Dominant currency and exchange market pressure

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Abstract
The dominant currency paradigm proposes a theoretical framework that embodies a key stylized fact: exports and imports of peripheral economies are invoiced in a dominant currency, namely the US dollar or euro, instead of their respective national currency. This paper extends the analysis by empirically showing that movements in a dominant currency have wide macroeconomic effects, including debt sustainability in the periphery. Using a novel dataset for twelve emerging markets, the paper finds that a positive shock (appreciation) to the trade-weighted US dollar or the euro elicits strong foreign exchange pressure (shortage) in the periphery. Appreciation of the dominant currency also leads to the peripheral economy's economic growth contraction, expansion of external debt, and wider financial intermediation spread. The paper also finds evidence supporting previous work showing high exchange rate pass-through given a depreciation of the peripheral currency. Between the two dominant currencies, the US dollar produces stronger effects on the macroeconomic variables of emerging markets.

Keywords: currency hegemony, dominant currency, exchange market pressure, external debt
JEL Codes: E52, F31, F41, F63

1. Introduction

The dominant currency paradigm (DCP) suggests that globally large and small economies price their exports in the currency of a dominant economy such as the United States dollar or the Eurozone's euro (e.g., Boz et al. 2020, Gopinath et al. 2010, Gopinath et al. 2020). Emerging markets and developing economies on the periphery of the global trade also have their imports priced in the global dominant currency even when importing from a non-dominant currency economy, which may or may not be their main trading partner. The effects of the exchange rate pass-through in the periphery are stronger when imports are invoiced in the dominant currency (Boz et al. 2020, Gopinath et al. 2020). The logic of DCP suggests that a depreciation of the national currency may not improve the trade balance, hence failing to improve short-term economic growth. Another important finding of the DCP is the terms of trade stability. This stability emerges from micro-econometric panel studies using firm-level data (e.g., from Colombia in the influential work on the topic by Gopinath et al., 2020).

In this paper we argue that micro-level stability of the terms of trade conceals an important structural feature of economies in the periphery: the availability of foreign currency (Seers, 1964; Taylor, 1994; Blackman, 1998). Furthermore, export and import invoicing in a dominant currency by countries in the periphery is indeed one source of currency dominance or hegemony. There are, however, other determinants of the currency's dominance. For example, and more specifically, the US dollar's hegemony could be a function of the path-dependent role of banks in recycling surplus-countries' savings into the US assets (Schwartz, 2019). A Chartalist rationale holds that the dollar is needed as a credible safe haven in moments of global financial instability (Fields and Vernengo, 2013). Composition of foreign exchange reserves may also be affected by the domestic currency's variance against key international reserve currencies (e.g., Ito and McCauley, 2020). The lower variance is preferred, minimizing reserve portfolio's risk by allocating larger shares to the dominant currency holdings. The dollar's dominance is also likely sustained by higher earnings of the US foreign direct investments compared with the earnings of foreign companies in the U.S. (Ali, 2016).

More broadly, Eichengreen et al. (2016) in their economic history-based analysis develop a systemic view of the international reserve currency, with implications for the DCP understanding. Here, shifting away from a currency monopoly view, instead, a plurality of dominant currencies is possible conditioned on the state of the global economy and country specific pull factors. Those pull factors, in turn, are shaped by the macroeconomic stability and relative scale of the reserve currency issuing economy, predictably of its political cycles, national security, and, most critically, existence of internationally competitive efficient deep and broad liquid financial markets with a variety of financial instruments open to the global economy. For Eichengreen et al. (2016) it is the consistency in the combination of the above pull factors and international economy's dynamics that have propelled the US dollar to its privileged global position.

In this context, the significance of the dominant currency pricing in international trade and as a key macroeconomic element has long been known to researchers and policy makers across developing countries, although mainly at the macrolevel and not so much at the microlevel data. For example, Worrell (2003) points out that a change in nominal exchange rate for Caribbean economies has no predictable effect on relative export-import prices. Haynes (1997) notes that the US dollar rate relative to the sterling and euro is a key determinant of tourism revenues for Barbados because hotels and other vacation items are essentially priced in the US dollars. Similarly, Kauzi and Sampson (2009) extend the finding to Papua New Guinea but in the context of an oil and gas economy. Downes and Khemraj (2019) demonstrate that the central bank's demand for foreign reserves, as well as commercial banks' demand for net foreign assets, is a function of the trade-weighted exchange rate of the US dollar. Elsewhere, working with microlevel data in Eastern Europe, Brown et al. (2011) find the demand for foreign-currency denominated loans to be determined by the currency composition of the firm-level revenues as opposed to any general macro indicators.

These broad determinants of the leading international reserve currency's dominance or hegemony require that we explore wider implications of the dollar and the euro exchange rate shocks in determining macro-variables in the non-dominant currency economies. Therefore, we test for not only exchange rate pass-through, but also for the response of GDP growth, foreign exchange availability, foreign currency denominated debt, and interest-rate spread given a shock to the dominant currency. Foremost, we demonstrate that these shocks have significant implication for the availability of foreign exchange (FX) in the periphery. The idea that the availability of FX – often referred to as the FX gap or constraint – is central to economies in the periphery has long been (and continues to be) recognized by researchers (Chenery and Bruno, 1962; McKinnon, 1964; Seers, 1964; Thirlwall, 1979; Taylor, 1994; Erten and Ocampo, 2013; Gevorkyan, 2017; Constantine, 2020).

Shocks to aggregate terms of trade are an external source of financial crises in the periphery (Cline and Vernengo, 2016). Often the first line of adverse response to an externally induced shock is a rapid depreciation (in some case devaluation) of the domestic currency vis-à-vis the hegemonic currency and a possible loss of international reserves. The extent of the FX reserves loss may vary depending on the currency regime, reserves composition, and central bank's balance between a monetary policy and exchange rate target (Gevorkyan and Khemraj, 2019). Note, that globally by the end of 2020 up to 60 percent of the total currency international reserves were held in US dollars, 21.3 percent in the euros, and the rest in other currencies, according to the data from the International Monetary Fund. At the same time, in a purely flexible exchange rate regimes, the international reserves may be minimal, though this is rarely the case across emerging markets (e.g., Flood and Marion, 2002).

Following domestic currency depreciation (either competitive or due to appreciation of the dominant currency) and in the situation of a constrained pass-through there also exists a possibility of a J-curve like effect, short-lived or not, that may have significant impact on the domestic economy (e.g., Bahmani-Oskooee and Fariditavana, 2015). Therefore, it is important to account for the complexity of the diverse outcomes in an informed analysis of the DCP across emerging markets. To that end, we utilize an established measure of exchange market pressure (EMP) encompassing the percentage depreciation and loss of international reserves (Aizenman and Hutchison, 2012; Aizenman and Binici, 2015; Gevorkyan, 2019).

One advantage of the EMP measure found in the literature is that the percentage change in international reserves shows a growth rate of a stock variable – the stock of international reserves (minus gold) of the central bank. This stock variable is associated with flow adjustments in the local FX market. In other words, the growth in the stock variable is consistent with a flow FX gap as outlined by Taylor (1994). The second appeal of the EMP is that the adjustments in the exchange rate signal pressure in the respective local market where the national currency is traded against the dominant currency. Importantly, our findings have immediate implications for the macroeconomic development prospects of the small open economies finding themselves at the crossroads in the highly volatile environment. The latter is characterized by the ongoing processes of automation, global value chains reshuffling, rising levels of foreign and local currency debt, and the added pressures of the health and economic crises due to the pandemic.

The rest of the paper is organized as follows. Section 2 covers some relevant facts showing the extent of invoicing in a dominant currency by the twelve economies in our sample. These are the economies that are included in our empirical exercise. Section 3 outlines theoretical notes showing how the following macro-economic variables are related: exchange market pressure, GDP growth, inflation, foreign debt and loan-deposit rate spread. Section 4 conducts a detailed empirical analysis, while Section 5 concludes.

2. Stylized Facts

We start by documenting most recent trends in export and import invoicing in the two dominant currencies (USD and EUR), home, and any other currency for the group of countries in our sample. The sample includes countries found in the original dataset in Arslanalp and Tsuda (2014), in turn based on the JPMorgan's local-currency emerging market government bond index. Owing to data limitations our working sample had to be adjusted from the source as documented in the subsequent sections. For now, following Boz et al. (2020) we report in Table 1 the average for 2000-2019 percent shares of exports and imports invoiced in USD and EUR for ten out of twelve economies that are the subject of this study (there was no data on currency invoicing for two economies, Mexico and Philippines, as explained in the Note to the table).

Table 1 reveals a general pattern of the dominant currency pricing across the emerging markets. The US dollar accounts for the largest share of exports in the economies for which the data are available, except for the four European economies: Bulgaria, Hungary Poland and Romania. The euro accounts for the largest share of export prices for these four economies. The dollar, however, is a solid second for the four economies. Overall, exports are hardly priced in national currencies, except for Russia.

Table 1. Invoicing currencies in global trade (average for 2000-2019), % of total

Country	Export USD	Export EUR	Export Home	Other Export Currency	Import USD	Import EUR	Import Home	Other Import Currency
Brazil	95.5	3.4	1.4	(0.4)	84.9	10.1	2.7	2.3
Bulgaria	38.6	59.4	na	2.0	32.5	64.9	na	2.6
Chile	94.4	3.7	0.3	1.6	87.5	7.6	2.7	2.2
Hungary	11.6	81.4	na	6.9	20.9	70.8	na	8.3
Indonesia	93.4	1.3	0.9	4.4	80.8	4.1	1.9	13.2
Poland	21.2	65.2	na	13.5	28.4	56.9	na	14.6
Romania	24.9	69.6	na	5.5	25.6	67.7	na	6.7
Russia	76.5	12.1	10.0	1.4	41.1	30.2	26.4	2.2
Ukraine	74.7	11.4	0.4	13.5	64.8	27.1	0.4	7.7
Uruguay	90.1	2.0	1.5	6.4	67.5	3.5	17.0	11.9

Source: Boz et al. (2020)

Note: as explained in Boz et al (2020), data for some countries may be missing for a range of reasons, including lacking timely accurate data or currency of invoicing is not mandatory in customs declaration, thus excluding from this table information on the Philippines in the former and on Mexico in the latter case. The column headings correspond to exports or imports being invoiced in the USD, EUR, home, or other currencies.

Similarly, the imports are also minimally invoiced in the national currencies. The four European economies invoiced the largest percentage of imports in euros, but the dollar comes in as a close second. Russian exports are denominated mainly in dollars, but less so its imports. In terms of our sample, Russia has the highest percent of imports invoiced in its own currency (26.4 percent).

In order to economize on space, we do not include a separate table indicating manufacturing value added. Nevertheless, we calculate the average manufacturing share for the period 2010 to 2019. There is no clear correlation between manufacturing value added as a share of GDP and dominant currency invoicing. For example, for Brazil manufacturing accounts for 12.3 percent of GDP, but 95.5 percent of exports and 84.9 percent of imports are invoiced in dollars. The manufacturing share in Indonesia is 24.3 percent of GDP, but 93.4 and 80.8 percent of exports and imports are invoiced in USD dollars, respectively. One final example, manufacturing accounts for 13.3 percent of GDP in Russia, but as noted earlier, this country somewhat splits its exports and imports among three categories: domestic currency pricing, dollar pricing and euro pricing.

The interim conclusion points to a significant role of the reserve (dominant) currencies in the pricing of the leading of emerging markets' exports and imports. As noted earlier, there is limited leverage for the national or other currencies in the international trade context. Another important observation, which is more broadly discussed in Boz et al. (2020), is that the US dollar is a globally dominant currency while the Euro is a regionally dominant currency, which Table 1 helps to reconfirm. The degree to which individual developing economies, peripheral in terms of global financial and trade flows, can rely on their national currencies remains limited. As such and despite the recent growth in the local currency bonds (mainly within the large commodity exporting emerging markets, as shown in Arslanalp and Tsuda (2014), the peripheral economies remain dependent on the dominant currency dynamics, often tied to the larger economy's business cycles.

In their analysis, Andrade and Prates (2013) raise some of the related concerns in connection with exchange rate determination in the peripheral open monetary economies with attention to macroeconomic uncertainties and institutional factors guiding the smaller economies' integration with the global capital markets. With such background we proceed on developing our theoretical framework in the analysis of the DCP's relevance for exchange market pressures across emerging markets and developing economies.

3. Theoretical Notes

The following model illustrates the connection between invoicing in a dominant currency and exports and imports, as well as the stock of international reserves and external debt. Identity equation (1) shows that the change of central bank's international reserves (F) is a function of the trade balance ($X - M$) and the change in external debt (D). For tractability and relevance, we assume net capital flows and net income from abroad are zero.

$$\Delta F = X - M + \Delta D \tag{1}$$

The second identity equation (2) shows that the evolution of the stock of external debt is a function of two flows: the fiscal gap ($G - T$) and the private sector investment-savings gap ($I - S$). This identity and the previous one assumes that domestic currency borrowing is zero – an assumption that helps us to focus on the endogenous connection among exchange market pressure (EMP), external borrowing, interest rate spread, and the dominant-currency invoicing.[1]

$$\Delta D = (G - T) + (I - S) \tag{2}$$

The first behavioral equation (3) shows that export of country *j* is a function of a series of bilateral exchange rates, all expressed in terms of one unit of the dominant currency (*d*). This would be an indirect quote whereby a higher value indicates a depreciation of the currency of country *j* relative to that of the dominant or hegemonic economy ($s_{j/d}$). Country *j* also exports to countries on the periphery $p_1, p_2, \ldots p_n$.

$$X(s_{j/d}, s_{p_1/d}, \ldots, s_{p_n/d}, z) \tag{3}$$

Consistent with the DCP the bilateral exchange rate between *j* and other economies in the periphery is of little significance for the export of country *j*. What matters is the relevant bilateral exchange rate between a country in the periphery and the dominant currency, even though *j* is exporting to $p_1, p_2, \ldots, p_n$ as well. These exchange rates – the rate between *j* and the dominant currency ($s_{j/d}$) and the rates between economies in the periphery and the dominant currency ($s_{p_1/d}, \ldots, s_{p_n/d}$) – enter the export function of country *j*. An increase of these rates signals the dominant currency has appreciated and a decrease indicates a depreciation of dominant currency. The variable z indicates the rate of growth of demand in the trading partner of *j*. The partial derivative here is straightforward: $X'(z) > 0$.

Since the exports of *j* are invoiced in the dominant currency, the partial derivative for all the bilateral rates in the export function is less obvious than when *j* is able to set its external price in its own currency. First, consider *j*'s export to the dominant economy. In this case the bilateral exchange rate between *j* and the dominant economy is important: $s_{j/d}$. Even though *j*'s export is not invoiced in its own currency, a depreciation of its currency could realize higher profit growth for exporters. At the same time, an appreciation of *j*'s currency would exert the opposite effect. In theory, therefore, and assuming the earlier mentioned J-curve effects are insignificant, we should expect the following qualitative partial effect: $X'(s_{j/d}) > 0$. The quantitative size of the effect depends on the export share going to the dominant economy and the size of the tradable versus non-tradable sectors in *j*.

[1] Combining equations 1 and 2 gives the impression that an increase in debt is associated with higher international reserves. This obviously only holds for foreign-currency loans in the short run. Domestic debt, assumed to be zero, obviously increases absorption and thus is associated with a negative change in international reserves. The interaction of domestic and external debt is beyond the scope of this paper.

Second, as it relates to all other exchange rates, an appreciation of the dominant currency makes *j*'s exports (priced in the dominant currency) more expensive to countries in the periphery. In other words, it should depress *j*'s exports: $X'(s_{p_1/d}),\ldots,X'(s_{p_n/d})<0$. If *j*'s percentage of exports to the periphery is greater than that to the dominant economy, an appreciation of the dominant currency will likely contract its exports. We test this hypothesis later in the paper by looking at GDP growth rates.

The second behavioral equation is the import-demand function expressed as (4). It is similar to the export function in terms of the various bilateral rates. However, the rate of *j*'s domestic economic growth (*y*) determines overall import demand. There is an intuitive partial derivative here: $M'(y)>0$. Imports become more expensive if *j*'s own currency depreciates relative to the dominant currency and cheaper if there is a domestic currency appreciation. In other words, we should expect: $M'(s_{j/d})<0$.

$$M(s_{j/d},s_{p_1/d},s_{p_1/d},\ldots,s_{p_n/d},y) \tag{4}$$

Since imports are invoiced in the dominant currency, we can expect a higher price when importing from the non-dominant countries given an appreciation of the dollar. When the dollar depreciates, it becomes cheaper to import from a non-dominant country. In other words, we should expect the following partial derivatives: $M'(s_{p_1/d}),\ldots,M'(s_{p_n/d})<0$.

The logic of the model means, then, that an appreciation of the dominant currency potentially depresses both exports and imports in the periphery. The opposite occurs when there is a depreciation against all non-dominant economies. A recent empirical study by Gopinath et al. (2020) confirms the theoretical proposition. The net result is most likely an empirical question. However, we test the hypothesis indirectly by looking at the GDP growth instead of trade. If an appreciation of the dominant currency engenders a net contraction of GDP, that then implies that the import cost has increased more than the gains from exports with respect to intra-periphery trade.

In this paper we are quite interested in motivating what such a contraction in world trade means for macroeconomic growth in the periphery with possible ramifications for economic development policymaking. Therefore, the next set of postulations attempt to link financial intermediation with the investment-savings gap (a flow variable). The expression in equation (5) attempts to show such a link.

$$I-S=f(r_L-r_D,\Psi) \tag{5}$$

The private-sector gap, another flow variable, is explained by the interest rate spread. A higher interest spread is assumed to be associated with a lower demand for investment and therefore there is less financial intermediation. Hence, we expect the following: $f'(r_L-r_D)<0$. The variable Ψ in equation (5) controls for other factors that are exogenous to the core model.

Following equations (3) and (4), we need an exchange rate to proxy the rate between the dominant currency relative to other economies, including the currency of country *j*. This exchange rate is a weighted average exchange rate. The dominant economy's weighted average rate is expressed as equation (6). A shock to this rate will exert significant influence on the endogenous variables of interest in the periphery, including country *j*. The trade weights must satisfy: $\varphi + w_1 + w_2 + ... + w_n = 1$ (there are $n+1$ countries in the periphery).

A higher value of the weighted dominant currency's exchange rate (d^w) signals an appreciation of that currency, while a lower value shows the opposite.

$$d^w = \varphi s_{j/d} + \sum_{i=2}^{n} w_i s_{p_i/d} \tag{6}$$

The measure of *EMP* is given by equation (7). We can observe that the measure of exchange pressure includes a rate of growth of the stock of foreign reserves. Higher values of *EMP* indicate greater FX pressure in the periphery. This is signaled by a loss of international reserves and a depreciation of the nominal bilateral exchange rate. Note, consistent with the earlier discussion, higher values of $s_{j/d}$ show a depreciation of the nominal rate of the respective country in the periphery. Lower values indicate the opposite.

$$EMP = [(s_{j/d,t} - s_{j/d,t-1}) / s_{j/d,t-1}] - [(F_t - F_{t-1}) / F_{t-1}] \tag{7}$$

We expect several testable empirical relationships given the discussion from equations (1) to (7). These empirical relations are given from equations (8) to (12). First, equation (8) shows that short-term growth is determined by the weighted exchange rate of the dominant economy. For the rest of this paper, we make no attempt to explain the trend or long-term growth rate, just cyclical fluctuations.

We anticipate an ambiguous partial effect: $y'(d^w) > 0 \, or < 0$. This ambiguity comes from whether the appreciation of the dominant currency has a bigger effect on *X* or *M* for country *j*. Other exogenous determinants of growth are embodied into Υ_1.

$$y(d^w, \Upsilon_1) \tag{8}$$

Equation (9) expresses the idea of exchange rate pass-through to domestic inflation (π) under the new paradigm of dominant currency pricing. The partial derivative of the pass through is $\pi'(d^w) > 0$. Other exogenous determinants of inflation – outside of the scope of this work – such as conflict, cost-push, and other factors are embedded in Υ_2.

$$\pi(d^w, \Upsilon_2) \tag{9}$$

Equation (10) shows that EMP is a function of the dominant currency weighted rate (d^w) and other exogenous factors (Υ_3). Exchange market pressure will rise when d^w appreciates: $EMP'(d^w) > 0$.

$$EMP(d^w, \Upsilon_3) \tag{10}$$

External debt is expected to be a function of d^w as well as other exogenous variables outside the scope of this paper: Υ_4. The following partial effect should hold $D'(d^w) > 0$. We anticipate that an appreciation of d^w will result in more external borrowing offset the FX shortage or pressure.

$$D(d^w, \Upsilon_4) \tag{11}$$

Finally, we anticipate an ambiguous effect between d^w and the intermediation spread ($i = r_L - r_D$). This is shown as $i'(d^w) > 0 \, or < 0$.

$$i(d^w, \Upsilon_5) \tag{12}$$

Exporters will earn more in the national currency following the appreciation of the dominant rate. This allows them to repay domestic currency loans and therefore is likely to reduce the spread. However, importers will experience a higher cost in terms of the national currency. They will find it hard to repay their domestic-currency loans to banks. In this case, the spread could increase as non-performing loans increase. Therefore, we expect an ambiguous effect given an appreciation of d^w. The following section conducts the empirical analysis based on the above formulations.

4. Empirical Analysis

We use panel data encompassing twelve economies (N = 12) over the period 2004: Q1 to 2019: Q4 (T = 64). In addition to the ten countries appearing in Table 1 our full sample also includes observations for Mexico and Philippines. As explained in Section 2, our primary interest was in the leading emerging markets that account for the largest global capital and trade flows in the larger group. The country list and initial data on the local and foreign currency denominated government debt comes from the extended databases accompanying Arslanalp and Tsuda (2014).

The empirical strategy involves two core aspects: (i) pooled single-equation estimates and (ii) pooled panel VAR. Following, Pesaran (2015) and Wooldridge (2002) we are not able to use the fixed and random effect estimators given the small number of countries (N) compared with the time periods (T). The issue of stationarity is important for both the single-equation and VAR estimates. While a VAR model incorporates all the variables as endogenous, the estimators used in the single-equation setup require exogenous explanatory variables (Pesaran 2015, Wooldridge 2002). In particular, we used the seemingly unrelated regression (SUR) method with generalized least squares (GLS) as one of the estimators for the single-equation models. As a robustness, we also use the pooled mean group (PMG) estimator.[2]

As the next step we discuss the issue of exogeneity and stationarity. Following Holly et al. (2011), the exogenous shock (v_t) is extracted by first estimating the following model via the OLS for both the trade weighted exchange rate (*TWE*) of the US dollar and the euro: $TWE_t = \beta_0 + \beta_1 TWE_{t-1} + v_t$. The variable (v_t) is then treated as exogenous in several single-equation models for the following endogenous variables: *EMP*, *Debt* (external, i.e., foreign currency denominated), *GDP growth*, *Inflation* and *Spread*. For robustness, we also report single-equation estimates with the first-difference of *TWE* (dollar and euro) assumed to be exogenous. Tables 2 and 3 report the estimated single-equation models. Finally, the *TWE* is the proxy for d^w in the previous section.

Next, the panel unit root tests found that the following endogenous variables are unambiguously stationary: *TWE*, *GDP growth*, *Inflation* and *Spread*.[3] However, test results on *Debt* are mixed, indicating the possibility that this is long-memory stationary series (for a discussion of stationary long-memory variables, see Pesaran, 2015). *Debt* is foreign currency denominated central government debt, measured as the percentage share of the total government debt, which includes both local and foreign currency denominated debt. Therefore, *Debt* is entered in levels instead of its first difference in the panel regression models to be discussed below (and the pooled panel VARs later in the paper).

Furthermore, panel cointegration is not necessary given the overwhelming tendency towards stationarity in the variables used for this work. However, the unit root test results indicate that the levels of *TWE* for both dollar and euro are non-stationary or I (1), unambiguously. Therefore, ΔTWE enters the panel VAR along with the other stationary variables.

Table 2 shows estimation results for responses in five endogenous variables as shocks to TWE-USA and TWE-EUR. There are a few general observations. As we interpret the results, it should be noted that the EMP is multiplied by 100 to enable a percentage-based interpretation of the results. First, the dollar *TWE* shock produces an effect of statistical and economic significance on the five variables. Second, the PMG estimator produces relatively more statistically significant results. Unlike the SUR estimates that are done on a static model, the PMG estimator is conducted using dynamic models (ARDLs) – hence producing better statistical results. We report the long-run coefficient estimates for the ARDL models. The number of observations adjusts for lags and missing values for each equation.

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[2] Pesaran (2015) provides detailed discussion of the PMG estimator, as well as its provenance.

[3] The following panel unit root test was conducted: (i) Levin, Lin and Chu test, (ii) Im, Pesaran and Shin W- stat.; (iii) ADF-Fisher Chi-square; and (iv) PP-Fisher Chi-square.

Table 2. Single-equation estimates with exogenous trade-weighted dollar and euro shocks

	EMP	**GDP growth**	**Inflation**	**Debt**	**Spread**
	SUR pooled regression: EGLS				
Constant	-1.66 (0.563)*	1.67 (0.141)*	1.26 (0.042)*	31.6 (0.151)*	7.68 (0.056)*
TWE-USA-Shock	1.08 (0.248)*	0.083 (0.057)	-0.015 (0.016)	0.027 (0.052)	0.038 (0.021)***
TWE-EUR-Shock	-0.53 (0.255)	0.082 (0.067)	-0.023 (0.0215)	0.065 (0.072)	0.012 (0.026)
Obervations	756	752	756	694	700
	Pooled mean group (long-run coefficients)				
TWE-USA-Shock	2.27 (0.168)*	-0.164 (0.042)*	-0.055 (0.020)*	3.29 (0.811)*	0.691 (0.156)*
TWE-EUR-Shock	0.12 (0.198)	-0.143 (0.0445)*	0.019 (0.024)	0.48 (0.671)	0.297 (0.141)**
Observations	744	715	744	682	688
ARDL model	(1, 1, 1)	(4, 1, 1)	(1, 1, 1)	(1, 1, 1)	(1, 1, 1)

NOTES:
Observations = after accounting for lags and missing values.
Standard errors are in parentheses.
Optimal ARDL model selected by SIC.
* 99% significance
** 95% significance
*** 90% significance

It is clear the dollar shock engenders significant effects, both statistical and economic, in the periphery. The static SUR estimates that a unit shock increases the exchange market pressure by 1.08 percent. The dynamic PMG estimator results in a larger coefficient of 2.27 percent increase for every unit positive shock in the TWE-USA shock. This should not be a surprise since the SUR model estimates contemporaneous coefficients while the PMG estimator accounts for lags in the single-equation models.

The appreciation in the TWE-USA and TWE-EUR produces a statistically significant contraction in GDP growth in the periphery of -0.164 and -0.143 percent, respectively, according to the PMG estimator. This result is consistent with the dominant currency paradigm (DCP). The appreciation in the two hegemonic currencies contracts trade in the periphery in order to decrease GDP growth. As noted earlier, Gopinath et al. (2020) estimated their results for trade and not GDP growth.

An appreciation of the dollar *TWE* would be associated with a depreciation in peripheral currencies. However, this does not produce an increase in inflation in the non-dominant economies as predicted by DCP, but a contraction in inflation of -0.054 percent (PMG estimator). This finding corroborates the previous result of a decline in GDP growth. However, we will observe later – from estimated impulse response functions – that inflation does indeed increase from the third quarter after the TWE-USA shock.

According to the PMG estimator, the external debt rises substantially, 3.29 percent, following a positive shock to the dollar TWE. This result suggests that external debt is incurred in response to an appreciation of a hegemonic currency. This finding should be intuitive if we consider that a stronger dominant currency requires surrendering more domestic currency to purchase foreign technology and similar items. Also, the result is consistent with the dominant currency paradigm if indeed the positive shock in the dollar results in a contraction of trade in the periphery. External debt is undertaken to fill the foreign exchange gap.

The two *TWE* shocks account for a positive increase in the intermediation spread. While the result is mixed for the SUR estimates, both shocks result in a statistically significant increase in spread – according to the PMG estimator. The positive effect might be signaling higher risk of loan default when the home currency depreciates against the dominant currency. The higher risk could be a function of higher external debt cost for businesses and government, as well as greater local currency cost of imports. These costs could be perceived as outweighing the positive benefits of the depreciation – namely the increased national currency earnings from exports.

Table 3 Single-equation estimates with first-differenced dollar trade-weighted dollar and euro rates

	EMP	**GDP growth**	**Inflation**	**Debt**	**Spread**
	SUR pooled regression: EGLS				
Constant	-1.91 (0.579)*	1.67 (0.150)*	1.27 (0.043)*	28.6 (0.439)*	7.69 (0.056)*
D(TWE-USA)	1.06 (0.255)*	0.093 (0.061)	-0.016 (0.016)	0.093 (0.171)	0.038 (0.021)***
D(TWE-EUR)	-0.29 (0.263)	0.082 (0.068)	-0.024 (0.020)	0.038 (0.182)	0.007 (0.024)
Obervations	756	752	756	694	700
	Pooled mean group (long-run coefficients)				
D(TWE-USA)	2.76 (0.173)*	-0.171 (0.044)*	-0.054 (0.021)*	3.35 (0.827)*	0.733 (0.164)*
D(TWE-EUR)	0.12 (0.201)	-0.136 (0.046)*	-0.005 (0.025)	0.58 (0.675)	0.326 (0.145)*
Observations	744	715	744	682	688
ARDL model	(1, 1, 1)	(4, 1, 1)	(1, 1, 1)	(1, 1, 1)	(1, 1, 1)

NOTES:
Observations = after accounting for lags and missing values.
Standard errors are in parentheses.
Optimal ARDL model selected by SIC.
* 99% significance
** 95% significance
*** 90% significance

Table 3 repeats the estimation, but the explanatory variables are the first-differenced (ΔTWE) dollar and euro rates. These results are largely consistent with the previous ones. For example, EMP rises by 1.06 given a unit shock to the dollar ΔTWE (SUR estimator). The result for the dynamic PMG estimator is also remarkably similar at 2.26 percent compared with the 2.27 percent in the previous table. The response of GDP growth and inflation given a unit appreciation in ΔTWE was also quite similar to the previous estimates. We also did not observe a sign reversal for any of the statistically significant results – hence indicating robustness of the estimations.

The final aspect of the empirical exercise involves estimating a VAR using panel data. The variables in the VAR are ΔTWE , *EMP*, *GDP growth*, *Inflation*, *Debt* and *Spread*. All the variables are endogenous in a VAR, but their respective shocks are exogenous. The shocks – of varying degrees of exogeneity based on the ordering of the variables – engender an impact response and dynamic adjustments in the endogenous variables (impulse response functions, IRFs). Our main purpose for using the pooled VAR method is to estimate these IRFs for measuring how the dollar-TWE and euro-TWE shocks affect the endogenous variables – primarily *EMP*, *GDP growth*, *Inflation*, *Debt* and *Spread*.

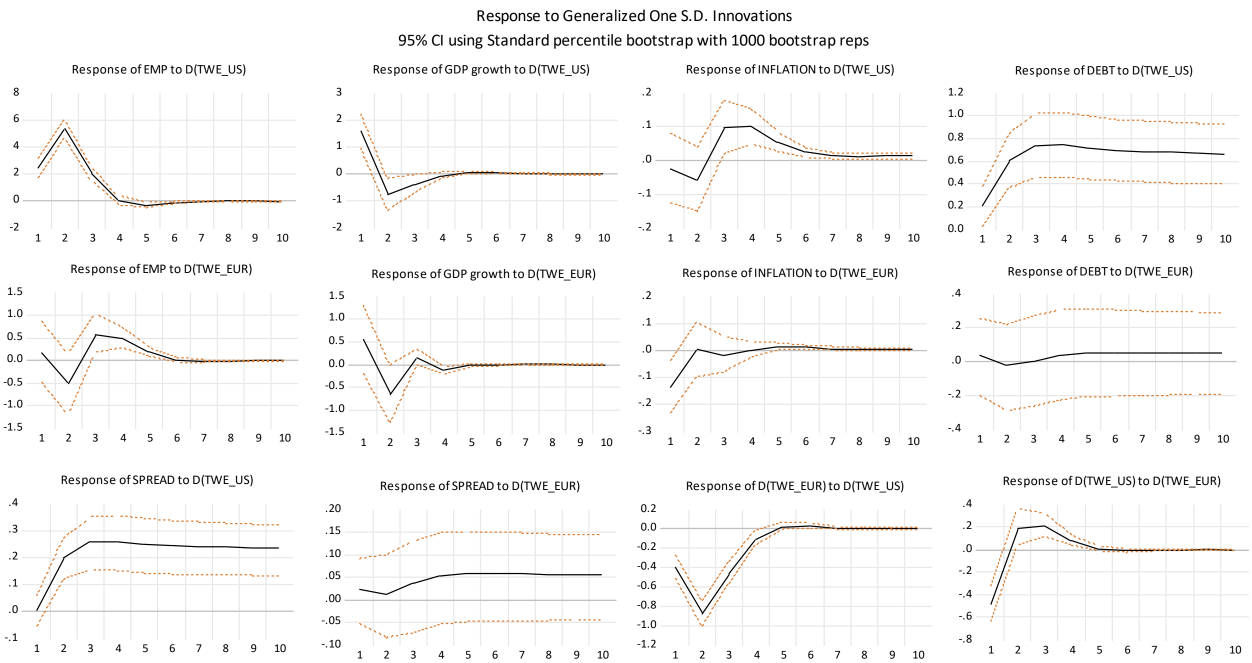
The final lag length was chosen using the SIC and AIC. The former suggests one lag while the latter proposes two. The simpler model – in the spirit of Occam's razor – with one lag is used. The variables included in the model are stationary as suggested by the unit root tests. The generalized IRFs were used in order to remain agonistic about a particular ordering of the variables. A pooled VAR is estimated for all 12 economies, followed by several sub-categories: (i) Mexico, Chile, Brazil and Uruguay; (ii) Bulgaria, Hungary, Poland and Romania; and (iii) Russia, Ukraine, Indonesia and Philippines. Our country grouping is based on geographic region in the first two groups and a general emerging markets designation and reliance on commodity exports in the case of the third group.

Figure 1 presents the generalized IRFs for the 12 economies. We present 10 forecast quarters, as well as 95 percent bootstrap confidence internals (1000 replications). The first row shows the estimated impact multiplier and dynamic adjustments for the TWE-dollar shock. The second row gives the same for only the TWE-euro shock. The final row presents responses to a mixture of TWE-dollar and TWE-euro shocks.

As an overall observation, Figure 1 shows that the TWE-dollar shock produces larger magnitude effects as well as narrower confidence intervals. Therefore, we can conclude that the dollar, in general, is a more dominant currency compared with the euro. We will discuss a few of the results and let the readers discern for themselves the rest. When interpreting the various charts, it is also important to keep in mind that the software relied upon in this paper uses $t = 1$ for the impact period, which mathematically has to be $t = 0$ when calculating the impact coefficient. This means that $t = 2$ in the chart is a $t = 1$ in the mathematical derivation, $t = 3$ in the chart is mathematically a $t = 2$ when deriving the IRFs, and so on. For the rest of the paper, we will use the forecast time periods illustrated by the charts when discussing the results.

As can be inferred from Figure 1, the impact response of EMP following the dollar shock is approximately 2.6 percent compared with 0.2 percent for the euro shock. This impact coefficient in the VAR setup corroborates the earlier PMG estimates. As it relates to the EMP, we will discuss the dollar shock given that it produces a better confidence band. After the first quarter, the FX market pressure rises to approximately 4.5 percent in the second forecast quarter and declines subsequently. It takes four quarters, on average, for the domestic FX market in the periphery to go back to equilibrium.

Figure 1 Generalized IRFs for all twelve economies



Another point to note is a positive TWE-dollar shock (appreciation) should be accompanied by a negative response in TWE-euro (depreciation) and vice versa. Indeed, this is exactly what the final two charts (bottom right of Figure 1) indicate. The latter result is useful for testing the consistency and credibility of the data. An appreciation of the TWE-dollar following a shock in that currency should result in a depreciation in the TWE-euro. Similarly, an appreciation in the TWE-Euro is followed by a depreciation in the TWE-dollar.

Figure 1 also shows that the TWE-dollar shock initially produces a positive impact response in GDP growth of approximately 1.5 percent. Economic growth turns negative in the second forecast quarter, Q2, and does not return to equilibrium until Q5. We believe the initial positive impact response is capturing the fact that when the dollar appreciates, non-dominant currency economies are able to generate higher US dollar export revenues when exporting to non-dollar regions. However, this temporary boost to growth is short-lived because a stronger dominant currency tightens the availability of foreign exchange in the periphery. Although the confidence bands are wider, the positive TWE-euro shock also produces an initial increase of approximately 0.5 percent GDP growth. The growth however turns negative by the second forecast quarter.

Government's external debt in emerging markets increases by approximately 0.22 percent following a positive shock to the US dollar. The response in foreign currency-denominated debt then rises to about 0.75 percent by the third forecast quarter and decreases only gradually afterward. Such debt dynamics may be indicating the persistent accumulation in external debt following an appreciation of the dollar. In the analysis of the euro shock on external debt, the IRFs and accompanying confidence intervals indicate lack of statistical and economic significance.

Overall, our results appear to be consistent with the inflation pass-through of the DCP. However, the pass-through result occurs starting from the third forecast quarter. The finding might be unique to our sample of economies. Yet, there may be two factors that offer a more general explanation for a delayed pass-through of currency depreciation to the domestic price levels. First, as was mentioned in the early sections of the paper, a J-curve effect may have significance in this case. Recall that in the J-curve framework, a currency depreciation does not immediately result in country's cheaper exports and more expensive imports. Some period of adjustment, pass-through, may be required to for transactional and longer-term contractual obligations (perhaps, as part of larger global value chains) before the new price levels settle in causing a structural (import-led) inflation, as prices on, primarily, manufactured imports adjust to hire levels (e.g., Russian ruble's devaluation in late 2014).

The other factor that might explain the initial decrease in inflation following an appreciation of the dollar is the effective decrease in commodity prices (Rezitis 2015). Here volatility in the global crude oil market serves as benchmark for other primary commodities, affecting a larger group of emerging markets, even non-oil exporters. As it relates to oil, most of the twelve economies rely on importing the resource (except Brazil, Mexico, and Russia where crude oil exports as well as imports of refined oil products constitute an important share of each country's trade profile). As the US dollar appreciates, the effective relative price of crude oil, and hence revenue converted in national non-dominant currencies, tends to fall, thereby reducing inflation in emerging markets in the short term. But the cost pressures catch up, by way of import-induced increase, quickly as is also confirmed in Figure 1. These trends are also consistent with the findings in Gevorkyan (2019) where EMP dynamics are analyzed for groups of primary commodity exporters among emerging markets. Related, is the non-linearity of the exchange rate regimes as observed in that paper, especially for the emerging markets with multiple leading commodity exports. Similar to other results, the inflation pass-through in the case of the euro shock is nonexistent and the error bands are larger.

On average, for the entire sample in Figure 1, the financial intermediation spread increases following a shock to the dollar. This increase in the interest rate spreads occurs until the third forecast quarter. Although still positive, the spread declines gradually after the third quarter. Such interest rate spread dynamic may be indicating that the appreciation of the US dollar raises the risk of loan default in the non-dominant economy. The results are not significant in statistical or economic terms in the case of the euro shock.

For brevity, we omit a detailed discussion of the findings for earlier mentioned three country groups. Those results are reported in Appendix 1 of the paper and are meant for assessing robustness. As can be observed, the patterns are largely similar to the overall estimates. For example, the responses of EMP and of GDP growth across all three country groups are similar to the overall estimate trends. In terms of external debt (and risk premia, specifically), there may be more expected sensitivity to the euro spillovers as argued in Gevorkyan and Semmler (2016). Still, the US dollar effects remain more dominant as the in the post-GFC period, especially, the direction of the US denominated liquidity has dominated the trends across regional and sub-regional markets.

Nevertheless, there are a few interesting variations. The inflation pass-through for the four non-dominant Eastern European economies is unambiguously negative. However, the pass-through is unambiguously positive for the South American economies + Mexico and in the third group of emerging markets. This variation might be explained by the differences in the commodity dependence of the first and third country groups and much closer integration with the European Union of the Eastern Europe country group. In the latter case, despite national currencies, there is closer co-movement with the euro.

5. Conclusion

In its effort to contribute to the growing literature on the dominant currency paradigm, our analysis finds significant effects of the US dollar, and in some cases of the euro—two dominant currencies in the global trade and financial transactions—on the macroeconomic indicators across emerging economies. The principal focus of this paper is the behavior of the exchange market pressure in response to the trade-weighted US dollar and euro shocks. Our model also provides insights on the behavior of the economic growth, inflation, and foreign currency denominated government debt. The latter category is of particular interest in the emerging markets and developing economies that have seen levels of debt in foreign currency, primarily US dollars, surge in the post-GFC period and through the recovery measures implemented in the 2020 pandemic. Such trends have led to concerns over debt sustainability and stability of the general economic models across emerging markets – the majority of which are either closely integrated with supply chains of larger advanced markets (e.g., Eastern Europe in our sample) or rely heavily on primary commodity exports (e.g., the rest of the countries in our sample).

Constructing a new dataset that includes a share of foreign-currency denominated debt in select emerging markets, our findings indicate that a positive shock (appreciation) to the US dollar or the euro prompts strong foreign exchange pressure (shortage of foreign exchange) in the periphery. The EMP reaction to the dominant currency shock also confirms the existence of the foreign exchange constraint characterizing the development experience of developing economies. In addition, appreciation of the dominant currency leads to the peripheral economy's economic growth contraction, expansion of external debt, and wider financial intermediation spread. The paper also finds evidence for the non-linear exchange rate pass-through to the domestic price levels. Between the two dominant currencies, the US dollar produces stronger effects on the macroeconomic variables of emerging markets compared with the impacts from the euro's pressures.

While a larger country sample might lead to more precision, current results of this paper may help inform policy making across emerging markets' central banks with additional relevance for fiscal policy (e.g., debt sustainability). Finally, the macroeconomic significance of the paper's findings points to the complex outcomes of the dominant currency paradigm in the examples of economic integration (whether regional, trade- or finance-based) or unique export profiles.

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Appendix

Figure A1 Generalized IRFs for Mexico, Chile, Brazil and Uruguay

Response to Generalized One S.D. Innovations

95% CI using Standard percentile bootstrap with 1000 bootstrap reps

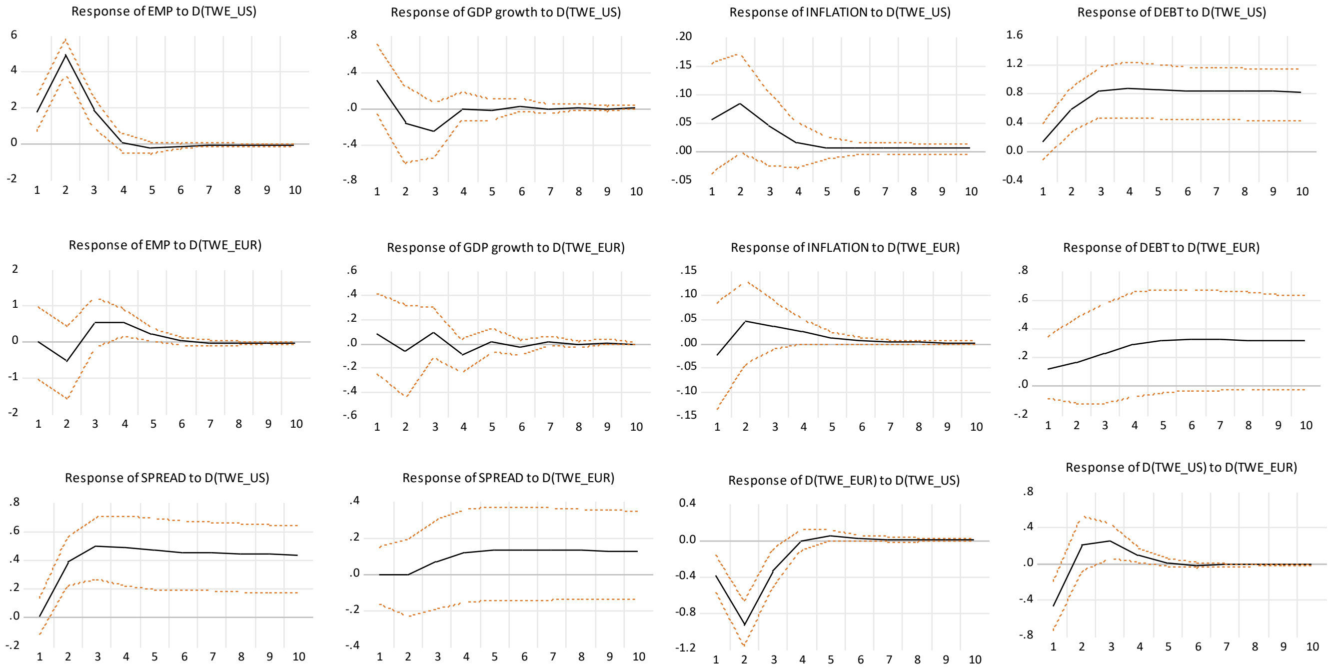

Figure A2 Generalized IRFs for Bulgaria, Hungary, Poland and Romania

Response to Generalized One S.D. Innovations

95% CI using Standard percentile bootstrap with 1000 bootstrap reps

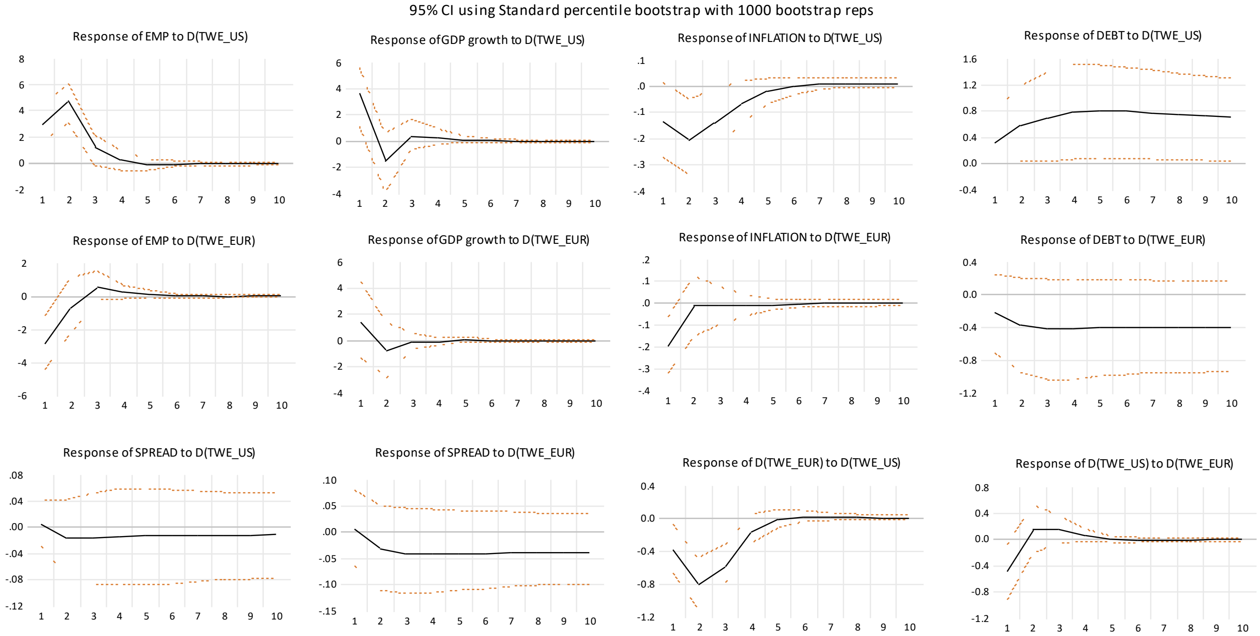

Figure A3 Generalized IRFs for Russia, Ukraine, Indonesia and Philippines