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US Dollar Dominance in Asia's Trade Invoicing

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Abstract

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Keywords

international trade invoicing, dominant currency paradigm, GVCs and MNCs

JEL Classification

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1.   Introduction

Why does the United States (US) dollar continue to be the dominant currency in the invoicing of international trade in the Asia and Pacific region? In general, trade can be invoiced in either of three currencies, i.e., in the home currency of the exporter known as producer-currency pricing (PCP), in the currency of the destination country or importer known as local-currency pricing (LCP), or in the currency of a third country known as 'vehicle' currency or dominant-currency paradigm (DCP). However, it is observed that most often, it is the US dollar (or sometimes the euro) that constitute a considerable proportion of global trade transaction invoicing irrespective of the countries involved in the trade, postulating a DCP where prices are set in a 'vehicle' currency (Adler et al. 2020 and Gopinath 2015). Often, the US dollar plays the role of the 'vehicle' currency, constituting around 40% of all international trade transaction invoicing globally. This is much higher than US' share in global trade at around 10% (Georgiadis et al. 2021, Goldberg and Tille 2008, Gopinath 2015, and Boz et al. 2020). In the Asia and Pacific region, the median share of US dollar in the trade invoicing of economies with data is even higher at about four-fifths, whereas the median share of the US in the region's goods trade is less than a tenth (ADB 2021).[1]

The use of the US dollar as 'vehicle' currency in trade invoicing has several implications. First, external adjustments due to exchange rate movements would have a more muted response in the short-term. Under the Mundell-Fleming framework, an exchange rate depreciation will lead to an increase in a country's import prices, measured in local currency, resulting in lower import demand. But this also entails a drop in the prices faced by trading partners in terms of their respective domestic currency. This leads to higher demand for a country's exports. Consequently, a depreciation of a country's exchange rate leads to lower imports and higher exports, and thereby an improvement in the trade balance in the short-term.

In contrast, under DCP, a country's depreciation will also result in an increase in import prices in domestic currency, and hence, lower import demand. However, the local currency prices faced by its trading partners are unchanged as their exchange rates relative to the vehicle or dominant currency have not changed. Thus, under DCP, a depreciation of the domestic exchange rate leads to lower imports, and muted response of exports in the short-term. Second, under DCP, greater exchange rate movement is needed to achieve significant near-term external adjustment, particularly for economies with excessive trade deficits. This will lead to adverse balance sheet effects, which may feed into inflation, and/or tighter macroeconomic policies (IMF 2020).

Given the risks associated with DCP, understanding what factors relate to why economies have higher US dollar trade invoicing is relevant. This paper extends existing studies that consider relevant factors that explain DCP in trade invoicing, such as Georgiadis et al. (2021), by focusing on the Asia and Pacific economies as they have a larger share of their exports and imports invoiced in US dollar. A key factor to consider is the role of global value chains (GVCs) as integration in GVCs could lead exporters to invoice in the currency used for imported inputs (IMF 2020 and Georgiadis et al. 2021). Moreover, aside from GVCs, this paper also considers the significance of multinational corporations (MNCs) in explaining the dominant role of the US dollar in trade invoicing. It is MNCs' business decision to fragment or outsource production activities to separate locations, giving rise to GVCs. The presence of MNCs may reinforce the dominance of the US dollar as foreign affiliates in the economy may

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[1] For trade invoicing, calculations based on Boz et al. (2020) show that the median US dollar share in the region's export invoicing is over 84% while the median US dollar share in the region's import invoicing is over 76%. For the US share in goods trade, calculations based on the data of the International Monetary Fund Direction of Trade Statistics show that the median share of the US in the region's goods exports is close to 9% of the total while it is about 7% in imports. The calculations are based on the averages from 2009 to 2015 of each of the 12 Asia and Pacific economies included in the dataset. For comparability, only the periods when both variables are available are covered.

opt to invoice exports and imports in third currency (Ito et al. 2010). Hence, this paper differs from previous studies in two aspects. First, it focuses on the Asia and Pacific sample where the US dollar plays a greater role in trade invoicing; and second, it considers the presence of MNCs.

To address the main research question, the Boz et al. (2020) dataset is used on currency invoicing of exports and imports for selected economies including those in Asia and Pacific and exploit its cross-sectional variation in terms of the share of US dollar in trade invoicing.[2] The empirical specification considers whether economies with greater participation in GVCs and/or more MNCs tend to have higher or lower share of exports and imports invoiced in US dollar. The empirical results show: (i) Asia and Pacific economies with higher GVC participation tend to have higher US dollar invoice share for both exports and imports; and (ii) Asia and Pacific economies with more MNCs tend to have higher US dollar invoice share for exports only. We also find evidence that non-Asia and Pacific economies with higher GVC tend to have lower US dollar invoice share for both exports and imports, which contrasts with the results for Asia and Pacific economies. This implies that there could be varying impacts of GVC participation across different regions.

This paper proceeds as follows. The next section provides a review of related literature. Section 3 presents selected stylized facts, while Section 4 discusses the empirical specification and data sources. Section 5 discusses the empirical results before the concluding remarks in Section 6.

2. Literature Review

The determinants of trade invoicing currencies have been examined by several studies in the past, in the context of understanding the dominance of the US dollar in international trade invoicing. Among the factors previously cited to influence the choice of trade invoicing currency are the trade share of the US and other major trading economies, extent of trade that is coursed through organized exchanges, the economic size of the trading economies, substitutability of the goods being traded, participation in the global value chain, financial market development, and inertia resulting from customary practice. In the case of the euro, geographic proximity is also cited as an influential factor. In terms of the point of view, the existing literature has executed either global or country-level analysis.

Boz et al. (2020), with a comprehensive dataset of 102 countries over the period from 1990 to 2019, confirm the US dollar dominance in trade invoicing, while highlighting several other facts. These include: i) use of the dollar and euro as invoice currency has grown overtime, despite the respective countries' or region's faltering trade share globally; and ii) countries in the euro area or part of the European Union are prone to use euro as invoice currency and this share has increased overtime at the expense of the dollar. The authors further investigate the role of anchor-currency invoicing for exchange rate pass-through to import prices and trade volumes. They found that the pass-through from the fluctuations in US dollar exchange rates to import prices and trade volumes tend to be higher compared to the fluctuations in the bilateral exchange rates of importing and exporting countries.

In an earlier study, Goldberg and Tille (2008) look at a dataset of 24 countries for the determining factors in invoicing exports in certain currencies. They explore characteristics like economies of scale, price sensitivity of demand, volatility in macroeconomy, covering wages and aggregate demand and transaction costs in foreign exchange markets. They conclude that the use of US dollar is highly prevalent for most of the international trade transactions with the US and for goods traded on organized exchanges. The size of exporting countries matters

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[2] The Asia and Pacific sample includes Australia, Azerbaijan, India, Indonesia, Japan, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, New Zealand, Republic of Korea, and Thailand.

as an exporter from a small country is unlikely to play a dominant role in the destination country, they are thus less likely to use their own currency for invoicing. Moreover, as producers in small countries are more likely to depend on imports from other countries vis-à-vis the same from larger countries, inputs for the former are invoiced in a dominant currency, reducing the tendency of producers in small countries to use their home currency for invoicing. Industries tend to coalesce around a single currency, particularly the US Dollar, when dealing with highly substitutable goods. There was no substantial evidence that the US dollar is used as a hedging currency for covariances in macroeconomic fundamentals or its usage is influenced by its transaction costs in foreign-exchange markets. On the other hand, the use of the euro is determined by closeness in trade and proximity to the euro area.

Georgiadis et al. (2021) deduce four findings about invoicing currency for 115 countries. First, they conclude that the large size of the euro area and the US underpins strategic complementarities in price setting and directly correlates with the role of the euro and the US dollar as invoicing currencies for imports from the euro area and the US. Integration in global value chains influences invoicing of exports from the euro area and the US to the rest of the world as this allows the hedging of profits against changes in imported input costs due to exchange rate fluctuations. Between the two currencies, for every percentage point increase in the share of a country's exports to the US, US dollar invoicing goes up by 0.8 percentage point, higher than the increase in euro invoicing. Second, US dollar invoicing dominates in third-country trade, with limited evidence for the euro in such vehicle-currency role. Third, the rising importance of the People's Republic of China (PRC) in global trade has benefitted the US dollar. The greater use of the renminbi, albeit at limited scale, has happened at the expense of the local currencies and euro. Finally, the authors prove that the People's Bank of China's global network of currency swap lines has resulted in the rise of renminbi invoicing, at least for the countries that share stronger trade ties with PRC. This has happened at the expense of both the US dollar and euro, though the impact is larger for the dollar.

Exploring the factors influencing the currency choice in trade invoicing, Ito and Chin (2014), look at the case of the renminbi and the relationship of its use with capital account liberalization. They conclude that countries with more developed financial markets are open to new currencies for their trade invoice. More particularly, countries with open capital accounts have greater propensity to invoice in either euro or in their home currency. While this finding implies that a more developed and open financial system may lower the US dollar dominance and may support internationalization of another currency like the renminbi, there is also inertia in the choice of currency in trade invoicing, i.e., once a currency is in use for a while to settle trade transactions, it takes a while before a trader may decide to move to a new currency.

Ito and Kawai (2016) investigate the determinants of dominant currency in trade invoicing during 1970-1998 using several factors like trade ties with a major currency country, commodity trade, exchange rate volatility, financial development and openness, and others. Their findings are as follows: first, the decision to choose a major currency for trade invoicing is positively related by these countries' export share with the major-currency country, though this is not fully applicable to the US dollar as it is driven by many other factors outside of trade ties; second, financial development and openness in third economy is not a determining factor for major currency invoicing, suggesting that a country with more developed and open financial market may invoice its exports in its own home currency; third, countries trading in commodities are likely to invoice their exports in US dollar; fourth, the share of major currency in trade invoicing is influenced by countries' allotted weights to major currencies in their currency baskets and their share of trade with major-currency zone countries. In other words, as the paper finds that Asia-Oceania countries belonged to the U.S. dollar zone, it implies greater use of the US dollar in trade transactions for these economies; finally, excluding the observations for the US dollar, it finds that major currency countries are likely to invoice their trade in their own currencies (home currencies), provided they have a large share in global

trade and have high per capita income. More developed financial markets do not have much impact on such decision-making. In addition, Ito and Kawai (2021) purport that the dominance of the US dollar is anchored by (i) the position of the US as being the largest and most dynamic economic power; (ii) the level of development of the dollar-based financial market as it is the most open, deepest, broadest, and most liquid in the world; (iii) the reputation of the Federal Reserve as one of the most responsible central banks; and (iv) the "network externalities" and incumbency "inertia" that continue to support the dollar's role as an unparalleled international currency.

At the country level, Amiti et al. (2020) provide theoretical and empirical analysis on how firms in Belgium decide on their currency for export and import transactions. They find that euro is as important as the US dollar for both Belgian imports and exports outside of the European Union. As determinants of currency choice in exports, the authors identify two influencing factors, i.e., firm size and the cost share of imported inputs. Larger firms with a greater share of imports as intermediate input are likely to choose non-euros for their export pricing, deviating from producer currency pricing. Most often this other currency is the US dollar. The authors find that the currency of imported inputs is positively correlated with the export currency choice. Related to this, global value chain, measured as firms' engagement in cross-border activities of ownership and foreign direct investment (FDI), increases the possibility of foreign currency use, particularly US dollar, for exports. However, for the firms' choice of currency for imports, the size of firms is not a determining factor. The firms are less active in making decision over currency choice in imports vis-à-vis exports. Another factor that influences a firm's choice of currency in exports and imports is its competitors' choice of currency for similar kinds of transactions.

Similarly, Ito et al. (2010) looked at Japanese exporting firms to highlight determinants of currency invoicing. They interviewed 23 Japanese firms across four industries, i.e., automobile, electrical, general machinery, and electrical component industries to gather information on their currency invoicing behavior and on their strategy to choose an invoice currency. They found that while Japanese electronics and automobile firms have the tendency to choose local currency invoicing when exporting to advanced countries, the same firms prefer to choose US dollar invoicing for exporting to Asia and Pacific economies. They found evidence for new determinants. First, Japanese exporters prefer importer's currency invoicing to developed markets to prevent competition between their local subsidiaries there and firms present in the local markets. Second, for exporting highly differentiated products to advanced markets, Japanese firms choose yen invoicing. Third, Japanese firms go for the US dollar invoicing for exports to their production subsidiaries in Asia and Pacific markets as their final destination market remains the US.

As contributions to the existing literature and policy debate, this research examines the sample of Asia and Pacific economies and assesses the role of multinational corporation affiliates in host countries in their choice of their trade invoicing currency. As it stands, while the studies that take a global approach include economies in the Asia and Pacific region, the discussion of the regional context is limited if any. Moreover, the role of multinational corporations (MNCs) is left out in the analysis of invoicing currency determinants although there is ample literature linking MNCs, value chains, and external trade (Kiyota and Urata 2005; Anderer, Dür, and Lechner 2020; Qiang, Liu, and Steenbergen 2021). Additionally, the paper explores further the influence of global value chain participation on invoicing currency to complement the findings of and add perspective to the scant but growing literature on the matter (Georgiadis et al. 2021)

3. Trade Invoicing Dataset and Stylized Facts

In assessing the behavior of economies in invoicing their trade, the dataset of Boz et al. (2020) is used. This is the most comprehensive dataset currently available. It shows the breakdowns

of exports and imports by invoicing currency, namely the US dollar, euro, home currency, and other currencies. In the published dataset, economy-level data are available for over 90 economies from 1990 to 2020, albeit there are data gaps or missing information.[3] The analysis focuses on data for 12 Asia and Pacific economies of Australia, Azerbaijan, India, Indonesia, Japan, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, New Zealand, Republic of Korea, and Thailand[4] for the period from 2009 to 2015. The choice of the period is determined by the data availability of the independent variables in the empirical analysis as will be described in detail in the subsequent section.

Moving to the trends and stylized facts, notwithstanding the modest share of the US in goods trade, Asia and Pacific economies are heavily reliant on the US dollar for invoicing. This observation holds for both exports and imports, although the ordering of the economies are not identical. For exports from 2009 to 2015, the average share of US in the total exports of the 12 regional economies with data ranges from less than a percent to over 17%, but the average share of US dollar in invoicing ranges from about half to 97%. Similarly, for imports during the same period, the proportion of the value of goods coming from the US to total imports ranges from 4% to about 11%, but the proportion of the total imports invoiced in US dollar ranges from just below 50% to 87%.

As can be seen in Figure 1, Asia and Pacific economies are more dependent on the US dollar than the economies outside the region even if the share of the US in trade flows are roughly the same. Isolating the Asia and Pacific region from the advanced and other emerging economy groups conveys a similar story (Figure 2a). Understandably, since most of the advanced economies are European, their trade is predominantly invoiced in euro, which underlines the role of the regional currency in trade settlement (Figure 2b). Incidentally, a sizable number of the emerging and developing economies (EMDE) in the sample are also European. Thus, as a group, the share of US dollar in trade invoicing in EMDEs is not as pronounced as in the Asia and Pacific region. However, if the non-Asia and Pacific emerging economy group is disentangled further, the data reveal that the average trade invoicing shares of the US dollar in Asia and Pacific economies is just slightly higher than in the non-European and non-Asia and Pacific EMDEs. The distribution of non-US dollar currencies in the two groups is nonetheless dissimilar, with home currency taking a markedly larger share in the Asia and Pacific region.

The share of the US dollar in Asia and Pacific economies' trade invoicing has been notably stable from 2009 to 2015. Both the trends of exports and imports are robust in favor of the US dollar (Figure 3a). This indicates relative steadiness in the drivers or the anchoring factors. Zooming in on the "other currencies," which are used for a little less than a fifth of the trade transactions in Asia and Pacific economies with data, shows that home currencies are used as the invoicing currency more than any other curency outside of the US dollar and euro. Interestingly, however, it is not the case for goods imports (Figure 3b).

Participation in the global value chain (GVC), proxied by the share of GVC-related output to total output, appears to be negatively associated with the share of the US dollar (Figures 4a.i to 4a.ii). However, in the Asia and Pacific region, this finding does not seem to hold (Figures 4b.i to 4b.iv). This is presumably because the participation in the regional value chain underpins a substantial portion of participation in the global value chain.[5] And the regional

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[3] In their paper, a dataset of 102 economies was used while in the published dataset 96 economies with economy-level are included and 6 economies were lumped together as Union Economique et Monétaire Ouest Africaine (UEMOA) or West African Economic and Monetary Union.

[4] Unfortunately, China and Singapore are not included in the Boz et al. (2020) dataset.

[5] For instance, Fujita (2019) notes that the regional value chain or RVCs are part of GVCs and the importance of the former is increasing in the Association of Southeast Asian Nations. Pomfret and Sourdin (2014), citing Johnson and Noguera (2012), also posit that there is evidence in some country clusters, including the Asian subregions,

value chain in the Asia and Pacific region is reliant on the US dollar. In comparison, the existence of a regional common currency tends to have a strong influence on the currency invoicing choice of European economies (Figures 4c.i to 4c.iv). And as their participation in the global value chain deepens–which is regional in nature like in the other regions–European economies also tend to use the euro more.

The negative relationship can likewise be observed when the US dollar invoicing share is plotted against the number of affiliates of multinational companies (Figures 5a to 5d) and the total goods trade to GDP ratio (Figures 6a to 6d). Yet, as with GVC, focusing on the Asia and Pacific economies reveals a different picture.The relationship is positive with respect to the number of MNC affiliates and unclear with respect to the total trade-to-GDP ratio.[6]

Notably, between 2009 and 2015, the number of MNC affiliates operating in the Asia and Pacific region has been on a steady increasing path. Most of these affiliates are operating in Australia, India, and Thailand (Figures 6c to 6d). In the absence of comprehensive datasets, however, there appears to be no solid account on the extent of contribution of MNC affiliates to the trade and economic output of the Asia and Pacific region.[7] At the global level, by imposing some assumptions, OECD (2018) estimates that the production of MNCs and their affiliates is about 33% of the economic output in 2014, of which the affiliates contribute 12% and the headquarters contribute 21%.

To put these observations in context and as mentioned in the previous section, it is important to emphasize that the global sample of economies with data is largely European, which happen to be using euros more than the US dollars in their trade transactions. This implies that geographic location and proximity as well as regional arrangements are potentially pivotal in the choice of invoicing currency.

4.   Empirical Specification and Data Sources

To address the research question on what relevant factors are associated with the Asia and Pacific region's high level of US dollar trade invoice, several factors are considered in explaining the cross-country variation in US dollar trade invoicing. The Asia and Pacific sample is the focus, given that the stylized facts presented in the previous section show the region's high level of US dollar trade invoicing. Specifically, the following equation is estimated:

$$y_i^{USD} = \alpha + \beta' X_i + \gamma' X_i * AP_i + \delta\gamma' Z_i + \theta AP_i + \varepsilon \qquad \text{(Equation 1)}$$

where y_i^{USD} refers the share of US dollar exports and imports trade invoice separately for country i for a given period. X_i and Z_i are vector of explanatory variables, and AP_i is a dummy variable which takes a value of 1 if an economy belongs to the Asia and Pacific region, and 0 otherwise. For X_i, we consider GVCs and MNCs as variables of interests. Per capita GDP is included (as proxy for level of development) and trade openness indicators as controls in Z_i. To address potential endogeneity, y_i^{USD} is regressed with the one-year lagged values of X_i and Z_i. Robust standard errors are used.

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that "distance matters [and] RVCs are more pronounced than global supply chains, presumably reflecting lower trade and monitoring costs when suppliers or customers are geographically closer."

[6] The MNC data were obtained from the OECD.Stat database (i.e., outward activity of multinationals by country of location). Total MNCs were calculated as the sum of manufacturing and services MNCs. The domicile countries of foreign entity behind the MNC affiliates operating in the Asia and Pacific region classified under manufacturing and services include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, Republic of Korea, Spain, Slovenia, Sweden, and United Kingdom,

[7] While the OECD.Stat database provide information on the value added, exports, and imports of MNC affiliates, the available data are very limited at this juncture.

Equation (1) is regressed on annual basis from 2010 to 2015, given that GVC and MNC data are both available for these years, thereby conducting cross-sectional regression. As Equation 1 exploits the cross-sectional variation of US dollar trade invoicing, the sign and significance of GVCs and MNCs will indicate whether economies with higher (lower) GVCs or MNCs tend to have significantly lower (higher) share of exports and imports invoiced in the US dollar. The inclusion of the interaction term between GVCs or MNCs and AP dummy variable will indicate whether Asia and Pacific economies with higher or lower GVCs or MNCs tend to have significantly greater or lesser share of US dollar trade invoice compared to non-regional sample. Both GVCs and MNCs are first separately estimated before including both in single specification. MNCs may reflect GVCs particularly for some subsectors or products of manufacturing and services, but there are other MNC subsectors and products which are more oriented towards the domestic market, and hence, not reflected as part of GVCs. Estimating GVCs and MNCs separately and jointly addresses concerns on multicollinearity.[8]

Aside from conducting cross-section analysis, the empirical specification is extended by conducting pooled OLS data. Pooling the dataset will increase the sample size and thereby improve the estimation results. Moreover, the results are checked using panel regression analysis with economy and time fixed effects. But the inclusion economy fixed effects will control for the cross-country heterogeneity which is the focus of our analysis. Moreover, several sensitivity tests are done by conducting sample splits, differentiating MNCs for manufacturing and services, controlling for the exchange rate regime, and using restricted sample for the Asia and Pacific economies.

The datasets used in this study are obtained from various sources (Table 1). The trade invoicing currency shares data are from the published dataset of Boz et al. (2020) as mentioned in the previous section. The global value chain (GVC) participation rates, which pertain to the proportion of the GVC-related output to total output, are from the World Bank World Integrated Trade Solutions online database, originally sourced from Eora.[9] The gross domestic product (GDP) and GDP per capita are from the International Monetary Fund (IMF) World Economic Outlook October 2021 database. The number of affiliate firms of multinational corporations are from the Organization for Economic Co-operation and Development (OECD) Statistics database.[10] The log values of both per capita income and MNCs are used to linearize both data. Meanwhile, the merchandise exports and imports data are from the IMF Direction of Trade Statistics database. Table 2 presents the descriptive statistics of dependent and independent variables for Equation 1. The values clearly indicate that the shares of US dollar in export and import trade invoice for Asia and Pacific economies are greater than the full sample average values.

5.   Empirical Results and Analysis

Table 3 presents the baseline results of the cross-section regression for all economies in 2015. Columns (1), (3) and (5) show the estimates for the share of US dollar in export trade invoicing, while columns (2), (4), and (6) present the results for the share of US dollar in import trade invoicing. Columns (1) and (2) focuses on GVCs, columns (3) and (4) considers MNCs, while columns (5) and (6) include both GVCs and MNCs. Separate estimates including GVCs and MNCs are presented as part of MNCs are involved in GVCs. Except for columns (1) and (2), cross-sectional analyses are restricted by the smaller sample size. Nonetheless, Table 3 provides evidence that Asia and Pacific economies with high GVC participation tends to have significantly higher share of exports and imports invoiced in US dollar. The results could imply that when imported inputs in the region are mostly invoiced in US dollar, this induces firms in

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[8] As part of sensitivity test, we differentiate between MNCs manufacturing and services.
[9] This measure subsumes pure backward GVC participation, pure forward GVC participation, and two-sided GVC participation. For additional details, refer to the World Bank World Integrated Trade Solutions portal, https://wits.worldbank.org/gvc/gvc-output-disaggregated.html.
[10] The total number of MNC affiliates refers to the sum of MNC affiliates in manufacturing and services.

the region to also invoice exports in US dollars, as suggested by Georgiadis et al. (2021). In addition, the estimates indicate Asia and Pacific economies with more MNCs tend to have significantly higher share of exports invoiced in US dollars. This may imply that the presence of foreign affiliates in the region plays a significant role in invoicing exports in US dollars as foreign affiliates in the domestic economy are inclined to invoice in a third currency such as the US dollar. The results presented in Table 3 hold when we consider cross-sectional regressions for 2010 to 2014.[11] The estimates for the control variables, per capita GDP, and trade openness, indicate that economies with higher per capita income and trade openness tend to have lower share of exports and imports invoiced in US dollar.

To improve the robustness of the baseline results, Equation (1) is estimated by pooling cross-sectional data for years 2010 to 2015. The results are similar as shown in Table 4. However, there is evidence that non-regional economies with higher GVC participation tend to have significantly lower share of trade invoiced in US dollar. This may suggest that imported inputs in non-Asia and Pacific economies are less invoiced in US dollar, and hence, non-regional firms are less inclined to invoice exports in US dollar. This conjecture is reasonable given that the non-Asia and Pacific sample includes European economies whose share of euro trade invoice may have increased due to higher GVC participation which includes other euro area countries. The results shown in Table 4 hold when separate pooled OLS regressions for regional and non-regional samples are conducted as shown in Tables 5 and 6. Table 6 shows that non-regional economies with higher GVC participation tend to have significantly lower share of trade invoiced in US dollar, consistent with Table 4. However, when Equation (1) is estimated as a panel regression with economy fixed effects, the results appear weaker as some estimate coefficients lose their significance. This finding is expected as the inclusion of economy fixed-effects controls for cross-country differences and hence the estimates capture differences across time, which is insignificant across economies given that the share of exports and imports invoiced in US dollar do not change much over the sample period of 2010 to 2015. Nonetheless, the findings hold when Equation (1) is estimated as panel regression with year fixed effects.[12]

In summary, the key findings are as follows. First, Asia and Pacific economies with greater GVC participation tend to have a higher share of their exports and imports invoiced in US dollars. This contrasts with non-regional economies wherein economies with higher GVC have a significantly lower share of exports and imports invoiced in US dollar. This suggests that there could be varying impacts of GVC participation across different regions and economies. In several of the European countries, for example, the role of the US dollar as invoicing currency in international trade is limited by the greater use of the euro due to the importance of the euro area in the countries' overall trade. These countries have seen an increase in euro invoicing in line with greater cross-border value chain activities and deeper European integration (Georgiadis et al. 2021). Thus, while policies and infrastructure to lower trade cost increased trade activities within the region, a strong regional currency also helped in its greater use in trade invoicing. This differs from the Asia and Pacific economies considered in the paper. Though some of the Asia and Pacific economies in the sample has shown greater trade integration and participation in regional value chains, the extent of cross-border activities within the region is still relatively small. Moreover, for many of these countries, a third country, most often the US or/ and Europe, is the largest export destination. Besides, the region is yet to produce a strong regional currency, though there is some evidence that renminbi invoicing is growing among Southeast Asian countries due to their growing trade relation with China and the People's Bank of China's policy-driven initiatives (Georgiadis et al. 2021; Sato and Shimizu 2016).

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[11] The results for cross-section regressions from 2010 to 2014 are available upon request.
[12] The results for panel regressions with fixed effects are also available upon request.

Second, Asia and Pacific economies with more MNCs usually have a significantly higher share of exports invoiced in US dollar. One probable reason for this could be the higher bargaining power of MNCs, where they can demand US dollar invoicing as the destination for their final products is the US market, thus passing on the foreign exchange risk to the GVC participant located in an Asian economy. We do not find conclusive evidence that this is true for imports. The inertia argument in the choice of invoicing currency also applies to MNC affiliates. As purported by Ito and Chinn (2014), citing Krugman (1980), it is difficult to switch currencies once it has become customary to use one currency–a supposition that is more entrenched in a setting wherein the trading entities involved are part of the same network of companies or MNCs. As described by De Backer, Miroudot, Rigo (2019) MNC affiliates are partly "motivated by the desire to place production close to customers and avoid trade costs (i.e., horizontal MNCs) [and] produce goods and services that are used as inputs for production activities within the MNC network in other countries (i.e., vertical MNCs).[13]

Several sensitivity tests and extensions were conducted using pooled OLS estimates. First, using winsorized log MNC values at the top 5% to address outliers yield the same results. Second, sectoral differences between MNC manufacturing and services may show different covariation with the share of US dollar invoicing as foreign affiliates of MNC manufacturers might be more inclined to invoice in a third currency, such as in US dollar, as compared to foreign affiliates of MNC services. Tables 7 and 8 indicate that Asia and Pacific economies with a greater presence of MNCs in manufacturing and service sectors tend to have a significantly higher share of exports invoiced in US dollar. However, the coefficients of MNC manufacturing tend to be higher than that for services, suggesting that the impact of MNC manufacturing is greater. Third, the Asia and Pacific sample includes economies with varying degrees of economic and financial development and trade and capital account openness. A smaller sample of Asia and Pacific economies, including India, Indonesia, the Republic of Korea, Malaysia, and Thailand, is considered. The estimates, presented in Table 9a, show the same results for GVC, but MNCs lose its significance. This suggests that the baseline result on the positive impact of GVC on US dollar trade invoicing is robust. For capital account openness, using the Chinn-Ito dataset (2006), the inclusion of *de jure* capital account openness measure shows that the results for GVC hold but that for MNCs do not, as presented in Table 9b.

Fourth, previous studies, including Devereux et al. (2004) and Goldberg and Tille (2008 and 2013), highlight the importance of exchange rate in exporters' invoicing currency choice. Table 10 shows the results for the Asia and Pacific sample with the inclusion of a dummy variable taking the value of 1 if the exchange rate regime is considered as fixed, pegged, or managed to the US dollar based on the IMF's AREAR report, and 0 otherwise.[14] The estimates indicate that for the Asia and Pacific region, higher GVC participation of economies with fixed, pegged, or managed exchange rate regimes tend to have a significantly lower share of their exports invoiced in US dollar, perhaps because export earnings under fixed exchange rate with the US dollar is the same as invoicing in exports in US dollar. Fifth, to show the varying impacts of GVCs and MNCs across regions, Tables 11a and 11b present the pooled OLS estimates for European and non-Asia and Pacific and non-European economies samples. For the European sample, the estimates show weak positive and significant effects in columns (1) and (2) and negative and strongly significant effects in columns (5) and (6). Consequently, the results are inconclusive for the European sample as shown in Table 11a.[15] For the non-Asia and Pacific and non-European sample, the estimates presented in Table 11b indicate that

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[13] De Backer, Miroudot, Rigo (2019) use the term multinational enterprises.
[14] In the sample of Asia and Pacific economies, those with fixed, pegged, or managed exchange rates include Azerbaijan, Kazakhstan, Kyrgyzstan, and Malaysia.
[15] The European sample includes Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and United Kingdom.

higher GVC participation and more MNCs are significantly associated with lower US dollar invoicing.[16] These results are contrary to the findings for the Asia and Pacific sample, implying that higher GVC and MNCs have different effects on trade invoicing across regions.

In summary, these extensions and sensitivity tests indicate that not only do the baseline results hold, but cross-country and regional differences are important in understanding the prevalence of US dollar trade invoicing in the Asia and Pacific region.

6.   Concluding Remarks

This paper draws attention to the fact that Asia and Pacific economies tend to have a higher share of their exports and imports invoiced in US dollar. This paper aims to assess the covariation between GVCs and MNCs with US dollar share in trade invoicing for Asia and Pacific economies. Using the Boz et al. (2020) dataset, the empirical analysis of this paper exploits cross-sectional heterogeneities that could explain the high share of the US dollar in the region's trade invoice. The results show that Asia and Pacific economies with greater GVC participation tend to have a higher share of their exports and imports invoiced in US dollars, in contrast with non-regional economies wherein economies with higher GVC have a significantly lower share of exports and imports invoiced in US dollar. One likely reason for the difference lies in the extent of regional trade exposure or regional trade cooperation and the establishment of a regional currency. In addition, Asia and Pacific economies with more MNCs usually have a significantly higher share of exports invoiced in US dollar. This is possibly because the US remains a key destination for the final products for many MNCs. These new findings offer empirical evidence in the context of the Asia and Pacific region as well as relevance of foreign affiliates of MNCs, which are the main contributions of this paper.

Following the results of the empirical exercise, the Asia and Pacific's regional value chain reflects global value chains, reinforcing US dollar trade invoicing. Greater openness to foreign firms in the region likewise seems to have a similar effect. These findings lend support to the inertia argument purported by Ito and Chin (2014) and emphasize the centrality of the US dollar in the Asia and Pacific's regional trade and financial architecture currently. Traders in the Asia and Pacific region are used to transacting in US dollar. The financial infrastructure and protocols for US dollar invoicing, payment, and settlement are also significantly more well-established than other currencies.

The risks of having high dependency on US dollar trade invoicing ranges from its limiting impact on external adjustments, balance sheet effects, currency mismatches, and financial vulnerabilities. To lessen the region's reliance on the US dollar, systems that will drive down the cost and improve the ease of using the other regional currencies must be in place to make them more competitive relative to the US dollar. To this end, supporting the push for a broader regional financial infrastructure that links the different domestic markets coupled by agreements that promote the use of regional currencies in trade is key to gradually lessen the region's US dollar dependence. MNCs can play a significant role in this by increasing the percentage of their invoicing in local currencies instead of dollars, and thus reduce the risk management burden on players in GVCs located in developing economies. Separately, as noted in the discussion above, Georgiadis et al. (2021) posit that "the establishment of currency swap lines by the People's Bank of China has been associated with increases in renminbi invoicing". Potential expansion of the local currency settlement framework adopted by Indonesia, Malaysia, and Thailand (Sato 2019) and similar initiatives, for instance, can likewise be explored in this respect. Finally, strengthening the development of FX hedging markets in Asia is a vital step in promoting local currency stability, which can later encourage their use for trade invoicing.

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[16] Non-Asia and Pacific and non-European sample include Argentina, the Bahamas, Botswana, Brazil, Chile, Colombia, Costa Rica, Egypt, Israel, Liberia, Malawi, Mauritius, Morocco, Paraguay, Peru, Russia, and Tunisia.

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Figures and Tables

Figure 1. Asia's Trade with the United States and US Dollar Invoicing, 2009-2015 Averages (%)
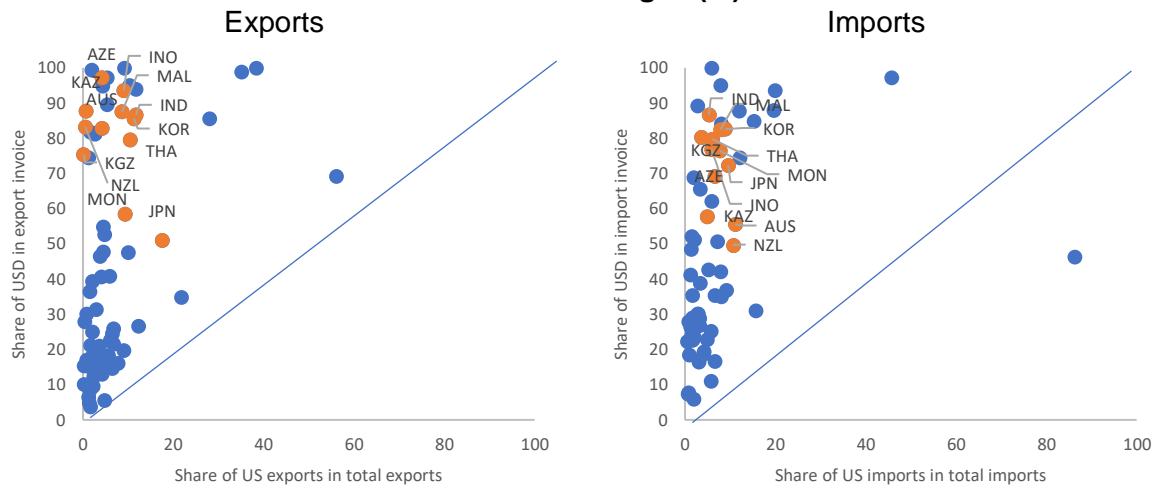
Exports

Imports

AUS = Australian, AZE = Azerbaijan, IND = India, INO = Indonesia, JPN = Japan, KAZ = Kazakhstan, KOR = Republic of Korea, KGZ = Kyrgyzstan, MAL = Malaysia, MON = Mongolia, NZL = New Zealand, THA = Thailand, US = United States, USD = United States dollar.
Note: The averages by economy only cover years when data for both variables are available.
Source: Authors, based on Boz el al. (2020) and IMF Direction of Trade Statistics database (accessed November 2021).

Figure 2. US dollar and Non-US dollar Trade Invoicing by Country Group, 2009-2015 Averages (%)

a. US dollar and Other Curencies Trade Invoicing, Distribution
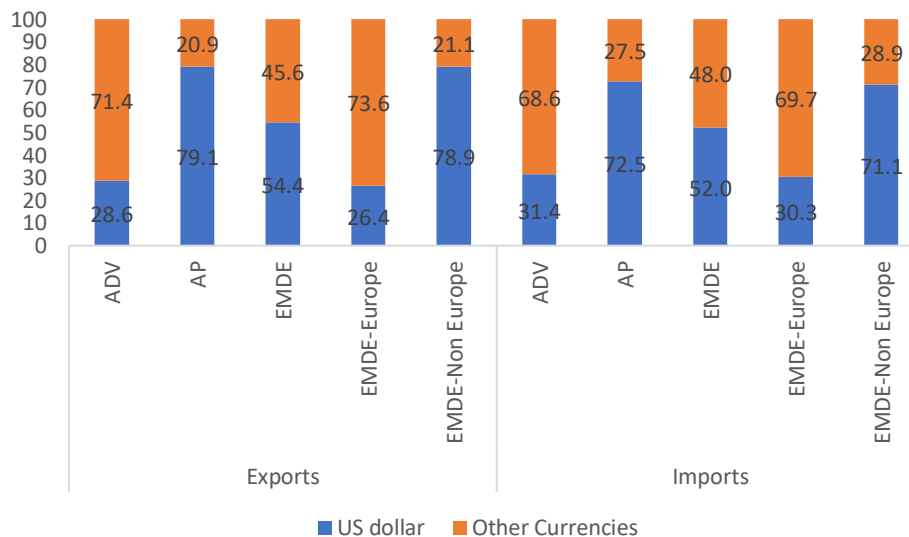
b. US dollar, Euro, Home Currency and Other Currency Trade Invoicing, Distribution

ADV = advanced economies, AP = Asia and Pacific, EMDE = emerging market and developing economies, US = United States.

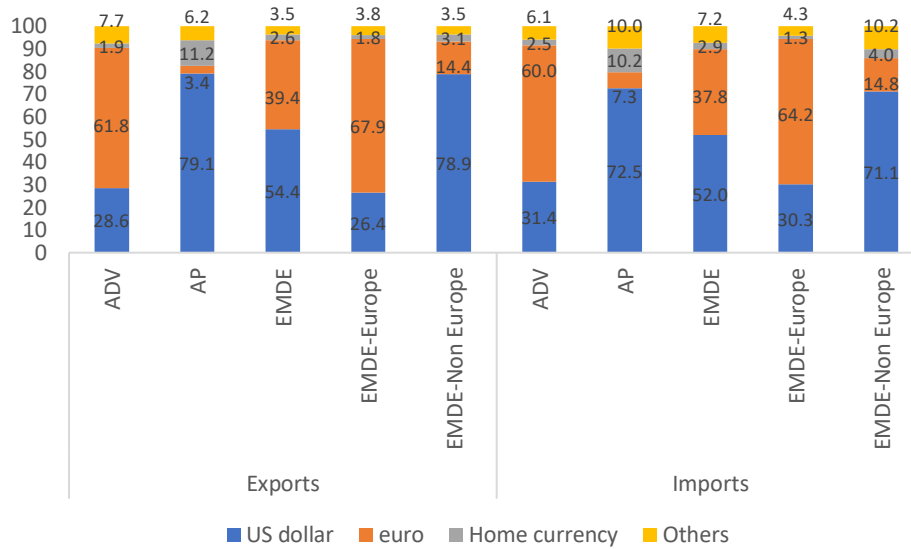Notes: Asia and Pacific economies are based on the membership of ADB. The other groupings based on income are based on the definition of the IMF. The EMDE group excludes economies that are in the Asia and Pacific group. The averages cover all years with data from 2009 to 2015. The averages are calculated by country group first then over the years.

Source: Authors, based on Boz el al. (2020).

Figure 3. Currency Shares of Asia's Trade Invoice, Annual Averages (%)

a. Major currencies
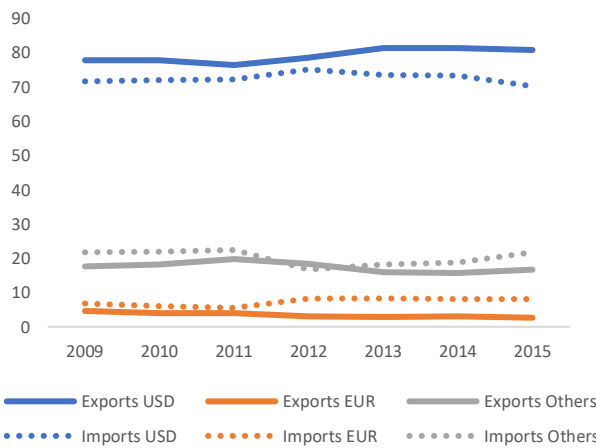
b. Home currency and other non-US dollar and non-euro currencies
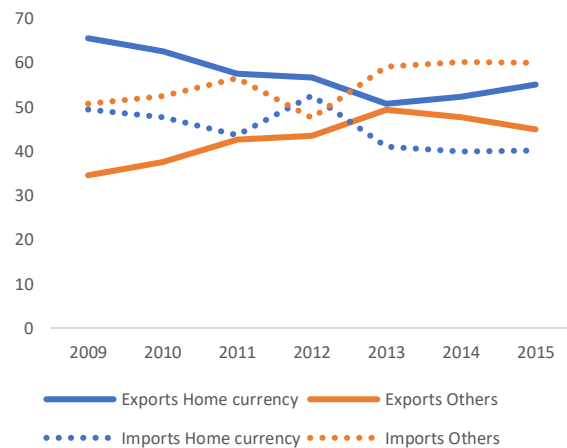
EUR = euro, US = United States, USD = United States dollar. The values presented in Figure 3b pertains to the average annual values of "Others" in Figure 3a.

Source: Authors, based on Boz el al. (2020).

Figure 4. US Dollar Invoicing Share and GVC Participation (%), 2009-2015
a. US dollar-invoiced exports and imports and GVC participation
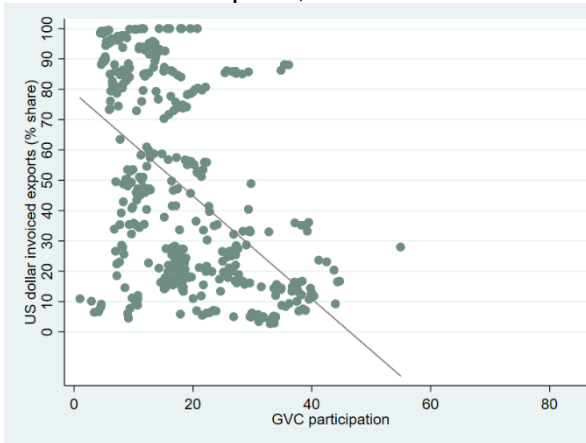
i. Exports, all data   ### ii. Imports, all data
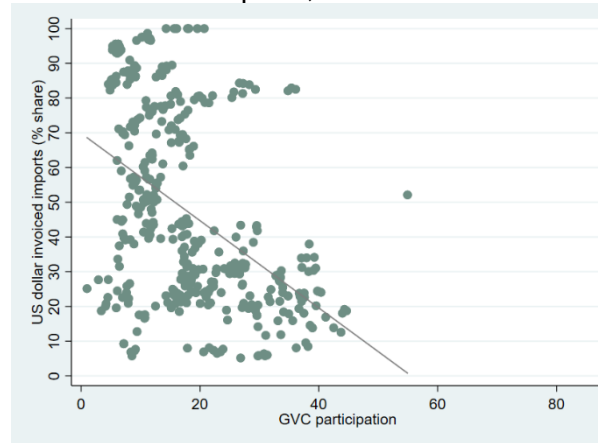
b. US dollar-invoiced exports and imports and GVC participation, by region
i. By region, exports   ### ii. By region, imports

iii. By region annual average, exports   ### iv. By region annual average, imports

16
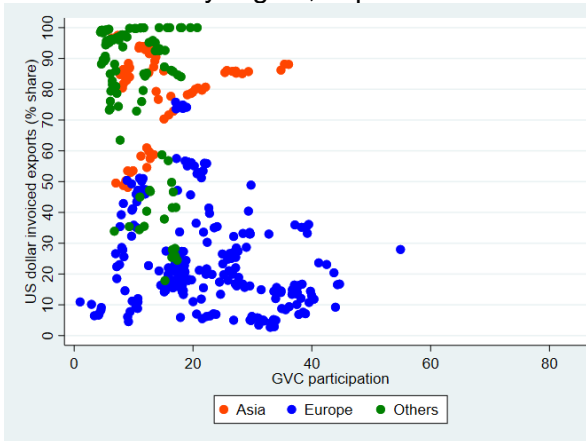
c. Euro-invoiced exports and imports and GVC participation, by region
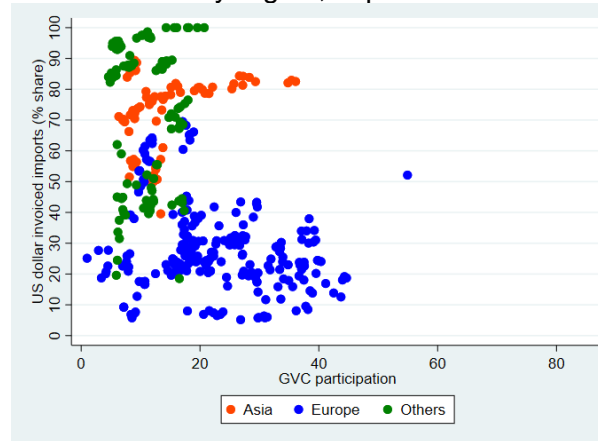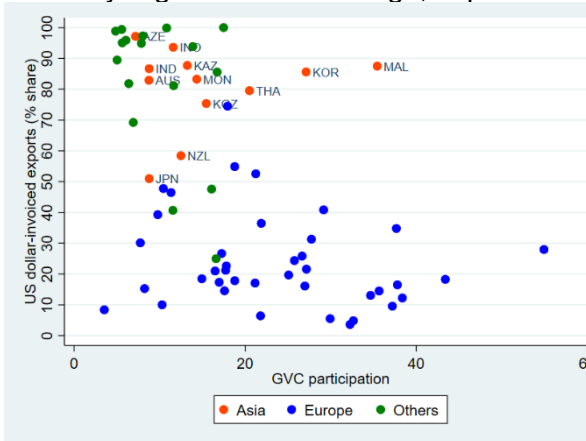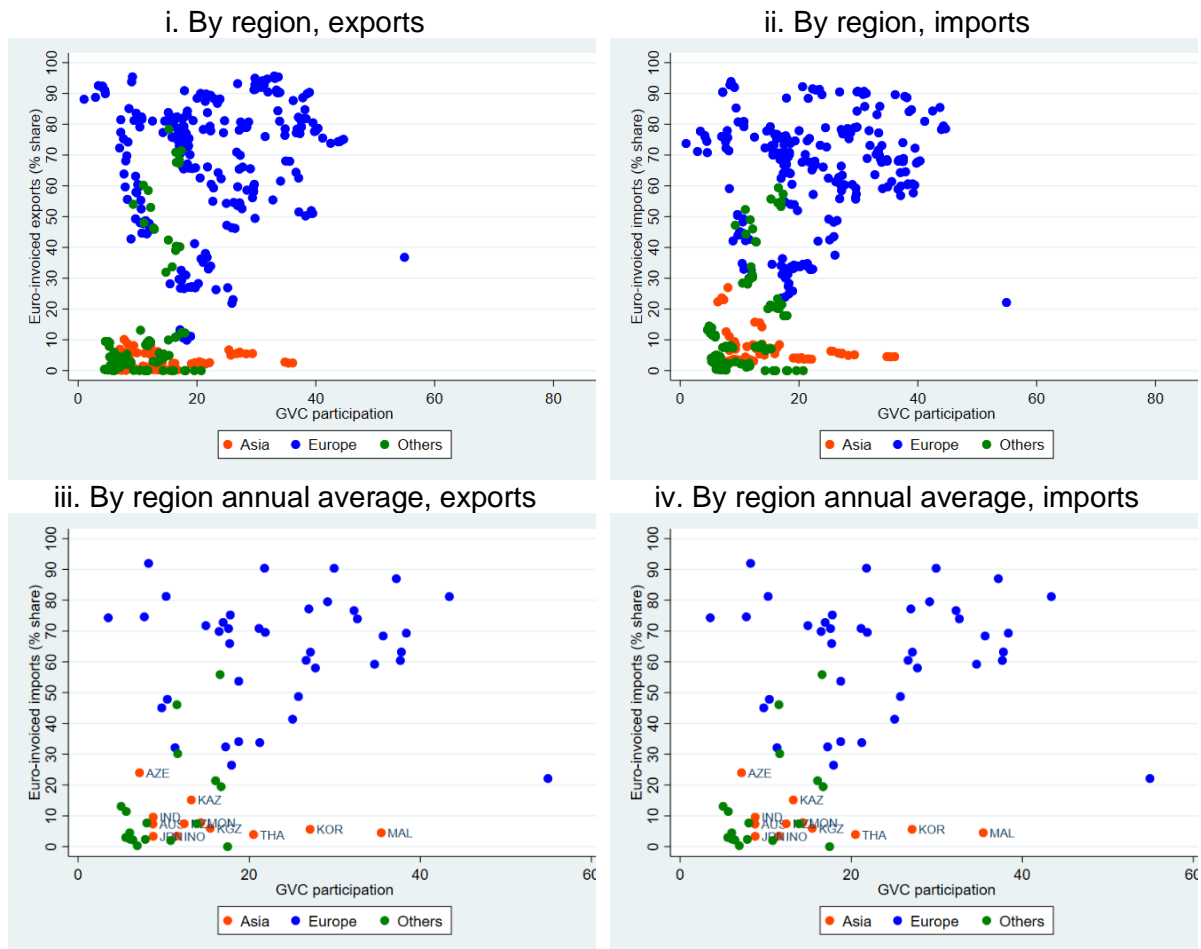
i. By region, exports

ii. By region, imports

iii. By region annual average, exports

iv. By region annual average, imports

AUS = Australian, AZE = Azerbaijan, IND = India, INO = Indonesia, JPN = Japan, KAZ = Kazakhstan, KOR = Republic of Korea, KGZ = Kyrgyzstan, MAL = Malaysia, MON = Mongolia, NZL = New Zealand, THA = Thailand. AP = Asia and Pacific, GVC = global value chain, USD = United States dollar.
Notes: GVC participation refers to GVC-related output as percentage of output. The averages by economy only cover years when data for both variables are available. The data are sourced from Eora and published on the World Bank World Integrated Trade Solutions (WITS) database, https://wits.worldbank.org/gvc/gvc-output-table.html. The averages by economy only cover years when data for both variables are available.
Source: Authors, based on Boz el al. (2020) and World Bank WITS database (accessed November 2021).

Figure 5. US Dollar Invoicing Share (%) and Number MNC Affiliates, 2009-2015

a. Exports, all data
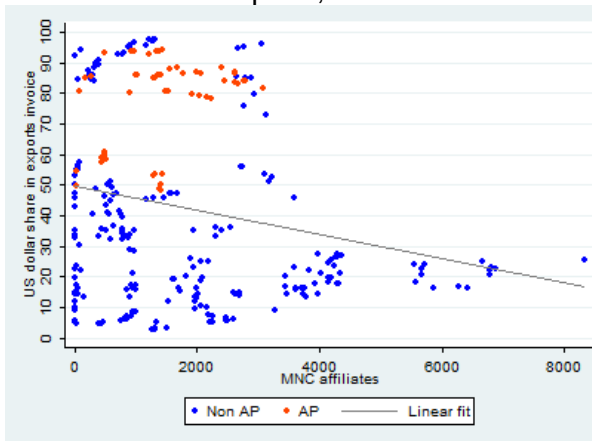
b. Imports, all data
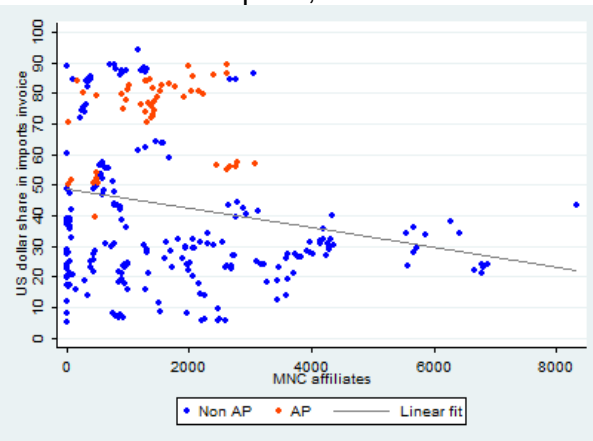
c. Exports, annual average
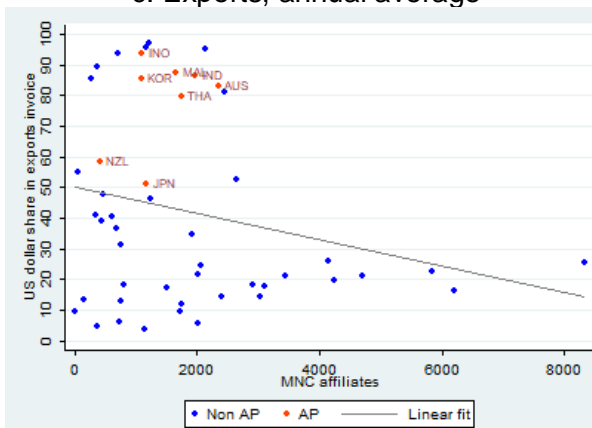
d. Imports, annual average
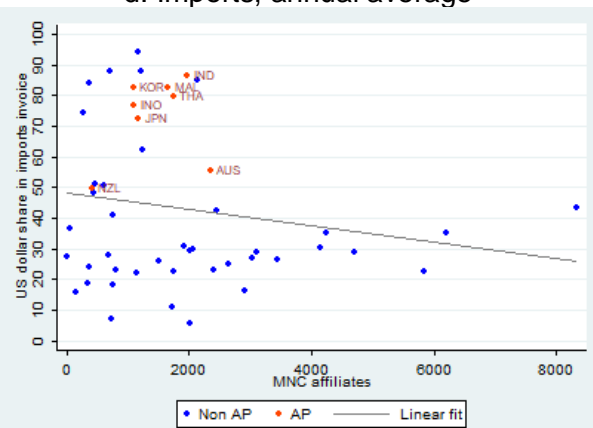
AUS = Australian, IND = India, JPN = Japan, KOR = Republic of KoreaMAL = Malaysia, NZL = New Zealand, THA = Thailand. AP = Asia and Pacific, MNC = multinational corporations, US = United States.

Note: The averages by economy only cover years when data for both variables are available.

Source: Authors, based on Boz el al. (2020) and OECD Stat database (accessed November 2021).

Figure 6. US Dollar Invoicing Share and Total Trade-to-GDP (%)

a. Exports, all data
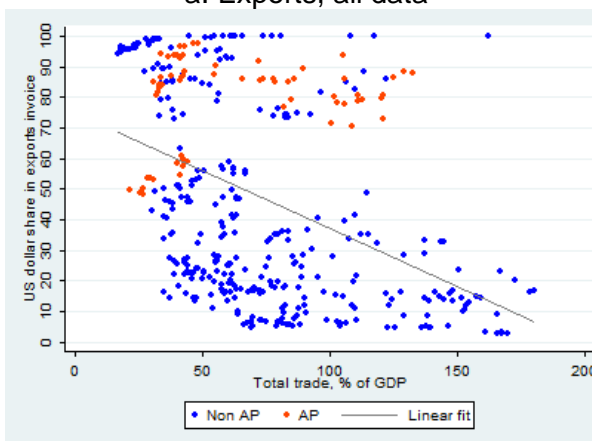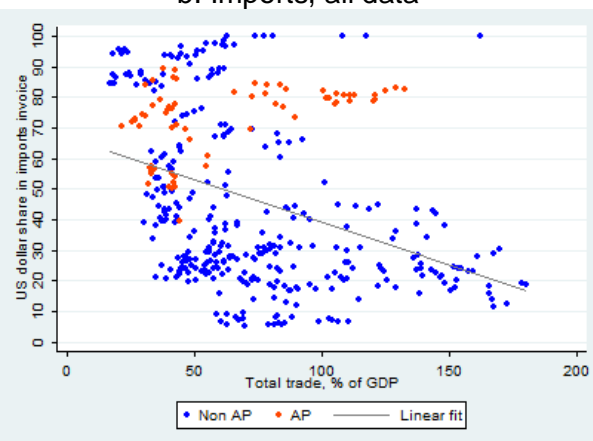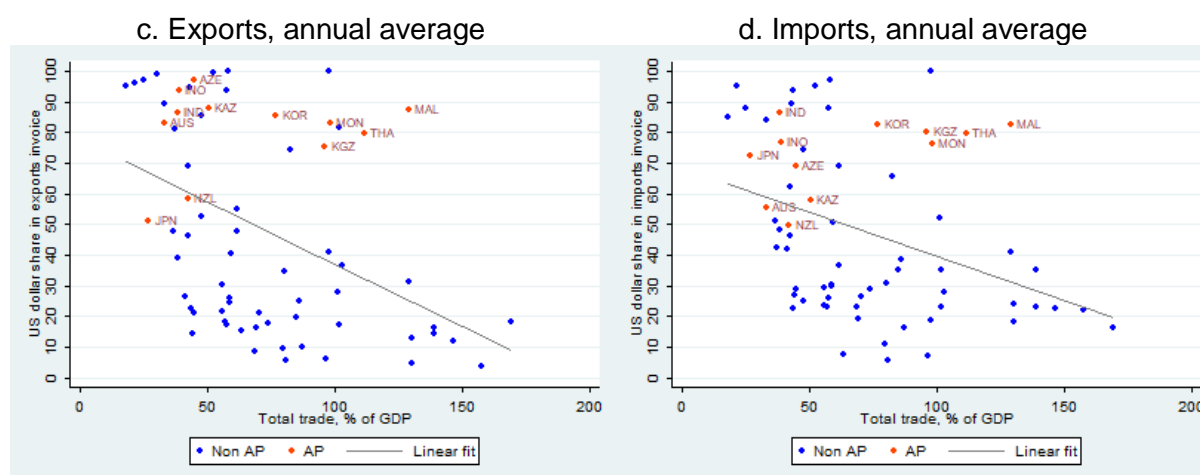
b. Imports, all data

c. Exports, annual average

d. Imports, annual average

AUS = Australian, AZE = Azerbaijan, IND = India, INO = Indonesia, JPN = Japan, KAZ = Kazakhstan, KOR = Republic of Korea, KGZ = Kyrgyzstan, MAL = Malaysia, MON = Mongolia, NZL = New Zealand, THA = Thailand.
AP = Asia and Pacific, GDP = gross domestic product, US = United States.
Note: The averages by economy only cover years when data for both variables are available.
Source: Authors, based on Boz el al. (2020), IMF Direction of Trade Statistics database (accessed November 2021), and IMF World Economic Outlook October 2021 database (accessed November 2021).

Table 1. Data and Sources

| Data	Source
Trade invoicing currency shares	Boz et al (2020)
Global value chain participation (share of GVC-related output to total output)	World Bank WITS sourced from EORA
GDP, nominal current prices	IMF World Economic Outlook October 2021
GDP per capita, nominal current prices	IMF World Economic Outlook October 2021
Multinational corporations, number of affiliate firms (Outward activity of multinationals by country of location)	OECD.Stat
Bilateral goods trade, nominal current prices	IMF Direction of Trade Statistics

GDP = gross domestic product, IMF = International Monetary Fund, OECD = Organisation for Economic Co-operation and Development, WITS = World Integrated Trade Solutions.
Source: Authors.

Table 2. Descriptive Statistics

All economies	Number of economies	Number of observations	Mean	Standard deviation	Minimum	Maximum
Exports invoiced in US dollar, share (%)	69	398	48.0	33.0	2.7	100.0
Imports invoiced in US dollar, share (%)	69	397	47.0	27.7	5.2	100.0
Global value chain participation (%)	69	483	18.8	12.0	1.0	86.4
LN(Number of multinational corporation affiliates)	69	330	6.9	1.9	0.0	10.0
LN(GDP per capita in US dollars)	69	483	9.5	1.2	6.1	11.7
Total goods trade (% of GDP)	69	483	71.6	36.5	17.0	180.2
Asia and Pacific economies	Number of economies	Number of observations	Mean	Standard deviation	Minimum	Maximum
Exports invoiced in US dollar, share (%)	12	68	79.4	14.1	48.1	97.7
Imports invoiced in US dollar, share (%)	12	67	72.5	11.8	39.5	89.4
Global value chain participation (%)	12	84	15.5	8.5	6.3	38.8
LN(Number of multinational corporation affiliates)	12	56	6.9	1.1	3.1	8.0
LN(GDP per capita in US dollars)	12	84	9.1	1.3	6.8	11.1
Total goods trade (% of GDP)	12	84	66.7	34.8	21.4	140.5

GDP = gross domestic product, LN = natural logarithm, US = United States.
Source: Authors' calculations.

Table 3. Cross-section OLS, 2015, All Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC_{t-1}	-0.456	0.248			-1.709	-2.164*
	(0.483)	(0.296)			(1.487)	(1.215)
$AP*GVC_{t-1}$	1.813***	1.856***			2.572**	2.699***
	(0.451)	(0.326)			(0.956)	(0.726)
$LN(MNC)_{t-1}$			-4.685	-0.963	-3.895	0.119
			(4.334)	(4.164)	(4.119)	(3.661)
$AP*LN(MNC)_{t-1}$			24.521***	13.421	18.597***	6.635
			(8.005)	(13.036)	(5.601)	(9.792)
$LN(GDPPC)_{t-1}$	-6.942**	-9.624***	-5.313	-7.418**	0.702	-0.067
	(2.852)	(2.252)	(3.725)	(3.526)	(6.471)	(4.918)
$Trade_{t-1}$	-0.368**	-0.440***	-0.360***	-0.296***	-0.083	0.073
	(0.138)	(0.085)	(0.091)	(0.075)	(0.275)	(0.225)
AP	0.509	-8.110	-148.113**	-70.875	-151.141***	-69.901
	(12.041)	(8.750)	(56.547)	(91.723)	(38.047)	(67.434)
Constant	148.525***	164.714***	156.802***	143.895***	104.561	78.444
	(28.556)	(22.097)	(47.443)	(42.283)	(72.275)	(55.642)
Observations	52	52	32	32	32	32
R-squared	0.470	0.482	0.543	0.517	0.629	0.648

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
AP = Asia and Pacific economies dummy, GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.
Source: Authors' calculations.

Table 4. Pooled OLS, All Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC_{t-1}	-0.674**	-0.098			-1.447***	-1.575***
	(0.292)	(0.204)			(0.302)	(0.266)
$AP*GVC_{t-1}$	1.885***	1.747***			2.285***	2.101***
	(0.203)	(0.156)			(0.207)	(0.174)
$LN(MNC)_{t-1}$			-0.026	0.563	-0.030	0.551
			(0.753)	(0.615)	(0.712)	(0.560)
$AP*LN(MNC)_{t-1}$			5.917***	3.486**	3.875**	1.640
			(1.944)	(1.703)	(1.664)	(1.670)
$LN(GDPPC)_{t-1}$	-7.246***	-9.195***	-8.458***	-8.668***	-3.456**	-3.188**
	(1.568)	(1.261)	(1.320)	(1.055)	(1.557)	(1.280)
$Trade_{t-1}$	-0.266***	-0.297***	-0.365***	-0.274***	-0.112*	0.012
	(0.070)	(0.047)	(0.034)	(0.028)	(0.063)	(0.053)
AP	1.802	-2.631	-9.928	1.227	-34.115***	-21.385*
	(5.082)	(3.696)	(13.179)	(11.731)	(12.282)	(12.345)
Constant	143.592***	154.233***	148.986***	142.379***	111.581***	100.543***
	(14.690)	(11.796)	(14.802)	(12.160)	(15.452)	(12.698)
Observations	351	350	246	245	246	245
R-squared	0.460	0.451	0.520	0.521	0.596	0.628

Robust standard errors in parentheses. Level of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
AP = Asia and Pacific economies dummy, GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.
Source: Authors' calculations.

Table 5. Pooled OLS, Asia and Pacific Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC $_{t-1}$	0.859***	1.054***			1.195***	1.094***
	(0.245)	(0.147)			(0.251)	(0.198)
LN(MNC) $_{t-1}$			3.138*	1.738	3.556*	2.125
			(1.650)	(1.515)	(1.784)	(1.590)
LN(GDPPC) $_{t-1}$	-6.694***	-6.837***	-5.699***	-5.635***	-7.024***	-6.854***
	(1.363)	(0.794)	(1.209)	(0.808)	(1.421)	(0.795)
Trade $_{t-1}$	-0.163***	-0.123***	0.061	0.101***	-0.215***	-0.152***
	(0.049)	(0.033)	(0.043)	(0.026)	(0.052)	(0.044)
Constant	138.938***	127.572***	106.601***	108.473***	113.807***	115.080***
	(10.904)	(6.598)	(16.588)	(12.389)	(17.628)	(11.742)
Observations	60	59	44	43	44	43
R-squared	0.297	0.594	0.430	0.552	0.526	0.659

Robust standard errors in parentheses. Level of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.
Source: Authors' calculations.

Table 6. Pooled OLS, Non-Asia and Pacific Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC $_{t-1}$	-0.637*	0.005			-1.851***	-2.001***
	(0.332)	(0.225)			(0.417)	(0.361)
LN(MNC) $_{t-1}$			0.029	0.630	-0.167	0.419
			(0.743)	(0.602)	(0.704)	(0.547)
LN(GDPPC) $_{t-1}$	-7.289***	-9.854***	-8.912***	-9.389***	0.145	0.403
	(2.080)	(1.665)	(1.691)	(1.342)	(2.662)	(2.166)
Trade $_{t-1}$	-0.280***	-0.327***	-0.425***	-0.327***	-0.024	0.106
	(0.081)	(0.053)	(0.037)	(0.031)	(0.090)	(0.075)
Constant	144.331***	160.806***	157.630***	153.081***	78.526***	67.558***
	(19.331)	(15.372)	(18.172)	(14.725)	(24.999)	(20.394)
Observations	291	291	202	202	202	202
R-squared	0.339	0.330	0.412	0.410	0.465	0.503

Robust standard errors in parentheses. Level of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.
Source: Authors' calculations.

Table 7. Pooled OLS Using Manufacturing MNCs, Asia and Pacific Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC_{t-1}	0.859***	1.054***			1.308***	1.161***
	(0.245)	(0.147)			(0.227)	(0.211)
$LN(MNC\_m)_{t-1}$			5.135***	2.744	6.085***	3.609
			(1.811)	(2.035)	(1.980)	(2.194)
$LN(GDPPC)_{t-1}$	-6.694***	-6.837***	-4.559***	-5.047***	-5.788***	-6.143***
	(1.363)	(0.794)	(1.348)	(0.904)	(1.501)	(0.824)
$Trade_{t-1}$	-0.163***	-0.123***	0.040	0.091***	-0.267***	-0.182***
	(0.049)	(0.033)	(0.047)	(0.028)	(0.054)	(0.052)
Constant	138.938***	127.572***	87.363***	98.737***	90.797***	101.694***
	(10.904)	(6.598)	(19.232)	(17.373)	(20.479)	(17.215)
Observations	60	59	44	43	44	43
R-squared	0.297	0.594	0.462	0.562	0.576	0.681

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC_m = multinational corporation affiliates in manufacturing, OLS = ordinary least squares, US = United States.

Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.

Source: Authors' calculations.

Table 8. Pooled OLS Using Services MNCs, Asia and Pacific Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC $_{t-1}$	0.859***	1.054***			1.140***	0.989***
	(0.245)	(0.147)			(0.231)	(0.195)
LN(MNC_s) $_{t-1}$			3.897***	-0.088	3.962**	-0.029
			(1.203)	(1.206)	(1.478)	(1.404)
LN(GDPPC) $_{t-1}$	-6.694***	-6.837***	-6.047***	-5.770***	-7.444***	-6.986***
	(1.363)	(0.794)	(1.329)	(0.889)	(1.555)	(0.886)
Trade $_{t-1}$	-0.163***	-0.123***	0.079*	0.104***	-0.185***	-0.124***
	(0.049)	(0.033)	(0.042)	(0.026)	(0.046)	(0.043)
Constant	138.938***	127.572***	104.898***	122.738***	115.440***	131.891***
	(10.904)	(6.598)	(16.652)	(10.132)	(19.100)	(10.536)
Observations	60	59	38	37	38	37
R-squared	0.297	0.594	0.486	0.523	0.573	0.617

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC_s = multinational corporation affiliates in services, OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.
Source: Authors' calculations.

Table 9a. Pooled OLS, Selected Asia and Pacific Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC $_{t-1}$	0.755***	0.479***			0.772***	0.536***
	(0.143)	(0.142)			(0.137)	(0.155)
LN(MNC) $_{t-1}$			0.028	1.535	0.577	1.917
			(1.104)	(1.888)	(1.302)	(1.773)
LN(GDPPC) $_{t-1}$	-2.961**	-2.761**	0.939	-0.023	-2.949**	-2.722*
	(1.110)	(1.250)	(0.647)	(0.873)	(1.096)	(1.337)
Trade $_{t-1}$	-0.208***	-0.062**	-0.108***	-0.011	-0.215***	-0.085***
	(0.021)	(0.025)	(0.031)	(0.024)	(0.023)	(0.028)
Constant	113.128***	100.694***	86.455***	71.602***	109.102***	87.321***
	(8.429)	(9.980)	(10.736)	(17.613)	(13.453)	(18.028)
Observations	26	26	26	26	26	26
R-squared	0.677	0.133	0.485	0.060	0.682	0.216

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.

Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details. The Asia and Pacific economies included in this estimation are India, Indonesia, Malaysia, Republic of Korea, and Thailand.

Source: Authors' calculations.

Table 9b. Pooled OLS, with Capital Account Openness Measure

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC_{t-1}	0.532*	1.102***			1.608***	1.170***
	(0.278)	(0.157)			(0.184)	(0.230)
$LN(MNC)_{t-1}$			1.799	1.821	1.785	1.813
			(1.606)	(1.602)	(1.526)	(1.622)
$LN(GDPPC)_{t-1}$	-3.016*	-7.376***	-0.143	-5.990***	0.468	-5.502***
	(1.669)	(0.912)	(3.418)	(1.687)	(3.623)	(1.531)
$Trade_{t-1}$	-0.141**	-0.126***	-0.061	0.109**	-0.485***	-0.201***
	(0.064)	(0.035)	(0.064)	(0.047)	(0.072)	(0.071)
$KAOPEN_{t-1}$	-21.755***	3.241	-31.232*	2.014	-44.685***	-8.152
	(5.982)	(5.064)	(15.806)	(10.452)	(16.433)	(10.022)
Constant	120.858***	130.202***	88.700***	109.621***	90.688***	110.891***
	(13.065)	(6.863)	(20.723)	(12.850)	(22.075)	(11.842)
Observations	60	59	44	43	44	43
R-squared	0.419	0.598	0.502	0.552	0.663	0.665

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, KAOPEN = standardized capital account openness measure from Chinn and Ito (2006), OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details.
Source: Authors' calculations.

Table 10. Pooled OLS with Exchange Rate Regime, Asia and Pacific Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC_{t-1}	1.204***	1.185***			1.233***	1.281***
	(0.296)	(0.146)			(0.318)	(0.186)
$FX_{t-1}*GVC_{t-1}$	-0.807***	-0.175			-0.497***	-0.142
	(0.243)	(0.143)			(0.177)	(0.116)
$LN(MNC)_{t-1}$			3.106*	1.742	3.526*	2.200
			(1.697)	(1.552)	(1.865)	(1.716)
$FX_{t-1}*LN(MNC)_{t-1}$			-12.852	4.075	-0.326	-0.807
			(9.991)	(7.742)	(3.321)	(2.045)
$LN(GDPPC)_{t-1}$	-5.985***	-7.291***	-5.349***	-5.703***	-6.652***	-7.106***
	(1.370)	(0.781)	(1.223)	(0.837)	(1.497)	(0.841)
$Trade_{t-1}$	-0.176***	-0.125***	0.053	0.099**	-0.197***	-0.165***
	(0.051)	(0.026)	(0.054)	(0.039)	(0.057)	(0.038)
FX_{t-1}	20.885***	-2.976	99.337	-29.855	16.204	3.120
	(5.317)	(3.423)	(70.586)	(54.183)	(22.426)	(14.505)
Constant	126.254***	131.383***	103.239***	109.293***	108.713***	115.549***
	(10.088)	(6.312)	(17.221)	(13.117)	(18.301)	(12.728)
Observations	60	59	44	43	44	43
R-squared	0.405	0.640	0.454	0.552	0.541	0.679

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

FX = exchange rate regime. GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates in manufacturing, OLS = ordinary least squares, US = United States.

Notes: All independent variables are lagged by 1 period. Trade refers to total trade as percentage of GDP. Refer to Table 1 for additional details. The exchange rate regime is a dummy variable that takes that value of 1 if fixed and 0 if floating. The data are sourced from IMF, Annual Report on Exchange Arrangements and Exchange Restrictions database (accessed November 2021). Regimes labelled as floating and free floating in the IMF database are lumped under floating. All other arrangements are lumped under fixed.

Source: Authors' calculations.

<h2>Table 11a. Pooled OLS, European Economies</h2>

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC_{t-1}	0.405*	0.340*			-0.734**	-0.948***
	(0.229)	(0.185)			(0.308)	(0.242)
$LN(MNC)_{t-1}$			-0.701	0.208	-0.678	0.237
			(0.472)	(0.303)	(0.461)	(0.292)
$LN(GDPPC)_{t-1}$	-3.967	-4.020**	-0.793	-4.865***	3.372	0.513
	(2.465)	(1.798)	(1.626)	(1.404)	(2.346)	(1.702)
$Trade_{t-1}$	-0.257***	-0.195***	-0.171***	-0.152***	-0.017	0.046
	(0.054)	(0.047)	(0.022)	(0.023)	(0.068)	(0.055)
Constant	75.567***	76.446***	50.859***	89.826***	13.567	41.669**
	(23.978)	(17.972)	(16.496)	(15.680)	(21.856)	(17.301)
Observations	201	201	160	160	160	160
R-squared	0.158	0.123	0.242	0.242	0.276	0.314

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.
Notes: All independent variables are lagged by 1 period. The European sample includes Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and United Kingdom.
Source: Authors' calculations.

Table 11b. Pooled OLS, Non-Asia and Pacific and Non-European Economies

Variables	(1) Exports (US dollar invoiced, share)	(2) Imports (US dollar invoiced, share)	(3) Exports (US dollar invoiced, share)	(4) Imports (US dollar invoiced, share)	(5) Exports (US dollar invoiced, share)	(6) Imports (US dollar invoiced, share)
GVC $_{t-1}$	-1.617***	0.656			-8.204***	-12.969***
	(0.520)	(0.477)			(1.863)	(1.237)
LN(MNC) $_{t-1}$			-1.430	-2.762*	-2.500***	-4.453***
			(1.119)	(1.574)	(0.835)	(1.048)
LN(GDPPC) $_{t-1}$	-1.851	-9.555***	10.534***	2.243	36.739***	43.668***
	(2.455)	(1.757)	(2.854)	(2.637)	(6.311)	(3.675)
Trade $_{t-1}$	-0.095	-0.376***	-0.693***	-0.356**	1.042**	2.388***
	(0.088)	(0.105)	(0.161)	(0.173)	(0.425)	(0.276)
Constant	118.758***	169.980***	24.218	83.647***	-193.389***	-260.348***
	(21.448)	(15.972)	(27.784)	(30.188)	(54.654)	(30.052)
Observations	84	84	36	36	36	36
R-squared	0.134	0.182	0.560	0.154	0.770	0.670

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

GDPPC = gross domestic product per capita in US dollars, GVC = global value chain participation, LN = natural logarithm, MNC = multinational corporation affiliates, OLS = ordinary least squares, US = United States.

Notes: All independent variables are lagged by 1 period. Non-Asia and Pacific and non-European sample include Argentina, the Bahamas, Botswana, Brazil, Chile, Colombia, Costa Rica, Egypt, Israel, Liberia, Malawi, Mauritius, Morocco, Paraguay, Peru, Russia, and Tunisia.

Source: Authors' calculations.