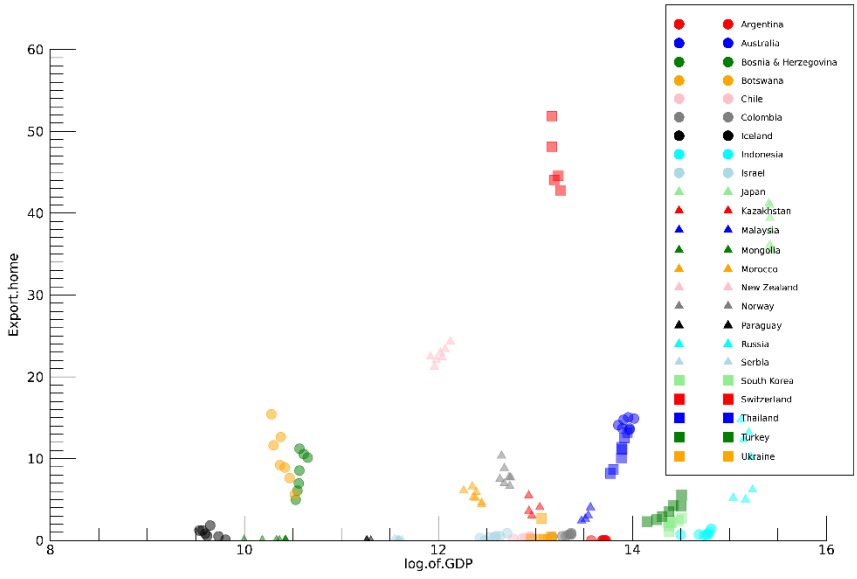

Figure 9, from Appendix A. Home currency export share (y axis) and logarithm of GDP (x axis). Countries coded by color.

In order to carry out a cursory analysis of the material that does not hinge on assumptions

about distribution, I collect spearman rank correlations for each of the independent variables on each of the dependent variables. This is done separately for each year to account for the hierarchic structure of the data (so that rank numbers are only assigned among countries). Here, I also include import shares, although these will not be included in the later analysis. Below is the spearman rank correlation matrices for years 2012 and 2014; for other years, see appendices.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.4561404	0.2438596	0.3631579	0.3385965	-0.3666667	-0.2526316
p	-0.1701754	-0.7245614	0.2263158	0.2578947	0.0947368	-0.0929825
EURm	0.1192982	0.1052632	-0.6087719	-0.5684211	0.9350877	0.8175439
EURx	0.022807	-0.0157895	-0.6157895	-0.5210526	0.8719298	0.8824561
USm	0.4526316	-0.0333333	0.4929825	0.4035088	-0.1070175	-0.145614
USx	0.4017544	0.1877193	0.4982456	0.4087719	-0.3631579	-0.1631579
o	0.522807	0.4824561	-0.2263158	-0.0263158	0.0035088	0.0473684

Spearman rank correlations, year 2012. Also presented in Appendix B.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.4432524	0.2761152	0.474873	0.1326934	-0.3540373	-0.1733484
p	-0.4105025	-0.5189159	0.2874082	0.5177866	-0.3167702	-0.3721062
EURm	0.1552795	0.1168831	-0.6442688	-0.7075099	0.9548278	0.8068888
EURx	-0.0841333	0.0242801	-0.6713721	-0.526821	0.7255788	0.689441
USm	0.4443817	0.0254094	0.4793902	0.2399774	-0.1530209	-0.1157538
USx	0.4398645	0.1259176	0.552795	0.1812535	-0.4116318	-0.0694523
o	0.3833992	0.3280632	-0.1948052	-0.0909091	0.0468662	-0.0468662

Spearman rank correlations, year 2014. Also presented in Appendix B.

Some notable observations can be made from this first analysis. Some results are consistent with my hypotheses; for example, the larger economies (as measured by the logarithm of GDP) appear to invoice both imports and exports to a larger extent in home currency and to a lower extent in euro, and higher inflation is negatively correlated with home currency invoicing share and positively correlated with USD invoicing share. Share of imports and exports coming from

and going to the euro area is strongly positively correlated with euro invoicing share, and vice versa for the US holds true.

However, for the trade openness variable, the results appear to contradict the hypotheses. Here, we see a positive Spearman correlation between the export share of GDP and home currency invoicing shares, as well as a negative correlation with USD import shares. Another result that contradicts the hypotheses is the positive Spearman correlation between economy size and USD import shares; yet another one is that inflation appears to correlate negatively with euro invoicing shares.

It is possible that some of the latter results will be discarded when moving into the multivariate analysis; for example, as we saw in the correlation matrix, the larger countries in my data set tend to trade more with the US and less with the euro area, which could explain why the larger countries also invoice to a higher degree in US dollars. I will thus leave further analysis to sections below.

5.2. RESULTS PT. 2: REGRESSION ANALYSIS ON HOME CURRENCY USE

In order to test my hypotheses on home currency export invoicing, I specify two versions of a linear regression model with fixed effects for country (denoted i) and year (denoted t) as follows:

(1) $$XS_{i,t}^{home} = \beta_1 + \beta_2 p_{i,t} + \beta_3 o_{i,t} + \beta_4 g_{i,t} + \beta_5 USx_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

(2) $$XS_{i,t}^{home} = \beta_1 + \beta_2 p_{i,t} + \beta_3 o_{i,t} + \beta_4 g_{i,t} + \beta_5 EURx_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

Where p is inflation (measured as GDP deflator inflation), o is trade openness (measured as export share of GDP), g is economy size (measured as the logarithm of GDP), and USx and EURx are my trade flows variables (measured as the US and euro area's respective share as export destination). Here, α signifies the individual- (country-) specific effect and γ signifies the time-

(year-) specific effect. These effects are introduced to control for country-specific and year-specific circumstances – such as difficult-to-measure institutional properties in the former case, and international economic trends and fluctuations in the latter – that are not captured by the explanatory variables, but that nonetheless affect invoicing currency choices in each country at each time point. Note that tables of regression outputs for section 5.2 and 5.3 are presented in section 5.4.

Starting with regression 1, a Kolmogorov-Smirnov test yields that residuals follow a normal distribution overall; however, a Breusch-Pagan test reveals that residuals are heteroskedastic (see Appendix C, table 1).

The first coefficient test, using White-adjusted robust standard errors, yields that all explanatory variables have a significant impact. Consistent with my hypotheses, inflation, trade openness and US share as export destination all predict lower use of home currency invoicing. Contrary to my hypothesis, however, economy size appears to have a negative impact on home currency export invoicing.

I run the regression again, now with small sample-adjusted clustered standard errors. When doing so, coefficients all remain the same compared with the previous regression, but standard errors increase such that only the trade openness variable now has a significant (negative) impact.

Moving to regression 2, Kolmogorov-Smirnov and Breusch-Pagan tests likewise yield that the residuals follow a normal distribution overall but are heteroskedastic (see Appendix C). A coefficient test with White-adjusted standard errors return coefficients similar to those in regression 1, with all explanatory variables continuing to have a negative impact on home currency export shares. When running regression 2 with small sample-adjusted clustered standard errors, the only explanatory variable that has a significant impact is the trade openness one (as was the case for regression 1).

Since the box plots presented in section 5.1 indicated that the time-dependent variance in home currency export share is small, I proceed to test the statistical significance of the year-specific fixed effects. F tests of the time specific effects show that they do not significantly

improve the model fit for regression 1 or 2. I therefore redo the original regression tests using White-adjusted robust standard errors, but now without the fixed effects for year. When doing so, economy size loses statistical significance both in the case of regression 1 and regression 2. See Appendix C for these additional tests.

F tests for the country-specific fixed effects are also carried out; here, however, the fixed effects clearly improve model fit for all regressions.

5.3. RESULTS PT. 3: REGRESSION ANALYSIS ON USE OF THE US DOLLAR AND THE EURO

In order to test my hypotheses about the dollar and euro share of exports, I specify two linear regressions with fixed effects for country and year. The notation here reflects that of the previous section. As seen below, the regression describing the US dollar invoicing share controls for US share as export partner, whereas the one for euro invoicing share controls for euro area share as export partner. As noted in section 5.2, all regression outputs are summarized in a table in chapter 5.4.

(3) $$XS_{i,t}^{USD} = \beta_1 + \beta_2 USx_{i,t} + \beta_3 o_{i,t} + \beta_4 g_{i,t} + \beta_5 p_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

(4) $$XS_{i,t}^{EUR} = \beta_1 + \beta_2 EURx_{i,t} + \beta_3 o_{i,t} + \beta_4 g_{i,t} + \beta_5 p_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

Starting with regression 3, a Kolmogorov-Smirnov test yields that residuals follow a normal distribution overall, but a Breusch-Pagan test reveals that they are heteroskedastic. The same is the case for regression 4 (see Appendix C).

I run regression 3 with White-adjusted robust standard errors. Consistent with my hypotheses, inflation, trade openness and US share as export destination all have significant positive impact. Contradicting my hypothesis, however, economy size also has a significant and positive impact. I run regression 3 again, now with small sample-adjusted clustered standard errors. The

estimated standard errors increase such that inflation and economy size now are the only explanatory variables that show significance (see section 5.4).

I run regression 4 with White-adjusted robust standard errors. All explanatory variables except for inflation show significance. This time, all coefficients are consistent with my hypotheses. When running the regression with small sample-adjusted clustered standard errors, estimated standard errors increase such that only economy size shows a significant impact (see section 5.4).

Unlike the findings on home currency invoicing shares, fixed effects for year do significantly increase R-squared in the case of regression 3 and regression 4. I will therefore proceed without testing additional versions of these regressions. As in section 5.2, I note that the country-specific fixed effects clearly improve the model fit for all regressions.

5.4. REGRESSION OUTPUT TABLES

First up below is the regression output table with significance levels retrieved from coefficient tests using White-adjusted robust standard errors. To give a reminder of what each of the four regression specifications include: regression 1 describes home currency export invoicing shares and includes the US share as export destination, whereas regression 2 describes home currency export invoicing shares and includes the euro area share as export destination; regression 3 describes euro export invoicing shares, and regression 4 describes dollar invoicing shares. All four regressions use the two-way fixed effects estimator to account for country-specific and year-specific effects that are otherwise uncontrolled for. Statistical significance at the 10% level is indicated using a period mark; significance at the 5% level using an asterisk; and significance at the 1% level using two asterisks.

Next, we have the same regression outputs, but now with coefficients tested using small sample-adjusted clustered standard errors. Note that coefficients remain the same, whereas significance levels change.

Something to be noted as I proceed to the discussion is the rather low R-squared statistic retrieved from the regressions, indicating that although the regressions do explain some of the

variance in the material, the models I use are quite far from a comprehensive explanation of invoicing currency patterns.

	Regression 1	Regression 2	Regression 3	Regression 4
Inflation	-0.0758 (*)	-0.0781 (*)	0.1315 (*)	-0.0179
Economy size	-6.6708 (.)	-6.5141 (*)	20.0861 (**)	-9.3545 (**)
Trade openness	-0.1316 (**)	-0.1388 (**)	0.1984 (*)	-0.0894 (*)
US trade share	-0.1362 (.)		0.1842 (.)	
EA trade share		-0.1419 (**)		0.1156 (*)
R^2	0.1498	0.1998	0.1533	0.1033

Regression table 1. Coefficient tests of each of the four main regressions (section 5.2 and 5.3) using White-adjusted robust standard errors. All regressions use the two-way fixed effects estimator with respect to country and year.

	Regression 1	Regression 2	Regression 3	Regression 4
Inflation	-0.0758	-0.0781	0.1315 (*)	-0.0179
Economy size	-6.6708	-6.5141	20.0861 (**)	-9.3545 (**)
Trade openness	-0.1316 (.)	-0.1388 (.)	0.1984	0.0894
US trade share	-0.1362		0.1842	
EA trade share		-0.1419		0.1156
R^2	0.1498	0.1998	0.1533	0.1033

Regression table 2. Coefficient tests of each of the four main regressions (section 5.2 and 5.3) using small sample-adjusted clustered standard errors. Regressions use the two-way fixed effects estimator with respect to country and year.

6. DISCUSSION OF RESULTS

Below follows my discussion comparing results to the hypotheses created in section 3. Having restricted the regression analysis to export invoicing shares as dependent variable, the discussion below also focuses on the export side.

Hypothesis 1: inflation. Some evidence in support of hypothesis 1 is found in the regression analysis, as GDP deflator inflation appears to have a negative impact on home currency

invoicing and a positive impact on dollar invoicing. Throughout regressions 1, 2, and 3, the coefficient on inflation is in line with this hypothesis, with a significant impact when using White-adjusted robust standard errors. When using clustered standard errors, inflation shows a positive impact in regression 3 (analyzing dollar invoicing shares), which is also consistent with hypothesis. As for euro invoicing (regression 4), the coefficient on GDP deflator inflation is negative (which contradicts my hypothesis); however, this effect is not statistically significant.

This could suggest that high-inflation economies tend to invoice less in home currency, and that the US dollar is the go-to currency to use instead of home currency when inflation is high (insofar as the partner country's currency is not used).

The insignificant impact of inflation on euro invoicing is interesting. This difference between US dollar and euro invoicing patterns was also observed in the Spearman rank correlation tables computed in section 5.1: here, there is a clear difference where high-inflation countries tend to invoice more in dollars but less in euros. As just mentioned, it could be that the US dollar (and not the euro) is the go-to substitute currency when inflation is high for the countries included in the panel. It could also be that countries with deepened ties to the euro area, and thereby a higher share of euro invoicing, tend to have lower inflation, for example due to euro area inflation pass-through into domestic prices or because these countries adopt fiscal and/or monetary prudency from the euro area countries.

A third explanation is that the countries in the data set with the deepest ties to the euro area (for example Norway and Switzerland) are also countries with well-functioning monetary institutions. Such effects should in part be captured by the country-specific fixed effects, but could still have an impact on the results.

Hypothesis 2: trade openness. Evidence in support of hypothesis 2 is found throughout the regression analysis. The coefficient on trade openness (here measured as export share of GDP) is consistently in line with hypotheses, with a negative effect on home currency invoicing shares and a positive impact on dollar and euro invoicing shares. The impact is statistically significant in all regressions when using White-adjusted robust standard errors. When using clustered

standard errors, the effect is significant in regressions 1 and 2 (pertaining to home currency invoicing shares).

It thus appears that the results from the Spearman correlation tables computed in section 5.1 – which contradicted my hypothesis – are not robust to multivariate examination, and that more open economies do indeed tend to trade more in foreign currencies.

Hypothesis 3: economy size. The results on economy size are more difficult to interpret than the ones for inflation and trade openness, as the logarithm of GDP shows both effects consistent with my hypotheses and effects that contradict my hypotheses throughout the regression analysis.

On one hand, economy size appears to have a negative effect on euro invoicing share, a result that is significant both when using White-adjusted robust standard errors and when using clustered standard errors, which is consistent with my hypothesis.

On the other hand, economy size shows a negative coefficient on home currency invoicing share, and a positive coefficient on dollar invoicing shares (the former being statistically significant only when using White-adjusted robust standard errors; the latter also being statistically significant when using clustered standard errors), which contradicts my hypotheses. The result that larger economies tend to invoice more in US dollars is also borne out by the Spearman correlation matrices computed in section 5.1.

It should be mentioned here, that when removing the time-fixed effects in regression 1 and 2 (as they cannot be shown to significantly increase R-squared; see Appendix C), the influence of economy size on home currency invoicing shares becomes statistically insignificant. Taken together, the results on the effects of economy size on home currency invoicing are perhaps best viewed as inconclusive.

One possible explanation for the influence of economy size on dollar invoicing that there is some background variable that is not controlled for. It might, for example, be the case that the larger countries in the data set are geographically closer to the US; or that for some other reason the larger countries in the data set have political ties to the US, which in turn could lead

to a greater degree of dollar invoicing. This picture is supported by the correlation matrix presented in section 5.1, where it is shown that economy size correlates positively with US share as export destination and negatively with euro area share as export destination. As with the discussion of inflation, I will note that such effects should in part be captured by the country-specific fixed effects (and would probably be highly correlated with the trade flows variables) but could still have an impact on the results.

Another possible explanation is that there is a causal connection from US dollar invoicing shares to economy size; that is, that more US dollar invoicing leads to higher economic growth. Although such speculation lies outside the scope of this paper, it is not to be precluded. All in all, the findings from the regressions analysis remain somewhat inconclusive on the role of economy size as a determinant of invoicing patterns.

Hypothesis 4: trade flows. Throughout the regression analysis, the coefficients on US or euro area share as export destination remain consistent with my hypotheses. Greater trade flows to the US appear to predict a higher share of dollar invoicing, and vice versa holds for trade flows to the euro area; likewise, either variable appears to have a negative impact on home currency invoicing share. These results show statistical significance when using White-adjusted robust standard errors, but not when using clustered standard errors.

Recalling that the initial Spearman rank correlation computations seemed to suggest a positive impact of US share as export destination on home currency invoicing, it now appears that this result is not robust to multivariate analysis. Although the statistical significance of my findings on trade flows' impact on invoicing currency shares is rather weak, the regression analysis presents some evidence that the US or euro area presence as trading partners matters for the use of the euro and the dollar internationally.

7. CONSIDERATIONS FOR FUTURE RESEARCH

This exploratory study of the determinants of invoicing currency patterns raises some questions for further studies and carries some limitations that will be discussed below.

Among the results discussed in section 6, the findings that diverge from my hypotheses are mainly on inflation (where high inflation does not appear to predict a higher degree of euro invoicing), and economy size (where larger economies appear to trade more, not less, in US dollars). Regarding the impact of inflation, it might have been helpful to use inflation from an earlier time period (i.e. inflation at t – 1 instead of inflation at time t), in order to get closer to an understanding of which direction the causal connection goes. Concerning the inconclusive results on economy size, it is possible that the country's share in world trade, instead of GDP, would have higher explanatory power. I reasoned in section 3 that economy size would proxy for the country's share in world trade, which is not necessarily the case.

Regarding both euro and US dollar invoicing shares, an explanatory variable that could have been of interest is geographical distance to the euro area and the US respectively. Another explanatory variable of potential interest is FDI flows. In part, the reason why these variables were not included above is because they were both assumed to be proxied for to some degree by the trade flows variables included. Nonetheless, for future studies these areas are relevant for understanding invoicing currency patterns.

A general limitation of this study is that there is no way to discern currency shares in trade between specific pairs of countries. To exemplify what this means, consider the trade flows variable: here, there is no telling whether increased trade with the US leads to a higher degree of dollar invoicing in trade with countries other than the US (i.e. if the dollar gains a greater role as vehicle currency), or if the increased dollar usage is limited to trade with the US. Vice versa is, of course, also the case for the euro. To resolve this question, a more advanced study – mapping out invoicing currency patterns in greater detail – would be required, which would in turn require the collection of microdata which may not be available at this moment.

Furthermore, some discussion is warranted concerning the data panel. Ideally, both longer time series and a wider range of countries would have been used, although the inclusion of data is limited by the unbalanced nature of the data that is available. One suggestion for a more thorough study of the Boz et al (2020) panel is to split the data into different time periods, with

different sets of countries being present in each one. This would allow for the use of more countries while retaining sufficiently balanced data for regression analysis.

One potential extension that lies close to hand moving from this paper would be the inclusion of an analysis on import invoicing. The dynamics of import and export invoicing respectively need not necessarily reflect one another for a given country. Trading firms may have different currency preferences for exports and imports, and country-level factors such as position in production chains could create differing currency needs for importing and exporting.

As mentioned in section 5.4, the low R-squared statistics of the regressions give reason to explore options or extensions to the regression specifications, such as those discussed above. There is also the question of whether linear regression analysis is suitable for the questions at hand here. For some of the explanatory variables, there is likely an endogenous relation to invoicing currency shares; for example, inflation may affect home currency invoicing shares, which in turn affects inflation spillovers from trade partner countries, leading to an endogeneity issue when using regression analysis. For this reason, recent analytical literature on the topic uses more elaborate endogenous models – see, for example, the equilibrium model presented by Muhkin (2022) – than the ones presented here.

Nonetheless, the findings in this paper present a case for country-level macroeconomic and trade variables influencing invoicing currency choices in international trade, and indicate that national and central bank policy affect the international usage of the currencies they are tied to.

The Boz et al (2020) data set is of great value to economists wishing to carry out data-driven research on the international price system and serves as a basis for future collecting of more data on the subject. This study is perhaps best viewed as a rough example of how the panel they provide can be used in conjunction with other country-level data sets to investigate currency use patterns. Hopefully, it provides some pointers for more comprehensive research using better data mining techniques and utilizing more of the available data.

SOURCES

Amiti, M., Itskhoki, O. and Konings, J. (2020). Dominant Currencies: How Firms Choose Currency Invoicing and Why it Matters, NBER working paper 27926, National Bureau of Economic Research.

Baccetta, P. and van Windcoop, E. (2005). A Theory of the Currency Denomination of International Trade, Journal of International Economics, Vol. 67, No. 2, pp. 295-319.

Boz, E., Casas, C., Georgios, G., Gopinath, G., Le Mezo, H., Mehl, A., Nguyen, T. (2020). Patterns in Invoicing Currency in Global Trade, IMF Working Paper No. 2020/126. International Monetary Fund.

Crowley, M. A., Han, L. and Son, M. (2020). Dominant Currency Dynamics: Evidence on Dollar Invoicing from UK Exporters. CEPR Discussion Paper No. DP15493. Centre for Economic Policy Research. Revised Feb 2022.

Donnenfeld, S. and Haug, Alfred A. (2002). Currency Invoicing of U.S. Imports, working paper 2002-11, York University, Department of Economics, revised April 2002.

Donnenfeld, S. and Zilcha, I. (1991). Pricing of Exports and Exchange Rate Uncertainty, International Economic Review Vol. 32, No. 4, pp. 1009-1022.

Feenstra, R. C., Inklaar, R., and Timmer, M. P. (2015). The Next Generation of the Penn World Table, American Economic Review, Vol. 10, No. 10, pp. 3150-3182.

Friberg, R. (1996). On the Role of Pricing Exports in a Third Currency, SSE/EFI Working Paper Series in Economics and Finance, Vol. 128, Stockholm School of Economics.

Goldberg, L. S. and Tille, C. (2009). Micro, Macro, and Strategic Forces in International Trade Invoicing, FRB of New York Staff Report No. 405. Federal Reserve Bank of New York.

Grassman, S. (1976). Currency distribution and forward cover in foreign trade: Sweden revisited, 1973, Journal of International Economics, Elsevier, Vol. 6, No. 2, pp. 215-221.

Ito, T., Koibuchi, S., Sato, K., and Shimizu, J. (2013). Choice of Invoicing Currency: New evidence from a questionnaire survey of Japanese export firms, RIETI Discussion Paper Series 13-E-034, Research Institute of Economy, Trade and Industry.

Kiyotaki, N., Matsui, A. and Matsuyama, K. (1993). Toward a Theory of International Currency, The Review of Economic Studies, Vol. 60, No. 2, pp. 283-307.

Ligthart, J. E., Da Silva, J. (2007). Currency Invoicing in International Trade: A Panel Data Approach, CentER discussion paper, Vol. 2007-25, Department of Economics, Tillburg University.

Magee, Stephen P. and Rao, Ramesh K. S. (1980). Vehicle and Nonvehicle Currencies in International Trade, The American Economic Review, Vol. 70, No. 2, pp. 368-373.

Muhkin, Dmitry (2022). An Equilibrium Model of the International Price System, The American Economic Review, Vol. 112, No. 2, pp. 650-88.

UNCTAD (2021). Merchandise trade matrices in United States dollars, annual, 2006-2020. Available from UNCTADstat Data Center, International merchandise trade, Trade Structure: https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx [Accessed online June 2022].

World Bank (2022). World Development Indicators. Available from the World Bank DataBank: https://databank.worldbank.org/source/world-development-indicators. [Accessed online June 2022]

APPENDIX A: PLOTS OF INVOICING CURRENCY SHARES ON EXPLANATORY VARIABLES

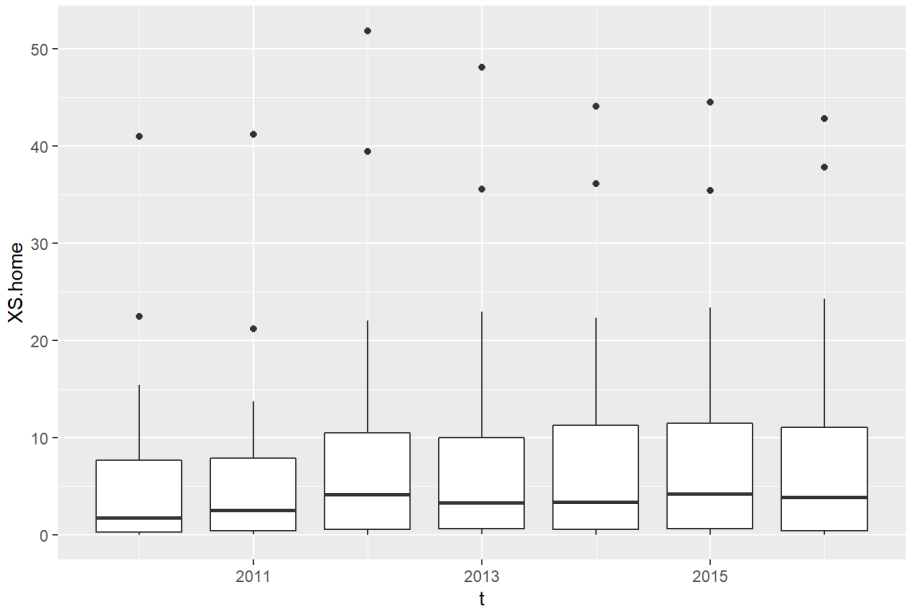

Figure 1. Box plots of home currency export share over time.

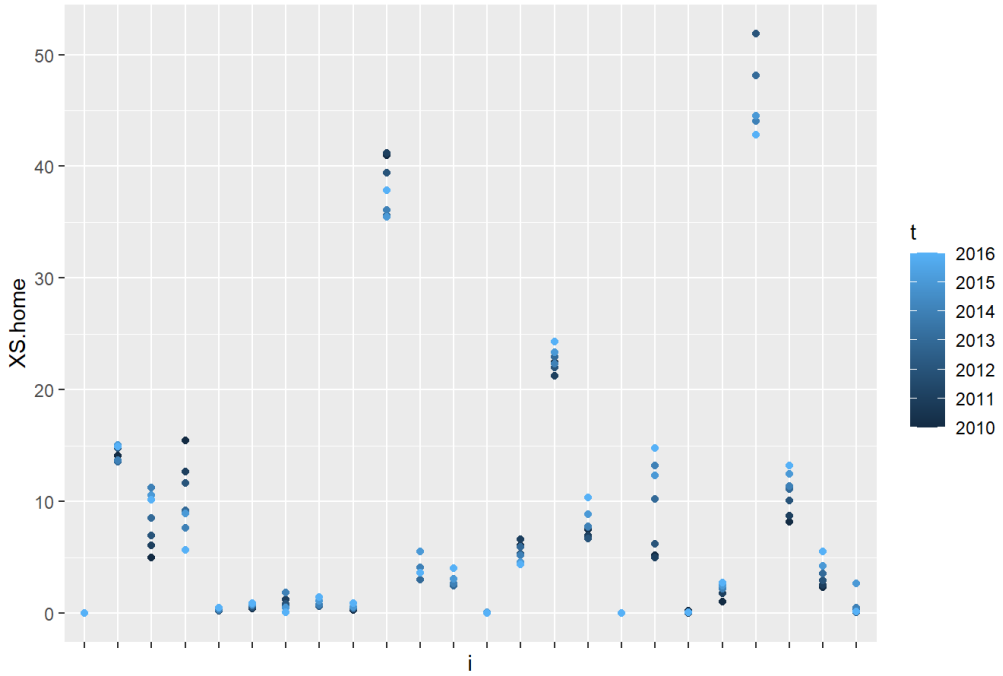

Figure 2. Home currency export share by country. Years coded by color.

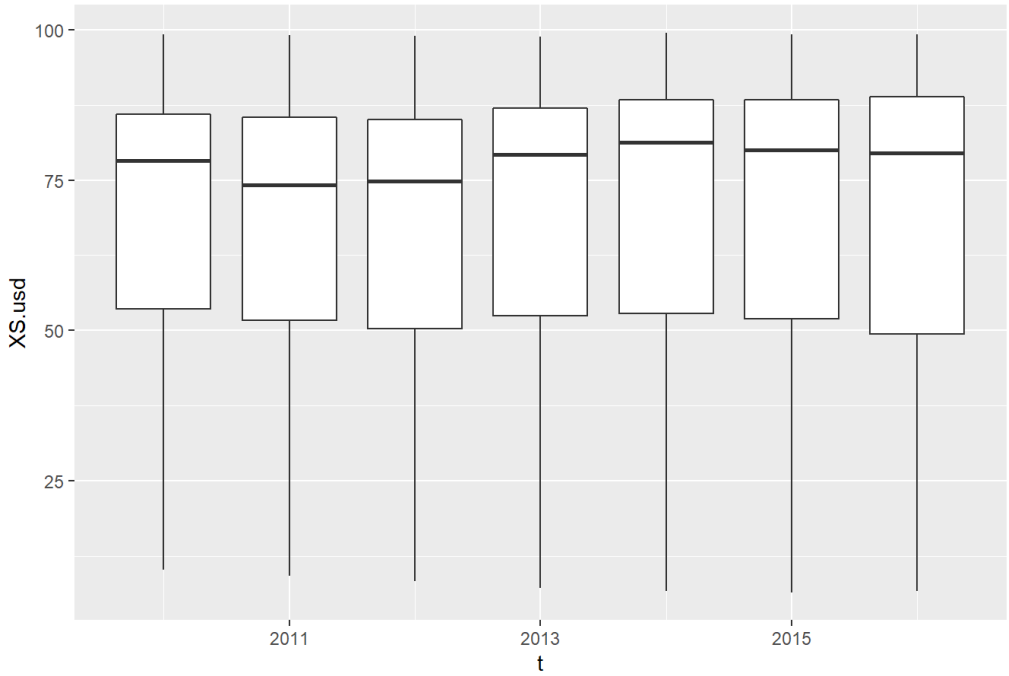

Figure 3. Box plots of US dollar export shares over time.

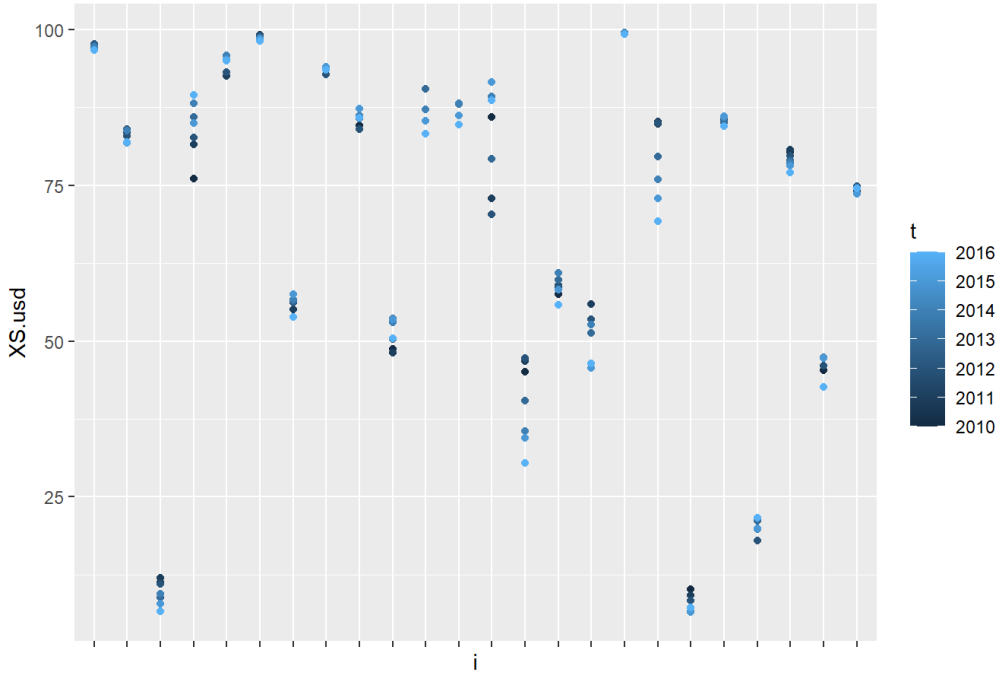

Figure 4. US dollar export shares by country. Years coded by color.

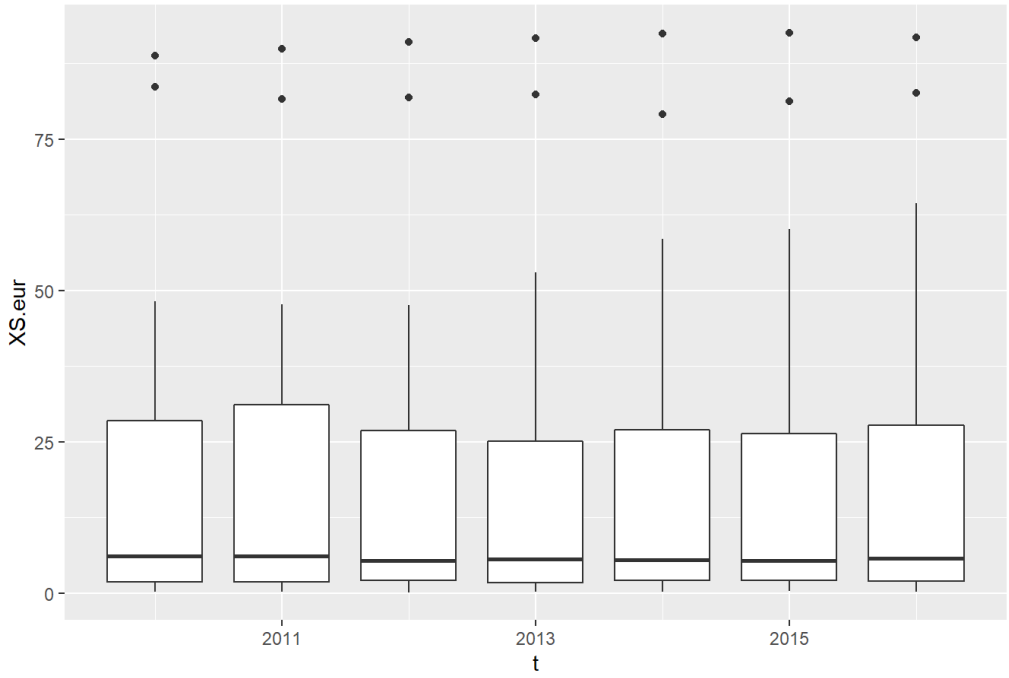

Figure 5. Box plots of euro export shares over time.

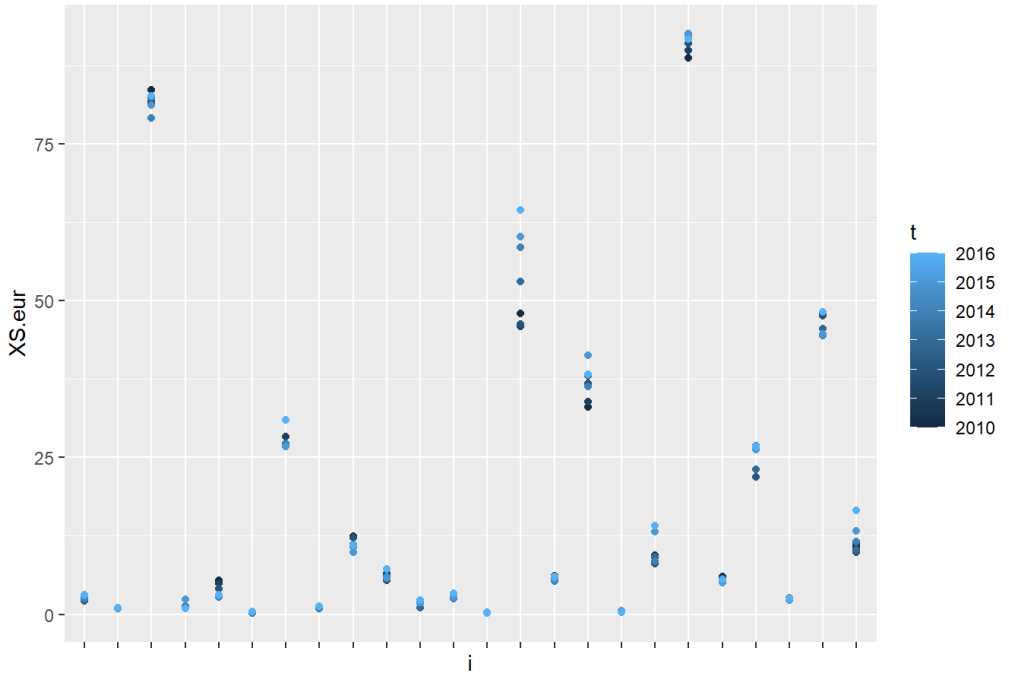

Figure 6. Euro export shares by country. Years coded by color.

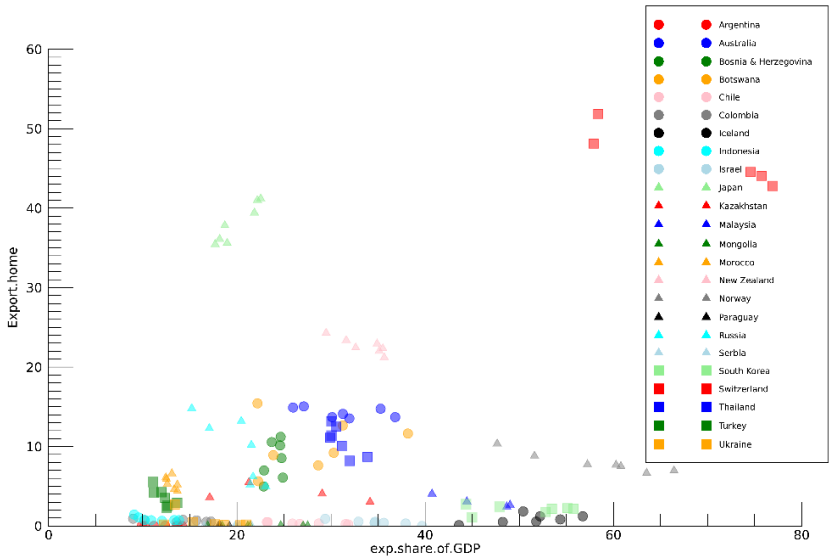

Figure 7. Export share of GDP and home currency export share. Countries coded by color.

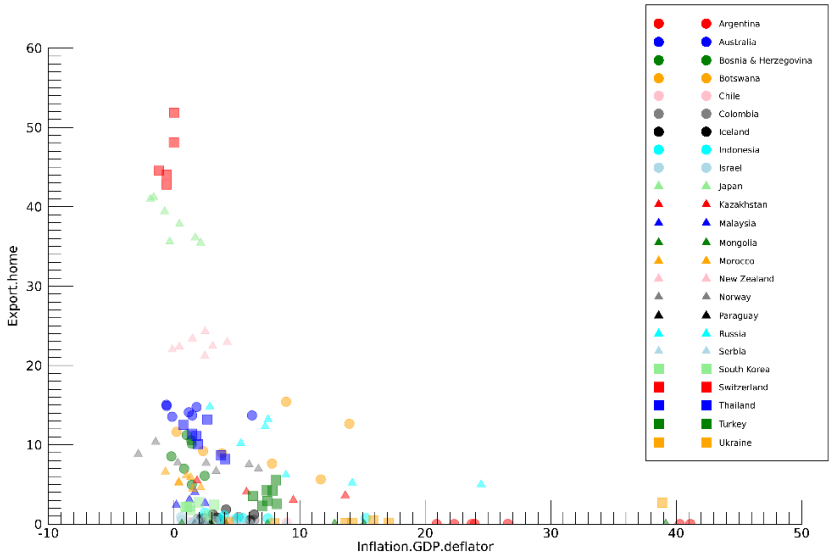

Figure 8. GDP deflator inflation and home currency export share. Countries coded by color.

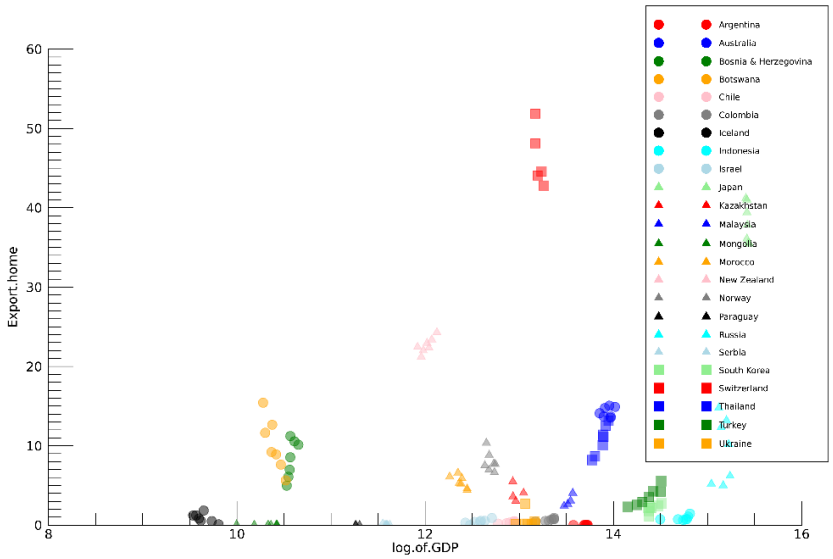

Figure 9. Logarithm of GDP and home currency export share. Countries coded by color.

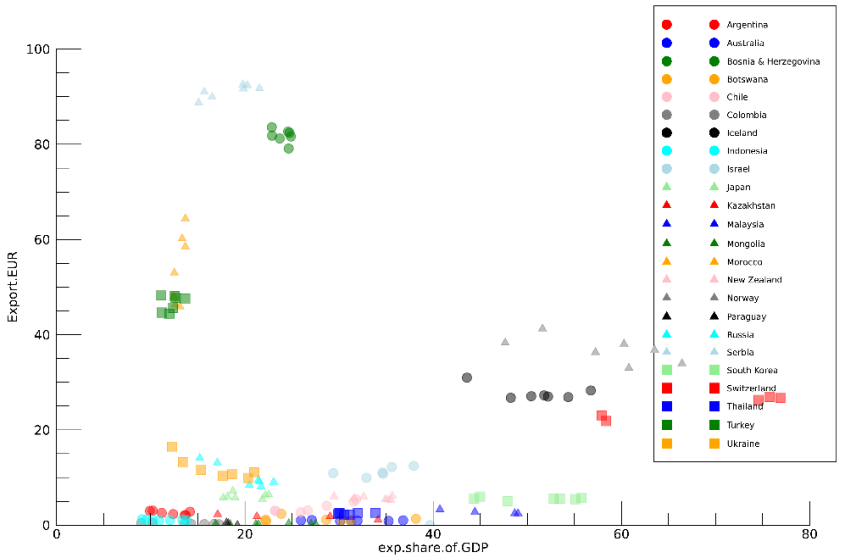

Figure 10. Export share of GDP and euro export share. Countries coded by color.

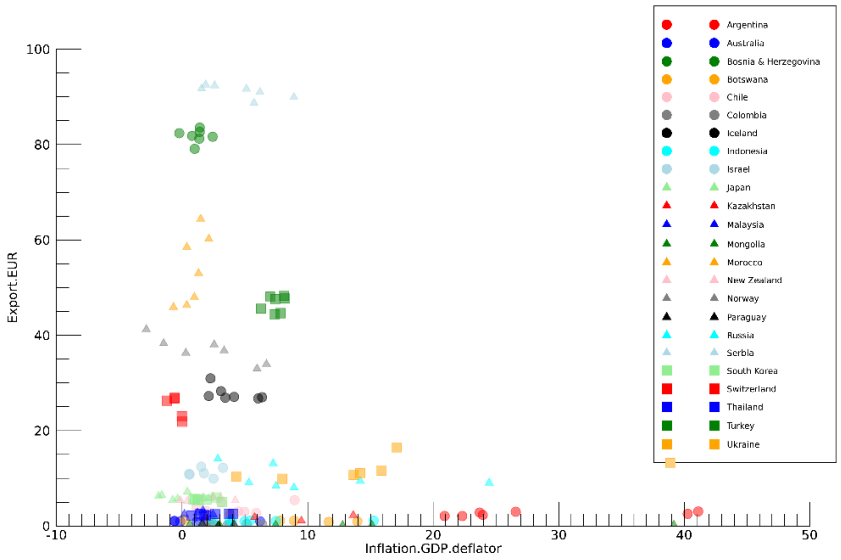

Figure 11. GDP deflator inflation and euro export share. Countries coded by color.

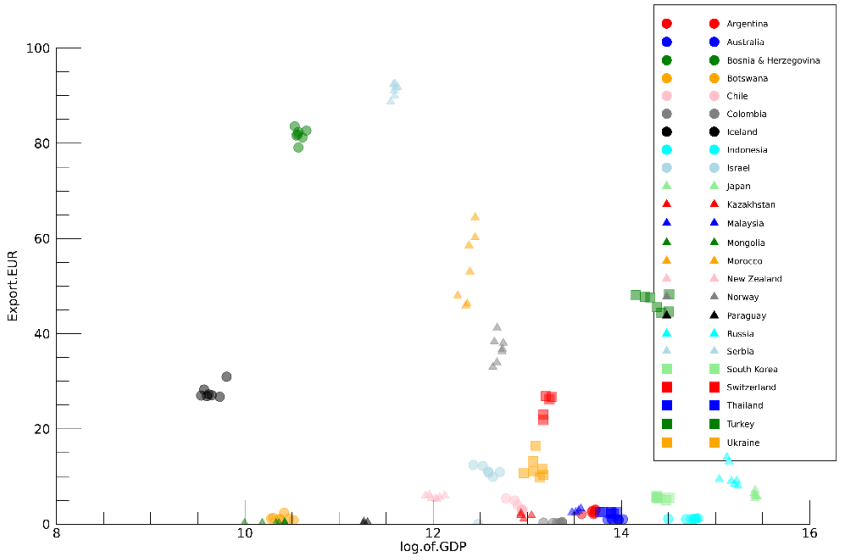

Figure 12. Logarithm of GDP and euro export share. Countries coded by color.

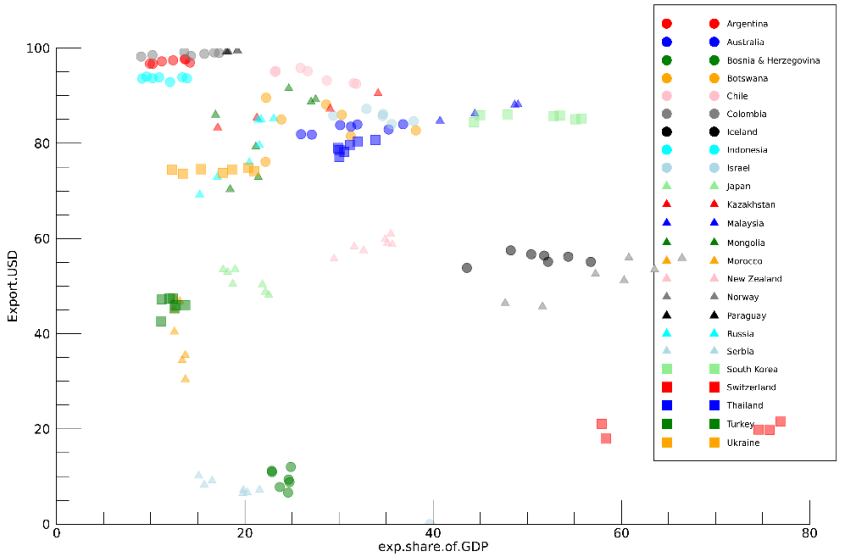

Figure 13. Export share of GDP and USD export share. Countries coded by color.

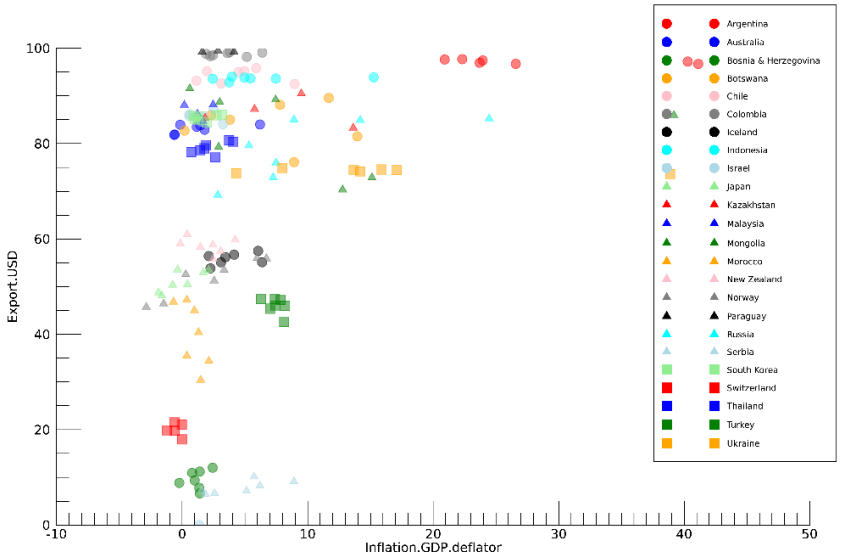

Figure 14. GDP deflator inflation and USD export share. Countries coded by color.

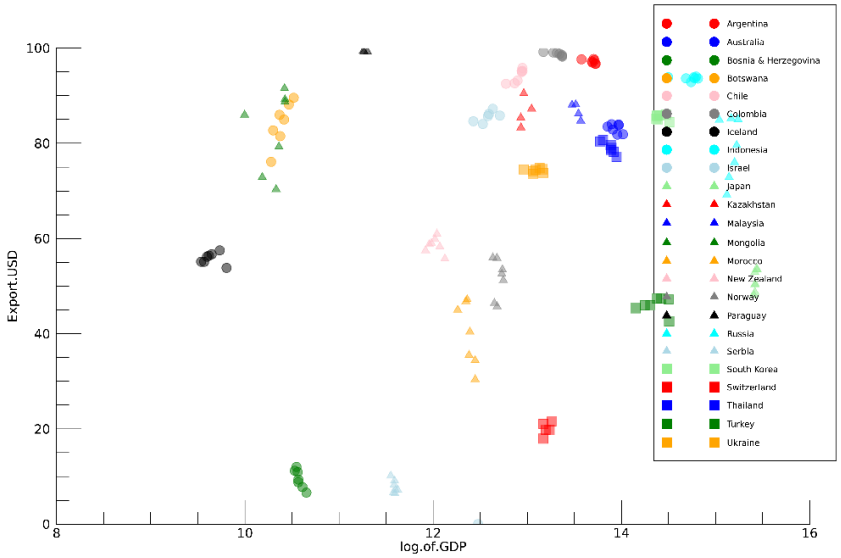

Figure 15. Logarithm of GDP and USD export share. Countries coded by color.

APPENDIX B: CORRELATION MATRICES

Variable:	g	p	o	EURx	USx
g	1	0.02892	-0.175	-0.3674	0.28862
p	0.02892	1	-0.36079	-0.12629	-0.2217
o	-0.175	-0.36079	1	0.152599	0.026115
EURx	-0.3674	-0.12629	0.152599	1	-0.32148
USx	0.28862	-0.2217	0.026115	-0.32148	1

Matrix 1. Correlation coefficients between the explanatory variables.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.485964912	0.147368421	0.424561404	0.312280702	-0.368421053	-0.150877193
p	-0.356140351	-0.607017544	0.231578947	0.571929825	-0.112280702	-0.364912281
EURm	0.038596491	-0.071929825	-0.473684211	-0.552631579	0.910526316	0.821052632
EURx	-0.050877193	-0.152631579	-0.414035088	-0.514035088	0.79122807	0.859649123
USm	0.50877193	-0.00877193	0.568421053	0.350877193	-0.236842105	-0.187719298
USx	0.51754386	0.178947368	0.575438596	0.363157895	-0.563157895	-0.229824561
o	0.480701754	0.277192982	-0.075438596	0.047368421	-0.161403509	-0.01754386

Matrix 2.1. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2010.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.4282766	0.1764706	0.4674923	0.3931889	-0.4179567	-0.1062951
p	-0.2899897	-0.5190918	0.0505676	0.3312693	0.0319917	-0.246646
EURm	0.0877193	-0.0980392	-0.5417957	-0.5748194	0.9050568	0.8679051
EURx	0.00516	-0.2321981	-0.4262126	-0.4571723	0.8018576	0.8452012
USm	0.4365325	0.1558308	0.4406605	0.2899897	-0.2094943	-0.1620227
USx	0.4447884	0.3622291	0.4860681	0.3622291	-0.5521156	-0.2156863
o	0.6016512	0.4035088	-0.1909185	0.1351909	-0.1434469	-0.1682147

Matrix 2.2. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2011.

Variable:	Mshome	Xshome	Msusd	Xsusd	Mseur	Xseur
g	0.4561404	0.2438596	0.3631579	0.3385965	-0.3666667	-0.2526316
p	-0.1701754	-0.7245614	0.2263158	0.2578947	0.0947368	-0.0929825
EURm	0.1192982	0.1052632	-0.6087719	-0.5684211	0.9350877	0.8175439
EURx	0.022807	-0.0157895	-0.6157895	-0.5210526	0.8719298	0.8824561
USm	0.4526316	-0.0333333	0.4929825	0.4035088	-0.1070175	-0.145614
USx	0.4017544	0.1877193	0.4982456	0.4087719	-0.3631579	-0.1631579
o	0.522807	0.4824561	-0.2263158	-0.0263158	0.0035088	0.0473684

Matrix 2.3. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2012.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.3822699	0.2614342	0.4680971	0.2523998	-0.4105025	-0.2038396
p	-0.2490119	-0.4624506	0.0502541	0.2501412	0.0694523	-0.0965556
EURm	0.1631846	-0.0220215	-0.6070017	-0.5844156	0.9265951	0.8091474
EURx	-0.0615471	-0.0479955	-0.6600791	-0.4274421	0.7278374	0.7188029
Usm	0.3348391	-0.108978	0.5200452	0.3709768	-0.297572	-0.2625635
Usx	0.3879164	0.0954263	0.4929418	0.2151327	-0.4263128	-0.0028233
o	0.3879164	0.3077357	-0.2298137	-0.0231508	0.0671937	0.0208922

Matrix 2.4. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2013.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.4432524	0.2761152	0.474873	0.1326934	-0.3540373	-0.1733484
p	-0.4105025	-0.5189159	0.2874082	0.5177866	-0.3167702	-0.3721062
EURm	0.1552795	0.1168831	-0.6442688	-0.7075099	0.9548278	0.8068888
EURx	-0.0841333	0.0242801	-0.6713721	-0.526821	0.7255788	0.689441
USm	0.4443817	0.0254094	0.4793902	0.2399774	-0.1530209	-0.1157538
USx	0.4398645	0.1259176	0.552795	0.1812535	-0.4116318	-0.0694523
o	0.3833992	0.3280632	-0.1948052	-0.0909091	0.0468662	-0.0468662

Matrix 2.5. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2014.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.5217391	0.3162055	0.3616601	0.0879447	-0.2924901	-0.1047431
p	-0.0642292	-0.3922925	0.2114625	0.2124506	-0.0118577	0.1828063
EURm	0.1837945	0.0790514	-0.6472332	-0.6511858	0.9100791	0.8132411
EURx	-0.1037549	-0.0148221	-0.6699605	-0.5602767	0.7045455	0.6966403
USm	0.3843874	-0.0444664	0.5563241	0.3883399	-0.3162055	-0.2104743
USx	0.5059289	0.1798419	0.4120553	0.1749012	-0.3586957	-0.0523715
o	0.2756917	0.2559289	-0.2144269	-0.1482213	0.0790514	0.013834

Matrix 2.6. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2015.

Variable:	MShome	XShome	MSusd	XSusd	MSeur	XSeur
g	0.4743083	0.3784585	0.4031621	0.055336	-0.2865613	-0.0563241
p	-0.5839921	-0.486166	0.3438735	0.5167984	-0.18083	-0.3883399
EURm	0.1521739	0.0820158	-0.6413043	-0.687747	0.8942688	0.8231225
EURx	-0.0869565	-0.0098814	-0.6660079	-0.5503953	0.694664	0.6986166
USm	0.3922925	0.0177866	0.4812253	0.2727273	-0.2529644	-0.1294466
USx	0.5187747	0.2934783	0.4278656	0.1749012	-0.4051383	-0.0790514
o	0.4189723	0.2974308	-0.236166	-0.194664	0.0019763	0.0642292

Matrix 2.7. Spearman correlation coefficients between explanatory variables and invoicing currency shares, year: 2016.

APPENDIX C: ADDITIONAL REGRESSION OUTPUTS

Output from:	Breusch-Pagan test	Kolmogorov-Smirnov test
p value, regression 1	8.58E-08	0.016659
p value, regression 2	6.24E-08	0.017087
p value, regression 3	1.21E-06	0.006782
p value, regression 4	4.21E-10	0.001907

Table 1. Breusch-Pagan tests and Kolmogorov-Smirnov tests carried out for each of the four regression specifications tested in the regression analysis. Displayed p values for Breusch-Pagan tests correspond to the alternative hypothesis that heteroskedasticity is present in the regression. Kolmogorov-Smirnov tests are computed for all the residuals pooled together without respect to any of the explanatory variables, with the alternative hypothesis that errors are normally distributed.

Regression	R-squared with time effects	R-squared without time effects	F test p value
Regression 1	0.149790844	0.142436766	0.620880488
Regression 2	0.199764807	0.18783016	0.523742581
Regression 3	0.153258828	0.110897859	0.049220446
Regression 4	0.103333853	0.049481585	0.000465191

Table 2. F tests of the time-specific effects for each of the four main regressions.

Expl. Var	Estimate	Pr(>|t|)	Significance
p	-0.067816	0.085938	.
g	-2.222898	0.309692	
o	-0.147619	0.000437	***
USx	-0.116176	0.055314	.

Table 3. Regression 1 without fixed effects for year. Coefficient test using White-adjusted robust standard errors.

Expl. Var	Estimate	Pr(>|t|)	Significance
p	-0.068165	0.088937	.
g	-1.938541	0.326872	
o	-0.15229	0.000228	***
EURx	-0.131268	0.007209	**

Table 4. Regression 2 without fixed effects for year. Coefficient test using White-adjusted robust standard errors.

APPENDIX D1: INVOICING CURRENCY DATA

Country	Year	imp.home	exp.home	imp.usd	exp.usd	imp.eur	exp.eur
Australia	2010	32	14.1	54.9	83.5	7.1	0.9
Australia	2011	30.6	13.7	56.4	84	7	1
Australia	2012	30.841758	14.755431	56.01563	82.89529	7.253362	0.890841
Australia	2013	30.781484	13.535074	55.80814	83.94342	7.836825	0.927149
Australia	2014	29.314961	13.696024	57.23458	83.818	7.958587	0.862801
Australia	2015	30.794231	15.04467	56.78459	81.82885	6.525483	1.05124
Australia	2016	33.343579	14.909212	53.32079	81.88839	7.242567	1.020708
Argentina	2010	2.1621192	0.0082125	87.62812	97.63463	8.15764	2.101052
Argentina	2011	1.9985747	0.0105781	88.4997	96.95346	7.401495	2.811452
Argentina	2012	2.6445504	0.007311	87.13491	97.69581	7.669378	2.090918
Argentina	2013	2.5048114	0.022002	87.8449	97.43495	7.389588	2.320568
Argentina	2014	2.0424456	0.0029013	87.38676	97.20398	7.91566	2.54749
Argentina	2015	2.4718124	0.0189779	87.52154	96.72032	7.521681	2.98352
Argentina	2016	1.7353444	0.0115087	87.74706	96.70017	8.360697	3.045888
Chile	2010	1.75	0.19	89.22	92.51	6.51	5.42
Chile	2011	1.48	0.25	89.47	92.61	7.1	4.95
Chile	2012	2.75	0.31	88.12	93.18	7.19	4.07
Chile	2013	3.78	0.26	86.5	95.16	7.74	3.08
Chile	2014	3.38	0.3	87.23	95.83	7.46	2.7
Chile	2015	3.94	0.49	86.06	95.19	7.73	2.97
Chile	2016	5.45	0.49	83.18	94.99	8.71	3.04
Iceland	2010	3.2210775	1.2184327	38.80093	55.10901	33.14185	27.01389
Iceland	2011	4.2721661	1.2265867	39.07003	55.10561	33.76859	28.27879
Iceland	2012	5.955073	0.8306252	38.0825	56.17439	33.96106	26.90361
Iceland	2013	7.7237125	0.5634271	36.73626	56.39522	34.25139	27.25516
Iceland	2014	8.9959245	1.8347619	35.62156	56.69162	33.74818	27.07945
Iceland	2015	9.6679387	0.5068426	32.84977	57.50144	36.36055	26.75079
Iceland	2016	8.0178516	0.106076	29.68987	53.8229	40.35015	30.97258
Indonesia	2010	1.4126341	0.7425145	75.01023	93.88105	3.16936	1.123943
Indonesia	2011	1.2888814	0.7334564	77.59238	93.64466	3.07367	1.046117
Indonesia	2012	1.7311632	0.6495919	76.09142	92.85869	3.259171	1.058006
Indonesia	2013	2.2878863	0.7203009	76.72409	93.84323	3.484388	0.944694
Indonesia	2014	2.6265976	0.7682913	75.86098	93.6633	3.588481	1.165728

Indonesia	2015	2.962546	1.0708098	77.3624	94.02023	4.416805	1.158929
Indonesia	2016	3.7748851	1.4439744	84.10616	93.59567	4.278354	1.235567
Israel	2010	2.4398871	0.3051897	75.33764	84.63052	17.79268	12.42187
Israel	2011	NA	NA	NA	NA	NA	NA
Israel	2012	2.3260775	0.3967674	76.4885	84.05223	17.856	12.21397
Israel	2013	2.6625507	0.4191463	74.21379	85.73	20.17353	11.06153
Israel	2014	2.7837898	0.5286244	73.75495	86.14957	20.27186	10.78929
Israel	2015	3.6026669	0.54716	72.03968	87.25327	21.20795	9.93243
Israel	2016	3.7889661	0.8990959	68.01128	85.80999	23.50809	10.92553
Japan	2010	23.6	41	71.7	48.76	3.2	6.25
Japan	2011	23.15	41.2	72.26	48.13	3.15	6.45
Japan	2012	22.45	39.42	73.1	50.32	2.95	5.45
Japan	2013	20.6	35.6	74.3	53.55	3.4	5.75
Japan	2014	20.65	36.1	73.76	52.95	3.55	6
Japan	2015	23.19	35.45	70.46	53.5	3.7	5.75
Japan	2016	26.46	37.83	66.8	50.47	4	7.19
Kazakhstan	2013	1.2725	3.0325	61.0375	90.485	14.2125	1.085
Kazakhstan	2014	0.8375	4.065	57.2225	87.2375	15.55	1.8125
Kazakhstan	2015	1.125	5.5025	54.79	85.375	15.7225	1.8425
Kazakhstan	2016	0.9425	3.6075	50.4125	83.2925	15.9625	2.2575
Malaysia	2013	2.5381299	2.4286677	82.52099	88.07128	4.533324	2.47102
Malaysia	2014	2.2043818	2.6561515	82.91739	88.13866	4.470483	2.438769
Malaysia	2015	2.2212013	3.0735059	82.07609	86.21028	4.552257	2.768571
Malaysia	2016	2.8864096	4.05509	80.67706	84.70271	4.654019	3.27659
Mongolia	2010	0.0762424	0.0554272	78.21714	85.95452	7.299301	0.201689
Mongolia	2011	0.0325993	0.0250747	78.99498	72.87254	8.415155	0.212729
Mongolia	2012	0.1505023	0.0489952	80.63376	70.33572	7.13127	0.163057
Mongolia	2013	0.0782748	0.0314911	76.68723	79.28979	8.601209	0.183181
Mongolia	2014	0.0946386	0.0402893	73.26029	89.21764	7.356156	0.219495
Mongolia	2015	0.1569295	0.064576	69.62769	91.54307	8.161126	0.316895
Mongolia	2016	0.1316165	0.0146406	62.8435	88.69512	10.00669	0.21334
Morocco	2010	1.2	6.1	52.2	45	44.3	48
Morocco	2011	0.9	6.6	55.5	46.8	41.8	45.9
Morocco	2012	1	5.3	55.5	47.2	41.9	46.3
Morocco	2013	1.6	5.9	51	40.4	46	53
Morocco	2014	1.7	5.2	48	35.5	49	58.5
Morocco	2015	2.3	4.6	43.9	34.4	52.3	60.2
Morocco	2016	2.1	4.4	41.6	30.4	55	64.4

New Zealand	2010	17.773586	22.455267	50.73662	57.48973	7.161083	5.968135
New Zealand	2011	13.613467	21.21472	39.54048	58.75995	5.376602	6.169549
New Zealand	2012	NA	22.00862	NA	59.02461	NA	5.406934
New Zealand	2013	17.479986	22.940031	54.02135	59.83134	7.860026	5.34804
New Zealand	2014	19.691351	22.345995	52.0392	60.97775	8.121656	5.217083
New Zealand	2015	20.905524	23.379339	50.43317	58.29034	7.815146	5.678922
New Zealand	2016	22.048271	24.298585	47.61243	55.76235	7.981759	6.038264
Norway	2010	27.28	7.52	27.1	55.98	32.81	33
Norway	2011	27.5	6.97	27	55.9	32.94	33.94
Norway	2012	28.14	6.67	25.02	53.49	33.36	36.79
Norway	2013	28.06	7.69	24.02	51.23	34.75	38.05
Norway	2014	28.54	7.75	23.93	52.57	34.54	36.3
Norway	2015	27.62	8.83	25.83	45.7	33.77	41.23
Norway	2016	30.86	10.36	22.28	46.42	34.69	38.3
Paraguay	2014	0.0130831	9.33E-06	95.17465	99.49438	2.99221	NA
Paraguay	2015	0.0101395	0.0005937	94.95301	99.26033	2.958385	0.497118
Paraguay	2016	0.013254	3.31E-05	94.61884	99.23234	2.879831	0.362808
Russia	2010	23.110055	5.2	44.23832	84.91841	31.18414	9.440685
Russia	2011	24.663523	5	43.54746	85.23828	30.29956	9.070231
Russia	2012	26.707514	6.2	42.32152	85.01292	29.71481	8.06957
Russia	2013	28	10.2	40.6	79.6	29.9	9.1
Russia	2014	30.2	13.2	39.6	76	28.1	8.4
Russia	2015	28	12.3	41.4	72.9	28.4	13.1
Russia	2016	29.4	14.8	36.7	69.2	31.1	14.1
Serbia	2010	0.225	0.2	27.675	10.15	71.15	88.725
Serbia	2011	0.45	0.025	27.725	9.125	70.775	89.925
Serbia	2012	2.075	NA	22.6	8.25	74.45	91
Serbia	2013	2.7	NA	20.775	7.15	75.825	91.675
Serbia	2014	2.625	0.05	20.075	6.65	76.4	92.375
Serbia	2015	2.575	NA	18.725	6.45	77.725	92.55
Serbia	2016	2.275	0.05	16.05	7.2	80.7	91.75
South Korea	2010	2.3940758	1.0527386	81.31754	85.89597	5.431313	5.990669
South Korea	2011	3.554449	1.7809716	82.48107	85.73486	5.119036	5.544729
South Korea	2012	3.4231012	2.2465374	83.85479	85.05243	4.955153	5.451952
South Korea	2013	3.4216245	2.1656716	84.21655	85.20733	5.62287	5.675761
South Korea	2014	3.9117086	2.1636919	84.32021	85.80688	5.66911	5.545706
South Korea	2015	4.8204944	2.4348071	81.75977	86.08231	6.283316	5.026195
South Korea	2016	6.1264965	2.7458395	78.58996	84.44433	6.651444	5.503366

Thailand	2010	4.4	8.2	78.7	80.4	3.7	2.6
Thailand	2011	4.3	8.7	80.7	80.7	3.7	2.6
Thailand	2012	5.3	10.1	78.6	79.7	3.8	2.2
Thailand	2013	6	11.1	80.6	79	3.8	2.3
Thailand	2014	6.3	11.4	80.5	78.6	4.1	2.6
Thailand	2015	7.2	12.5	79.5	78.2	4.1	2.2
Thailand	2016	8.2	13.2	77.1	77.1	4.8	2.5
Turkey	2010	3.1394037	2.3183924	61.45891	45.35519	33.61743	48.16118
Turkey	2011	3.1483723	2.5447251	62.37683	45.98003	32.71432	47.74545
Turkey	2012	4.0086616	2.9450228	64.22916	46.02379	30.23975	47.6322
Turkey	2013	4.5278862	3.5287765	63.56016	47.39403	30.64902	45.56679
Turkey	2014	5.1292117	4.2482371	63.48722	47.39989	29.97496	44.40295
Turkey	2015	6.5420223	4.2342068	59.04474	47.21671	32.91686	44.64614
Turkey	2016	7.1869124	5.5272559	56.02146	42.57625	35.38253	48.22439
Ukraine	2010	0.25	0.15	68.275	74.525	23.85	10.675
Ukraine	2011	0.175	0.175	66.13	74.15	25.825	11.125
Ukraine	2012	0.1	0.1	65.35	74.875	24.875	9.9
Ukraine	2013	0.175	0.2	63.5	73.775	28.325	10.3
Ukraine	2014	0.325	0.475	65.15	74.55	27.375	11.6
Ukraine	2015	2.525	2.7	60.45	73.625	31.2	13.275
Ukraine	2016	0.075	0.175	52.575	74.45	41.65	16.5
Bosnia & Herzegovina	2010	0.6943024	4.9725834	17.58049	11.20732	80.75365	83.57437
Bosnia & Herzegovina	2011	2.3230305	6.0885511	17.61724	12.02405	79.19825	81.6429
Bosnia & Herzegovina	2012	1.5791257	6.9867802	16.71992	10.9327	80.84819	81.81785
Bosnia & Herzegovina	2013	1.6428973	8.547117	16.59704	8.82303	80.8315	82.38278
Bosnia & Herzegovina	2014	1.095442	11.221173	17.49951	9.359277	80.38604	79.10678
Bosnia & Herzegovina	2015	1.01256	10.557086	12.7538	7.789406	85.26774	81.22223
Bosnia & Herzegovina	2016	1.8048183	10.134207	10.40007	6.625226	86.90094	82.65802
Botswana	2010	0.9595658	15.431023	24.48147	76.10989	2.528457	1.119889
Botswana	2011	1.0950929	12.651249	31.52403	81.5106	1.776531	0.96435
Botswana	2012	1.9898173	11.633584	37.45564	82.70661	1.852673	1.329757

Botswana	2013	0.9508289	9.2110978	44.92212	85.97744	1.537353	1.07447
Botswana	2014	1.1770864	7.6274939	44.50883	88.13881	1.962571	1.134244
Botswana	2015	1.0405844	8.91871	45.01022	84.99672	2.479424	2.392385
Botswana	2016	0.7155887	5.6377478	40.76729	89.5572	2.524412	0.856734
Colombia	2010	NA	0.4468493	NA	99.19442	NA	0.322585
Colombia	2011	NA	0.5191981	NA	99.07865	NA	0.262278
Colombia	2012	NA	0.5532945	NA	98.97673	NA	0.188744
Colombia	2013	NA	0.7120703	NA	98.78921	NA	0.21245
Colombia	2014	NA	0.7730966	NA	98.34145	NA	0.272719
Colombia	2015	NA	0.728587	NA	98.52497	NA	0.410928
Colombia	2016	NA	0.9212965	NA	98.20721	NA	0.407665
Switzerland	2012	21.629313	51.857982	32.49971	17.95877	43.52506	21.86282
Switzerland	2013	20.402515	48.12692	39.97687	21.07515	37.49192	23.05453
Switzerland	2014	23.217821	44.07128	31.74128	19.77081	42.46559	26.90044
Switzerland	2015	19.484218	44.547321	35.65821	19.87926	42.03054	26.29167
Switzerland	2016	18.103706	42.798586	38.36606	21.55408	40.78537	26.70713

Table 9. Invoicing shares data used. Source: Boz et al (2020).

APPENDIX D2: DATA ON GDP, TRADE OPENNESS, INFLATION AND TRADE FLOWS

Country	Year	GDP	g	p	o	EURm	EURx	USm	USx
Australia	2010	1038250	13.853	1.1654	31.265	13.411	3.954	11.186	3.975
Australia	2011	1084070	13.896	6.2068	36.812	12.736	4.138	11.442	3.654
Australia	2012	1097671	13.909	1.7891	35.266	12.806	3.715	11.733	3.714
Australia	2013	1166545	13.97	-0.1526	31.948	12.902	2.735	10.246	3.015
Australia	2014	1168395	13.971	1.4418	30.119	13.202	2.623	10.613	4.135
Australia	2015	1151139	13.956	-0.6165	27.11	12.552	3.082	11.274	5.313
Australia	2016	1223294	14.017	-0.5976	25.961	14.176	3.089	11.459	4.621
Argentina	2010	787149	13.576	20.915	13.694	15.058	13.75	10.786	5.382
Argentina	2011	884236	13.692	23.703	14.157	13.265	14.33	10.56	5.183
Argentina	2012	895049	13.705	22.315	13.612	15.669	11.84	12.47	5.03
Argentina	2013	903833	13.714	23.949	12.383	15.49	10.42	10.84	5.506
Argentina	2014	878697	13.686	40.283	11.175	14.878	10.66	13.854	5.967
Argentina	2015	914850	13.727	26.58	9.9057	14.15	11.03	13.184	6.048
Argentina	2016	911368	13.723	41.119	10.217	15.093	11.55	12.494	7.759
Chile	2010	352790	12.774	8.9623	31.827	10.658	15.62	16.919	9.733
Chile	2011	386907	12.866	3.1129	31.559	10.83	15.71	20.1	11.09
Chile	2012	398689	12.896	1.1302	28.699	10.988	13.2	23.163	12.29
Chile	2013	416747	12.94	1.9766	26.674	13.349	12.35	20.209	12.75
Chile	2014	420146	12.948	5.9063	25.901	12.876	12.19	19.525	12.33
Chile	2015	420354	12.949	4.9535	23.271	13.402	10.91	18.878	13.19
Chile	2016	417507	12.942	4.4699	23.185	14.531	10.57	17.393	13.95
Iceland	2010	13838.1	9.5352	6.3689	52.207	32.264	63.06	7.9335	4.565
Iceland	2011	14284.3	9.5669	3.0967	56.747	27.687	65.07	10.884	3.728
Iceland	2012	14714	9.5966	3.4409	54.351	28.246	58.82	10.241	4.509
Iceland	2013	15016.4	9.6169	2.1245	51.793	26.025	59.22	9.6409	4.71
Iceland	2014	15482.6	9.6475	4.1417	50.417	27.76	55.63	10.135	4.94
Iceland	2015	16865.3	9.733	6.0545	48.244	30.87	57.37	7.8606	5.669
Iceland	2016	18134	9.8055	2.2609	43.586	32.302	56.43	10.044	7.783
Indonesia	2010	1976891	14.497	15.264	13.353	5.2108	9.182	5.9563	9.064
Indonesia	2011	2387109	14.686	7.4659	13.848	4.9053	8.684	5.1092	8.107
Indonesia	2012	2521018	14.74	3.7539	12.043	5.3695	8.074	5.0398	7.846

Indonesia	2013	2590538	14.767	4.966	10.9	5.7075	7.725	4.7826	8.623
Indonesia	2014	2625076	14.781	5.4432	10.181	5.8061	8.009	4.5555	9.407
Indonesia	2015	2660288	14.794	3.9802	9.5581	6.3209	8.206	5.1111	10.82
Indonesia	2016	2710646	14.813	2.4389	9.0842	6.6425	8.195	4.8793	11.19
Israel	2010	249409	12.427	1.5212	37.926	30.424	20.54	17.136	31.65
Israel	2011	262254	12.477	1.3526	39.66	31.011	20.82	17.594	28.66
Israel	2012	275769	12.527	3.2559	35.599	30.185	19.63	18.638	27.75
Israel	2013	291375	12.582	1.7365	34.627	30.337	20.18	17.387	26.21
Israel	2014	294264	12.592	0.593	34.68	29.158	19.84	18.028	26.93
Israel	2015	306599	12.633	2.5006	32.917	29.725	17.38	18.087	28.29
Israel	2016	330636	12.709	0.5605	29.388	31.183	18.11	16.429	29.05
Japan	2010	4968421	15.419	-1.8807	22.171	7.7078	8.334	9.958	15.63
Japan	2011	4909095	15.407	-1.6221	22.535	7.6522	8.574	8.9161	15.51
Japan	2012	4968331	15.419	-0.7561	21.86	7.6695	7.622	8.8277	17.79
Japan	2013	5043419	15.434	-0.3544	18.967	7.7025	7.594	8.6368	18.81
Japan	2014	4963311	15.418	1.6863	18.169	7.7504	7.846	8.9937	18.95
Japan	2015	5094436	15.444	2.1113	17.691	9.185	7.831	10.926	20.23
Japan	2016	4982681	15.421	0.4199	18.715	9.9753	8.273	11.405	20.25
Kazakhstan	2013	426074	12.962	9.4991	34.147	14.282	48.13	4.4167	0.466
Kazakhstan	2014	462919	13.045	5.7712	29.056	16.114	49.98	4.8264	0.519
Kazakhstan	2015	412877	12.931	1.8235	21.283	18.214	45.55	4.856	0.945
Kazakhstan	2016	413606	12.933	13.638	17.116	17.661	43.64	5.0725	1.68
Malaysia	2013	711948	13.476	0.1745	48.668	8.9524	7.436	7.8167	8.077
Malaysia	2014	740480	13.515	2.4675	49.015	8.6589	7.709	7.6664	8.415
Malaysia	2015	762343	13.544	1.2181	44.433	8.3331	8.114	8.0753	9.455
Malaysia	2016	780617	13.568	1.6583	40.724	8.2064	8.235	7.9695	10.22
Mongolia	2010	21958.6	9.9969	39.178	16.88	5.7175	1.991	2.8944	0.625
Mongolia	2011	26489.7	10.185	15.119	21.425	5.6331	1.666	2.9249	0.337
Mongolia	2012	30690.6	10.332	12.784	18.435	5.614	1.52	2.9346	0.471
Mongolia	2013	31623.3	10.362	2.9078	21.164	8.0532	2.006	8.0641	0.294
Mongolia	2014	33708.8	10.426	7.4488	27.519	6.6519	1.462	4.2293	0.271
Mongolia	2015	33554.6	10.421	0.6098	24.66	7.0882	1.565	3.0651	0.401
Mongolia	2016	33720.2	10.426	2.9931	27.032	7.5457	1.661	4.1735	0.23
Morocco	2010	211208	12.261	0.9756	12.451	44.13	55.13	7.0516	3.873
Morocco	2011	230751	12.349	-0.691	13.089	42.37	52.02	8.1135	4.463
Morocco	2012	233702	12.362	0.3693	12.611	41.604	50.33	6.3831	4.256
Morocco	2013	240536	12.391	1.3073	12.511	44.035	53.68	7.5174	4.211
Morocco	2014	238162	12.381	0.3778	13.676	45.23	55.51	6.9706	3.824

Morocco	2015	254068	12.445	2.129	13.341	46.918	54.57	6.3846	3.87
Morocco	2016	254343	12.446	1.4832	13.679	48.933	56.54	6.3778	3.79
New Zealand	2010	150150	11.919	3.0749	32.62	10.581	6.643	10.409	8.638
New Zealand	2011	156176	11.959	2.4499	35.658	11.349	6.768	10.744	8.383
New Zealand	2012	159640	11.981	-0.1419	35.115	11.338	6.055	9.3269	9.189
New Zealand	2013	165992	12.02	4.2269	34.894	12.639	5.974	9.3965	8.479
New Zealand	2014	169430	12.04	0.4132	35.501	13.117	6.001	11.634	9.399
New Zealand	2015	174614	12.07	1.4596	31.619	13.4	6.149	11.798	11.76
New Zealand	2016	184350	12.125	2.4758	29.478	13.358	6.075	11.323	10.93
Norway	2010	307003	12.635	5.9682	60.792	32.546	40.56	5.5277	4.995
Norway	2011	320497	12.678	6.7167	66.439	32.783	40.13	5.3829	5.627
Norway	2012	339720	12.736	3.3429	63.523	33.246	41.57	5.4096	5.027
Norway	2013	343018	12.746	2.5552	60.282	33.497	46.07	5.4329	4.43
Norway	2014	337563	12.73	0.2906	57.246	32.988	47.5	6.1843	3.706
Norway	2015	321282	12.68	-2.8549	51.614	31.8	46.97	6.4522	4.445
Norway	2016	311902	12.65	-1.4743	47.652	33.908	44.26	6.4179	4.179
Paraguay	2014	77660.9	11.26	2.857	19.203	10.493	12.92	9.5072	2.157
Paraguay	2015	78029.1	11.265	1.6039	18.041	10.859	12.73	9.2083	2
Paraguay	2016	81080.6	11.303	4.1348	18.22	10.714	10.16	8.1906	1.803
Russia	2010	3404145	15.041	14.191	21.427	37.255	35.51	3.0958	3.005
Russia	2011	3860054	15.166	24.46	23.062	36.484	33.99	3.1355	3.023
Russia	2012	4151727	15.239	8.9079	21.716	36.31	36.15	3.7524	2.482
Russia	2013	4091233	15.224	5.3201	21.543	35.92	35.87	3.912	2.12
Russia	2014	3996437	15.201	7.4901	20.468	34.164	36.43	4.3646	1.919
Russia	2015	3773719	15.144	7.2497	17.072	32.103	32.02	4.5425	2.441
Russia	2016	3686973	15.12	2.8442	15.207	32.748	35.19	4.0161	3.346
Serbia	2010	103733	11.55	5.7289	15.088	36.92	NA	1.537	0.714
Serbia	2011	108053	11.59	8.9091	16.516	37.028	39.94	1.4572	0.675
Serbia	2012	107514	11.585	6.1993	15.692	38.676	39.67	1.6796	0.877
Serbia	2013	109215	11.601	5.1254	19.847	40.151	43.63	1.4975	3.357
Serbia	2014	106657	11.577	2.5854	20.264	40.814	44.6	1.365	2.107
Serbia	2015	108471	11.594	1.8729	19.784	40.867	44.48	1.6012	1.874
Serbia	2016	111738	11.624	1.5499	21.557	41.63	43.47	1.7171	1.653
South Korea	2010	1756263	14.379	2.7375	44.981	7.5517	8.206	9.5455	10.72
South Korea	2011	1750333	14.375	1.2819	52.791	7.4164	7.457	8.5458	10.16
South Korea	2012	1772986	14.388	1.2518	55.098	7.5791	6.644	8.4016	10.73
South Korea	2013	1741781	14.37	1.0185	55.752	8.6814	6.092	8.1001	11.14
South Korea	2014	1797827	14.402	0.9069	53.456	9.4018	6.129	8.6634	12.32

South Korea	2015	1928057	14.472	3.1856	47.885	10.481	6.037	10.128	13.31
South Korea	2016	1999700	14.509	1.986	44.349	10.315	6.467	10.684	13.47
Thailand	2010	956814	13.771	4.081	32.007	5.8442	7.547	5.8943	10.36
Thailand	2011	988918	13.804	3.7431	33.867	6.0053	7.332	5.8966	9.568
Thailand	2012	1073296	13.886	1.9091	31.152	6.1857	6.64	5.2645	9.94
Thailand	2013	1081350	13.894	1.7787	29.903	6.9739	6.912	5.8658	10.07
Thailand	2014	1073821	13.887	1.4415	30.047	6.4991	7.269	6.4385	10.53
Thailand	2015	1108116	13.918	0.7221	30.559	6.8333	7.23	6.8884	11.24
Thailand	2016	1142219	13.948	2.6362	30.038	7.3904	7.297	6.2447	11.4
Turkey	2010	1402147	14.154	7.0093	12.563	29.359	33.35	6.6414	3.307
Turkey	2011	1541769	14.248	8.2008	12.652	28.787	33.73	6.6608	3.399
Turkey	2012	1636864	14.308	7.4227	13.653	28.24	27.55	5.9738	3.677
Turkey	2013	1755262	14.378	6.2801	12.365	28.078	29.88	5.1187	4.117
Turkey	2014	1839776	14.425	7.3895	11.993	28.065	30.66	5.3616	4.157
Turkey	2015	1986635	14.502	7.8449	11.148	29.186	30.64	5.4317	4.65
Turkey	2016	1996259	14.507	8.1305	11.118	30.06	32.45	5.5769	4.866
Ukraine	2010	426395	12.963	13.673	18.632	19.803	15.4	2.919	1.58
Ukraine	2011	471797	13.064	14.182	20.993	20.099	15.44	3.1483	1.629
Ukraine	2012	503930	13.13	7.9826	20.333	20.081	15.15	3.4424	1.477
Ukraine	2013	525784	13.173	4.3088	17.659	22.615	15.58	3.5986	1.405
Ukraine	2014	521305	13.164	15.902	15.357	24.658	18.78	3.5525	1.239
Ukraine	2015	471818	13.064	38.882	13.408	24.897	20.98	3.9555	1.264
Ukraine	2016	482436	13.087	17.097	12.248	28.267	21.91	4.311	1.176
Bosnia & Herzegovina	2010	37415.5	10.53	1.4063	22.854	40.901	50.2	1.3315	0.531
Bosnia & Herzegovina	2011	38074.7	10.547	2.4325	24.88	40.484	50.67	1.4037	0.763
Bosnia & Herzegovina	2012	38599.6	10.561	0.7958	22.885	40.221	51.82	0.8931	0.912
Bosnia & Herzegovina	2013	38843.5	10.567	-0.2241	24.74	39.748	52.17	1.0532	0.903
Bosnia & Herzegovina	2014	38879.5	10.568	1.0003	24.646	39.204	53.75	1.2055	1.222
Bosnia & Herzegovina	2015	40599.2	10.612	1.3657	23.7	41.975	53.37	1.0832	1.316
Bosnia & Herzegovina	2016	42325.1	10.653	1.407	24.589	43.289	53.88	0.8695	1.223
Botswana	2010	29094.2	10.278	8.92	22.187	3.0069	6.643	1.0129	3.02

Botswana	2011	32053.1	10.375	13.958	31.251	2.5404	3.255	1.4227	3.106
Botswana	2012	29751.5	10.301	0.1938	38.171	2.3223	4.803	1.2702	2.475
Botswana	2013	31823.8	10.368	2.3091	30.294	3.6697	12.4	1.5995	2.611
Botswana	2014	35154.7	10.468	7.7992	28.64	4.4682	30.19	1.0019	3.709
Botswana	2015	33411.1	10.417	3.8161	23.869	4.1755	27.48	0.8052	3.498
Botswana	2016	37009.3	10.519	11.684	22.253	5.0602	25.65	0.8034	4.217
Colombia	2010	524874	13.171	3.8049	13.565	12.198	10.36	25.888	43.05
Colombia	2011	583482	13.277	6.3868	16.767	12.064	12.53	24.99	38.54
Colombia	2012	605689	13.314	3.6167	17.253	10.853	12.77	24.343	36.86
Colombia	2013	623035	13.342	1.9077	15.696	11.647	13.29	27.666	31.78
Colombia	2014	638671	13.367	2.2356	14.279	11.856	14.76	28.513	26.41
Colombia	2015	639606	13.369	2.4493	10.189	13.176	14.72	28.839	28.17
Colombia	2016	640535	13.37	5.1483	8.9814	11.771	13.95	26.665	32.88
Switzerland	2012	524904	13.171	-0.0038	58.393	53.423	38.1	8.6217	8.164
Switzerland	2013	524604	13.17	-0.0233	57.899	45.325	32.53	7.5888	7.617
Switzerland	2014	537447	13.195	-0.5904	75.749	50.413	37.64	7.7501	10.12
Switzerland	2015	560735	13.237	-1.2042	74.563	48.235	35.7	8.0242	10.55
Switzerland	2016	571575	13.256	-0.5967	76.896	45.444	34.81	9.0434	12.15

Data on GDP, logarithm of GDP (g), GDP deflator inflation (p), export share of GDP (o), euro area share as of imports (EURm), euro area share as export destination (EURx), US share of imports (USm), and US share as export destination (USx). Sources: Penn World Table (2019), World Bank (2022), UNCTADStat Data Centre (2020).