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## Article

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## FINANCIAL ECONOMICS | RESEARCH ARTICLE

# How international capital inflows and domestic financial institutional development affect domestic credit: Evidence from developing countries

Subroto Rapih<sup>1,2\*</sup>

**Abstract:** This study examines the effects of international capital flows segmented by borrower type (i.e., banks versus other types of financial institutions) and the development of domestic financial institutions on the level of domestic credit in 74 developing countries between 2005 and 2017. Through dynamic panel data estimation, this study yields four main findings. First, domestic credit is closely associated with international capital inflows to the banking sector, although the increase of foreign capital inflows to financial institutions other than banks harms domestic credit. Second, the development of domestic financial institutions is essential for increasing domestic credit in developing countries. Third, increasing international capital inflows to the banking sector will stimulate the level of domestic credit in countries with less developed domestic financial institutions and vice versa. Fourth, greater uncertainty in global economic and financial market conditions suppresses domestic credit in developing countries.

**Subjects:** International Finance; Banking; Credit & Credit Institutions

**Keywords:** International capital inflows; development of financial institutions; domestic credit; developing countries

### ABOUT THE AUTHOR

Subroto Rapih is currently a PhD student at the Graduate School of East Asian Studies, Yamaguchi University, Japan. He is also an assistant professor and researcher in the Department of Office Administration Education, Sebelas Maret University, Indonesia. His research interests focus on macroeconomics, international finance, economic education, and institutional economics.

### PUBLIC INTEREST STATEMENT

This research explores the effects of international capital flows segmented by borrower type and the development of domestic financial institutions on the level of domestic credit in 74 developing countries between 2005 and 2017. By using dynamic panel data estimation, this study finds two notable empirical findings. First, our findings show that well-developed domestic financial institutions can lead to more rapid and sustainable domestic credit growth. Second, this study finds that increases in international capital inflows to the banking sector positively affect developing countries' credit levels. This study also confirms that the increase in domestic credit in developing countries has been supported by the large increase in international capital inflows to the banking sector.

## 1. Introduction

Domestic credit plays an important role in developing countries. As noted by Obstfeld (2012), domestic credit growth directly affects economic welfare in developing economies. Domestic credit growth has also been a leading driver of economic growth, especially since the early 1990s (Samargandi & Kutan, 2016). Higher levels of domestic credit lead to an increase in household spending, thus increasing the output production and contributing to higher gross domestic product (GDP). Although domestic credit plays an important role in developing countries, these countries' credit markets are still in transition (Nguyen et al., 2018). Moreover, the level of domestic credit available to the private sector is also much lower in developing countries than in developed countries (Chaudhuri et al., 2010; Driver & Muñoz-Bugarin, 2010; Gong et al., 2012). The aim of this study is to empirically investigate domestic credit across a wide range of 74 developing countries over the period 2005–2017 within dynamic panel data estimation framework.

Understanding the determinants of domestic credit growth in developing countries is essential for several reasons. First, domestic credit fulfills an important role in the economic development of developing countries (Beling et al., 2016). Domestic credit reflects the financial development of a country and also leads to effective investment allocation in developing countries (Bencivenga & Smith, 1991; Boyd & Prescott, 1986; Bui, 2019). Second, domestic credit can be an early warning indicator of a financial crisis (Lane & McQuade, 2014; Montoro & Rojas-Suarez, 2012; Schularick & Taylor, 2012). A rapid increase in domestic credit availability may be a predictor of a subsequent financial or economic crisis (Jordà et al., 2011; Mendoza & Terrones, 2012; Obstfeld & Rogoff, 2010). Besides, excessive domestic credit growth has been identified as having been a critical driver of the Global Financial Crisis and of much other financial instability (Borio & Lowe, 2002; Schularick & Taylor, 2012). Another potential signal of an impending financial crisis is when domestic credit grows faster than the pool of available retail deposits and the banking sector starts using other (non-core) funding sources to support its credit growth (Hahm et al., 2012).

As shown in previous studies, domestic credit is closely associated with internal macroeconomic factors, including GDP growth, interest rates, current account balance (CAB), and exchange rates (Andreasen & Valenzuela, 2016; Gozgor, 2018). Moreover, domestic credit is also determined by other domestic social factors. Stable political conditions, including low levels of poverty, unemployment, and corruption and high consumer confidence levels, have been shown to be the main drivers of domestic credit growth (Gozgor, 2018). Domestic credit growth is also determined by the quality of local institutions. Strong and sound local institutions are essential to creating sustainable domestic credit growth (Nguyen et al., 2018). Well-developed local institutions reduce economic problems such as inefficiency, information asymmetry, and domestic credit constraints (Beck et al., 2004; Djankov et al., 2007; Doblas-Madrid & Minetti, 2013; Fauceglia, 2015).

Besides the internal factors, external factors such as international capital flows are also likely to contribute to domestic credit growth (Gozgor, 2014; Hahm et al., 2012; Hegerty, 2019; Lane & McQuade, 2014). International capital flows have been having a greater influence on domestic credit growth, especially since the global financial crisis of 2008–2009 (Bruno & Shin, 2012; Lane & McQuade, 2014). In particular, international capital flows have both positive and negative effects on the host country. On the one hand, as an element of other (non-core) liquidity, international capital flows play an essential role in helping local banks meet the demand for domestic credit. On the other hand, a large stock of international capital flows erodes the risk premium, thus increasing vulnerability to a financial crisis (Hahm et al., 2012).

Although several previous studies have confirmed that international capital flows and local institutions play essential roles in domestic credit growth, which types of international capital and local institutions are decisive remains unclear. Moreover, the combined effects of the levels of domestic financial institutions and international capital inflows have rarely been studied. To fill this gap, this study focuses on the combined influence of international capital inflows and domestic financial institutional development on domestic credit levels in developing countries. By using

international capital inflows segmented by borrower type, i.e., international capital inflows to the banking sector and other financial institutions, and the indicators of the level of development of domestic financial institutions, we address the following research question: Do the two types of international capital inflows (to banks and other financial institutions) and the development of domestic financial institutions influence domestic credit levels in developing countries?

This study makes three novel contributions. First, we measure international capital inflows by decomposing debt inflows by borrower type (i.e., banks versus other types of financial institutions) as a proxy for external factors. This allows us to measure the foreign debt inflows most associated with domestic credit specifically. Second, we adopt the domestic financial institutional development index developed by Svirydzenka (2016) to represent internal factors. This index includes three sub-indices, which measure the depth of, access to, and efficiency of domestic financial institutions, respectively. By using these specific sub-indices, we generate a more in-depth understanding of the determinants of domestic credit in developing countries. Third, this study presents a further investigation of the combined influence of international capital inflows and the development of domestic financial institutions on the domestic credit level while controlling for other determinants such as GDP per capita, the CAB, and exchange rates.

To the best of our knowledge, this is the first study to explore the combined influence of international capital inflows segmented by borrower type (i.e., banks versus other types of financial institutions) and the development of domestic financial institutions on the domestic credit level across a wide range of developing countries (74 in total) for the period 2005–2017.

The remainder of this article is organized as follows. Section 2 conducts a literature review; then section 3 describes the data and details the methodology. Section 4 reports and discusses the empirical results. Section 5 reports the robustness checks and, finally, section 6 concludes.

## 2. Literature review

### 2.1. Banks and non-bank financial institutions

This study emphasizes the combined influence of international capital inflows segmented by borrower type (i.e., banks versus other types of financial institutions) and the development of domestic financial institutions on the domestic credit level in developing countries. Therefore, it is important to stress the differences between banks and non-bank financial institutions (NBFIs) and their roles in the domestic economy.

Previous studies confirm that banks and NBFIs in the past decade have been known to play an essential role in the development of the domestic economy (Bond, 2004; Khawaja et al., 2021; Mhadhbi et al., 2019). They have catalyzed economic growth by providing longer-term funding through several types of financial services, including domestic credit. NBFIs both complement and compete with commercial banks. On the one hand, banks are financial institutions that perform several functions, such as accepting deposits and making loans, and operate under strict regulations and supervision. On the other hand, NBFIs are financial institutions that do not have full banking licenses and are not fully regulated or supervised by domestic or international authorities.

In particular, the banking sector plays a dominant role in the financial intermediation process in most developing and developed countries (Aluko and Ajayi, 2018). It plays a critical role in igniting industrialization by facilitating the mobilization of capital. Moreover, the banking sector has served as a catalyst for alleviating poverty, reducing household and firm financing constraints, and promoting economic growth.

Furthermore, NBFIs are financial institutions that do not have a full banking license and cannot take deposits from the public. However, they also provide alternative financial services, as in the case of contractual savings institutions (pension funds and insurance companies), investment

intermediaries (finance companies, mutual funds, and money market funds), microloan organizations, and venture capitalists (Mishkin, 2007). NBFIs are a source of consumer credit (along with licensed banks) by providing a wide range of products and services to mitigate the financial intermediation gap and play an important role as a complement to commercial banks (Shrestha, 2007; Sufian, 2008). In particular, NBFIs are also considered an important source of financing for underserved markets, such as micro, small and medium enterprises.

In most developing countries, both the banking sector and NBFIs are underdeveloped despite various series of reforms (Allen et al., 2014; David et al., 2014). This has an impact through the low levels of domestic credit available in developing countries. Therefore, identifying what makes domestic credit develop through banking and NBFI channels is essential because a better-developed banking sector and better-developed NBFIs will have a greater ability to provide sustainable domestic credit growth.

## **2.2. Previous studies on the determinants of the domestic credits**

previous studies show that domestic credit growth determined by several internal macroeconomic factors: GDP per capita, interest rates, exchange rates, CAB, and monetary policy (Andreasen & Valenzuela, 2016; Gozgor, 2018). Several previous studies specifically highlight the fact that domestic credit growth is determined by internal and external factors. Of the internal factors, domestic institutional quality has been found to be crucial for domestic credit growth. For example, Djankov et al. (2007) confirm that institutional factors are highly correlated with the volume of private credit. Similarly, Nguyen et al. (2018) find that institutional quality is critical to local credit growth and confirmed that domestic institutions are vital for channeling foreign direct investment (FDI) into domestic credit. Fauceglia (2015) suggest that sound domestic institutions in developing countries will improve the capability to obtain external funding and reduce credit constraints. Beck et al. (2004) also show that local firms have more access to domestic credit financing in countries with well-developed institutions. However, these studies only considered domestic institutions in general and did not explicitly distinguish between different kinds of domestic institutions.

Moreover, Gozgor (2018) show that better socioeconomic and local institutions (i.e., low levels of poverty, unemployment, and corruption and high levels of consumer confidence) affect domestic credit positively. By using the economic uncertainty index as a proxy for internal economic conditions, Gozgor et al. (2019) find that higher uncertainty harms domestic loans. Park (2012) examines the impact of corruption on banking services in various countries between 2002 and 2004 and found that corruption distorts the allocation of bank funds from normal projects to bad projects, which decreases the quality of banking services, including domestic credit services. Generally, however, these studies did not focus on the driving forces behind cross-institutional differences in credit growth.

Several previous studies also highlight the external determinants of domestic credit growth. For example, Shin (2012) find that gross capital flows between Europe and the US were the main drivers of the US credit boom in the mid-2000s. Nevertheless, Shin's study do not take into account the different relationships between variables in other countries. Lane and McQuade (2014) analyze the relationship between international capital flows and domestic credit growth in the boom period of 2003–2008 and observed that domestic credit growth in European countries is strongly related to foreign debt inflows. Rey (2016) also finds that the VIX index (as benchmark measures of uncertainty in global financial markets) influences the domestic credit growth. However, their study only focus on developed countries and did not consider the different characteristics of international capital flows based on the borrowing institution. Hegerty (2019) also shows that international capital flows are highly related to domestic credit growth in Central and Eastern Europe. Specifically, capital inflows significantly increase consumption through domestic credit in Central and Eastern European countries. However, that study do not explicitly explain the underlying mechanism between international capital flows, domestic consumption, and domestic credit growth.

In other relevant studies, Orhangazi (2014) observes that net private capital inflows are positively correlated with periods of rapid credit expansion in Turkey. Davis et al. (2016) show that CAB and cross-border borrowing are significant drivers of domestic credit, and Harrison and McMillan (2003) conclude that FDI reduces domestic credit constraints by raising the level of capital in the domestic credit market. Nguyen et al. (2018) find that FDI affects domestic credit in emerging market economies positively through sound domestic institutions. However, they did not differentiate between the different types of institutional borrowers, and they only considered FDI rather than equity or debt flows.

International capital flows have positive and negative impacts on the host country. On the positive side, Bekaert et al. (2005) emphasize that international debt inflows can support domestic investment and economic growth in the host country through domestic credit channels. Similarly, Baskaya et al. (2017) find that external borrowing in the banking sector is vital to supporting domestic credit demand. Moreover, Hahm et al. (2012) state that international capital (as a non-core liability) provides an alternative source for domestic banks to finance domestic credit demand. On the negative side, Hahm et al. (2012) emphasize that a large stock of non-core liabilities (including international capital) indicates an erosion of the risk premium and, hence, can increase financial vulnerability.

Overall, a review of the literature shows that domestic credit growth is determined by internal and external factors. However, which types of international capital and local institutions are decisive remains unclear. Moreover, the combined effects of international capital inflows and the levels of domestic financial institutions have rarely been studied. This creates a need for further research to extend the previous empirical studies to gain a deeper understanding of the determinants of domestic credit levels in developing countries. In this study, our primary focus is on how the relationships between international capital flows, domestic financial institutional development, and the interaction among these variables affect domestic credit levels in developing countries.

### 3. Data and methodology

This paper examines empirically how the two types of international capital inflows and domestic financial institutional development affect domestic credit across a broad range of 74 developing countries. We classify our sample based on the United Nations Conference on Trade and Development and select countries for which data on international capital inflows and domestic financial institutional development are available (Appendix A). Annual data are obtained for each variable for the period 2005–2017 from several sources (Appendix B). We focus on this period for two main reasons. First, for several countries, data on international debt inflows to banks and other financial institutions are only available from 2005. Second, this period covers a full boom–bust cycle, rather than only booms or busts in domestic credit levels, especially in emerging and developing countries (Gozgor, 2014). Thus, using this period assures a large and balanced panel of countries.

#### 3.1. Variable selection

In the dynamic panel data estimations, we consider the international capital inflows segmented by borrower type, i.e., international capital inflows to the banking sector and other financial institutions (as a percentage of GDP) as the benchmark indicator of external factors. As Hahm et al. (2012) indicate, external factors such as international capital flows are likely to contribute to domestic credit growth. Increasing international capital flows to a developing economy tend to increase the volume of domestic credit (Kim & Wu, 2008; Lane & McQuade, 2014). Moreover, the overall position of banks in developing countries strongly depends on their ability to borrow from abroad (Obstfeld, 2012). Therefore, by using international capital inflows segmented by borrower type, this allows us to measure the foreign debt inflows most associated with domestic credit specifically.

Furthermore, we adopt the domestic financial institutional development index developed by Svirydzenka (2016) to represent internal factors. As shown in previous studies, domestic credit is closely associated with domestic institutions and socioeconomic conditions (Gozgor, 2018; Nguyen

et al., 2018). Strong and sound local institutions are essential to creating sustainable domestic credit growth. Moreover, stable political conditions, including low levels of poverty, unemployment, and corruption and high consumer confidence levels have been shown to be the main drivers of domestic credit growth (Gozgor, 2018). The domestic financial institutional development index developed by Svirydzenka (2016) includes three sub-indices, which measure the depth of, access to, and efficiency of domestic financial institutions, respectively. By using these specific sub-indices, we generate a more in-depth understanding of the determinants of domestic credit in developing countries.

This study also uses three control variables: GDP per capita, CAB, and the nominal (official) exchange rate. Following the study by Frankel and Romer (1999), we adopt real GDP per capita, instead of nominal or real GDP, as the benchmark measure of domestic income or domestic demand. As Takats (2010) shows, a higher growth rate of domestic income leads to increased domestic demand and, thus, higher levels of domestic credit. We also include CAB in the econometric model in recognition of the previously identified negative relationship between CAB and domestic credit (Lane & McQuade, 2014). Finally, we consider the nominal (official) exchange rate as a control variable in determining the volume of domestic credit in developing countries. In this context, a fall in the value of the official exchange rate has previously been found to denote an appreciation of the domestic currency, leading in turn to an increase in domestic credit (Borio et al., 2011). A more detailed description of the measurements and data sources is given below, and the statistical descriptions of the variables are presented in Tables 1 and Tables 2.

### **3.2. Domestic credit data**

We use annual data on domestic credit to the private sector (as a percentage of GDP). We collect domestic credit data from the World Development Indicators and the Global Financial Development database of the World Bank. This dataset captures domestic credit extended to the private sector by financial corporations as a percentage of GDP for more than 100 countries. According to the World Bank (2019), domestic credit to the private sector includes the financial resources provided by financial corporations in the form of loans, purchases of nonequity securities, trade credits, and other accounts receivable that establish a claim for repayment. The financial corporations include monetary authorities, deposit money banks, and other corporations that do not accept transferable deposits but do incur liabilities such as time and savings deposits. Examples of these other financial corporations include finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies.

### **3.3. International capital flows data**

We decompose international capital inflows by borrower type, distinguishing between banks and other financial institutions as an external factor. By using these data, we present dynamic and cross-sectional patterns of capital inflows as a function of global push factors and countries' own business cycles. The main source of these capital flows data is the other investment debt flows in the International Monetary Fund's balance of payments (BOP) dataset. The other investment debt flows dataset captures the vast majority of external bank flows and allows us to segment international capital inflows by borrower type, i.e., banks and other financial institutions, central banks, and governments. Furthermore, we can specifically measure the foreign debt inflows most associated with domestic credit, i.e., inflows to banks and foreign other financial institutions. To enlarge and improve the balance of the panel of countries, we use the data-filling technique developed by Kalemli-Ozcan et al. (2017). Specifically, when the BOP data report the total score for the category and the scores for three of the four sectors, we subtract the latter from the former to obtain the score for the fourth sector.

### **3.4. Financial institutional development data**

We use the annual data on the domestic financial development index as a proxy for the level of development of domestic financial institutions. Developed by Svirydzenka (2016), this index is the most comprehensive measure of domestic financial development and captures the development level of more than 100 countries since 2005. A higher value on the index reflects a higher level of

**Table 1. Data summary**

Variable	Unit	Min	Max	Mean	Std. Dev
Domestic Credit to Private Sector	Percentage of GDP	1.596	160.12	38.18	29.15
Domestic Credit to Private Sector by Banks	Percentage of GDP	1.344	123.065	34.383	23.468
GDP Per Capita	Logarithm Form	2.513	4.695	3.455	0.455
Current Account Balance	Percentage of GDP	−65.029	45.454	−3.171	9.721
Nominal exchange rate	LCU per USD	0.269	13389.413	628.239	1740.146
The VIX Index	Index	11,090	32,693	18,759	6,720
International capital inflows to bank	Percentage of GDP	−12.045	28.698	0.681	2.3142
International capital inflows to other financial institution	Percentage of GDP	−28.073	32.1753	0.943	3.538
Financial institution Index	Index 0–1	0.038	0.7399	0.352	0.137
Financial Institution Depth Index	Index 0–1	0.002	0.8837	0.189	0.180
Financial Institution Access Index	Index 0–1	0.005	0.7408	0.247	0.178
Financial Institution Efficiency Index	Index 0–1	0.119	0.8897	0.615	0.137

domestic financial institutions. We also include three indicators of the domestic financial development index, namely, the financial institutions depth index, the financial institutions access index, and the financial institutions efficiency index in the empirical model.

The financial institutions depth index measures the size and liquidity of the banking sector and other financial institutions, the assets of mutual funds and pension funds, and the size of life and non-life insurance premiums (Svirydzenka, 2016). The financial institutions access index measures the number of bank branches and automated teller machines per 100,000 adults, the number of bank accounts per 1,000 adults, the percentage of firms with a line of credit, and usage of mobile phones to send and receive money (Svirydzenka, 2016). The financial institutions efficiency index measures three aspects of bank efficiency: (i) efficiency in intermediating savings to investment, measured by the net interest margin (the accounting value of a bank's net interest revenue as a share of its average interest-bearing assets) and lending-deposit spread; (ii) operational efficiency measures, such as non-interest income to total income and overhead costs to total assets; and (iii) profitability, such as return on assets and return on equity (Svirydzenka, 2016).

### 3.5. Control variables data

This study uses three control variables: GDP per capita, CAB, and the nominal (official) exchange rate. We use the logarithm of GDP per capita (constant) in US dollars (USD) as the benchmark measure of domestic income or domestic demand. We include CAB (as a percentage of GDP) in the econometric

**Table 2. Correlations pairs**

	logGDPcap	CAB	ERTS	Bank-inflows	Other-inflows	Insti	Depth	Acces	Efficiency
LogGDPcap	1								
CAB	0.333	1							
ERTS	-0.175	-0.133	1						
Bankinflows	0.105	-0.155	-0.022	1					
Otherinflows	-0.101	-0.283	0.022	0.072	1				
Insti	0.72	0.133	-0.193	0.130	-0.065	1			
Depth	0.521	0.137	-0.183	0.062	-0.93	0.843	1		
Acces	0.681	0.016	-0.157	0.105	-0.006	0.784	0.453	1	
Efficiency	0.383	0.185	-0.071	0.149	0.041	0.577	0.358	0.170	1

**Table 3. Panel unit root test**

Variable	Levin-Lin-Chu	Augmented Dickey Fuller
Dcps (% of GDP)	−5.464 ***	−8.846 ***
Bankcredit (% of GDP)	−3.115 ***	−8.775 ***
LogGDPpercapita (Log of GDP per capita)	−6.382 ***	−8.472 ***
CAB (% of GDP)	−8.382 ***	−8.978 ***
ERTS (LCU per USD)	−10.382 ***	−7.568 ***
Bankinflows (% of GDP)	−20.459 ***	−9.048 ***
Otherinflows (% of GDP)	−16.208 ***	−9.341 ***

*Notes. Panel unit root is not tested for all indicators of financial institutions development index variable and dummy variable for the GFC. These variables are containing either index or dummy (0 and 1) value, which is irrelevant for the test in this respect.*

*\*\*\* Significant at 1 %; \*\* significant at 5 %; \* significant at 10 %*

model in recognition of the previously identified negative relationship between CAB and domestic credit (Lane & McQuade, 2014). We also consider the nominal (official) exchange rate measured as units of local currency per USD. A fall in the value of the official exchange rate has previously been found to denote appreciation of the domestic currency, leading in turn to an increase in domestic credit (Borio et al., 2011). The data for GDP per capita, CAB, and nominal (official) exchange rate are sourced from the World Bank's World Development Indicators.

### 3.6. Preliminary tests and panel data estimation procedure

As a preliminary, we utilize the panel unit root test to disclose that whether a cointegration relationship is present in the domestic credit variable for all countries during the research period. In this study, we use Levin-Lin-Chu test and Augmented Dickey Fuller tests to analyze the panel unit root. Table 3 shows the panel unit root test estimates for the potential determinants of domestic credit in the sample of 74 developing countries. The results in Table 3 demonstrate that the null hypothesis is rejected and indicate that there is no cointegrated relationship because the domestic credit is stationary series in panel countries during the sample period.

In light of this finding, we use the dynamic panel generalized method of moments (GMM) estimation developed by Arellano and Bond (1991) to avoid not only the autocorrelation and heteroskedasticity issues but also the possible presence of different degrees of serial integration in the balanced panel data framework. Moreover, by using this method, the bootstrapped covariance matrix can be applied in the estimation process and consistent estimators can be acquired. We employ Arellano and Bond (1991) estimation with consistent estimators to get differentiated dynamic panel data estimates as well as avoid possible multicollinearity among the explanatory variables.

Furthermore, this dynamic panel GMM estimation technique requires two assumptions. First, instruments must be uncorrelated with error terms. Second, instruments must be correlated with the instrumented variables. Hence, the estimation must find empirical evidence in favor of first-order autocorrelation but against second-order autocorrelation in the residuals.

### 3.7. Empirical model

We use a dynamic panel data model to estimate the linear relationships among the variables. We also extend our model by including the interaction terms between domestic financial institutions development with the two types of international capital inflows (to banks and other financial institutions) to establish whether the two types of international capital inflows react differently to the domestic financial institutions in the context of domestic credit levels. In this study, we estimate the dynamic panel data regression as follows:

$$\begin{aligned} Dcps_{it} = & \beta_0 + \beta_1 Dcps_{it-1} + \beta_2 LogGDPpercapita_{it} + \beta_3 CAB_{it} + \beta_4 ERTS_{it} + \beta_5 Bankinflows_{it} \\ & + \beta_6 Otherinflows_{it} + \beta_7 Insti_{it} + \beta_8 X_{it} + \beta_9 (Bankinflows_{it} \times insti_{it}) \\ & + \beta_{10} (Otherinflows_{it} \times insti_{it}) + \varepsilon_{it} \end{aligned} \quad (1)$$

where  $Dcps_{it}$  is the domestic credit extended to the private sector in country  $i$  in year  $t$ ;  $LogGDPpercapita$  is the logarithmized GDP per capita in country  $i$  in year  $t$ ;  $CAB$  is the current account balance in country  $i$  in year  $t$ ;  $ERTS$  is the nominal (official) exchange rate of country  $i$  in year  $t$ ;  $Bankinflows_{it}$  is foreign debt inflows to the banking sector in country  $i$  in year  $t$ ;  $Otherinflows_{it}$  is foreign debt inflows to other financial institutions in country  $i$  in year  $t$ ;  $Insti_{it}$  is the level of domestic financial institutions development index;  $X_{it}$  is the indicators of the domestic financial institutions development index (financial institutions depth sub-index, financial institutions access sub-index, and financial institutions efficiency sub-index) in country  $i$  in year  $t$ .

We divide our model into six sub-models (sub-model I to sub-model VI). Sub-model I estimates the baseline model, excluding the domestic financial institutional development index and its indicators. Sub-models II to V include the domestic financial institutional development index and its indicators. Finally, Sub-model VI estimates the interaction terms between the two types of international capital inflows (international capital inflows to banks versus those to other types of financial institutions) with the domestic financial institutions development index.

We also calculate the marginal effect of the interaction analysis by measuring the coefficient value. To get coefficient values of the international capital inflows variable that are changed by the domestic financial institutions variable, we use the partial derivatives (marginal effect) of the regression values and compute it as follows:

$$\frac{\Delta Dcps_{it}}{\Delta Bankinflows_{it}} = \beta_5 + \beta_9 Insti_{it} \quad (2)$$

$$\frac{\Delta Dcps_{it}}{\Delta Otherinflows_{it}} = \beta_6 + \beta_{10} Insti_{it} \quad (3)$$

A positive sign of coefficient value reflects an increase in domestic credit levels, whereas a negative sign reflects a decrease in domestic credit levels. In other words, as an integral part of this function, the domestic financial institutions development variable determines the signs of these marginal effect estimations.

#### 4. Results and discussion

The results of our dynamic panel data estimation are reported in Table 4. The results of the Lagrange Multiplier (LM) test for autocorrelation, AR (1) and AR (2), indicate first-order but no second-order autocorrelation. Thus, the statistical results in Table 4 satisfy the necessary conditions for the application of GMM estimation.

The results in Column I show that GDP per capita does not have a statistically significant effect on the level of domestic credit. Meanwhile,  $CAB$  is significantly negatively related to the domestic credit level. This means that the domestic credit level rose in countries running current account deficits during this period. This result is in line with Gozgor (2018) and Lane and McQuade (2014). The nominal exchange rate is also significantly negatively related to domestic credit, indicating that appreciation of the domestic currency is associated with higher domestic credit, which is consistent with Borio et al. (2011).

The results in Column I also demonstrate that international capital inflows to the banking sector are positively related to the domestic credit level. These results are in line with previous empirical

**Table 4. Results of Arellano and Bond (1991) dynamic panel data estimation. Dependent variable (Y): Domestic credit to the private sectors (% of GDP)**

	I	II	III	IV	V	VI
Dcps (-1)	0.750 *** (0.000)	0.7078 *** (0.000)	0.572 *** (0.000)	0.749 *** (0.000)	0.754 *** (0.000)	0.671 *** (0.056)
LogGDPpercapita	13.708 (0.124)	3.156 (0.753)	10.116 (0.241)	12.635 (0.197)	11.136 (0.202)	5.327 (8.842)
CAB	-0.208 *** (0.001)	-0.201 *** (0.001)	-0.159 *** (0.002)	-0.207 *** (0.001)	-0.209 *** (0.001)	-0.201 *** (0.059)
ERTS	-0.001 ** (0.020)	-0.001 *** (0.007)	-0.000 (0.211)	-0.001 ** (0.011)	-0.001 ** (0.016)	-0.001 ** (0.001)
Bankinflows	0.308 *** (0.008)	0.290 ** (0.012)	0.203 * (0.056)	0.319 *** (0.005)	0.292 ** (0.010)	0.778 *** (0.283)
Otherinflows	-0.138 ** (0.049)	-0.130 ** (0.038)	-0.123 ** (0.042)	-0.128 * (0.060)	-0.133 ** (0.049)	-0.279 ** (0.165)
Insti		35.959 *** (0.000)				38.232 *** (8.314)
InstiDepth			96.723 *** (0.000)			
InstiAcces				5.112 (0.417)		
InstiEfficiency					7.519 *** (0.001)	
Bankinflows.Insti						-1.192 ** (0.651)
Otherinflows.Insti						0.414 (0.385)
Observations	814	814	814	814	814	814
AR (1)	0.00	0.00	0.00	0.00	0.00	0.00
AR (2)	0.26	0.27	0.50	0.30	0.30	0.45

Notes. All sub-models were estimated using Arellano and Bond (1991) dynamic panel data estimation. AR (1) and AR (2) show the results of the LM statistics for autocorrelation (null hypothesis: no first-order autocorrelation and no second-order autocorrelation, respectively). Standard errors are in parentheses, and the p-values are in brackets. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

findings showing that domestic credit in developing economies is supported by external funding (Arndt et al., 2010; Tang et al., 2008). According to Khan and Khan (1998), capital flows can increase bank lending and are accompanied by a surge in asset prices. This pattern suggests that foreign capital inflows to the banking sector are an important explanatory factor in the interrelation between international capital flows and domestic credit in developing countries. This result also confirms that the banking sector in developing countries still depends on foreign capital to support domestic credit demand (Khan & Khan, 1998). Hahm et al. (2012) observed that traditional deposit funding in developing countries does not keep pace with domestic credit growth, with the result that banking sector expansion is funded by non-core liabilities (in this case, from foreign creditors). The highly significant positive relationship between foreign debt inflows to the banking sector and domestic credit also indicates that bank-based finance still plays a major role in developing countries.

Column I also includes the noteworthy finding that foreign capital inflows to other financial institutions are negatively related to domestic credit levels in developing countries. Other financial institutions are non-bank entities that also provide financial intermediation. According to Apostoae and Bilan (2019), Arora and Zhang (2018), Gabrieli et al. (2018), and Zhou et al. (2019), credit services provided by non-bank financial institutions substitute for the domestic credit provided by the banking sector in developing countries. Besides, as non-bank financial institutions are the primary buyers of corporate bonds, foreign debt inflows to these institutions will result in high corporate bond purchases, thereby providing companies with alternative financing. This result is in line with Astrauskaite and Paškevičius (2014).

The results in Column II demonstrate that the domestic financial institutional development index is significantly positively related to the domestic credit level. This indicates that better domestic financial institutions positively affect domestic credit to the private sector in developing countries. The linear relationship between domestic financial institutional development and the domestic credit level also highlights the importance of domestic financial institutions in developing countries (Morakinyo et al., 2018). Financial institutions play a vital role in financial activities: better quality institutions are associated with higher quality financial services, including domestic credit for the private sector. On the one hand, domestic financial institutions are vital to fostering the process of industrialization via coordination between savers and investors (Basu, 2007). On the other hand, increasingly fragile domestic financial institutions may impair the financial sector's ability to extend credit to individuals or innovative small enterprises (Rewilak, 2017).

The results in Column III indicate that the depth of domestic financial institutions is positively related to the level of domestic credit. However, the results in Column IV suggest that access to domestic financial institutions is not significantly related to the domestic credit level. The financial institutions depth sub-index concerns the size and liquidity of domestic financial institutions. Deeper financial institutions have greater liquidity to meet domestic credit demand. This result is in line with Gaytan and Rancière (2001), who found that deeper domestic financial institutions are associated with the provision of a higher quality of financial services (including domestic credit) to households and firms. Moreover, countries with deeper financial institutions tend to be more resilient to financial crisis shocks (Gaytan & Rancière, 2001).

Column V shows a positive and statistically significant link between the efficiency of domestic financial institutions and the domestic credit level in developing countries. This indicates that higher efficiency of domestic financial institutions will lead to an increase in the level of domestic credit in developing countries. Efficiency is defined as the ability of financial institutions to produce a result with minimal effort or resources. Thus, a higher level of efficiency of domestic financial institutions will improve the quality of financial services.

Finally, the results in Column VI show that the interaction between international capital inflows to banks and the domestic financial institutions development index has a negative effect on the

**Table 5. Coefficient value of interaction term analysis and their signs**

$\frac{Y}{\Delta \text{Bankinflows}}$	0.778 – 1.192.Insti
	Insti > 0.653 = –Insti < 0.653 = +
$\frac{Y}{\Delta \text{Otherinflows}}$	–
	–

domestic credit level in developing countries. Meanwhile, the interaction terms between international capital inflows to other financial institutions and domestic financial institutions development index are not significant. In other words, higher international capital inflows to the banking sector will increase the level of domestic credit in countries with less developed domestic financial institutions and vice versa. The results of the interaction analysis are also in line with Moradi et al. (2016), who stated that developing countries with less developed financial institutions mostly have a characteristic bank-based financial system.

This result confirms that the development level of domestic financial institutions determines the relationship model between international capital inflows to the banking sector. Based on our marginal effect analysis (Table 5), if a country has relatively less developed financial institutions ( $\text{Insti} < 0.653$ ), then international capital inflows to the banking sector are more likely to stimulate an increase in domestic credit levels in developing countries. The performance of most countries in the sample on the domestic financial institutions index was below these points during the research period (Table 1). This means that international capital inflows to the banking sector mostly demonstrated a positive effect on the domestic credit level over the period.

## 5. Robustness check

### 5.1. Robustness check by using a different measure of domestic credit

We run a robustness check using a different measure of the domestic credit level, namely the domestic credit extended to the private sector by banks (% of GDP) instead of all financial institutions. In this robustness check, we also consider the VIX index as an indicator of global uncertainty. We rerun the dynamic panel data GMM estimation using this alternative measure of domestic credit level and additional control variables; the results are reported in Table 6.

The results of the robustness check are similar to the main estimation results reported in Table 3. Again, GDP per capita is not statistically significant, whereas the nominal exchange rate and CAB are significantly negatively related to the domestic credit level. Also, foreign debt inflows to the banking sector are again positively related to the domestic credit level. The only minor change is that foreign debt inflows to other financial institutions are not statistically significantly related to the domestic credit level. This change is explained by our dependent variable only covering domestic credit extended by the banking sector. Thus, foreign debt inflows to other financial institutions do not correlate with our dependent variable.

The results in Column II demonstrate that the VIX index is negatively related to the domestic credit level. As a higher level of the VIX index indicates higher global risk, an increase in the VIX index will reduce capital inflows to developing countries and, in turn, reduce bank credit (Forbes & Warnock, 2012).

The results in Column III show that a higher level of domestic financial institutions is positively related to the level of domestic credit in developing countries. Columns IV and VI show that the depth and efficiency of financial institutions are positively and significantly associated with the level of domestic credit in developing countries, whereas access to financial institutions is not statistically significant (Column V).

**Table 6. The results of the robustness check by using a different measure of domestic credit. Dependent variable (Y): Domestic credit to the private sectors provided by banking sector (% of GDP)**

	I	II	III	IV	V	VI
Bankcredit (-1)	0.773 ***(0.000)	0.778 ***(0.000)	0.734 ***(0.000)	0.623 ***(0.000)	0.781 ***(0.000)	0.775 ***(0.000)
LogGDPpercapita	11.570(0.165)	11.248(0.179)	1.123(0.905)	7.270 (0.373)	9.578(0.272)	8.860(0.278)
CAB	-0.187 ***(0.003)	-0.191 ***(0.003)	-0.172 ***(0.003)	-0.139 ***(0.009)	-0.180 ***(0.003)	-0.183 ***(0.003)
ERTS	-0.001 ** (0.013)	-0.001 ** (0.014)	-0.001 *** (0.084)	-0.000(0.1149)	-0.001 ** (0.012)	-0.001 ** (0.007)
Bankinflows	0.312 *** (0.008)	0.305 *** (0.008)	0.293 ** (0.014)	0.220 * (0.050)	0.322 *** (0.006)	0.295 ** (0.011)
Otherinflows	-0.098(0.123)	-0.108(0.100)	-0.090(0.132)	-0.067(0.216)	-0.085 (0.164)	-0.096(0.126)
VIX		-0.072 ** (0.012)				
Dummy		0.699(0.178)				
Insti			34.222 *** (0.000)			
Depth				79.967 *** (0.000)		
Acces					3.433 (0.522)	
Efficiency						7.818 *** (0.001)
Observations	814	814	814	814	814	814
AR (1)	0.00	0.00	0.00	0.00	0.00	0.00
AR (2)	0.90	0.83	0.83	0.46	0.88	0.94

Notes: All sub-models were estimated using Arellano and Bond (1991) dynamic panel data estimation. AR (1) and AR (2) show the results of the LM statistics for autocorrelation (null hypothesis: no first-order autocorrelation and no second-order autocorrelation, respectively). Standard errors are in parentheses, and the p-values are in brackets. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

**Table 7. The results of the robustness check by including the structural change (the impact of GFC of 2008/ 2009). Dependent variable (Y): Domestic credit to the private sectors (% of GDP)**

	I	II
Dcps (−1)	0.706 ***(0.000)	0.702 ***(0.000)
LogGDPpercapita	3.880(0.715)	6.772(0.519)
CAB	−0.204 *** (0.001)	−0.204 *** (0.001)
ERTS	−0.001 ** (0.005)	−0.001 *** (0.001)
Bankinflows	0.276 ** (0.023)	0.404 *** (0.002)
Otherinflows	−0.146 ** (0.032)	−0.117 * (0.072)
Insti	38.880 *** (0.001)	41.112 *** (0.001)
Dummycrisis	−0.417 (0.262)	0.001 (0.981)
Bankinflows.Crisis		−0.670 *** (0.002)
Otherinflows.Crisis		−0.087 (0.267)
Observations	814	814
AR (1)	0.00	0.00
AR (2)	0.28	0.50

Notes. All sub-models were estimated using Arellano and Bond (1991) dynamic panel data estimation. AR (1) and AR (2) show the results of the LM statistics for autocorrelation (null hypothesis: no first-order autocorrelation and no second-order autocorrelation, respectively). Standard errors are in parentheses, and the p-values are in brackets. \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

## 5.2. Robustness check by including the structural change (the impact of the global financial crisis of 2008/ 2009)

In this robustness check, we control for the impact of the global financial crisis of 2008–2009 (GFC) on domestic credit by using a time dummy variable. A dummy variable for this robustness check codes this variable as “1” for 2008 and 2009 and “0” for other years; the results are reported in Table 7. Again, we run this model by including the interaction terms between a dummy variable for the GFC with the two types of international capital inflows (to banks and other financial institutions). The results of this robustness check show that the interaction between international capital inflows to banks and a dummy variable for the GFC has a negative effect on the domestic credit level in developing countries. Meanwhile, the interaction between international capital inflows to other financial institutions and a dummy variable for the GFC is not significant. This result indicates that the GFC weakens the relationship between international capital inflows to the banking sector with the level of domestic credit in developing countries. Even though most developing countries had no direct exposure to the effect of GFC, their economies suffered as a result of falling demand for imports and commodities in developed countries. Therefore, export-oriented firms in developing countries might reduce their borrowing; and thus, reduces the demand for domestic credit.

## 6. Discussion and implications

The results of this study highlight the importance of domestic financial institutional development and international capital inflows on domestic credit levels in developing countries. First, our findings show that better domestic financial institutions (i.e., those having a greater level of depth and which are more efficient) positively affect the level of domestic credit in developing countries. This is because well-developed domestic financial institutions can lead to more rapid and sustainable domestic credit growth. Sound domestic financial institutions are particularly essential in the context of most developing countries, given the relative lack of savings, the higher proportion of the population that is underbanked, and the massive investment needs. Moreover, better domestic financial institutions can serve as shock absorbers and mitigate the negative effects of real external shocks on the domestic economy.

Second, we find that increases in international capital inflows to the banking sector positively affect developing countries' credit levels. According to the result, this is the most important (external supply) factor in domestic credit expansion in developing countries. In fact, the level of domestic credit in developing countries is growing faster than the retail deposits available. Hence, the banking sector will turn to external sources of funding by borrowing short-term debt on international inter-bank and money markets and by issuing bonds to support its credit growth. This study also confirms that the increase in domestic credit has been supported by the large increase in international capital inflows to the banking sector. Moreover, the tight correlation between retail deposits and domestic credit seems to have broken down as domestic banks increasingly turned to wholesale cross-border funding.

In particular, international capital can increase welfare by consumption smoothing and may also increase investments through domestic credit channels. However, it has bitter consequences as well. Previous studies confirm that excessive capital inflows will eventually lead to balance-of-payment crises as well as currency crises (Calvo et al., 1996; Chuhan et al., 1998). For instance, the propagation of the Asian financial crisis can be explained through this mechanism. Before the Asian financial crisis, international capital inflows to developing countries (especially to the banking sector) were sustained at a relatively high level throughout the 1990s. However, domestic banks in developing countries mostly raised external funds by borrowing short-term debt, which is very volatile and associated with consumption booms or inefficient investment. Thus, this condition weakens countries' fundamentals, possibly resulting in financial crises in those countries (Khan, 2004).

In turn, our findings have several policy implications. First, policymakers in developing countries should focus on policies that foster the development of domestic financial institutions. Second, the potential interplay between international capital flows and domestic credit in developing countries is especially important in the context of the various distortions that can lead to inefficient credit booms and international overborrowing. Therefore, domestic and external factors should be interpreted in an integrated joint framework to achieve more rapid and sustainable domestic credit growth.

## 7. Conclusion

This study investigated the determinants of the domestic credit level across a wide range of 74 developing countries in the period 2005–2017. We employ Arellano and Bond (1991) dynamic panel GMM estimation method to examine the effect of internal financial institutions and an important external supply factor on the domestic credit level. We checked the robustness of the empirical findings by considering the global economic and financial conditions, controlling for the VIX index and the effect of the GFC.

There are four notable empirical findings. First, this study confirms that domestic credit in developing countries is closely associated with international debt inflows to the banking sector. However, the increase of international capital inflows to other types of financial institutions harms the domestic credit level in developing countries. These findings confirm a substitution effect between domestic credit provided by the banking sector and other financial institutions. Second, the empirical results indicate that better domestic financial institutions, particularly in terms of depth and efficiency, positively contribute to domestic credit expansion in developing countries. Third, based on interaction analysis, higher international capital inflows to the banking sector will increase the level of domestic credit in countries with less developed domestic financial institutions and vice versa. In this respect, the bank-based system is more dominant for developing and transitional countries without well-developed domestic financial institutions. Fourth, we find that more uncertain global economic and financial market conditions suppress domestic credit in developing countries.

Considering the close relationship between international capital flows to the banking sector and domestic credit in developing countries, policymakers should carefully manage international

capital flows to overcome their negative effects as well as the pursuit of sustainable domestic credit growth. Moreover, policymakers in developing countries should improve the quality of domestic financial institutions in order to achieve sustainable domestic credit growth.

One shortcoming of our analysis is that we fail to divide our country sample into proportional sub-samples (e.g., based on region or income level). Thus, our analysis fails to obtain more specific results based on certain sub-sample categories. In turn, further research that considers a specific country sample is needed to get a deeper understanding of the factors behind the growth of domestic credit.

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#### Availability of data and material

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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## Appendix A List of developing countries in the dataset

<b>Albania</b>	<b>Cambodia</b>	<b>Ghana</b>	<b>Lesotho</b>	<b>Panama</b>	<b>Tanzania</b>
Algeria	Cameroon	Guatemala	Madagascar	PNG	Tajikistan
Angola	Chile	Guinea	Maldives	Peru	Tunisia
Argentina	Colombia	Guinea Bissau	Malaysia	Philippines	Uruguay
Armenia	Costa Rica	Honduras	Mali	Senegal	
Azerbaijan	Cote de Ivoire	India	Mexico	Sierra Leone	
Bangladesh	Dominica	Indonesia	Moldova	Sri Lanka	
Belarus	Dominican Republic	Jamaica	Morocco	Suriname	
Benin	Ecuador	Jordan	Myanmar	South Africa	
Bolivia	Egypt	Kazakhstan	Namibia	Swaziland	
Bosnia & Herzegovina	El Salvador	Kenya	Niger	Thailand	
Botswana	Fiji	Kuwait	Nigeria	Togo	
Brazil	Georgia	Kyrgyz Republic	North Macedonia	Trinidad and Tobago	
Burkina Faso	Gambia	Lebanon	Pakistan	Turkey	

## Appendix B Variable description and data sources

No.	Code	Description	Measurement	Data sources
1.	Dcps	Domestic credit to the private sectors.	% of GDP	World Bank: <a href="https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS">https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS</a>
2.	Bankcredit	Domestic credit to the private sectors by banks	% of GDP	World Bank: <a href="https://data.worldbank.org/indicator/FD.AST.PRVT.GD.ZS">https://data.worldbank.org/indicator/FD.AST.PRVT.GD.ZS</a>
3.	LogGDPpercapita	GDP per capita	Log of GDP per capita	World Bank: <a href="https://data.worldbank.org/indicator/NY.GDP.PCAP.CD">https://data.worldbank.org/indicator/NY.GDP.PCAP.CD</a>
4.	CAB	Current account balance	% of GDP	World Bank: <a href="https://data.worldbank.org/indicator/BN.CAB.XOKA.GD.ZS">https://data.worldbank.org/indicator/BN.CAB.XOKA.GD.ZS</a>
5.	ERTS	Nominal (official) exchange rate	LCU per USD	World Bank: <a href="https://data.worldbank.org/indicator/PA.NUS.FCRF">https://data.worldbank.org/indicator/PA.NUS.FCRF</a>
6.	VIX	The Chicago Board Options Exchange Volatility Index (The VIX Index)	Index	FRED economic data: <a href="https://fred.stlouisfed.org/series/VIXCLS">https://fred.stlouisfed.org/series/VIXCLS</a>
7.	Dummy	A dummy variable for the global financial crisis of 2008/2009	2008 and 2009 = 1; other years = 0	-
8.	Bankinflows	International capital (Debt) inflows to the banking sector	% of GDP	IMF BOP data (BPM6) <a href="https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52">https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52</a>
9.	Otherinflows	International capital (Debt) inflows to other financial institutions	% of GDP	IMF BOP data (BPM6) <a href="https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52">https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52</a>
10.	Insti	Financial institution index	Index 0–1	IMF: <a href="https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B">https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B</a>
11.	Depth	Financial institution depth index	Index 0–1	IMF: <a href="https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B">https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B</a>

(Continued)

(Continued)				
No.	Code	Description	Measurement	Data sources
12.	Access	Financial institution access index	Index 0–1	IMF: <a href="https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B">https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B</a>
13.	Efficiency	Financial institution efficiency index	Index 0–1	IMF: <a href="https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B">https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B</a>



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