Trade in value-added in developing countries: Does monetary policy matter?

Françoise Okah Efogo and Boniface Ngah Epo
Faculty of Economics and Management, University of Yaounde II, Soa, Cameroon

Received 12 April 2023
Revised 19 May 2023
Accepted 19 May 2023

Abstract

Purpose – This paper appraises the effects of monetary policy on trade in value-added (TiVA) using a panel of 38 developing countries spanning the period 1990 to 2019. Specifically, the authors subsequently summon the theory of trade in intermediate products within the New Keynesian framework for open economies that comprises price rigidity to verify this relationship and thereon control for robustness by correcting for endogeneity and unbalanced panel effect.

Design/methodology/approach – The authors mobilize the within estimator corrected for cross sectional dependence as well as the two-stage-least squares fixed effect estimator which corrects for endogeneity. For robustness, the authors also use the Hausman–Taylor estimator to control for endogeneity and random effects in annualized data and the least squares dummy variable corrected estimator.

Findings – Results suggest that the monetary policy instruments such as inflationary gaps and anticipatory inflationary outcomes significantly affect TiVA in developing countries only in the short term with no long-term effect. In addition to contributing to the scanty empirical literature, the authors provide relevant insights on monetary policy tools that can be mobilized in fashioning a global value chain penetration and upgrading strategies.

Originality/value – The authors convoke the theory of trade in intermediate products casted into the New Keynesian framework comprising price rigidity to verify the relationship between TiVA and monetary policy (b) verify for robustness by correcting for endogeneity and unbalanced panel effect.

Keywords Trade in value-added, Monetary policy, Developing countries, Panel data

Paper type Research paper

1. Introduction

As ascertained by Sanyal and Jones (1982), early literature on trade in value-added (TiVA) largely ignored the role of monetary policy (*see* Chang and Mayer, 1973; Ethier, 1982; Sanyal and Jones, 1982; Helpman, 1985; Sarkar, 1985). This neglect hinges on the observance that a significant number of studies concur on the theoretical assumption of a dichotomous relationship between the real and monetary spheres. In the former sphere, relative prices are determined whilst in the latter sphere money supply causes a rise in the level of prices. Consequently, these authors purport that little emphasis could be made on monetary issues without significantly altering TiVA.

JEL Classification — E52, F41, F62

Funding: This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Conflicts of interest/Competing interests: There is no conflict of interest or competing interests.

Journal of International Logistics and Trade
Vol. 21 No. 3, 2023
pp. 179-196
Emerald Publishing Limited
e-ISSN: 2508-7592
p-ISSN: 1738-2122
DOI 10.1108/JILT-04-2023-0026

Nonetheless, the pioneering study by Frankel (1984) argued that some components of the level of prices are sensitive to variations of the exchange rate. This implies that a contractionary monetary policy caused by an appreciation of the currency could lower the demand for domestic middle products in the short run. In the same vein, Sarkar (1985) introduced interest rate in TiVA modelling in capital markets indicating that under certain conditions the level of interest rate determines specialization within a value chain. In the beginning of the twenty first century, new studies re-emerged showing the implications of TiVA design on optimal monetary policies (Wei and Xie, 2020; Auer *et al.*, 2019; Gong *et al.*, 2016; Feenstra, 1998). Although these studies have not produced consensual results, the main takeaway is that they provide a leeway to further investigate the effects of TiVA on monetary policy. However, a glaring gap in the literature is that almost no study attempts to appraise this relationship the other way round by perusing the effects of monetary policy on TiVA as intended in this manuscript.

Recently, we observe the emergence of an empirical literature on the effects of monetary policy variables such as interest rates, inflation and exchange rates on TiVA (De Soyres and Franco, 2019; Patel *et al.*, 2019). Other publications from international organizations like the African Development Bank and the World Bank assert that monetary policies like inflation and currency appreciation are decisive for the outbreak and expansion of TiVA (African Development Bank [AfDB] *et al.*, 2014; World Bank, IDE–JETRO, OECD, RCGVC-UIBE and WTO, 2017). Overall, these publications do not explain the underlying mechanisms and are more akin to an empirical exercise. Furthermore, these assertions have been sparingly verified empirically for developing countries as suggested in this paper. Table A1 in the annexe shows the list of developing countries.

In view of the above substantiations, the originality of this paper is twofold. First, it offers an empirical analysis of the contribution of monetary policy to the participation of developing countries in international value chains. Second, this research aims to determine the effects of monetary policy on TiVA by looking at the effect of monetary policy instruments and monetary policy outcomes. This is in contrast to existing empirical works that determines the optimal monetary policy with respect to its welfare effects in a value chain context.

Consequently, the objective of this paper is to appraise the impact of monetary policies on the TiVA in developing countries. Specifically, (1) we convoke the theory of trade in intermediate products casted into the New Keynesian framework comprising price rigidity and (2) verify for robustness by correcting for endogeneity and unbalanced panel effect.

The rest of the manuscript is organized as follows. Section two reviews literature on the potential effects of monetary policy on TiVA. Section three, portrays the empirical model and appropriate modelling strategy. Section four presents the empirical findings. Section five concludes the paper.

2. A review of the theoretical literature on monetary policy effects and TiVA

Studies on the effects of monetary policy on TiVA are scarce. The current literature largely focuses on frameworks that explores how monetary models are casted in international trade theories (Dornbusch, 1976; Calvo and Rodriguez, 1977; Sachs, 1980; Eichengreen, 1981), and the new open economy macroeconomics theories (Obstfeld and Rogoff, 2000; Clarida *et al.*, 2002; Gali and Monacelli, 2005; Engel, 2011). These bodies of theory highlight a number of lessons which can constitute underlying assumptions in appraising the monetary policy–TiVA nexus.

The first teaching emanates from the traditional Mundell–Flemming–Dornbusch model (1976) which suggests that an expansionary monetary policy induces a depreciation in the value of the domestic currency, thus stirring a surplus in the trade balance via increased exports. The ensuing effect is an improvement in competitiveness.

The second lesson is conveyed by the J-curve hypothesis (Magee, 1973). This hypothesis argues that an expansionary monetary policy generates a real depreciation of the domestic currency which reduces the relative prices of local goods and therefore increases exports in the long-run. Empirically, verifying the J-curve hypothesis in developing countries is not universally established (Bahmani-Oskooee and Arize, 2019; Bahmani-Oskooee and Gelan, 2012; Bahmani-Oskooee and Ratha, 2004).

The third lesson is based on Dornbusch's (1976) overshooting hypothesis. According to this hypothesis, a negative monetary policy shock initially leads to an appreciation of the exchange rate followed by a gradual depreciation. In this logic, such a shock will initially lead to a deficit in the trade balance followed by a return to initial equilibrium or the achievement of a surplus. Nonetheless, empirical studies fail to bring consensual proofs of the overshooting hypothesis (Capistrán Carmona *et al.*, 2019; Ojede and Lam, 2017).

The fourth lesson indicates that the effect of monetary policy depends on two effects, namely the expenditure switching effect and the income effect. The first effect is such that a reduction in the supply of money leads to an appreciation of the exchange rate through the inflow of foreign capital. This then causes an increase in imports and a decline in exports. The income effect reveals that a fall in real income and therefore in real imports has a positive effect on the trade balance. These two effects act simultaneously and the outcome on international trade depends on the relative importance of each effect.

2.1 Argumentum on monetary policy instruments linkages with TiVA

Based on the aforementioned theoretical lessons, we purport that an expansionary monetary policy improves the competitiveness of domestic products and services through a depreciation of the local currency. However, contingent on an economy's reliance on foreign intermediate products and services, such a monetary policy could have several effects on TiVA. The intuitive effect resulting from improved competitiveness is increased exports of local intermediate products. If the country is highly dependent on foreign inputs and intermediates, this decline in imports could reduce the production of local value-added through higher prices on imported products and services. As a result, exports of local value-added will decline. In the case of low dependence, the decline in foreign imports will have little or no effect on exports of local value-added.

Another monetary policy instrument which can affect TiVA is the rate of inflation and/or credit. Theoretically, an increase in the supply of money induces an increase in the price of goods and services (money-induced inflation), thereby affecting demand for local products through the income and the substitution effects. For the former, this effect leads to a decrease in the demand for domestic value-added. If direct substitutes are available on the international market, the income effect will be accompanied by a substitution effect, which is conditional on greater demand for foreign intermediate products and services (increased imports of foreign value-added). On the contrary, if there are no competing intermediate goods and services, the income effect will lead to a decrease in local production as well as value-added exports.

In furtherance, a third monetary instrument linked to TiVA is access to credit. Current publications on TiVA demonstrate that financial institutions' credit has ambiguous effects (Okah Efogo, 2020a, b; Allard *et al.*, 2016; Gereffi and Fernandez-Stark, 2016). Regarding access to credit, a number of rigidities can distort its effectiveness on TiVA intensity in services (Galesi and Rachedi, 2019). These include information asymmetry, the quality of borrowers, the lending frisson syndrome, high inflation, and the level of development of the financial system (access, depth, efficiency and stability).

In sum, empirical studies are required to appraise the effect of monetary policies on TiVA given that we observe two opposing stands. The first stand as claimed early theoretical works and based on the neutral hypothesis, clamours that monetary policy may have no effect on TiVA. The second stand, though still fairly marginal in the literature suggests the contrary. In attempting to contribute to empirical literature, this paper empirically verifies the effects of some monetary policy tools/outcomes on TiVA in developing countries.

3. Modelling strategy

3.1 The empirical model

Our empirical model hinges on the New Keynesian theoretical framework in an open economy. In this framework, we incorporate an equation for TiVA and express the extended New Keynesian model comprising of six equations as:

$$\pi_t = \alpha_0 E_t(\pi_{t+1}) + \alpha_1\left(y_t - \bar{y}\right) + \varepsilon^S \tag{1}$$

$$y_t = a_2 E_t(y_{t+1}) - \alpha_3(i_t - \pi_t) + \alpha_4 cc_t + \varepsilon^D \tag{2}$$

$$i_t = a_5 r + a_6\pi_t + a_7\left(\pi_t - \bar{\pi}\right) + a_8\left(y_t - \bar{y}\right) + \varepsilon^R \tag{3}$$

$$cc_t = a_9 q_t - a_{10} y_t \tag{4}$$

$$q_t = s_t + \pi_t^* - \pi_t \tag{5}$$

$$s_t = i_t^* - i_t + E_t(s_{t+1}) \tag{6}$$

Equation (1) is the New Keynesian Phillips curve (PC). π_t is the inflation rate at time t; $E_t(\pi_{t+1})$ is the expected inflation in period t+1; $(y_t - \bar{y})$ is the gap in the output. Equation (2) represents the intertemporal IS curve (IS). In this equation, y_t is output in year t; $E_t(y_{t+1})$ is the expected output in period t+1; $(i_t - \pi_t)$ is the Fischer equation for the real interest rate; cc_t is the current account balance. Equation (3) captures the money market equation. It is a conventional monetary policy rule à la Taylor (1993). The nominal interest rate i_t is a function of the long-term interest rate r, the inflation rate π_t, the deviation of inflation from its target $(\pi_t - \bar{\pi})$ and $(y_t - \bar{y})$ the output gap. Equations (4), (5) and (6) establish the international relationships. The current account balance cc_t depends on output y_t and real exchange rate q_t. The latter depends on the terms of trade $\pi_t^* - \pi_t$ and of the nominal exchange rate s_t which is a function of the interest rate differential $i_t^* - i_t$.

According to a number of recent papers, some of the assumptions of this model have been modified to encompass trade in intermediate products (Engel, 2002; Mishkin, 2008; Poutineau, 2020). Given exchange rate fluctuations affect the production costs of goods and services, firm's competitiveness as well as the quantity of trade in final and intermediate goods and services within the country and internationally. Accounting for these changes, the New Keynesian model is augmented as follows:

$$\pi_t = \beta_0 E_t(\pi_{t+1}) + \beta_1\left(y_t - \bar{y}\right) + \beta_2 s_t + \varepsilon^S \tag{7}$$

$$y_t = \beta_3 E_t(y_{t+1}) - \beta_4(i_t - \pi_t) + \varepsilon^D \tag{8}$$

$$i_t = \beta_5 r + \beta_6\pi_t + \beta_7\left(\pi_t - \bar{\pi}\right) + \beta_8\left(y_t - \bar{y}\right) + \varepsilon^R \tag{9}$$

$$i_t = i_t^* - q_t \tag{10}$$

$$q_t = s_t + \pi_t^* - \pi_t \tag{11}$$

Inserting equations (7) and (9) into equation (8), we obtain equation (12) expressed as:

$$y_t = A_0 E_t(y_{t+1}) + A_1 E_t(\pi_{t+1}) + A_2 r + A_3 s_t + A_4 \pi_t + A_5\left(y_t - \bar{y}\right) + A_6\left(\pi_t - \bar{\pi}\right) + \Phi_t \quad (12)$$

where $A_0 = \beta_3; A_1 = \beta_4\beta_0; A_2 = -\beta_4\beta_5; A_3 = \beta_4\beta_2; A_4 = -\beta_4\beta_6; A_5 = \beta_4(\beta_1 - \beta_8); A_6 = -\beta_4\beta_7; \Phi_t = \varepsilon^D - \beta_4\varepsilon^R + \beta_4\varepsilon^S$.

Considering TiVA, we adopt the empirical equation by Chang and Mayer (1973) articulated as follows:

$$TiVA_t = A\left(\left(K_t^{\gamma_1} L_t^{(1-\gamma_1)}\right)^{\gamma_2}\right) TiVA_{t-1}^{(1-\gamma_2)} \quad (13)$$

where K represent capital, L labor and ($TiVA_{t-1}$) the lagged value of TiVA. Assuming $A \times K_t^{\gamma_1} L_t^{(1-\gamma_1)} = Y_t$, we modify equation (13) by inserting Y_t to obtain equation (14):

$$TiVA_t = A\left(\frac{K_t^{\gamma_1} L_t^{(1-\gamma_1)}}{K_t^{\gamma_1} L_t^{(1-\gamma_1)}}\right)\left(K_t^{\gamma_1} L_t^{(1-\gamma_1)}\right)^{\gamma_2} TiVA_{t-1}^{(1-\gamma_2)}$$

$$TiVA_t = Y_t\left(K_t^{\gamma_1} L_t^{(1-\gamma_1)}\right)^{\gamma_2 - 1} TiVA_{t-1}^{(1-\gamma_2)} \quad (14)$$

By log-linear transforming equation (14), we obtain:

$$TiVA_t = y_t + B_1 k_t + B_2 l_t + B_3 tiva_{t-1} \quad (15)$$

where $B_1 = (\gamma_2 - 1)\gamma_1$; $B_2 = (\gamma_2 - 1)(1 - \gamma_1)$; $B_3 = (1 - \gamma_2)$. Inserting equation (12) into equation (15) yields the empirical equation that will be subject to the econometric treatment and expressed as:

$$TiVA_t = C_0 + C_1 E_t(y_{t+1}) + C_2 E_t(\pi_{t+1}) + C_3 r + C_4 s_t + C_5 \pi_t + C_6\left(y_t - \bar{y}\right) + C_7\left(\pi_t - \bar{\pi}\right) + C_8 k_{t-1} + C_9 l_{t-1} + C_{10} tiva_{t-1} + \psi_t \quad (16)$$

where C_0 is a constant; $C_1 = A_0 = \beta_3$; $C_2 = A_1 = \beta_4\beta_0$; $C_3 = A_2 = -\beta_4\beta_5$; $C_4 = A_3 = \beta_4\beta_2$; $C_5 = A_4 = -\beta_4\beta_6$; $C_6 = A_5 = \beta_4(\beta_1 - \beta_8)$; $C_7 = A_6 = -\beta_4\beta_7$; $C_8 = B_1 = (\gamma_2 - 1)\gamma_1$; $C_9 = B_2 = (\gamma_2 - 1)(1 - \gamma_1)$;$C_{10} = B_3 = (1 - \gamma_2)$; $\psi_t = \varepsilon^{TiVA} + \Phi_t = \varepsilon^{TiVA} + \varepsilon^D - \beta_4\varepsilon^R + \beta_4\varepsilon^S$.

In equation (16), $E_t(y_{t+1})$ and $E_t(\pi_{t+1})$ are the expected future values of output and inflation at time t; r is the long-run interest rate; s_t is the nominal exchange rate; π_t, is the inflation rate; $(y_t - \bar{y})$ is the output gap; $(\pi_t - \bar{\pi})$ is the deviation of inflation from its target; k_{t-1} is the physical capital; l_{t-1} is labor; $tiva_{t-1}$ is the lagged value of TiVA.

3.2 Estimation strategy

The estimation strategy is executed in a stepwise manner based on preliminary tests. These tests aim at identifying and correcting potential bias in the estimation of the parameters. We first mobilize the panel dependence test to verify for stationarity (See Table A3 in the annexe). Results in Table A3 in the annexe show that the three indicators to measure of TiVA which comprise of total trade in value added (GVC), the upstream positioning in the value chain (FVA) and the downstream positioning in the value chain

(DVA), labor, local demand and the output gap are subject to dependence. We then apply the cross-sectional augmented IPS stationarity test by Pesaran (2007). Regarding the other variables, we use the Maddala and Wu (1999) test (see Table A4 in the annexe). Results show the variables are integrated of order zero (I(0)) except labor, physical capital, local demand and the output gap. Differentiating these variables and re-running the test suggest they are integrated of the first order.

After running these preliminary tests, we then verify for the appropriate estimator because the panel data is static with the number of countries superior to the number of years. Accounting for possible heteroscedasticity, autocorrelation or endogeneity, we run the Blomquist and Westerlund (2013) test and Hausman test to choose the appropriate estimator in Table A5 (Col. 1 and Col.2) in the annexe. These tests validate the appropriateness of a fixed effects model. Undertaking Wooldridge's (2002) test proves the presence of serial autocorrelation (Table A5, Col. 3 in annexe). The heteroskedasticity test indicates that the variance of errors is not identical in the panel.

There are several possible sources of endogeneity in this model. First, the literature review shows that TiVA and labor influence monetary policy (Pan, 2020; Dünhaupt and Herr, 2020). Thus, there could be a bi-causality bias, which may constitute a possible source of endogeneity. Second, the literature on value-added trade identifies several variables that may contribute towards understanding the phenomenon (see Okah Efogo, 2020b). Not all of these variables are included in the empirical equation and therefore may constitute a bias due to omission and another source of endogeneity. Third, the presence of the lagged dependent variables among the explanatory variables, which could be a source of endogeneity. To correct for these sources of bias, we opt to use the two-stage least squares within estimator (2SLS-FE). Clustering is used to account for heteroscedasticity. This estimator is robust for endogeneity, heteroscedasticity and autocorrelation. The test by Davidson and MacKinnon (1993) is used to identify the different endogenous variables (Table A6 in the annexe). Conditions for identification and exclusion restrictions are evaluated with Hansen's J test, Kleibergen–Paap's under identification test and Cragg–Donald's weak identification test.

4. Data

Data used in this paper are gotten from the 2020 World Development Indicator database (World Bank, 2020) and covers the period 1990 to 2019. The variables mobilized are the expected value of GDP per capital ($E_t(y_{t+1})$), the expected rate of inflation ($E_t(\pi_{t+1})$), the long-term interest rate (r) measured as the real interest rate for each country reported in 2019, the nominal exchange rate (s_t) captured as the ratio of the local currency to the US dollar, the output gap ($y_t - \bar{y}$) calculated using the Hodrick and Prescott (1997) filter applied to nominal GDP, the inflation gap ($\pi_t - \bar{\pi}$) computed by assuming that the target inflation rate is 2%. Physical capital (k_t) is measured as gross fixed capital formation in dollars. Labor (l_t) is computed as the secondary school enrolment rate. Inflation (π_t) is measured using the consumer price index.

The data on TiVA are extracted from the UNCTAD-EORA-TiVA database. We use three indicators to measure the total trade in value added (GVC), the upstream positioning in the value chain (FVA) and the downstream positioning in the value chain (DVA). GVC is measured as the ratio of foreign value plus indirect value added to gross export of a given country at time t. FVA is computed as the upstream positioning if a given country at time t in the value chain. DVA is calculated as the domestic value-added of a country at time t in the value chain. Descriptive statistics for the variables are posted in Table A2 in the annexe.

5. Empirical results

Table one presents results for both the annualized panel data set (Table 1, Col. 1 to Col. 6) and a five-year averaged panel data (Table one, Col. 7 to Col. 12) for the within estimator corrected for cross sectional dependence as well as the two-stage-least squares fixed effect estimator (2SLS-FE) which corrects for endogeneity. The annualized data captures short-term effects whilst the five-year average dataset is adopted to remove business cycle components and capture long-term relationship. For the later, this exercise entails constructing five-year periods of data for each country (1990–1994; 1995–1999; 2000–2004; 2005–2009; 2010–2014; 2015–2019).

Table one posts a negative relationship between inflation gap and TiVA (Table 1, Col. 4, 5 and 6). Inflation gap slightly dampens TiVA since a unit percentage increase in inflation gap very marginally reduces TiVA by 0.01%. To mitigate this, Central Banks should credibly commit to inflation target in the short run. On the contrary, the output gap has positive effects on TiVA (Table 1, Col. 4, 5 and 6) implying that production above the natural production level contributes towards increasing TiVA. For the other covariates, the lagged values for GVC, FVA and DVA relate positively with current values when considering the short-term (Table 1, Col. 4, 5 and 6) and long-term (Table 1, Col. 10, 11 and 12). In the short term, capital relates positively to all three measures of TiVA (Table 1, Col. 4, 5 and 6) whereas labor relates positively and significantly only with FVA (Table 1, Col. 4).

5.1 Robustness checks

In this section, we conduct a sensitivity analysis by extending the empirical model, altering estimators and measures of output gap. Specifically, we include in our baseline model several additional control variables from the TiVA literature. We insert domestic and foreign financial capital respectively assessed by financial credit to the economy from financial institutions ($\boldsymbol{fincredit_{it}}$) and foreign direct investment ($\boldsymbol{fdi_{it}}$). We also include tariffs ($\boldsymbol{wtarif_{it}}$) as a variable proxying access to markets. We then add labor productivity ($\boldsymbol{laborprod_{it}}$) which is a logistic variable proxied by access to electricity ($\boldsymbol{electr_{it}}$) and ICT using mobile phone subscriptions ($\boldsymbol{mobsubs_{it}}$). The objective of this approach aims to assess the strength of the results when other theoretical determinants of TiVA are taken in account.

We then use two alternative estimators to account for different problems in data. The first estimator is the Hausman–Taylor estimator to control for endogeneity and random effects in annualized data. The second estimator is the least squares dummy variable corrected estimator (LSDVC) by Bruno (2005) which is initialized with system GMM to control for endogeneity in small and unbalanced panel. The within estimator as well as Driscoll and Kraay (1998) standard deviation are also used to control for cross sectional dependence in annual data.

Furthermore, we test for the robustness of the output gap variable (Table 2). Hamilton (2018) criticizes the use of the Hodrick–Prescott filter to measure the output gap and suggest estimating an autoregressive model with four lags and thereon generating the residual. Implementing this procedure, we observe that the output gaps obtained using the Hamilton (2018) approach and the Hodrick–Prescott filter are both positively and significantly correlated as depicted in Table two.

Robustness results are presented in Tables three and four and confirm that elements of the Taylor rule are important determinants of TiVA in the short run (Table 3, Col. 1 to 9). Similar to results obtained in Table one, an increase output gap sustains TiVA while an increasing inflation gap reduces TiVA. Furthermore, expected inflation (Table 3, col 2, 5 and 8), the nominal exchange rate (Table 3, Col. 2 to 6), the volume of credit granted by

Table 1.
Effects of monetary policy on TiVA

	Annual data						5 -years mean data					
	FE corrected for cross sectional dependence			2SLS-FE			FE corrected for cross sectional dependence			2SLS-FE		
	LFVA Col 1	LDVA Col 2	LGVC Col 3	LFVA Col 4	LDVA Col 5	LGVC Col 6	LFVA Col 7	LDVA Col 8	LGVC Col 9	LFVA Col 10	LDVA Col 11	LGVC Col 12
$LFVA_{t-1}$	13.13***			14.58***			12.96***			15.56***		
	(0.000)			(0.000)			(0.000)			(0.000)		
$LDVA_{t-1}$		15.20***			16.04***			14.96***			17.42***	
		(0.000)			(0.000)			(0.000)			(0.000)	
$LGVC_{t-1}$			14.41***			15.86***			14.10***			15.10***
			(0.000)			(0.000)			(0.000)			(0.000)
$E_t(\text{inflation}_{t+1})$	−0.004	0.005	0.001	−0.015	−0.000	−0.011	−0.057***	−0.022**	−0.030**	1.314	1.117	0.206
	(0.657)	(0.343)	(0.816)	(0.336)	(0.958)	(0.466)	(0.000)	(0.030)	(0.014)	(0.219)	(0.390)	(0.742)
Per capita GDP	0.108***	0.076***	0.094***	0.004	0.029	−0.006	0.122***	0.091***	0.117***	−0.060	−0.064	0.054
	(0.000)	(0.000)	(0.000)	(0.924)	(0.487)	(0.901)	(0.000)	(0.000)	(0.000)	(0.371)	(0.723)	(0.321)
Nominal exchange rate	0.012*	0.015**	0.013*	−0.019	0.001	−0.016	0.008	0.013**	0.012**	−0.0404	0.000110	−0.0138
	(0.059)	(0.013)	(0.060)	(0.509)	(0.965)	(0.563)	(0.258)	(0.010)	(0.050)	(0.405)	(0.996)	(0.586)
Inflation gap	−0.010*	−0.008**	−0.009**	−0.011**	−0.010***	−0.010***	0.011***	0.006***	0.007***	−1.218	−0.741	0.185
	(0.062)	(0.019)	(0.029)	(0.016)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.221)	(0.539)	(0.752)
Output gap	0.078	0.110	0.111	0.109***	0.117***	0.125***	−0.458**	−0.295**	−0.353**	−0.195	−0.111	−0.134
	(0.342)	(0.125)	(0.177)	(0.005)	(0.000)	(0.000)	(0.016)	(0.033)	(0.045)	(0.481)	(0.511)	(0.329)
$E_t(GDP_{+1})$	−0.001	0.001	−0.001	−0.009	0.002	−0.007	−0.098***	−0.073***	−0.095***	0.014	0.070	−0.062
	(0.945)	(0.924)	(0.957)	(0.646)	(0.867)	(0.658)	(0.000)	(0.000)	(0.000)	(0.866)	(0.709)	(0.214)
Δ(Capital)	−0.039	−0.046*	−0.046	−0.048*	−0.045**	−0.046*	0.048	−0.020	−0.002	−0.074	−0.126	−0.017
	(0.216)	(0.054)	(0.116)	(0.095)	(0.032)	(0.058)	(0.104)	(0.245)	(0.918)	(0.395)	(0.468)	(0.824)
Δ(Labor)	−0.481**	−0.315**	−0.382**	−0.280*	−0.222	−0.264	−1.457**	−0.694***	−0.856***	−0.196	−0.357	−0.00751
	(0.049)	(0.028)	(0.044)	(0.075)	(0.126)	(0.119)	(0.001)	(0.000)	(0.000)	(0.776)	(0.602)	(0.988)
Constant	−21.38***	−26.68***	−24.68***				−21.01***	−26.12***	−23.99***			
	(0.000)	(0.000)	(0.000)				(0.000)	(0.000)	(0.000)			
Observations	1,046	1,046	1,046	1,009	1,009	1,009	225	225	225	151	151	151
R-squared	0.986	0.992	0.989	0.984	0.991	0.988	0.990	0.994	0.992	0.985	0.993	0.993
Hansen J test				0.000	0.000	0.000				0.000	0.000	0.000
Dmexogxt (exog test)				0.000	0.000	0.000				0.000	0.141	0.016
Rank	9	9	9	9	9	9	9	9	9	9	9	9

Note(s): p-values in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source(s): Computed by the authors

financial institutions, TIC and labor productivity (Table 3, Col. 1 to 9) have a significant effect on TiVA.

Tables three and four indicate that in the short run, the nominal exchange rate and labor productivity have positive and significant effects on TiVA. On the contrary, increased credit appears to spur TiVA. Okah Efogo (2020b) finds similar results for financial credit when considering countries in sub-Saharan Africa. Following Levine (2005), one possible explanation is misallocation where additional credit is not directed to firms operating in GVCs. A second explanation consistent with the findings of Manova and Yu (2014) is that credit in a context of existing financial frictions can determine a country's position in GVCs.

The LSDVC estimator (Table 3 Col. 10, 11 and 12) produces results that are different from the estimates gotten in Table one. This is not surprising since Bruno (2005) as well as Flannery and Hawkins (2013) indicate that the LSDVC estimator corrects for sample size bias and better suited than the other alternative estimators when the sample size is less than 400 observations. Nonetheless, overly the results in Table three confirm the absence of long-run monetary policy effects. Significant factors that improve TiVA were capital investment, foreign direct investment, labor (Table 3, Col. 12), per capita income and bank credit (Table 3, Col. 11 and 12). On the contrary, increasing tariffs and labor productivity reduce TiVA (Table 3, Col. 10, 11 and 12).

Table four presents the estimation results for the output gap using Hamilton's (2018) approach. Inflation gap remained negative and significant (Table 4, Col. 1 to 9), while output gap was not significant. Table four shows that the effect of the output gap depends on the measure used. Only the output gap measured using the Hodrick and Prescott (HP) filter is significant. Nonetheless, studies by Hamilton (2018) and Quast and Wolters (2020) argue for the preference of the Hamilton filter because the HP filter produces series with spurious dynamic relations.

6. Conclusion

This manuscript contributes towards filling the gap in the literature on the effect of monetary policy on TiVA. We examine this effect using a panel of 38 developing countries over the period 1990 to 2019. We also employed different estimators to gauge for robustness. Results purports that in developing countries, the effects of monetary policy on TiVA are mediated through the inflation gap, expected inflation and the volume of credit from financial institutions. We confirm the depressive effect of inflation gap on TiVA and align with the existing literature on monetary policy and trade within a sticky price framework. Increased inflationary gaps and anticipated inflationary outcomes only act significantly in the short term. Beyond this empirical contribution to the literature, findings from this study offer policymakers relevant insights on possible monetary policy tools that affect TiVA and should guide monetary policy actors in crafting a global value chain penetration and upgrading strategy.

	Output gap (Hodrick–Prescott)	Output gap (Hamilton)
Output gap (Hodrick–Prescott)	1.000	
Output gap (Hamilton)	0.699*	1.000

Note(s): * indicate a 5% significance level
Source(s): Computed by the authors

Table 2. Correlation of output gaps by the Hodrick–Prescott filter and Hamilton's approaches

Table 3.
Estimation with additional control variables and alternative estimators

	2SLS-FE annual data			Hausman–Taylor			FE corrected for cross sectional dependence			LSDVC 5 years mean data		
	LFVA Col 1	LDVA Col 2	LGVC Col 3	LFVA Col 4	LDVA Col 5	LGVC Col 6	LFVA Col 7	LDVA Col 8	LGVC Col 9	LFVA Col 10	LDVA Col 11	LGVC Col 12
$LFVA_{t-1}$	15.28***			13.55***			13.37***			0.740***		
	(0.000)			(0.000)			(0.000)			(0.000)		
$LDVA_{t-1}$		17.17***			16.03***			15.94***			0.753***	
		(0.000)			(0.000)			(0.000)			(0.000)	
$LGVC_{t-1}$			17.41***			15.30***			15.14***			0.674***
			(0.000)			(0.000)			(0.000)			(0.000)
$E_t(\text{inflation}_{t+1})$	0.006	0.018**	0.009	0.008	0.016**	0.011	0.011**	0.019***	0.015***	0.855	1.232	2.025
	(0.591)	(0.027)	(0.414)	(0.538)	(0.041)	(0.241)	(0.019)	(0.000)	(0.000)	(0.698)	(0.520)	(0.330)
Per capita GDP	−0.017	−0.016	−0.060	0.056	0.027	0.044	0.064**	0.031*	0.051**	0.150	0.305***	0.287***
	(0.726)	(0.673)	(0.249)	(0.247)	(0.369)	(0.281)	(0.010)	(0.075)	(0.023)	(0.172)	(0.001)	(0.004)
Nominal exchange rate	0.024	0.041***	0.032*	0.026*	0.031***	0.027**	0.031***	0.036***	0.033***	−0.034	−0.028	−0.042
	(0.170)	(0.001)	(0.078)	(0.079)	(0.001)	(0.019)	(0.000)	(0.000)	(0.000)	(0.315)	(0.326)	(0.185)
Inflation gap	−0.013***	−0.013***	−0.012***	−0.014***	−0.012***	−0.012***	−0.015***	−0.013***	−0.013***	0.088	−0.454	−0.789
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.945)	(0.683)	(0.511)
Output gap (Hodrick–Prescott)	0.066*	0.079***	0.069**	0.056	0.081**	0.081**	0.051	0.078	0.077	−0.455	−0.611	−0.496
	(0.051)	(0.006)	(0.025)	(0.161)	(0.011)	(0.015)	(0.458)	(0.215)	(0.280)	(0.529)	(0.335)	(0.465)
$E_t(GDP_{+1})$	−0.014	0.004	−0.008	−0.012	−0.002	−0.006	−0.013	−0.004	−0.008	0.467**	0.227	0.315
	(0.489)	(0.746)	(0.644)	(0.574)	(0.899)	(0.745)	(0.154)	(0.670)	(0.424)	(0.031)	(0.227)	(0.124)
Δ(Capital)	−0.055**	−0.041***	−0.053**	−0.036*	−0.042***	−0.047***	−0.035	−0.042**	−0.047**	0.728***	0.809***	0.776***
	(0.042)	(0.010)	(0.029)	(0.062)	(0.008)	(0.008)	(0.145)	(0.010)	(0.023)	(0.001)	(0.000)	(0.000)
Δ(Labor)	−0.336	−0.302**	−0.368*	−0.543***	−0.471***	−0.560***	−0.531*	−0.458**	−0.542**	3.371	2.542	3.467*
	(0.111)	(0.037)	(0.054)	(0.008)	(0.001)	(0.002)	(0.072)	(0.023)	(0.027)	(0.114)	(0.167)	(0.082)
Foreign direct investment	−0.006	−0.004	−0.003	−0.003	−0.003	−0.003	−0.004**	−0.004**	−0.003*	0.103***	0.055**	0.059**
	(0.366)	(0.454)	(0.620)	(0.574)	(0.467)	(0.640)	(0.039)	(0.032)	(0.099)	(0.001)	(0.039)	(0.039)
Electricity	−0.001	−0.001	−0.001	−0.000	−0.000	−0.001	−0.000	−0.000**	−0.000***	0.002	0.001	0.001
	(0.533)	(0.502)	(0.414)	(0.674)	(0.521)	(0.459)	(0.399)	(0.039)	(0.002)	(0.524)	(0.762)	(0.716)
Credit from financial institutions	−0.072*	−0.051**	−0.074**	−0.050*	−0.046**	−0.057**	−0.053***	−0.049***	−0.062***	0.111**	−0.0120	0.0276
	(0.071)	(0.017)	(0.031)	(0.086)	(0.014)	(0.020)	(0.000)	(0.000)	(0.000)	(0.047)	(0.804)	(0.600)
Weighted mean tariff	−0.001	−0.000	0.000	−0.002	−0.001	−0.001	−0.002	−0.001	−0.001	−0.020***	−0.012*	−0.016**
	(0.567)	(0.731)	(0.933)	(0.145)	(0.192)	(0.144)	(0.117)	(0.151)	(0.132)	(0.010)	(0.078)	(0.023)

(*continued*)

Table 3.

	2SLS-FE annual data			Hausman–Taylor			FE corrected for cross sectional dependence			LSDVC 5 years mean data		
	LFVA Col 1	LDVA Col 2	LGVC Col 3	LFVA Col 4	LDVA Col 5	LGVC Col 6	LFVA Col 7	LDVA Col 8	LGVC Col 9	LFVA Col 10	LDVA Col 11	LGVC Col 12
Mobile subscription	−0.023***	−0.022***	−0.033***	−0.007	−0.011***	−0.013**	−0.007***	−0.012***	−0.014***	0.008	−0.018	0.014
	(0.003)	(0.000)	(0.000)	(0.324)	(0.001)	(0.027)	(0.000)	(0.000)	(0.000)	(0.683)	(0.310)	(0.494)
Labor productivity	0.214*	0.186**	0.229**	0.166	0.147*	0.141	0.185***	0.160***	0.161***	−0.477***	−0.330**	−0.417***
	(0.052)	(0.049)	(0.030)	(0.126)	(0.082)	(0.152)	(0.000)	(0.000)	(0.000)	(0.005)	(0.017)	(0.007)
Constant				−23.44***	−29.72***	−27.68***	−23.21***	−29.64***	−27.50***			
				(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Number of observations	967	967	967	990	990	990	990	990	990	218	218	218
R-squared	0.985	0.993	0.989				0.987	0.993	0.991			
Hansen J test	0.000	0.000	0.000									
Rank	15	15	15	17	17	17	16	16	16	15	15	15

Note(s): *p*-values in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source(s): Computed by the authors

Table 4.
Estimation with Hamilton (2018) output gap

	FE corrected for cross-sectional dependence			2SLS-FE			Hausman–Taylor		
	LFVA	LDVA	LGVC	LFVA	LDVA	LGVC	LFVA	LDVA	LGVC
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
$LFVA_{t+1}$	13.36***			14.94***			13.47***		
	(0.000)			(0.000)			(0.000)		
$LDVA_{t+1}$		16.03***			17.13***			16.27***	
		(0.000)			(0.000)			(0.000)	
$LGVC_{t+1}$			15.20***			17.05***			15.51***
			(0.000)			(0.000)			(0.000)
$E_t(Inflation_{t+1})]$	−0.151**	−0.066	−0.081	−0.238*	−0.133	−0.185	0.020	−0.030	0.009
	(0.014)	(0.154)	(0.179)	(0.081)	(0.119)	(0.100)	(0.935)	(0.843)	(0.964)
$\Delta[E_t(GDP_{t+1})]$	−0.015	−0.003	−0.009	−0.021	−0.001	−0.014	−0.007	0.000	−0.001
	(0.170)	(0.649)	(0.349)	(0.178)	(0.925)	(0.314)	(0.684)	(0.973)	(0.915)
Δ(Capital)	−0.017	−0.020**	−0.020	−0.018	−0.012	−0.015	−0.015	−0.016	−0.017
	(0.247)	(0.036)	(0.112)	(0.243)	(0.285)	(0.261)	(0.284)	(0.156)	(0.164)
Nominal exchange rate	0.013***	0.011***	0.014***	0.015**	0.014**	0.018**	0.023	0.029**	0.021
	(0.000)	(0.000)	(0.000)	(0.018)	(0.035)	(0.012)	(0.237)	(0.013)	(0.121)
Inflation gap	−0.015***	−0.011**	−0.012**	−0.010*	−0.010***	−0.008*	−0.018**	−0.010**	−0.013**
	(0.009)	(0.022)	(0.028)	(0.054)	(0.003)	(0.051)	(0.019)	(0.023)	(0.024)
Output gap (Hamilton)	0.013	−0.003	−0.003	−0.013	−0.019	−0.034	0.010	−0.009	−0.018
	(0.617)	(0.875)	(0.907)	(0.562)	(0.267)	(0.158)	(0.669)	(0.629)	(0.431)
Δ(Labor)	−0.180	−0.221**	−0.264**	−0.146	−0.192	−0.228	−0.311*	−0.288**	−0.366**
	(0.225)	(0.025)	(0.042)	(0.429)	(0.195)	(0.224)	(0.079)	(0.041)	(0.030)
Per capita GDP	0.076***	0.038**	0.057***	0.001	−0.010	−0.038	0.069	0.021	0.042
	(0.001)	(0.014)	(0.010)	(0.987)	(0.774)	(0.421)	(0.156)	(0.491)	(0.282)
Foreign direct investment	−0.001	−0.003**	−0.001	−0.003	−0.003	−0.001	−0.002	−0.004	−0.003
	(0.259)	(0.030)	(0.444)	(0.519)	(0.466)	(0.810)	(0.672)	(0.426)	(0.604)
Electricity	0.000	−0.000**	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.001
	(0.904)	(0.026)	(0.108)	(0.758)	(0.510)	(0.504)	(0.840)	(0.434)	(0.449)
Financial credit	−0.037***	−0.034***	−0.043***	−0.051**	−0.037**	−0.054**	−0.047*	−0.040**	−0.051**
	(0.000)	(0.001)	(0.000)	(0.044)	(0.023)	(0.021)	(0.087)	(0.035)	(0.037)

(*continued*)

Table 4.

	FE corrected for cross-sectional dependence			2SLS-FE			Hausman–Taylor		
	LFVA Col 1	LDVA Col 2	LGVC Col 3	LFVA Col 4	LDVA Col 5	LGVC Col 6	LFVA Col 7	LDVA Col 8	LGVC Col 9
Weighted mean tariff	−0.000	0.000	0.000	0.000	0.000	0.001	−0.000	0.000	−0.000
	(0.600)	(0.737)	(0.968)	(0.498)	(0.492)	(0.260)	(0.683)	(0.984)	(0.944)
Mobile subscription	−0.006***	−0.009***	−0.011***	−0.019**	−0.016***	−0.027***	−0.007	−0.011***	−0.013*
	(0.001)	(0.000)	(0.000)	(0.020)	(0.000)	(0.000)	(0.370)	(0.003)	(0.051)
Labor productivity	0.153***	0.124***	0.128***	0.179	0.146	0.179	0.151	0.144*	0.128
	(0.000)	(0.000)	(0.000)	(0.104)	(0.126)	(0.105)	(0.143)	(0.094)	(0.192)
Long-term interest rate							−0.076	−0.017	−0.035
							(0.145)	(0.534)	(0.252)
Constant	−23.07***	−29.64***	−27.48***				−23.22***	−30.34***	−28.11***
	(0.000)	(0.000)	(0.000)				(0.000)	(0.000)	(0.000)
Number of observations	1,052	1,052	1,052	1,052	1,052	1,052	909	909	909
R-squared	0.988	0.993	0.991	0.986	0.992	0.989			
Rank	16	16	16	15	15	15	17	17	17

Note(s): p-values in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
Source(s): Computed by the authors

References

AfDB, OECD and UNDP (2014), *Global Value Chains and Africa's Industrialization, African Economic Outlook*, OECD Publishing, Paris.

Allard, C., Kriljenko, J.I.C., Chen, W., Gonzalez-Garcia, J., Kitsios, E. and Treviño, J. (2016), *Trade Integration and Global Value Chains in Sub-saharan Africa: In Pursuit of the Missing Link*. International Monetary Fund, Washington, DC, p. 36.

Auer, R.A., Levchenko, A.A. and Sauré, P. (2019), "International inflation spill-overs through input linkages", *Review of Economics and Statistics*, Vol. 101 No. 3, pp. 507-521.

Bahmani-Oskooee, M. and Gelan, A. (2012), "Is there J-Curve effect in Africa?", *International Review of Applied Economics*, Vol. 26 No. 1, pp. 73-81.

Bahmani-Oskooee, M. and Arize, A.C. (2019), "US-Africa trade balance and the J-curve: an asymmetry analysis", *The International Trade Journal*, Vol. 33 No. 4, pp. 322-343.

Bahmani-Oskooee, M. and Ratha, A. (2004), "The J-curve: a literature review", *Applied Economics*, Vol. 36 No. 13, pp. 1377-1398.

Baum, C. and Stillman, S. (2003), *DMEXOGXT: Stata Module to Test Consistency of OLS vs XT-IV Estimates. Statistical Software Components*, Boston College Department of Economics.

Blomquist, J. and Westerlund, J. (2013), "Testing slope homogeneity in large panels with serial correlation", *Economics Letters*, Vol. 121 No. 3, pp. 374-378.

Bruno, G.S. (2005), "Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models", *Economics Letters*, Vol. 87 No. 3, pp. 361-366.

Calvo, G.A. and Rodriguez, C.A. (1977), "A model of exchange rate determination under currency substitution and rational expectations", *Journal of Political Economy*, Vol. 85 No. 3, pp. 617-625.

Capistrán Carmona, C., Chiquiar, D. and Hernández, J.R. (2019), "Identifying Dornbusch's exchange rate overshooting with structural VECs: evidence from Mexico", *International Journal of Central Banking*, Vol. 61, pp. 207-254.

Chang, W.W. and Mayer, W. (1973), "Intermediate goods in a general equilibrium trade model", *International Economic Review*, Vol. 41, pp. 447-459.

Clarida, R., Galı, J. and Gertler, M. (2002), "A simple framework for international monetary policy analysis", *Journal of Monetary Economics*, Vol. 49 No. 5, pp. 879-904.

Davidson, R. and MacKinnon, J. (1993), *Estimation and Inference in Econometrics*, Oxford University Press.

De Soyres, F. and Franco, S. (2019), *Inflation Dynamics and Global Value Chains*, The World Bank, Washington, DC.

Dornbusch, R. (1976), "Expectations and exchange rate dynamics", *Journal of Political Economy*, Vol. 84 No. 6, pp. 1161-1176.

Driscoll, J. and Kraay, A. (1998), "Consistent covariance matrix estimation with spatially dependent panel data", *The Review of Economics and Statistics*, Vol. 80 No. 4, pp. 549-560.

Dünhaupt, P. and Herr, H. (2020), "Global value chains–a ladder for development?", *International Review of Applied Economics*, Vol. 35 Nos 3-4, pp. 1-19.

Eichengreen, B. (1981), "A dynamic model of tariffs, output and employment under flexible exchange rates", *Journal of International Economics*, Vol. 11, pp. 341-359.

Engel, C. (2002), "Expenditure switching and exchange-rate policy", *NBER Macroeconomics Annual*, Vol. 17, pp. 231-272.

Engel, C. (2011), "Currency misalignments and optimal monetary policy: a re-examination", *American Economic Review*, Vol. 101 No. 6, pp. 2796-2822.

Ethier, W. (1982), "National and international returns to scale in the modern theory of international trade", *American Economic Review*, Vol. 72, pp. 389-405.

Feenstra, R.C. (1998), “Integration of trade and disintegration of production in the global economy”, *Journal of Economic Perspectives*, Vol. 12 No. 4, pp. 31-50.

Flannery, M.J. and Hawkins, K.W. (2013), “Estimating dynamic panel models in corporate finance”, *Journal of Corporate Finance*, Vol. 19, pp. 1-19.

Frankel, J.A. (1984), “The theory of trade in middle products: an extension”, *The American Economic Review*, Vol. 74 No. 3, pp. 485-487.

Galesi, A. and Rachedi, O. (2019), “Services deepening and the transmission of monetary policy”, *Journal of the European Economic Association*, Vol. 17 No. 4, pp. 1261-1293.

Gali, J. and Monacelli, T. (2005), “Monetary policy and exchange rate volatility in a small open economy”, *The Review of Economic Studies*, Vol. 72 No. 3, pp. 707-734.

Gereffi, G. and Fernandez-Stark, K. (2016), “Global value chain analysis: a primer”, *In the Duke Center on Globalization, Governance and Competitiveness (Duke CGGC)*, 2nd ed., p. 34.

Gong, L., C., Wang and Zou, H.F. (2016), “Optimal monetary policy with international trade in intermediate inputs”, *Journal of International Money and Finance*, Vol. 65, pp. 140-165.

Hamilton, J.D. (2018), “Why you should never use the Hodrick-Prescott filter”, *Review of Economics and Statistics*, Vol. 100 No. 5, pp. 831-843.

Helpman, E. (1985), “International trade in differentiated middle products”, in Hague, D. and Jungenfelt, K.G. (Eds), *Structural Adjustment in Developed Open Economies*, Palgrave Macmillan, London, pp. 3-34.

Hodrick, R.J. and Prescott, E.C. (1997), “Post-war US business cycles: an empirical investigation”, *Journal of Money, Credit, and Banking*, Vol. 29 No. 1, pp. 1-16.

Levine, R. (2005), “Finance and growth: theory and evidence”, *Handbook of Economic Growth*, Vol. 1, pp. 865-934.

Maddala, G.S. and Wu, S. (1999), “A comparative study of unit root tests with panel data and a new simple test”, *Oxford Bulletin of Economics and Statistics*, Vol. 61 S1, pp. 631-652.

Magee, S.P. (1973), “Currency contracts, pass through and devaluation”, *Brooking Papers on Economic Activity*, Vol. 1, pp. 303-325.

Manova, K. and Yu, Z. (2014), *Firms and Credit Constraints along the Global Value Chain: Processing Trade in China. NBER Working Paper Series*, National Bureau of Economic Research, Cambridge, Vol. 18561.

Mishkin, F.S. (2008), *Exchange Rate Pass-Through and Monetary Policy*, National Bureau of Economic Research, Cambridge, NBER Working Paper No 13889.

Obstfeld, M. and Rogoff, K. (2000), “New directions for stochastic open economy models”, *Journal of International Economics*, Vol. 50 No. 1, pp. 117-153.

Ojede, A. and Lam, E. (2017), “The impact of changes in monetary aggregates on exchange rate volatility in a developing country: do structural breaks matter?”, *Economics Letters*, Vol. 155, pp. 111-115.

Okah Efogo, F. (2020a), “Financial development and African participation in global value chains”, in *Financing Africa’s Development by D. Seck Ed*, Springer, Cham, pp. 33-52.

Okah Efogo, F. (2020b), “Does trade in services improve African participation in global value chains?”, *African Development Review*, African Development Bank, Vol. 32 No. 4, pp. 758-772.

Pan, Z. (2020), “Employment impacts of the US global value chain participation”, *International Review of Applied Economics*, Vol. 34, pp. 699-720.

Patel, N., Wang, Z. and Wei, S.J. (2019), “Global value chains and effective exchange rates at the country-sector level”, *Journal of Money, Credit and Banking*, Vol. 51, pp. 7-42.

Pesaran, M.H. (2007), “A simple panel unit root test in the presence of cross-section dependence”, *Journal of Applied Econometrics*, Vol. 22 No. 2, pp. 265-312.

Poutineau, J.C. (2020), "Une introduction simple à la nouvelle macroéconomie ouverte", *Revue Française d'Economie*, Vol. 35 No. 2, pp. 3-50.

Quast, J. and Wolters, M.H. (2020), "Reliable real-time output gap estimates based on a modified Hamilton filter", *Journal of Business and Economic Statistics*, pp. 1-17.

Sachs, J. (1980), "Wages, flexible exchange rates and macroeconomic policy", *The Quarterly Journal of Economics*, Vol. 94 No. 4, pp. 731-747.

Sanyal, K.K. and Jones, R.W. (1982), "The theory of trade in middle products", *The American Economic Review*, Vol. 72 No. 1, pp. 16-31.

Sarkar, A. (1985), "A model of trade in intermediate goods", *Journal of International Economics*, Vol. 19 Nos 1-2, pp. 85-98.

Taylor, J.B. (1993), "Discretion versus policy rules in practice", *Carnegie-Rochester Conference Series on Public Policy*, Vol. 39, pp. 195-214.

Wei, S.J. and Xie, Y. (2020), "Monetary policy in an era of global supply chains", *Journal of International Economics*, Vol. 124, pp. 103-299.

Wooldridge, J.M. (2002), *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, MA, p. 108.

World Bank (2020), *World Development Indicator 2020*, World Bank, Washington, DC.

World Bank, IDE–JETRO, OECD, RCGVC-UIBE and WTO (2017), "Measuring and analysing the impact of GVCs on economic development", *Global Value Chain Development Report*, No. 2017, p. 189.

Annexe

Algeria	El Salvador	Mauritius	Tunisia
Argentina	Guatemala	Mexico	Turkey
Bangladesh	Honduras	Morocco	Uruguay
Bolivia	India	Nigeria	Venezuela, RB
Brazil	Indonesia	Pakistan	Vietnam
Chile	Iran, Islamic Rep	Panama	
Colombia	Jordan	Philippines	
Costa Rica	Kenya	South Africa	
Dominican Republic	Paraguay	Sri Lanka	
Ecuador	Peru	Tanzania	
Egypt, Arab Rep	Malaysia	Thailand	

Source(s): Computed by the authors

Table A1.
Countries in the panel

Variable	Mean	Std. Dev	Min	Max	Observations
LFVA	14.59	1.891	10.26	19.64	1,320
LDVA	16.23	1.677	12.34	21.35	1,320
LGVC	15.60	1.840	11.38	20.68	1,320
$E_t(\text{Inflation}_{t+1})]$	−0.034	0.363	−0.101	8.688	1,276
$\Delta[E_t(\text{GDP}_{t+1})]$	0.041	0.223	−2.605	1.514	1,232
Δ(Capital)	0.082	0.349	−4.410	3.269	1,276
Nominal exchange rate	3.070	2.967	−10.43	10.62	1,261
Inflation gap	20.15	236.4	−3.710	7479.7	1,320
ΔOutput gap	0.002	0.227	−3.110	2.028	1,276
Δ(Labor)	0.023	0.017	−0.048	0.107	1,231
Per capita GDP	8.038	1.129	4.556	11.08	1,320
Long term interest rate	23.12	19.51	7.348	93.91	1,140
Foreign direct investment	7.195	2.155	−6.908	11.84	1,290
Electricity	82.05	19.88	2.283	100	1,320
Financial credit	3.873	0.641	−0.647	5.386	1,308
Weighted mean tariff	8.684	6.112	0.000	91.27	1,320
Mobile subscription	14.75	3.225	5.521	21.22	1,222
Labor productivity	10.11	0.813	7.971	12.142	1,320

Source(s): Computed by the authors

Table A2.
Descriptive statistics on yearly data

Variables	CD-test	p-value	Correlation	abs(correlation)
$\Delta[E_t(\text{GDP}_{t+1})]$	113.60	0.000	0.796	0.796
ΔOutput gap	15.18	0.000	0.106	0.445
Inflation	.	.	.	.
$E_t(\text{Inflation}_{t+1})]$	.	.	.	.
Inflation gap	.	.	.	.
Nominal exchange rate	.	.	.	.
Long term interest rate				
LDVA	150.99	0.000	0.959	0.959
LFVA	153.91	0.000	0.977	0.977
LGVC	155.41	0.000	0.987	0.987
Capital_{t-1}	.	.	.	.
Labor_{t-1}	153.17	0.000	0.972	0.972
Per capita GDP	142.65	0.000	0.906	0.906

Source(s): Computed by the authors

Table A3.
Dependence test

Variables	Maddala and Wu test	p-value	Lags	CIPS test	p-value	Lags
ΔOutput gap				2.781	0.997	0
Inflation	467.495	0.000	0	.		
Inflation gap	467.494	0.000	0	.		
Nominal exchange rate	360.85	0.000	0	.		
LDVA				−2.989	0.000	0
LFVA				−5.771	0.000	0
LGVC				−4.531	0.000	0
Capital_{t-1}	67.70	0.956	0			
Labor_{t-1}				1.727	0.958	0
Per capita GDP				−4.113	0.000	0

Source(s): Computed by the authors

Table A4.
Stationarity test

Table A5. Other specification tests

Dependent variable	Blomquist and westerlund test (*slope homogeneity test*)	Hausman test (*FE vs RE test*)	Wooldrige test (*serial correlation test*)
FVA equation	−7.467*** (0.000)	243.6*** (0.000)	237.8*** (0.000)
DVA equation	−7.302*** (0.000)	231.38*** (0.000)	220.8*** (0.000)
GVC equation	−7.393*** (0.000)	238.7*** (0.000)	239.0*** (0.000)

Note(s): *p-values in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$*
Source(s): Computed by the authors

Table A6. Davidson–MacKinnon test of exogeneity (Baum and Stillman, 2003)

Variable	FVA	DVA	GVC
Inflation	0.467 (0.494)	0.180 (0.674)	0.246 (0.620)
Per capita GDP	1.814 (0.178)	4.727** (0.030)	2.770* (0.096)
Lagged dependent variable	121.7*** (0.000)	92.74*** (0.000)	127.2*** (0.000)
Overall test	88.53*** (0.000)	61.67*** (0.000)	70.25*** (0.000)

Note(s): *p-values in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$*
Source(s): Computed by the authors

Corresponding author
Boniface Ngah Epo can be contacted at: epongahb@yahoo.fr