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Cointegration Between Capital Flows and GDP in the Visegrád Countries. Implications for the Post Pandemic Era

Abstract. This chapter verifies presence of long-term co-integration between net capital inflows and GDP of the Visegrád Group countries (Czechia, Hunagary, Poland and Slovakia). Its aim is to investigate whether the GDP of the Visegrád (V4) countries and capital flows between the V4 and developed countries (in particular the European Monetary union) were integrated in such a way that they did not diverge from some equilibrium in the long term. The existence and strength of these relationships may be important for determining conditions for GDP growth in the post-pandemic era. Using the autoregressive distributed lag model (ARLD) the level of cointegration between push factors (current account and banks' net cross-border positions) and the net capital flows of the Visegrád countries is established. Furthermore, taking push factors as fixed regressors, and applying the ARLD model, the cointegration level between net capital flows and GDP, for the different time periods, is estimated for each of the V4 economies. The current account of the EMU was identified as a push factor for net capital flows in Czechia, Poland and Slovakia. Bank net cross-border positions of the EMU turned out to be push factors in Poland and bank net cross-border positions of the developed countries were statistically significant as push factors in Hungary and Slovakia. Using the ARLD model, cointegrations of current account and bank net cross-border positions with GDP were found in each of the V4 countries in the whole period 1995–2019. The strength of these cointegrations was the greatest in the last ten years i.e., in the period 2009–2019. No cointegration was found when calculated for 1995–2008. The analysis of data for the years 1995–2019 is extended by presenting recent changes of net capital inflows in the EMU and the V4 countries. The dynamics of the changes during the time of the pandemic (2020–2022) is discussed against the background of the results of cointegration. From the perspective of the past relationships between net capital flows and GDP in the V4 countries, changes in net capital flows observed in 2020 and later indicate potential threats to the recovery of GDP growth after the shocks caused by the pandemic and the war in Ukraine. If these shocks do not change the long-lasting cointegration between net capital flows and GDP then sudden and substantial changes of net capital flows in the V4 countries should be treated as an impediment to the recovery of sustainable GDP growth. Presumably, a corrected policy mix must therefore be adopted in order to avoid creating conditions for stagflation.

Keywords: current account, bank cross-border position, GDP growth, cointegration, pandemic

JEL classification: C29, E 44, F32, F43

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Introduction

At the beginning of the 90s increasing liberalization and globalization stimulated a surge of capital flows. The liberalization of the global financial markets was accompanied by growing capital account openness, flourishing financial innovations and deepening financial integration. This phenomenon, together with the rising volatility of rapidly mounting gross cross-border financial flows, caused a capital flow upsurge which continued until the global financial crisis (GFC) in 2008 and the Economic and Monetary Union's (EMU) debt problems in 2011. These two shocks changed the dynamics of capital streams and were characterized by simultaneous sharp declines in both capital inflows and outflows (Brockmeijer, Marston & Ostry, 2012; Cardarelli, Elekdag & Kose, 2009; ECB, 2012; Lane & Milesi-Ferretti, 2014; McKinsey, 2013; Reinhard, Ricci & Tressel, 2010; Reinhart & Reinhart, 2008; Viñals & Moghadam, 2011).

Capital movements, their level and dynamics are recorded in current, capital and financial accounts, which formally constitute a country's balance of payments. Consequently, by definition, the current account balance representing net capital flows is an outcome (in a given period) of net exports, income balances and capital transfers. As explained by Borio and Disyatat (2015) the current and capital account is "simply telling us whether a country is, on net, releasing resources to the rest of the world (if in surplus) or drawing on it for those resources (if in deficit)". If the economy experiences excessive and prolonged net capital inflows cointegrated with GDP this could indicate structural problems, e.g., low export competitiveness[1]. Therefore, cointegration between current account and GDP, if it exists, points to a specific long-term relationship between economic growth and foreign savings and at the same time unveils the risks of such long-term linkages for economic growth.

The current account balance shows the level of savings crossing borders, but not the method of financing a country's income and expenses. There are bank cross-border capital flows which address economy specific financial transactions. "Historically, cross-border capital flows mainly reflected transactions of goods or services with other countries. Over time, however, the financial aspect of capital flows has taken on a bigger significance" (Regling, 2017). Indeed, in the last decades cross-border flows have increased much faster than world trade and world GDP. This dramatic rise coincided with the financial deregulation in the global capital markets of the late 1990s and the early 2000s (Regling, 2017; Roy & Kemme, 2020). It entailed rising financial integration but also created thedanger of certain shocks, such as capital surges, stops, flight and re-

[1] We also acknowledge M. Obstfeld's three (related) reasons why prolonged and excessive current account deficits may lead to financial vulnerabilities, these are: (1) "sudden stops" and/or sudden retrenchment in capital flows; (2) a deterioration in the position of net foreign liabilities and (3) macroeconomic imbalances due to high demand elasticity of imports and low competitiveness of exports (Obstfeld, Shambaugh & Taylor, 2008; Obstfeld, 2012).

trenchments (Forbes & Warnock, 2011; Habib & Venditti, 2019). Despite arguments in favour of the pro-growth effects of capital flows, in reality "financial openness has proven a double-edged sword" (Carney, 2019). Capital inflow can increase economic growth, but capital flow volatility may do the opposite and finally reduce GDP in a period of increasing propensity to risk and hunt for yield. Potential costs associated with a cross-border flood of capital include misallocation of resources, pro-cyclicality or increased volatility (Forster, Vasardani & Ca'Zorzi, 2011). Cross-border financial flows could destabilize the global economy and lead to excessive current account divergence, as they make financial conditions more correlated across borders, consequently becoming hazardous channels for contagion (Allison, 2013; Cassidy, 2009; Lynn, 2011). Considering only the OECD countries, about 40% of the 75 large capital inflow episodes ended in a sudden stop and in either a banking or a currency crisis (Błaszczuk & Sawicki, 2017; OECD, 2011).

Medium sized open economies, like those of the Visegrád Group (V4) countries, are strongly interrelated with the external world through commercial and financial relations. It is vital therefore to recognise the dependence of the development of their economies on the dynamics of capital flows[2]. Relatively few studies have addressed this relationship so far, whether in the V4 countries or in other contexts (Gruber & Kamin 2005). In particular very few studies deal with the relationships between bank cross-border positions and economic growth. This study extends scarce research on these relationships and discusses the implications for postpandemic policy. It contributes to research both methodologically and by regarding the subject of the study. This is achieved by analysing the relationship between domestic capital flows in the V4 and capital changes in the environment using cointegration, a technique different from traditional regression. Next, the co-integration between GDP, the current account and net cross-border flows in each of the V4 is analysed. If such co-integration is a long term feature of these economies it will affect the recovery path from the current crisis.

The chapter is structured in the following way. After providing an overview of extant research on capital flows and economic growth, net capital flows in the European Monetary Union (EMU), the developed countries[3] and the V4 countries over the last 25 years are examined. Next, cointegration between push factors and the V4 countries net capital flows is calculated using the autoregressive distributed lag model. Then, having identified world push factors as fixed regressors, the cointegration between the V4 countries current accounts and bank net cross-border positions and their GDP is examined. After presenting the results, implications for the post-pandemic period are discussed.

[2] In the text net capital flows are defined as the current account of the balance of payments and after BIS banks' net cross-border positions on residents.

[3] As developed countries we adopted BIS classification.

Literature review

Capital flows as push factors

Net capital flows are the results of different causes. The IMF suggests that "although the importance of different "push" factors varies across studies, a consensus has emerged on the role of U.S. monetary policy, global risk aversion supply and global liquidity (especially in U.S. dollars)" as important factors that shape capital flows (Cerutti, Claessens & Puy, 2015). The IMF names the following variables as push factors in their reports: (i) the US VIX (S&P 500 Volatility Index) (ii) the average GDP growth rate in core economies (USA, Euro Area, Japan, and UK), (iii) changes in the expected U.S. policy rate, (iv) the slope of the U.S. yield curve (the difference between the 10 years and the 3-month U.S. government T-bill yields) and (v) the U.S. real effective exchange rate (REER) (Cerutti, Claessens & Puy, 2015). Some researchers add to that list a commodity price index (Kang & Kim, 2019) and the VIX (CBOE Volatility Index published by the FED). The VIX affects asset prices and capital flows in global markets and is closely related to conventional measures of investors' risk aversion. It is one of the so called "push factors" which exist in the global financial market, invariant across countries, influencing capital flows especially to peripheral countries. "Global risk, in particular, is significantly associated with extreme capital flow episodes and its role of global factors in international liquidity flows overshadows that of domestic ones" (Habib, 2019). Cerutti, Claessens & Puy (2015) analysing push factors for the EM economies distinguish the relative importance of different types of capital flows.

The change in the above factors collectively affects the dynamics of net capital flows recorded in the balance of payments of selected regions (the EMU and developed countries). Since the current account of these two regions and the V4 differs in scale, it is assumed that the net capital flows of the EMU and developed countries are the drivers of changes in the V4 countries (push factors).

Bank cross-border flows (CBF) enhance financial inclusion but have also proved to be one of the major financial channels through which stresses in the international financial system were transmitted (Takáts, 2011). An important element influencing the dynamics of the bank cross-border capital flows is the size and variability of the supply and demand of the so-called safe assets issued by financially safe countries ("risk heaven") (Sastre & Viani, 2014). This makes cross-border financial flows potentially as important as trade flows (or current account) in determining the dynamics of exchange rates and interest rates (Forster, Vasardani & Ca'Zorzi, 2011). This proved to be the case during the Global Financial Crisis (GFC) and during the EMU debt crisis or 2013 "taper tantrum" triggered by the FED policy. Therefore, bank net cross-border flows, if cointegrated with domestic capital movements, could increase or neutralize the effect of internal or external shocks. On the other hand, shock, if created by cross-border flows could strongly influence the

functioning of the international banking and capital market system, the structure of transmission channels and their role in capital flow creation. Based on this rationale, it can be argued that apart from the current account of the EMU and developed countries their bank net cross-border flows also constitute push factors for net capital changes in the V4.

Net capital inflow and GDP changes

In open economies GDP growth is correlated with capital flows as they change the level of resources used by the economy (Aizenman, Jinjarak & Park, 2011; Staehr, 2018)[4]. It is vital therefore to recognise the dependence of an economy's development on the dynamics of different capital flows. Various aspects of the importance of net capital flows for a country's GDP performance have been econometrically investigated. The World Bank has studied the relationship between foreign capital inflows and economic growth for many developing countries extensively (World Bank, 2000). Cross-country regressions found a positive relationship between capital flows and the growth of real gross domestic product per capita. Other aspects were also investigated, such as, volatility of capital flows, absorptive capacity, productivity and capital market integration. Also, the IMF has investigated capital flows and growth for many years e.g. (Mishra, 2001; IMF, 2016a). A number of empirical investigations were carried out by IMF staff (Phillips et al., 2013; IMF, 2016b) and EU analysts, especially after the onset of the financial crisis in 2008 and then of the following sovereign debt crisis in the Economic and Monetary Union (EMU) in 2010. Mody and Murshid (2011) regressed the average long-run (in 1980–2003) growth rate of real GDP per capita on a set of controls and the average capital inflow in 61 developing economies. They found the expected growth-enhancing role of foreign capital in a low volatility situation, while in high volatility conditions, capital inflows were negatively correlated with growth. Aizenman, Jinjarak & Park (2011) investigated the influence of the components of financial accounts on GDP within 100 emerging markets in the period 1990–2010. The relationships between GDP growth and lagged capital flows depended on the type of flows, economic structure, and global growth patterns were analysed. Edwards (2002) in his paper specified that substantial positive changes of current account (CA) have a negative influence on GDP. On the other hand CA changes are only indirectly dependent, through the level of investment, on GDP. Moreover, he statistically proved that CA balance changes are correlated with economic crisis.

In connection with the growing imbalances of the CAs in the United States, in 2005 Gruber and Kamin (2005) analysed a panel regression of the CA-to-GDP ratio for 61 countries from 1982 to 2003.Their studies confirmed a strong link between crisis and the CA

[4] Selected recent empirical investigations concerning capital flows and GDP relationships are presented in Błaszczuk and Sawicki (2017)

balance and also explained growing imbalances in the global financial market. As argued by Jordà, Schularick & Taylor (2010) an increasing negative ratio of CA-to-GDP was an important factor of financial crisis, though with a much smaller effect as compared to the credit-to-GDP ratio. A different approach was presented by Bagnai (2010), who confirmed a statistically significant positive relationship between the CA-to-GDP ratio and the State-Budget-deficit-to-GDP. Frankel & Saravelos (2012) in turn found that the CA balance had no significant effect on GDP, while the impact of external debt on the level of GDP turned out to be statistically significant. There are also dynamic balance-of-payments analyses within the framework of intertemporal theories (Gourinchas & Rey, 2013). In the intertemporal approach to the balance of payments it is assumed that the accumulation level of net foreign liabilities is limited in time by the terms of their repayment. The conclusions reached in a number of works are not unambiguous for determining the scale and relationship direction between current account and GDP and especially the long-term cointegration between balance of payments changes and GDP.

Only a few studies have focused on the relationships between bank cross-border positions and their impact on the real economy. The influence of the US versus the EMU as a push factor on EMU bank cross-border flows (CBF) was investigated (Cerutti, 2019). Lane and Milesi-Ferretti (2018) conducted research on the motives for bank cross-border flow dynamics. Choi, Furceri & Yoon (2018) investigated the international spill overs of fiscal shocks via banks' cross-border lending channels on the recipient economy. These studies also do not show whether and what long-term relationships existed between CBF net capital flows and GDP. They also fail to recognise whether and what long-term relationships existed between CBF net capital flows and GDP. In turn Bilas (2020a) using ARLD models, limits analysis of cointegration to the relationships between foreign direct investment (FDI) and GDP in the EU13. Results of cointegration tests indicated that there is no long-run equilibrium relationship between quarterly GDP growth rate and any of the FDI series in Croatia.

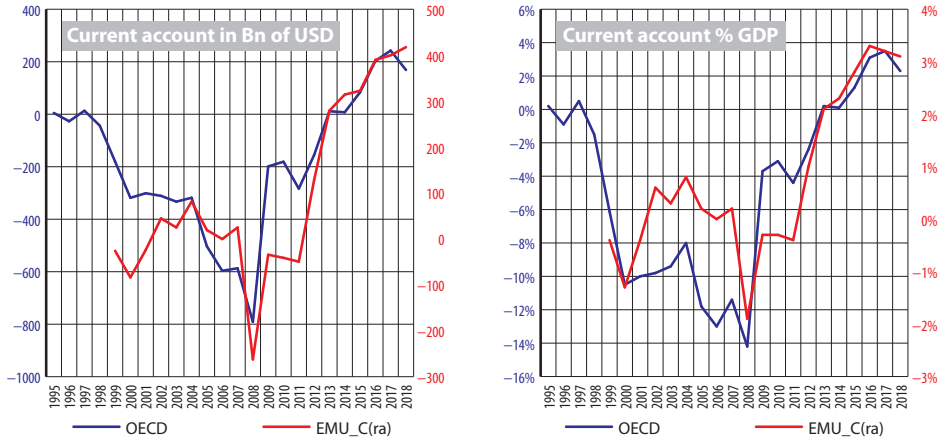
This chapter contributes therefore to the literature concerning long term relationships between net capital flows and GDP changes. This is achieved by means of a cointegration analysis between current account and bank net cross-border flows and GDP for the V4 economies in the period 1995–2019 and two subperiods 1995–2009 and 2009–2019. It is investigated whether different capital flows in V4 were integrated with GDP in a such way that they did not diverge from equilibrium in the long term.

Analysis of push factors for V4 capital flows

Current account of the balance of payments as a push factor

Since the current account of the EMU was selected as a push factor, the dynamics of this variable against the background of the OECD data deserve closer scrutiny (Figure 1)[5]. It is worthnoting the changing role of capital flows in the EMU within the analysed period.

Figure 1. Current account in the EMU and the OECD



Source: IMF Data Warehouse

From the beginning of the 2000's current account deficits of the EMU grew dynamically. The downward trend of the current account was halted by the global financial crisis (GFC) in 2008. Following the GFC, a similar change in current account balances can be noticed in both regions. The nominal expansion of the net capital flows was interrupted in around 2011, but the upward trend continued. In the OECD the results were affected by current account deficits registered in the USA, Australia, Canada, and Turkey, although the share of deficits in GDP in these economies slowly diminished. As for the EMU, the current account balance for the vast majority of the economies was positive and reached its nominal and relative maximum value in 2016 (3.3% of GDP). From this year on it slowly decreased, amounting to 2.8% of GDP in 2019, mainly due to a surplus of net exports of goods and services (2.1% of GDP).

[5] As the EMU countries are included in the OECD group the differences between the dynamics of these two region's current accounts show how OECD economies outside the EMU influenced results.

Bank cross-border flows position as a push factor

From the mid 90's the world[6] dynamics of cross-border capital flows began to change rapidly. These flows, as reflected by cross-border positions[7] rose from 53 trillion USD in 1995 to 192 trillion USD in 2006 (BIS, n.d.). In the period 2008–2013 these flows declined and amounted on average to minus 21 trillion USD. From 2015 to 2019, on average, net CBF amounted to 81 trillion USD. When their share in the world GDP8 is analysed, the importance of global bank cross-border flows becomes visible. In relation to world GDP, it was 49.1% GDP in 1995 and, 89% GDP in 2010. In the last 10 years this share fell to 62%. This could mean that in the period after the GFC world GDP dependency on bank cross-border flows has decreased. There are two reasons to support this thesis. The first is the growing importance of domestic capital. The second involves a slight increase in domestic currency loans provided by the international banks to local affiliates. However, we can also attribute this trend to statistical distortion as "investor exposures are increasingly distorted by firms' choices of where to establish legal residence and from what location to issue securities" (Bertaut et al., 2018). Analysing the subject structure of bank cross-border flows within the entire period 1995–2019, we notice that total bank cross-border claims were always always bigger than liabilities. On average, the position of liabilities exceeded claims by about 11%. The difference grew from 8% in 1995 to 14% in 2007 but in the following years it decreased to 6.6% by 2019. The question is whether a similar dependency change happened in the V4. There is also the important observation that while the volatility of gross flows has increased, net capital flows also registered as bank net cross-border positions of assets (difference between claims and liabilities) have become more stable.

Below gross and net bank cross-border positions[9] (BIS, Locational statistics, n.d.) against two geographical areas: the European Monetary Union EMU and developed countries[10] are reported (Figure 2).

Figure 2 shows (left figure) the share of gross (left axis) and net[11] (right axis) claims and libilities in the GDP of developed countries and the EMU (right figure). There has been a growing decoupling between gross and net flows since the late '90s, which means "that

[6] All countries reporting international banking statistics BIS

[7] FX and break adjusted change (BIS calculated)

[8] World Bank: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

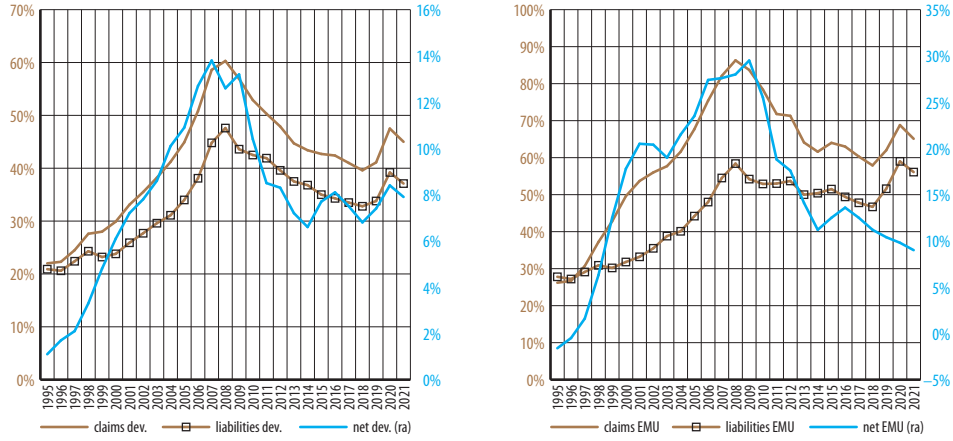
[9] "Position on a non-resident — for example, claim on or liability to a counterparty located in a country other than the country where the banking office that books the position is located" — see BIS Papers.

[10] BIS lists as developed countries: Australia, Austria, Belgium, Brazil, Canada, Chile, Chinese Taipei, Denmark, Finland, France, Germany, Greece, Guernsey, Hong Kong SAR, Ireland, Isle of Man, Italy, Japan, Jersey, Korea, Luxembourg, Macao, SAR Mexico, Netherlands, Philippines, South Africa, Spain, Sweden, Switzerland, United Kingdom, United States.

[11] Defined as the difference between cross-border claims and liabilities.

surplus countries do not necessarily "finance" deficit countries, and economies with a balanced current account may still get important financing from abroad and be vulnerable to sudden stops" (Guichard, 2017). The gap between claims and liabilities in both regions grew in the years preceding the economic crisis of 2008. The GFC brought a sudden stop to the sustained rise over the past decade in international financial integration. The significant gap between cross-border claims and liabilities was mainly the result of the flows registered in the non-banking sector. The question arises of how CBFS in the V4 behaved against the background of the decrease of CBFS in the EMU and the developed economies (push factors).

Figure 2. Cross-border positions in developed and EMU countries



Source: BIS Cross-border positions, by residence and sector of counterparty outstanding at the end of the second quarter 2021; share in GDP.

The Visegrád countries net capital flow fluctuations

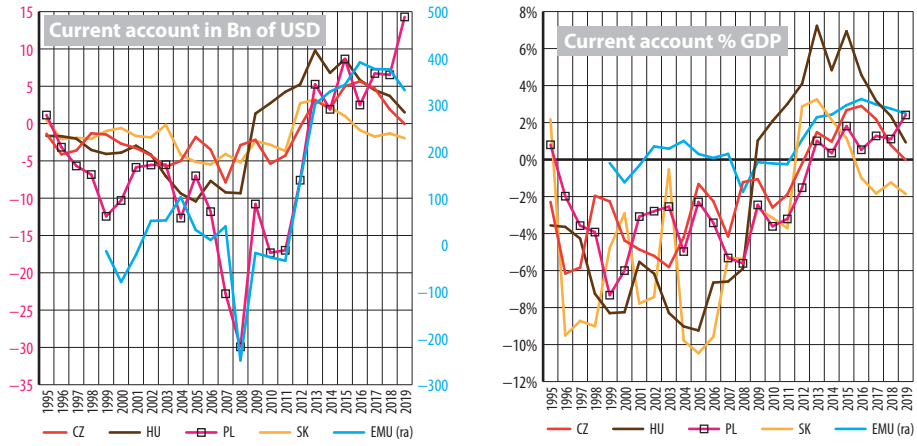
Current account changes in the V4 economies

A brief look at the changes of net capital flows of the V4 economies is due. First, the current account developments in the V4 economies against the EMU need to be scrutinised (Figure 3).

It can be noticed that the changes of the current account in the V4 countries show quite distinctive differences across the examined period. The share of current account in GDP was volatile throughout investigated period. Up to 2009 all the V4 countries were net importers of capital but in the following years this trend was reversed. On average, from 1995 to 2008 current and capital account deficits amounting to 4.89% GDP (±2,58%) were registered in the V4 countries, whereas between 2009 and 2019 there was a surplus

in the current account which amounted on average to 0.84% GDP (±2,63%). The balance improvements began differently in each of the examined countries. Hungary started building a current account surplus in 2010, the Czech Republic in 2014 while Poland was a net capital exporter in 2017 and 2019. It should be noted, however, that the results recorded in the current account of the balance of payments are directly dependent on capital transfers (mainly from the EU). Capital transfers in the V4 countries ranged from around 0.1% in 1995 to over 3% of GDP in 2015. In 2019, capital transfers amounted to 1.3% GDP. Furthermore, the importance of current account for GDP in the EMU countries was much lower than in the V4 economies. Only in Hungary, in recent years, did the current account surplus play a similar role in generating GDP as in the eurozone. It should also be noted that changes in the Polish current account balance were strongly correlated with current account changes in the eurozone (Pearson's r = 0.71). This is important for the cointegration phenomenon (if it exists) between a current account and GDP growth. If the pandemic shock changes the structure and dynamics of a current account e.g., diminishes the net exports (other things being equal) and historical cointegration between current account and GDP exists, then GDP can be expected to behave in line with its historic reaction.

Figure 3. Current account of the V4



Source: IMF and OECD data

Bank's net cross-border positions in V4 countries

As indicated before, increasing financial integration within Europe led to growing bank cross-border capital flows to Central Europe. These flows financed substantial current account deficits. Bank cross-border claims were more substantial than bank cross-border liabilities throughout the entire period and net BCF were positive (Figure 4).

Figure 4. Cross-border stock in the V4 countries % GDP

Source: BIS data; Author's calculations

The average bank net cross-border position varied significantly. Over the 1995–2919 period they amounted on average to 9,6% GDP in the Czech Republic, 24,5% GDP in Hungary, 8,8% GDP in Poland and to 13,5% GDP in Slovakia. Prior to 2000 these two series advanced in a similar way in all the V4 economies but they decoupled around two years before the V4 countries joined the eurozone. From that moment on, bank net cross-border flow positions co-moved with gross claims in all the V4 countries (Hungary being in some years an exception). The upsurge of gross cross-border claims was halted by the GFC, and cross-border lending to the V4 countries declined during and after the crisis. The immediate decrease of cross-border capital flows channelled the shock to each of the V4 economies in a varying degree. "The European Bank Coordination Initiative, known

as the "Vienna initiative", has helped to limit the degree of retrenchment of the euro area banking sector, particularly from the subsidiaries and offices situated in the most vulnerable countries" (Forster, Vasardan & Ca'Zorzi, 2011). It had a stabilizing effect on the financial shock created by the GFC. The restoration of bank cross-border claims after the GFC was to prevent the effects of the crisis, also for the investors. Gross bank capital outflows were smaller than anticipated, and the position of steady liabilities also played a stabilizing role (BIS, 2010). After 2012, in Hungary as well as in Poland net claims and liabilities began to fall. In Poland the bank net cross-border position was 50% lower in 2019 as compared with 2011.

Research methods

In order to verify if there exists a cointegration of the V4' countries GDP with current account and the bank net cross-border position, cointegration between these countries' current account and bank net cross-border position with push factors must be calculated. For this purpose unidirectional Granger causality tests were run to establish if push factors can be used for predicting current account and bank cross-border positions in V4 countries.

In order to evaluate cointegration between world push factors and the V4 current account and cross-border flows the ARDL (p, q) bound test model[12] is used, which in a generalized form is specified as follows:

$$(1) \quad \Delta C_t = a_0 + \sum_i^p \alpha_i \Delta C_{t-i} + {}_i\Delta P_{t-i} + \beta_1 C_{t-1} + \beta_2 P_{t-1} + \varepsilon_t$$

C — is a dependent variable; it denotes current account and bank net cross-border position; P — indicates push variables which constitute explanatory variables.

Dependent variables are the current accounts (C_) of each of the V4 countries; where the current account for the Czech Republic is denoted as (C_CZ), for Hungary as (C_HU), for Poland as (C_PL) and for Slovakia as (C_SK). Then, a separate model is estimated where dependent variables are the bank net cross-border position for each economy (CB_); dependent variables for each country are marked respectively as (CB_CZ), (CB_HU), (CB_PL) and (CB_SK).

P-push variables constitute explanatory variables; for each of the models these are: (a) the euro zone's current account (EMU_C), (b) net cross-border liabilities of the developed countries (NETCB_D) and (c) net cross-border liabilities of the EMU countries (NETCB_E).

[12] The ARLD model is described with the relevant literature in EViews10 User's Guide II Chapter 27; also: (Giles, 2018; Pesaran & Shin, 1995; Khan & Sajjid, 2005).

In order to evaluate cointegration between GDP and the V4 current account and cross-border flows again the ARDL (p, q) bound test model was used. To estimate cointegration between GDP and the V$ current account the model can be specified as follows:

$$(2) \quad \Delta GDP_t = a_0 + \sum_i^p \alpha_i \Delta GDP_{t-i} + {}_i\Delta C_{\_t-i} + \beta_1 GDP_{t-1} + \beta_2 C_{\_t-1} + \varepsilon t$$

To estimate cointegration between GDP and net cross border capital flows the ARLD model was used in the following form:

$$(3) \quad \Delta GDP_t = a_0 + \sum_i^p \alpha_i \Delta GDP_{t-i} + {}_i\Delta CB_{\_t-i} + \beta_1 GDP_{t-1} + \beta_2 CB_{\_t-1} + \varepsilon t$$

Where:

GDP is a dependent variable;

*C_* and *CB_* indicate current account and bank net cross-border position;

ε denotes shock,

a_0 is a constant term,

α and β are respectively the coefficients associated with lags of dependent variables and regressors;

p, q signify lags, respectively lags of dependent variables and regressors; p and q are determined using AIC, SC, HQ13;

t = 1995–2019;

The model is solved by assuming the absence of trend (with some exceptions); lags p and q are determined automatically by EViews10[14].

The model's results demonstrate the long-run equilibrating relationship between the variables represented by the error correction term CointEq(−1) and the effect of short run relationships[15]. The CointEq(−1) indicates the speed of adjustment to the steady state. It specifies percentage points of correction of the departure from equilibrium between net capital the departure of equilibrium between net capital and GDP. It should satisfy the following dependency CointEq(−1) ⊂ (−1,0); in CointEq(−1) < −1 the system oscillates around the state of equilibrium.

Long-term relationships resulting from the error correction model occur when the specified requirements expressed by *F* and *t tests* are met (Pesaran et al., 2001). Once the existence of cointegration is confirmed it can be inferred that the analysed variables move in the same direction. In other words when push factors and a country's net capital

[13] Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC) or Hannan-Quinn Criterion (HQC).

[14] EViews 10 is used to automatically select the number of lags for all variables.

[15] The short run results are not presented as not to interfere with the logic of the presentation.

flows deviate from a long-run relationship they adjust at a given (CointEq(-1) rate. The same reading should be applied to cointegration calculated between the V4 net capital flows and their GDP.

Research results

Cointegrations of the V4 net capital flows with push-factors

Cointegration (CointEq(−1)) for all statistically significant pairs of variables (push factors and current account as well as bank cross-border position of the V4 countries) is presented in Table 1. The results which meet conditions of the ARLD models using bounds tests are statistically significant. As the pairs of variables presented in Table 1 were cointegrated, the error correction term, as expected, was negative and highly significant. When more than one variable met such conditions the result with the greatest adjusted R-square was selected. The results of the ARLD models were also tested using the serial correlations LM test, the heteroscedasticity Breusch Pagan-Godfrey test and the stability diagnostics CUSUM test.

Table 1. Coinegrations between push factors and country's capital flows

X/Y	**C_CZ**	CointEq(−1)	**CB_CZ**	CointEq(−1)	X/Y	**C_HU**	CointEq(-1)	**CB_HU**	CointEq(−1)
EMU_C	5%	−1.16			EMU_C				
					NETCB_D			1%	−0.65
					NETCB_EMU			5%	−0.59

X/Y	**C_PL**	CointEq(−1)	**CB_PL**	CointEq(−1)	X/Y	**C_SK**	CointEq(−1)	**CB_SK**	CointEq(−1)
EMU_C	10%	−0.56	1.0%	−0.30	EMU_C	5%	−0.69		
NETCB_EMU	1%	−0.91			NETCB_D	1%	−1.46	2.50%	−0.57
					NETCB_EMU	3%	−1.62		

Source: Author's calculations; percentages represent the level of statistical significance

When the current account of the EMU (EMU_C) was considered as a push factor, cointegration existed between this variable and current accounts in all the V4 countries except Hungary. In the Czech Republic (EMU_C) was also cointegrated with the Czech cross border flows.

The net cross-border stock of the EMU (NETCB_EMU) was cointegrated with the Polish current account. The bank net cross-border position in Hungary (CB_HU) was cointegrated with net cross border flows of the EMU as well as developed countries. In Slovakia (NETCB_EMU) and net cross border flows of developed countries (NETCB_D)

were cointegrated with the current account. The cointegration coefficient was lower than −1 which means that the variables oscillated around equilibrium.

Therefore, taking into consideration the statistical significance of these results it is possible to say that in the Czech Republic current account was cointegrated with the net capital flows of the EMU. Similarly, in Poland the current account and net cross-border flows are cointegrated with the net cross border position of the EMU. In the case of Hungary there was long term interdependence between the bank net cross-border position and the bank net cross-border position in developed countries. In the Slovak Republic the current account of the EMU was cointegrated with the Slovak current account where bank net cross-border flows of the developed economies were loosely corelated with the Slovak bank net cross-border positions.

Summing up, current accounts and banks' net cross-border positions of the EMU and developed countries had been push factors in all V4 economies. Therefore, net capital flows in the individual V4 countries, although to different degrees, were dependant on the worldwide capital flows.

Cointegration between gdp and net capital flows in the V4 economies.

Cointegrations between the V4 GDP and their current account and bank cross-border positions, as previously, were solved using ARLD model's EViews10 specifications. Push factors were used as fixed regressors. No trend or a restricted trend were selected, depending on the dynamics of the raw variables. The number of lags for all variables was automatically chosen by EViews for the whole period and set of a maximum two lags for two shorter periods 1995–2008 and 2009–2019 was implemented. Results are presented in Table 2.

Table 2. Cointegration between GDP and net capital flows of the V4 countries

Cointegration GDP with current account					Cointegration GDP with cross-border flows				
	1995–2019					1995–2019			
	CZ	HU	PL	SK		CZ	HU	PL	SK
CointEq(−1)	−0.66	−0.58	−0.63	−0.49	CointEq(−1)	−0.55	−1.16	−1.00	−0.20
	1995–2008					1995–2008			
	CZ	HU	PL	SK		CZ	HU	PL	SK
CointEq(−1)					CointEq(−1)	−0.70		−0.24	
	2009–2019					2009–2019			
	CZ	HU	PL	SK		CZ	HU	PL	SK
CointEq(−1)	−2.25	−1.43	−0.72	−1.79	CointEq(−1)	−0.20	−1.78	−0.97	−0.62

Source: Author's calculations

With respect to the long-term relationship in the period of 1995–2019, the cointegration of GDP with the current account balance is at a similar level in all V4 countries. The recovery period after the current account shock is around two years. There was no cointegration between current account and GDP in the period 1995–2008 in any of the V4 economies. In the past ten years, cointegration between current account and GDP was similar to that registered in the long term only in Poland. In the remaining economies cointegration coefficients were ambiguous as they indicate the occurrence of oscillations between GDP and current account — cointegration coefficients were below minus 1 ($\lambda < -1$).

The strength of the interdependency between GDP and bank net cross-border flows varies. A close relationship in the years 1995–2019 existed in Poland and Hungary, when a return to equilibrium, following a shock, had taken place within a year. Weaker cointegration was seen for Slovakia, where 4 years were needed to return to equilibrium. In the years 1995–2008 a long-term dependence between net cross-border position and GDP was registered only in the Czech Republic and Poland. In the last ten years all the economies were cointegrated with bank net cross-border positions. The closest dependence was registered in the Czech Republic. In Hungary the cointegration coefficient was the smallest, which indicates the longest adjustment period.

Focsuing on the recent years, up to 2019, it can be noticed that, especially in Poland, the trend of changes in GDP was closely related to the trend of changes in net capital inflows. Only for this country were both current account and cross border flows statistically associated with push factors. This would indicate a significant dependence of Poland's GDP on changes of net capital inflows compared to the other V4 countries.

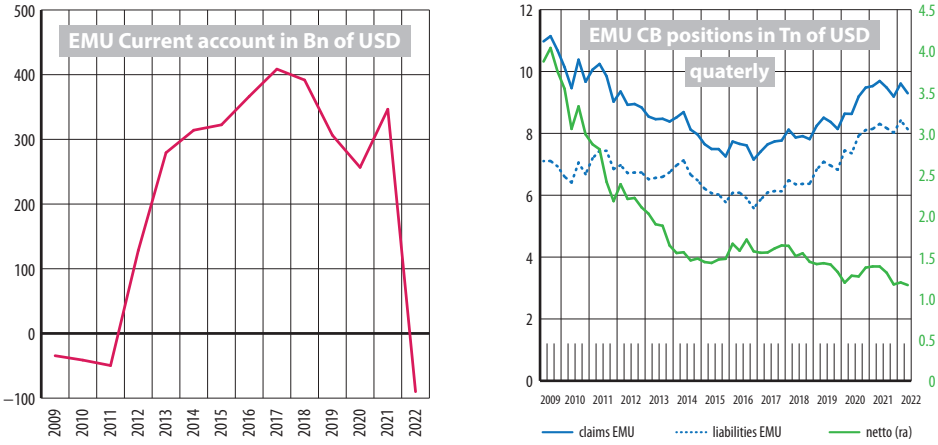
Discussion of recent developments

Bearing in mind the above findings, the following questions can be asked with respect to the COVID-19 implications for the V4 economies. (1) To what extent will the pandemic shock change the capital flows observed in the outside environment, (2) to what extent will the pandemic shock disturb the flow of capital movements between the external environment and the V4 economies and (3) how will these changes, assuming the existence of the observed cointegration between GDP and net capital flows, affect GDP in a post pandemic era characterised by energy and climate shocks.

Recent push factor changes

To discuss these topics, changes of the EMU's current account and bank net cross-border capital flows since 2009 need to be considered (Figure 5).

Figure 5. Current account and bank cross-border flows in the EMU



Source: Author's calculations; BIS and EUROSTAT data; 2022 Forecast;

With hindsight of the last 10 years, it can be observed that while the EMU's current account measured as a share in GDP fluctuated in 2020 and 2021, from January to October 2022 the EMU reported a EUR 86.7 billion gap, compared with a EUR 253.0 billion surplus during the same period of 2021.

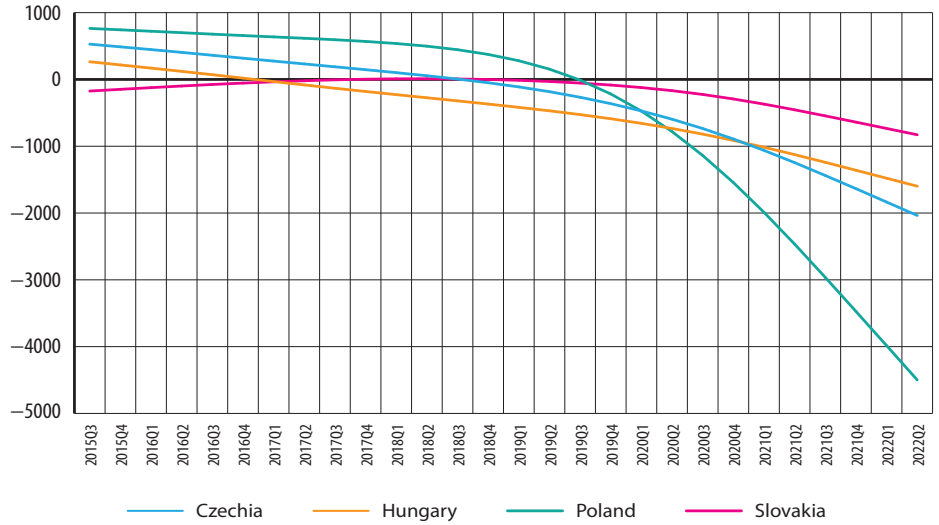
The EMU's net cross-border flows also fell due to faster rising liabilities. Comparing the last two years with the average registered for 2015–2019, net flows decreased by 13%. It is not possible to say if winding down the financial programmes implemented during the pandemic and energy crisis will not have an adverse impact on net capital flows to the EMU, as was the case in the past. However, the Fed decision of 2013 known as the taper tantrum did not stop capital flows (Davis, 2022); on the contrary, after 2013 a rising trend of bank net capital flows in the EMU was observed. Nevertheless, with further deterioration of the EMU current account and diminishment of the EMUs CBFs one cannot expect that push factors will support net capital inflows to the V4 countries.

Recent net capital flows in the V4

As regards current account development in the V4 countries, increasing surpluses were observed in the past, mainly due to a rising share of the balance of goods and services in GDP. This, along with the EU capital transfers, shaped the dynamics of their balance of payments in 2010–2019, when foreign trade was vital for GDP growth in each of the V4 economies. More recently, the pandemic and energy shocks caused a decline in GDP. At the time of writing this chapter, slightly negative developments of external balances in

the V4 can be observed. The trends of the balance of payments (Hodrick-Prescot — HP) presented in Figure 6 are influenced by the negative changes already registered in 2021 and 2022, especially in Poland. If the current account declines further, this could be attributed to particularly weak V4 net exports. If additionally, EU remittances are stopped or restricted in some countries and the cost of money increases, current account in the V4 countries could weaken further and existing cointegration between current account and GDP may slow economic growth.

Figure 6. Current account changes trend HP (1600)



Source: Author's calculations, EUROSTAT data

It is widely accepted that changes in bank net cross-border flows are not fully aligned with current account development. They could fall when the current account is being rebuilt. However, bank cross-border flows are not only a source of financing current account deficit, they are also an instrument of financial integration of an economy with capital markets. If bank cross-border flows decline when world non-bank flows stabilise or even increase that could suggest decreased interest of foreign investors. In turn, the substantial current account surpluses which occurred i.a., in 2020, accompanied by falling bank cross-border flows could signify certain structural changes between economic activity, bank cross-country capital flows and domestic finances. If CB flows in the V4 countries during the last three years are compared (Table 3) it becomes apparent that inflows have only increased in the case of Czech Republic. In Hungary they decreased by 50%, and in Slovakia even more. In Poland the net CB flows position decreased slightly.

Table 3. Share of net bank cross-border changes in GDP (USD)

	1995–2019	1995–2008	2009–2019	2020–2022	2020	2021	2022
CZ	9.6%	4.6%	15.9%	23.9%	24.6%	21.8%	25.2%
HU	24.5%	24.0%	25.1%	13.4%	12.5%	15.4%	12.3%
PL	8.8%	3.2%	15.9%	9.0%	9.4%	8.9%	8.7%
SK	13.5%	10.5%	17.3%	4.0%	4.2%	3.9%	4.0%

Source: Author's calculations; BIS data; data for 2022 cover first two quarters

The existance of cointegration between the bank cross-border position and GDP must be taken into account, particularly when considering changes in credit expansion over the last few years. The European financial sector, thanks to post-GFC recovery and the active support of central banks, was not infected by the pandemic. This was reflected in the credit activity in the V4 (Table 4). As can be noticed, the average of credit impulse in 1998–2019 was similar. The biggest differences are observed within the last three years.

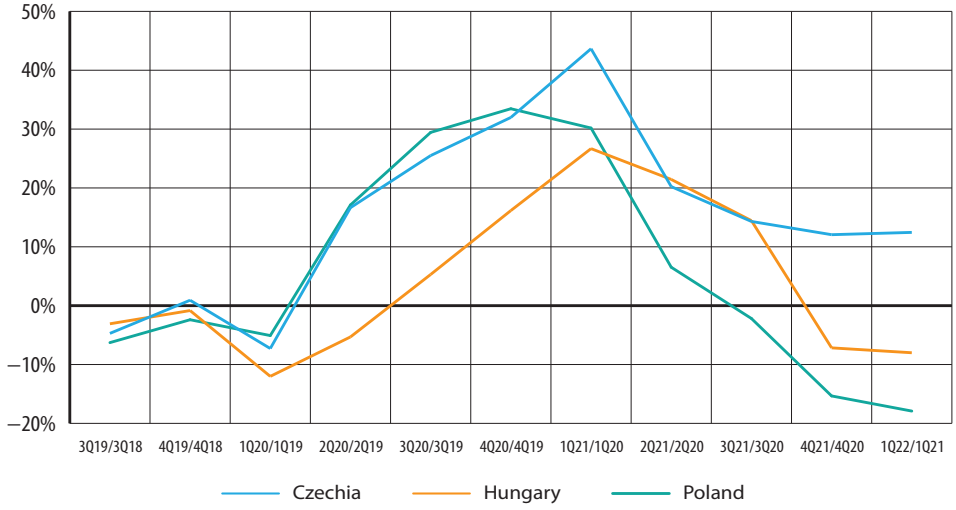
Table 4. Average credit impulse in Poland (%GDP)

% GDP		CZ			HU			PL	
average	NFS	GG	Banks	NFS	GG	Banks	NFS	GG	Banks
1998–2019	110.4	32.9	41.1	161.4	70.5	40.3	112.5	49.0	40.4
1998–2008	91.4	24.1	32.6	136.6	61.0	36.5	89.9	43.4	28.6
2009–2019	128.2	41.1	49.0	184.5	79.5	43.9	133.1	54.0	51.3
2000–2021	127.6	40.7	52.9	167.9	76.4	36.4	135.3	56.6	48.5
change	NFS	GG	Banks	NFS	GG	Banks	NFS	GG	Banks
2019–2020	3.2	6.3	1.8	19.3	10.7	5.5	8.3	9.5	–2.7
2021–2022	–2.7	–0.1	0.5	–6.3	–11.4	–1.1	–17.8	–11.4	–4.4

Source: Author's calculations; BIS data; NFS — non financial sector, GG — general government, Banks — credit to private non-financial sector from Banks

Up until 2019 the credit impulse in non-financial corporations and in general government rose in the Czech Republic, Hungary and in Poland. Similarly, credit to the private non-financial sector increased substantially. At that time, cointegraion between CB flows and GDP played an important role in all V4 countries. The pandemic crisis, causing lockdowns in most countries, seriously affected the real economy. Economic activity during the pandemic was stimulated by fiscal policy and supported by banks financing public expenses. It also increased the role of credit in the economy. But this shock forced, especially governments, into making a swift and strong response to protect vulnerable sectors. A particularly strong credit impulse in the general government sector was observed in Hungary, but it was also significant in Poland. The dynamics of general government debt diminished in subsequent quarters as a result of tensions in public finances (Figure 7).

Figure 7. Quarterly changes of outstanding debt issued by the public sector in Czech Republic, Hungary and Poland



Source: Authors calculations, BIS data

It becomes apparent that the shock that affected the V4's GDP in 2020 did not result from or cause dramatic changes in net capital flows. However, it did lead to significant changes in the structure of loans issued to the non-financial sector. An increase in the involvement of the financial sector in financing the public sector was observed (Table 4). This is related to the protective measures introduced for the real sector by the financial authorities — monetary and fiscal. But the falling share of CB positions in GDP during 2020–2022 in all the V4 countries (except for Hungary), accompanied a falling credit impulse and falling GDP dynamics. As CB flows, which indicate financial competitiveness of the economies, were cointegrated with the V4's GDP, a revival of banking activity in the private non-financial sector could be essential for sustaining long-term growth. Meanwhile, a small or even declining share of bank crediting went to the non-financial sector.

Conclusions and recommendatons

This chapter demonstrates that cointegration between foreign and domestic capital flows was present in all V4 countries. This means that domestic net capital flows are in the long-term strongly related to changes abroad. Particularly important is the long-term dependence of the current account of the V4 countries on changes in the euro area current account. Hungary is an exception in this regard.

When it comes to internal relationships, in all V4 countries the co-integration coefficient between GDP and their current account and CBF was statistically significant in both periods 1995–2019 and 2009–2019. In the case of Poland, the coefficient indicates a fairly strong relationship between GDP and the current account. In the remaining countries, there is no clear direction of these relationships, as the coefficients indicate the oscillation of these two variables around the equilibrium, suggesting much longer than a year adjustment period. This specific structural feature will be an important condition for GDP growth in the post-pandemic and energy shock period, more in the long than in the short term. Assuming that the cointegrations which existed up to 2019 continue, this feature could be accommodating for the restoration of sustainable development, provided that the net capital flow dynamics recorded up to 2020 are maintained. However, the net capital flow changes recorded in 2021 and 2022 are not clear. If the pandemic shock causes a downward trend in the balance of payments, then a growing deficit may deter growth, especially in the medium term. In turn, if prior cointegration between net bank cross-border flows and GDP continues, the present dynamics of the CBF in the Czech Republic and Slovakia will support their GDP growth rate. In the case of Poland and Hungary, if the observed decline in the bank net cross-border position continues, it will make GDP growth progressively dependent on domestic financial sources.

It is too short a time to assume that cointegration between net capital flows and GDP was broken by the pandemic and energy crisis (causing structural changes in the Main Street sector). Should the existing cointegration be broken as a result of these shocks, the relationship between capital inflow and GDP will change. Growth of GDP both in the short and long term may require an increase in the share of non-residents in financing government expenditures in foreign currencies and an increase in foreign capital imports (current account deficit deepening).

Should the cointegration between GDP and the net inflow of foreign capital continue, then the decline in the inflow of cross-border flows and the deepening deficit in the balance of payments will hamper growth in the long term. From the recent data presented above, it can be seen that so far these crises have (1) inhibited lending to private non-financial enterprises (measured as a share of GDP), and (2) caused a build-up of the trade deficit. If the level of financial integration, measured by the flow of cross-border capital of banks further decreases, it will appear as a significant factor hampering growth, especially in conjunction with the dynamic increase in current account deficits. Since the credit exposure of the public sector can increase as a result of COVID emergency support programmes, investment plans (climate, energy, defence spending) or attempts to limit the inflation, this will limit the credit exposure of the domestic financial sector to private enterprises. Effectively, this may have long-term effects for investments as the public sector will displace the private sector from the credit market. If negative changes in the dynamics of the current account occur and/or the decrease in net cross-border flows

continues, a further increase of issuance of domestic credit (public or semi-public) could have negative consequences for future financial stability.

When presenting the above conclusions, it is necessary to point out the research limitations that allowed only some general long-term relationships between capital flows and GDP to be identified. More in-depth research on the relationship between capital flows and growth in the period preceding the current shocks (overlapping effects of COVID, war in Ukraine, climate change) should cover gross flows such as FDI, debt or gross inflows of bank flows. Such additional research would enable more specific recommendations for economic policy. The study of long-term relationships between capital movements in GDP should also be supplemented with a parallel estimation of short-term relationships (Błaszczuk & Sawicki, 2017). In turn, when exploring long-term relationships, it would be important to examine the sensitivity of the existing cointegration to changes in the periods for which this relationship is estimated, while a panel study for the V4 or other cross-sections would show the occurrence of common trends and dependencies for the selected population.

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Biographical note

Janusz Bogdan Sawicki received a PhD in international trade theory in 1977 from the Faculty of International Trade, Warsaw School of Economics, where he subsequently worked as an assistant professor at the Department of Planning and Foreign Trade. From 1980 he was employed at the Ministry of Foreign Trade, after which he served as an Undersecretary of State at the Ministry of Finance. There he was responsible for Poland's foreign finances, including negotiations with creditors from the Paris Club and from the London Club. In 1991, as a government plenipotentiary, he signed an agreement with the Paris Club concerning Poland's debt reduction. A private entrepreneur since 1992, he has also worked at IKCHZ, a think tank focusing on international trade (later renamed IBRKK). He has published numerous analytical works as well as research papers, which have been published, among others, in National Economy, Ekonomista, Wspólnoty Europejskie as well as edited volumes. Among his key contributions is the book "Economic and Monetary Union — road to a debt trap" concerning the importance of debt for sustainable development. His research interests include the country's external financial equilibrium, balance of payments and game theory in credit negotiations.