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The Relationship Between the German Current Account and Financial Account: Evidence from the Toda-Yamamoto Causality Approach

https://doi.org/10.1515/ev-2024-0023
Received April 20, 2024; accepted April 29, 2024; published online May 15, 2024

Abstract: The paper examines the causality between the German current account and financial account. It contrasts with past research which assumes the current account and financial account to be jointly determined by a saving-investment imbalance. Our analysis decomposes the current account into exports and imports (real resource flows) and the financial account into domestic capital outflows and foreign capital inflows (gross capital flows). Evidence from the Toda-Yamamoto causality test shows that for Germany from Q1.1980 to Q2.2023, the causality runs from the financial account to the current account. It is not real resource flows but gross capital flows which exert significant impacts on the German real exchange rate. The finding implies that over the long run, strong German capital outflows and weak foreign capital inflows contributed to weak wage growth and stagnant investment in Germany, sustaining the persistent German current account surpluses. A reduction of the German current account surpluses requires a policy mix of fiscal expansion and monetary tightening which would expand the absorption of German and foreign capital in the German economy.

Keywords: current account; financial account; Toda-Yamamoto causality test; gross capital flows; net capital flows

JEL Classification: F32; F21; F30; F4; C01

1 Introduction

After a decade of current account deficits following unification in 1990, Germany has been running current account surpluses for over two decades.[1] Even in the

1 The discussion about Germany's persistent current account surplus dates back to as early as the 1950s (Wallich and Wilson 1979).

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coronavirus crisis which exerted substantial negative impacts on international trade (Hayakawa and Mukunoki 2021), the German current account recorded a surplus of 4.2 % of GDP in 2022.

Past debates on the German current account surpluses focused on the real side of the economy. The German current account surplus was seen as the outcome of a high saving rate driven by demographic factors (Felbermayr, Fuest, and Wollmershäuser 2017; Obstfeld and Rogoff 2005), the low investment rate (Berger and Wolff 2017; Micossi, D'Onofrio, and Peirce 2018), the restrictive wage policy (Gros and Busse 2013; Manger and Sattler 2020; Zemanek, Belke, and Schnabl 2010) or "… *the strong competitiveness of the German economy and the international demand for quality products from Germany*" as argued by the German government (Wall Street Journal 2013).

What has been left unexplored is the focus on the financial side of the economy. From a balance of payments perspective, the German current account surplus is the mirror image of net capital outflows. Past research on developing countries revealed the causality running from foreign capital inflows to current account deficits (Faroque and Veloce 1990; Higgins and Klitgaard 1998; Mastroyiannis 2012; Yan 2005). Yet little or no research examined how German capital outflows and foreign capital inflows affect the German current account surplus.

Using the Toda-Yamamoto causality procedure, the paper shows that for Germany from Q1.1980 to Q2.2023, the causality runs from the financial account to the current account. Gross capital flows, i.e. German capital outflows and foreign capital inflows, granger-cause changes in real resource flows, i.e. exports and imports, and not vice versa. Evidence also shows that it is not changes in real resource flows but changes in gross capital flows which are linked to the real depreciation of the German exchange rate observed since the late 1990s.

Seen through the financial lens, the German current account surpluses persisted because strong German capital outflows and weak foreign capital inflows contributed to weak wage growth and stagnant investment in Germany. From a policy perspective, a correction of the German current account surpluses requires fiscal expansion and monetary tightening. The policy mix would discourage German capital outflows and encourage foreign capital inflows, which leads to the real appreciation of the German exchange rate.

2 The Relationship Between the Current Account and Financial Account

From an accounting perspective, most international financial transactions only appear in the financial account without any impact on the current account. Yet from

an economic perspective, those (gross) international financial transactions affect the real economy and the current account through the cross-border transfer of purchasing power.

2.1 Recording of Balance-of-Payments Transactions

Every international transaction between residents and non-residents is entered twice with equal values in the balance of payments, once as a credit with plus sign and once as a debit with minus sign (International Monetary Fund 2009). The double bookkeeping accounting ensures that the current account always equals the financial account.[2]

First, the German net exports of goods in 2022 recorded a surplus of 111.9 billion euros, which enters the current account as a credit (plus sign). The resulting receipt of 111.9 billion euros reflects the increase of Germany's financial claims on the rest of the world, which enters the financial account as a debit (minus sign) of 111.9 billion euros.

The German exports, for instance, could have been financed by German trade credits to foreign importers. It would give rise to a debit (minus sign) of 111.9 billion euros in the financial account as a trade credit represents Germany's financial claims on the rest of the world. The corresponding credit (plus sign) of the trade credits also enters the financial account. The deposits created by the German trade credits increase Germany's financial liabilities against the rest of the world. The debit and credit entries are thus netted out to zero in the financial account.

The German exports could also have been financed by the German purchases of foreign bonds issued by foreign importers. A debit entry (minus sign) in the portfolio investment of the financial account reflects an increase of Germany's financial claims on the rest of the world. The corresponding credit (plus sign) in other investment of the financial account reflects an increase of Germany's deposit liabilities (financial liabilities against the rest of the world). Both debit and credit entries are cancelled out in the financial account.

Second, a transaction between Germany and other euro-area member states is settled in Target2, the euro-area interbank payment system.[3] The German Bundesbank's Target2 claims on the Eurosystem show that the interbank transfer of deposits

2 The current account consists of the accounts on goods, services, primary income and secondary income. The financial account consists of the accounts on direct investment, portfolio investment, other investment and reserves. In the absence of errors and omissions the current account and financial account always balance out (Fieleke 1996).

3 Whelan (2014) exemplifies how a cross-border transaction is settled in Target2 from a balance sheet perspective.

from banks participating in Target2 via the Bundesbank to banks participating in Target2 via other national central banks is greater than the other way around (Deutsche Bundesbank 2007, 2011). The double-entry bookkeeping records an increase in the Target2 claims as a debit entry (minus sign) under the other investment balance of the financial account.

The corresponding credit entry (plus sign) may appear on the current account if the counterpart is a real transaction, e.g. exports of goods. If the counterpart is a financial transaction, e.g. the sales of foreign securities by residents in Germany or the foreign purchases of German securities, the corresponding credit entry appears on the financial account. In the case of financial transactions, both debit and credit entries are cancelled out in the financial account.

These examples show that the accounting identity between the current account and financial account ensured by double-entry bookkeeping per se does not reveal any causal relationship. From an accounting perspective, a German current account surplus would not develop unless exports exceed imports, regardless of how much German capital flows out of the economy, because the credit and debit entries of the financial transactions are both made and offset on the financial account. Yet from an economic perspective, an excess of German capital outflows over foreign capital inflows can be seen as transfer of purchasing power to abroad with impacts on the real economy. Given the growth of global financial markets since the 1970s (Bayoumi and Macdonald 1995; Borio 2014), international capital flows should therefore be viewed as a current account determinant.

2.2 Standard Approaches to the Current Account Determination

Using the national income identity, Andersen (1990) showed four current account approaches:

$$\mathrm{EX} - \mathrm{IM} \equiv S - I \equiv Y - D \equiv F \tag{1}$$

where EX stands for total receipts for exports in the current account, IM for total payments for imports in the current account, S for total gross saving, I for total gross investment, Y for total output, D for total domestic demand and F for net capital flows.

The first approach is the trade approach. The current account (EX – IM) is traditionally seen as the outcome of relative income and prices including the real exchange rate. A prominent work related to the trade approach is the elasticity approach by Marshall (1923), Lerner (1936), and Harberger (1950). The second approach is the saving-investment approach which views the current account as the

outcome of changes in domestic saving and investment ($S - I$). The intertemporal approach developed by Obstfeld and Rogoff (1995) made substantial contributions to the saving-investment approach. Also, the saving-investment approach gained wide popularity through the savings glut hypothesis advanced by Bernanke (2005).

The third approach is Alexander's (1952) absorption approach which views the current account as the outcome of differences in total output and total domestic demand ($Y - D$). The fourth approach is the capital flow approach. The current account is seen as the outcome of changes in net capital flows (F). Net capital flows refer to the difference between domestic capital outflows and foreign capital inflows. The capital flow approach is perhaps the most unexplored approach in current account literature in comparison to the trade, saving-investment and absorption approaches which sparked a large literature in international economics.

As illustrated in equation (1), the common modelling of international capital flows is net capital flows. Schularick (2016) argues that the current account and net capital flows are the parallel consequence of saving and investment. A similar reasoning is echoed in Krugman, Obstfeld, and Melitz (2015): "[i]f national saving falls short of domestic investment, the difference equals the current account deficit. […] the country is borrowing abroad" (p. 678). In a similar vein, the intertemporal approach treats net capital outflows as the outcome of intertemporal decisions of saving and investment across countries (Gourinchas and Rey 2014).[4] What is common in literature is the use of the national income identity which allows international capital flows to be presented as a byproduct of other macroeconomic variables. The issue on how international capital flows affect exports and imports, domestic savings and investment or domestic expenditure and income appears to be rarely addressed.

A strand of research holds a critical view of the prevailing approaches in which the analysis of international capital flows goes no further than the realm of the national income identity. Shin (2012: 156) argues that the standard current account analysis treats international capital flows as "*the residual to the outcome from the real side of the economy*" (See also Johnson 1977). By the same token, Kim and Kim (2011: 498) argue that "*adherents to conventional macroeconomic theory dispense entirely with the causal approach and rely instead on the accounting identity approach. Because CA [current account] deficits are identical to KA (financial account) surpluses in this framework, it is impossible, apart from errors and omissions, to observe any causal relationship between the CA and the KA*".

4 Prasad, Rajan, and Subramanian (2006: 6) interpret net capital flows as "*the total amount of finance flowing in or out of a country*".

2.3 Gross Capital Flow Approach

Gross capital flows consist of domestic capital outflows and foreign capital inflows. Golub (1990), Turner (1991), and Johnson (2009) point out that it is not net capital flows but gross capital flows which offer a full picture of international capital flows. Similarly, Borio and Disyatat (2015) argue that the Feldstein-Horioka puzzle of international capital flows (1980) is a puzzle of net capital flows but not a puzzle of gross capital flows.[5] While research attention to gross capital flows has been growing in international finance literature, there is little research which examines the current account imbalances from a gross capital flow perspective.

To fill the gap the paper modifies Andersen's (1990) capital flow approach. The current account consists of total receipts for exports and total payments for imports. Likewise, net capital flows consist of domestic capital outflows and foreign capital inflows. Based on equation (1), the gross capital flow approach can therefore be formulated as follows:

$$\mathrm{EX} - \mathrm{IM} \equiv S - I \equiv Y - D \equiv \mathrm{KX} - \mathrm{KM} \tag{2}$$

where KX denotes domestic capital outflows, KM denotes foreign capital inflows and all the other variables remain the same as in equation (1). The sum of EX, IM, KX and KM is always equal to zero since "*[a]s with any other account, the total receipts of a country are bound be equal to the total payments of that country, if one includes all the receipts and all the payments of the country in the account*" (Meade 1970: 3–4; see also Beretta and Cencini 2020).

The paper follows the common definition in finance literature. Domestic capital outflows are the net of domestic purchases and domestic sales of foreign assets. Foreign capital inflows are the net of foreign purchases and sales of domestic assets. Forbes and Warnock (2012) label the net of domestic purchases and sales of foreign assets as "gross outflows" and the net of foreign purchases and sales of domestic assets as "gross inflows". Broner et al. (2013) call them "capital outflows by domestic agents" and "capital inflows by foreign agents". Hwang et al. (2017) use "asset flows" for domestic capital outflows and "liability flows" for foreign capital inflows.

While there is no clear terminology, all the terms refer to the net of domestic purchases and sales of foreign assets and the net of foreign purchases and sales of

5 Borio and Disyatat (2011: 199) argue that "*[b]y construction, current accounts and net capital flows reveal little about financing. They capture changes in net claims on a country arising from trade in real goods and services and hence net real resource flows. But they leave out transactions involving trade in financial assets, which make up the bulk of cross-border financial activity. They tell us little about the role a country plays in international borrowing, lending, and financial intermediation, about the degree to which its real investments are financed from abroad, and about the impact of cross-border activity on financial conditions*".

domestic assets as gross capital flows.[6] The main reason for looking at gross capital flows is not only to highlight the different investment behaviors by residents and nonresidents (Hwang et al. 2017). It also reveals the different impacts of domestic and foreign capital flows on the real economy (Forbes and Warnock 2012). The analysis on gross capital flows contributes to the understanding about the role of international capital flows in the development of financial crises and current account imbalances (Avdjiev, McCauley, and Shin 2016; Borio and Disyatat 2015; Vercelli 2019; Wolf 2014).

3 Empirical Analysis

Using the Toda-Yamamoto procedure, evidence for Germany suggests that over the long run, the causality runs from the financial account to the current account via the real depreciation of the German currency.

3.1 Data Description and Estimation Procedure

The analysis on the long-term causality between the German current account and financial account contains five variables. EX (exports) and IM (imports) stand for the total receipts and total payments in the German current account.[7] KX (domestic capital outflows) and KM (foreign capital inflows) stand for the net of domestic purchases and sales of foreign assets as well as the net of foreign purchases and sales of domestic assets in the German financial account.[8] REER is the German real effective exchange rate index, adjusted by unit labor costs.

All the variables excluding the real exchange rate index are expressed in percent of GDP. The data sample starts from Q1.1980 to Q2.2023. The data for EX, IM, KX and KM is retrieved from the balance of payments statistics compiled by the Bundesbank in line with the International Monetary Fund's (2009) Balance of Payments and

6 An analysis at a more disaggregated level is less suited for the analysis with respect to the real economy because the data is likely to be distorted by speculative capital flows for short-term arbitrage gains and by statistical inaccuracy (Broner et al. 2013).

7 The total receipts refer to the sum of credit entries with plus sign in the accounts for goods, services, primary income and secondary income. The total payments refer to the sum of debit entries with minus sign in the accounts for goods, services, primary income and secondary income.

8 KX (domestic capital outflows) and KM (foreign capital inflows) refer to the sum of credit entries with plus sign and debit entries with minus sign recorded in direct investment, portfolio investment including financial derivatives and other investment abroad by residents in Germany and nonresidents, respectively.

International Investment Position Manual. The REER is retrieved from the OECD Main Economic Indicators.

The paper follows the Toda and Yamamoto (1995) procedure, one of the most applied procedures in causality analysis (Hacker and Hatemi-J 2006), to test for the long-term causality between the German current account and financial account in a multivariate framework. The advantage of the Toda-Yamamoto approach over the Granger approach is the use of a modified Wald (MWALD) test statistic. The Granger causality analysis may suffer from a spurious inference if variables under study are integrated with different orders or cointegrated (Granger and Newbold 1974; Phillips 1986). By contrast, the Toda-Yamamoto modified Wald test allows to examine the causality, regardless of whether or not variables are integrated with different orders or cointegrated (Adriana 2014; Yan 2005; Zapata and Rambaldi 1997). Moreeover, the Toda-Yamamoto procedure allows to use the levels of the data (Giles 2011). It implies that the distortions and loss of the long-run information contained in the levels of the data due to the differencing of the data (Lütkepohl 1982) do not arise.

The paper takes the following steps: (1) Determine the order of maximum integration of the data (*dmax*) using unit root tests. (2) Specify a multivariate vector autoregression (VAR) model in levels. (3) Determine the optimal lag length (k) of the VAR model using information criteria. (4) Increase the optimal lag length (k) until the autocorrelation in the residuals is removed using LM statistics to ensure that the VAR model is well-specified. (5) Examine a cointegrated relationship between the variables in the VAR model using the Johansen cointegration test to ensure the existence of a long-term relationship (Johansen and Juselius 1990). (6) Estimate an augmented $(k + d_{\max})$th order VAR model in levels to ensure that the Wald statistic follows an asymptotic χ^2-distribution. (7) Apply a standard Wald statistic, which follows an asymptotic χ^2-distribution with the degrees of freedom (the number of eliminated lagged variables), to the first k VAR coefficient matrix to investigate the Granger causal relationship.

3.2 Model Description and Results of Unit Root and Cointegration Tests

In line with past research on a Granger causality analysis in a multivariate framework, the real exchange rate is incorporated as a key linking variable for the relationship between the German current account and financial account (see Calvo, Leiderman, and Reinhart 1993; Kim and Kim 2011; Yan 2005).[9] Our analysis is

9 On the interpretation of a Granger causality in a multivariate framework, Barrett, Barnett, and Seth (2010: 1–2) state that, "… *given interdependent variables X and Y, it is said that "Y Granger causes*

innovative in that the current account is differentiated between the total receipts (EX) and the total payments (IM), and the financial account is differentiated between domestic capital outflows (KX) and foreign capital inflows (KM). To identify the causality directions in a diagnostically well-specified and parsimonious way, the following four augmented $(k + d_{\max})$th order VAR models are estimated:

Model 1*: *Causality Between German Capital Outflows and Exports

$$\mathrm{EX}_t = a_1 + \sum_{i=1}^{k+d_{\max}} \beta_{1i}\mathrm{EX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{1i}\mathrm{KX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{1i}\mathrm{REER}_{t-i} + \varepsilon_{1t} \tag{1a}$$

$$\mathrm{KX}_t = a_2 + \sum_{i=1}^{k+d_{\max}} \beta_{2i}\mathrm{EX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{2i}KX_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{2i}\mathrm{REER}_{t-i} + \varepsilon_{2t} \tag{1b}$$

$$\mathrm{REER}_t = a_3 + \sum_{i=1}^{k+d_{\max}} \beta_{3i}\mathrm{EX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{3i}\mathrm{KX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{3i}\mathrm{REER}_{t-i} + \varepsilon_{3t} \tag{1c}$$

The objective of model 1 is to identity the existence of the effect of German capital outflows on German exports, and the other way around, conditional on the real exchange rate.

Model 2*: *Causality Between German Capital Outflows and Imports

$$\mathrm{IM}_t = a_1 + \sum_{i=1}^{k+d_{\max}} \beta_{1i}\mathrm{IM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{1i}\mathrm{KX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{1i}\mathrm{REER}_{t-i} + \varepsilon_{1t} \tag{2a}$$

$$\mathrm{KX}_t = a_2 + \sum_{i=1}^{k+d_{\max}} \beta_{2i}\mathrm{IM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{2i}\mathrm{KX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{2i}\mathrm{REER}_{t-i} + \varepsilon_{2t} \tag{2b}$$

$$\mathrm{REER}_t = a_3 + \sum_{i=1}^{k+d_{\max}} \beta_{3i}\mathrm{IM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{3i}\mathrm{KX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{3i}\mathrm{REER}_{t-i} + \varepsilon_{3t} \tag{2c}$$

The objective of model 2 is to identity the existence of the effect of German capital outflows on German imports, and the other way around, conditional on the real exchange rate.

Model 3*: *Causality Between Foreign Capital Inflows in Germany and German Exports

$$\mathrm{EX}_t = a_1 + \sum_{i=1}^{k+d_{\max}} \beta_{1i}\mathrm{EX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{1i}\mathrm{KM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{1i}\mathrm{REER}_{t-i} + \varepsilon_{1t} \tag{3a}$$

X" if, in a statistically suitable manner, Y assists in predicting the future of X beyond the degree to which X already predicts its own future. It is straightforward to extend G-causality to the conditional case, where Y is said to G cause X, conditional on Z, if Y assists in predicting the future of X beyond the degree to which X and Z together already predict the future of X".

$$\mathrm{KM}_t = a_2 + \sum_{i=1}^{k+d_{\max}} \beta_{2i}\mathrm{EX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{2i}\mathrm{KM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{2i}\mathrm{REER}_{t-i} + \varepsilon_{2t} \tag{3b}$$

$$\mathrm{REER}_t = a_3 + \sum_{i=1}^{k+d_{\max}} \beta_{3i}\mathrm{EX}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{3i}\mathrm{KM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{3i}\mathrm{REER}_{t-i} + \varepsilon_{3t} \tag{3c}$$

The objective of model 3 is to identity the existence of the effect of foreign capital inflows on German exports, and the other way around, conditional on the real exchange rate.

Model 4*: *Causality Between Foreign Capital Inflows in Germany and German Imports

$$\mathrm{IM}_t = a_1 + \sum_{i=1}^{k+d_{\max}} \beta_{1i}\mathrm{IM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{1i}\mathrm{KM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{1i}\mathrm{REER}_{t-i} + \varepsilon_{1t} \tag{4a}$$

$$\mathrm{KM}_t = a_2 + \sum_{i=1}^{k+d_{\max}} \beta_{2i}\mathrm{IM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{2i}\mathrm{KM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{2i}\mathrm{REER}_{t-i} + \varepsilon_{2t} \tag{4b}$$

$$\mathrm{REER}_t = a_3 + \sum_{i=1}^{k+d_{\max}} \beta_{3i}\mathrm{IM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \gamma_{3i}\mathrm{KM}_{t-i} + \sum_{i=1}^{k+d_{\max}} \delta_{3i}\mathrm{REER}_{t-i} + \varepsilon_{3t} \tag{4c}$$

The objective of model 4 is to identity the existence of the effect of foreign capital inflows on German imports, and the other way around, conditional on the real exchange rate.

To determine the order of maximum integration ($d_{\max}$) for the Toda-Yamamoto causality test, the Augmented Dickey-Fuller (ADF) and Kwiatkowski–Phillips–Schmidt–Shin (KSPP) unit root tests are conducted. Table 1 shows that all the variables are non-stationary in levels and stationary in first differences at the 5 % level. The results indicate that all the variables are integrated of order one, or I(1), implying the maximum order of integration of 1 ($d_{\max} = 1$).

Table 1: Results of ADF and KSPP unit root tests.

Variables	*ADF*		*KPSS (Trend)*	
	Levels	**First difference**	**Levels**	**First difference**
KX	−1.18 [8]	−7.63*** [8]	0.18** [4]	0.01 [4]
KM	−1.72 [8]	−8.07*** [7]	0.31*** [4]	0.01 [4]
EX	1.98 [10]	−5.11*** [9]	0.40*** [4]	0.06 [4]
IM	1.43 [10]	−6.11*** [6]	0.28*** [4]	0.03 [4]
REER	0.25 [7]	−6.45*** [6]	0.35*** [4]	0.06 [4]

Source: Own calculation. *Notes*: The number in the parenthesis for ADF test denotes the lag length based on the Akaike's Information Criterion (AIC). The number in the parenthesis for KPSS test denotes the truncation lag parameter. The null hypothesis of ADF test is that the time series is nonstationary, whereas the null hypothesis of KPSS test is that the time series is stationary. ***, **, and * represent the 1, 5, 10 % significance levels, respectively.

Table 2: Results of Johansen cointegration tests (Trace).

Model 1: KX, EX, REER [7]			
Null hypothesis	***Trace statistic***	***5 % critical value***	***1 % critical value***
$r = 0$*	49.27	34.91	41.07
$r = 1$	18.79	19.96	24.60
Model 2: KX, IM, REER [7]			
$r = 0$*	49.83	34.91	41.07
$r = 1$	18.39	19.96	24.60
Model 3: KM, EX, REER [7]			
$r = 0$*	42.10	34.91	41.07
$r = 1$	19.37	19.96	24.60
Model 4: KM, IM, REER [7]			
$r = 0$*	42.01	34.91	41.07
$r = 1$	17.29	19.96	24.60

Source: Own calculation. *Notes*: the number in the parenthesis shows lag length chosen based on the AIC criteria, which is seven for all models; r shows the number of cointegrating vectors; The null hypothesis (no cointegration) is rejected if trace statistic is greater than its 1 % critical value. * denotes the rejection of the null hypothesis at the 0.01 level.

A cointegrated relationship implies the existence of a long-term relationship between the variables under study (Johansen and Juselius 1990). Rambaldi and Doran (1996) argue that if there is a cointegrated relationship in a system, the Toda-Yamamoto MWALD test is suited for a Granger causality analysis. Since the results of the unit root tests in Table 1 suggest that all the variables under study are integrated, the paper conducts the Johansen cointegration test for all four models. The results in Table 2 suggests that at 1 % significance level, there is one long-run relationship in all four models, which supports the use of the Toda-Yamamoto procedure.

3.3 Results of Toda-Yamamoto Test for Multivariate Granger Causality

Table 3 shows the estimation results for the four models. Evidence from the Tada-Yamamoto causality procedure suggests that conditional on the German real exchange rate (REER), the direction of causality runs from German capital outflows (KX) and foreign capital inflows (KM) in the financial account to the total receipts (EX) and the total payments (IM) in the current account, and not the other way

Table 3: Results of Toda-Yamamoto causality test.

Null hypothesis	*Length of delay*	*MWALD test*	*Prob.*
	Model 1: KX, EX, REER		
KX does not Granger-cause EX	$(k = 8) + (d_{max} = 1) = 9$	27.44149	0.0006***
KX does not Granger-cause REER	$(k = 8) + (d_{max} = 1) = 9$	18.76122	0.0162**
EX does not Granger-cause KX	$(k = 8) + (d_{max} = 1) = 9$	12.60536	0.1262
EX does not Granger-cause REER	$(k = 8) + (d_{max} = 1) = 9$	9.281924	0.3191
REER does not Granger-cause KX	$(k = 8) + (d_{max} = 1) = 9$	8.339086	0.4011
REER does not Granger-cause EX	$(k = 8) + (d_{max} = 1) = 9$	14.30690	0.0741*
	Model 2: KX, IM, REER		
KX does not Granger-cause IM	$(k = 10) + (d_{max} = 1) = 11$	41.70559	0.0000***
KX does not Granger-cause REER	$(k = 10) + (d_{max} = 1) = 11$	19.95508	0.0297**
IM does not Granger-cause KX	$(k = 10) + (d_{max} = 1) = 11$	15.42195	0.1174
IM does not Granger-cause REER	$(k = 10) + (d_{max} = 1) = 11$	12.12977	0.2765
REER does not Granger-cause KX	$(k = 10) + (d_{max} = 1) = 11$	8.392535	0.5906
REER does not Granger-cause IM	$(k = 10) + (d_{max} = 1) = 11$	19.82374	0.0310**
	Model 3: KM, EX, REER		
KM does not Granger-cause EX	$(k = 8) + (d_{max} = 1) = 9$	22.74371	0.0037***
KM does not Granger-cause REER	$(k = 8) + (d_{max} = 1) = 9$	18.71061	0.0165**
EX does not Granger-cause KM	$(k = 8) + (d_{max} = 1) = 9$	12.51571	0.1296
EX does not Granger-cause REER	$(k = 8) + (d_{max} = 1) = 9$	11.06077	0.1983
REER does not Granger-cause KM	$(k = 8) + (d_{max} = 1) = 9$	9.804834	0.2790
REER does not Granger-cause EX	$(k = 8) + (d_{max} = 1) = 9$	12.94748	0.1137
	Model 4: KM, IM, REER		
KM does not Granger-cause IM	$(k = 10) + (d_{max} = 1) = 11$	30.47315	0.0007***
KM does not Granger-cause REER	$(k = 10) + (d_{max} = 1) = 11$	18.51951	0.0468**
IM does not Granger-cause KM	$(k = 10) + (d_{max} = 1) = 11$	13.89413	0.1779
IM does not Granger-cause REER	$(k = 10) + (d_{max} = 1) = 11$	12.16242	0.2743
REER does not Granger-cause KM	$(k = 10) + (d_{max} = 1) = 11$	8.072462	0.6218
REER does not Granger-cause IM	$(k = 10) + (d_{max} = 1) = 11$	17.23168	0.0694*

Source: Own calculation. *Notes*: ***, **, and * represent the 1, 5, 10 % significance levels. The choice of optimal lag length k is based on the Akaike's Information Criterion (AIC) and the log-likelihood ratio (LR) test with diagnostic tests.

around. This finding is consistent with Yan (2005) which shows the causality running from the financial account to the current account for Germany.

Another finding is that both KX and KM granger-cause REER at 5 % significance level, and not the other way around. By contrast, neither EX nor IM granger-causes REER, while REER granger-causes EX at 10 % significance level (see model 1) and IM at 5 or 10 % significance level (see model 2 and 4). These results imply that the effect of

gross capital flows (KX and KM) in the financial account on real resource flows (EX and IM) in the current account might percolate through the real exchange rate.

Figure 1 shows that all the inverse roots of autoregressive polynomial lie inside the unit circle. The results of the residual analysis imply that all the four augmented VAR models satisfy the stability conditions and ensure the robustness of our results (Dinh 2020; Shahzad et al. 2017).

4 The German Current Account Surplus from a Gross Capital Flow Perspective

The evidence implies that given the real exchange rate, gross capital flows in the financial account convey information for predicting the variation of real resource

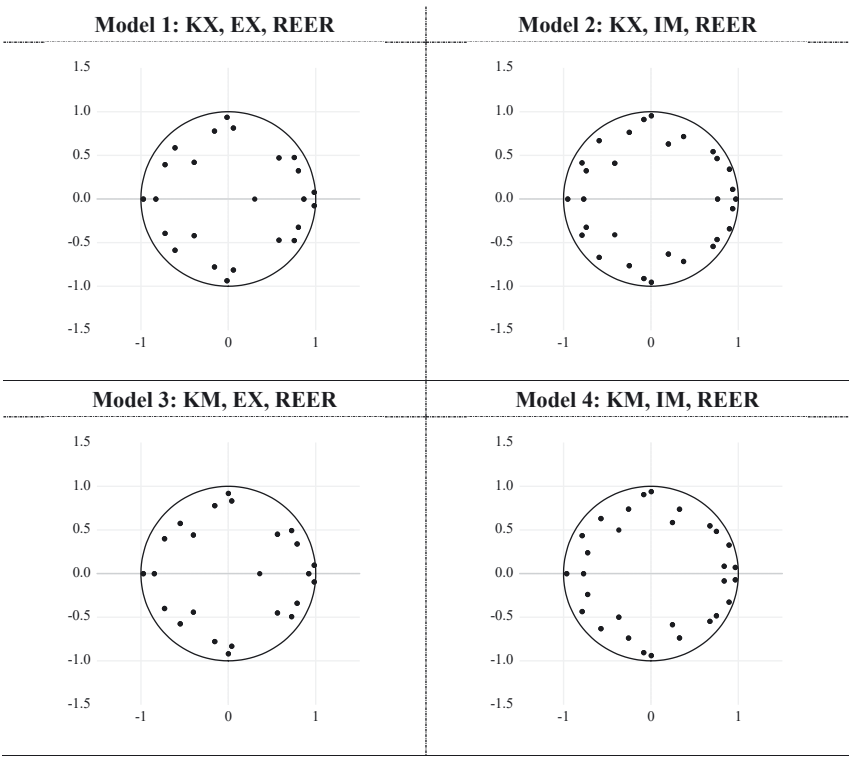

Figure 1: Inverse roots of AR characteristic polynomial. Source: Own calculation. *Notes*: No root lies outside the unit circle.

flows in the current account (see Diebold 2004). This section examines the Granger causality running from the German financial account to the current account from a macroeconomic perspective.

4.1 Bonanzas of Foreign Capital Inflows and Current Account Deficits in the 1990s

There is scarce research on the German current account from a gross capital flow perspective. The German reparation debate in the late 1920s drew attention to the effect of gross capital flows on the German current account. Keynes (1929) called gross capital flows 'liquids' which cannot alter such a 'solid mass' as the current account.[10] By contrast, Ohlin (1929) argued that gross capital flows transfer the purchasing power from one country to another, leading to the emergence of current account imbalances.[11] The Keynes-Ohlin debate led Machlup (1964) and Kindleberger (1976) to examine gross capital flows as a driver of current account imbalances.[12]

In the following decades, research attention to gross capital flows as a determinant of the German current account has faded away. The German current account deficits in the 1990s (see Figure 2) are usually seen as the reflection of expanded domestic demand due to the unification in 1990. Sinn (2002), and Felbermayr, Fuest, and Wollmershäuser (2017) argued that the drastic increase of domestic investment to rebuild the new eastern territory of reunified Germany surpassed domestic saving, turning the German current account into deficits.[13] Similarly, Schnabl and

10 "*Historically, the volume of foreign investment has tended, I think, to adjust itself […] to the balance of trade, rather than the other way round […]. In the case of German Reparations […] we are trying to fix the volume of foreign remittance and compel the balance of trade to adjust itself thereto. Those who see no difficulty in this – like those who saw no difficulty in Great Britain's return to the gold standard – are applying the theory of liquids to what is, if not a solid, at least a sticky mass with strong internal resistances*" (Keynes 1929: 7). Against Keynes's view, the fall of foreign capital inflows from the US after the Great Depression and the rise of German capital outflows for reparation payments sharply improved the German current account (Fraga 1986; Holtfrerich 1986).

11 Rueff (1929) also viewed capital outflows as the cause of the French current account imbalances in the 1920s.

12 See also Mises (1912: 182): "*[t]he surplus of the balance of payments […] was long regarded merely as a consequence of the state of international trade. […] international movements of money are not consequences of the state of trade; that they constitute not the effect, but the cause, of a favourable or unfavourable trade-balance*" as well as Böhm-Bawerk (1914: 508): "*[t]he balance of payments [= the financial account] commands, the balance of trade [= the current account] obeys, and not the other way round*".

13 Boss and Rosenschon (1996) estimated that between 1991 and 1995, the net transfer payments of about 886 billion German marks, which corresponds to about 452 billion euros, flowed from West Germany to East Germany.

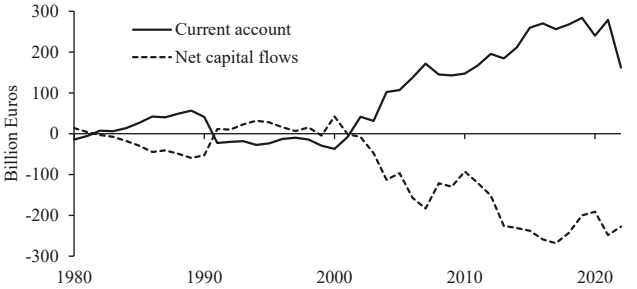

Figure 2: The German current account and financial account (net capital flows). Source: Deutsche Bundesbank. Notes: Positive values mean current account surpluses and net capital inflows. Negative values mean current account deficits and net capital outflows.

Zemanek (2012) argue that the excess of domestic investment over saving led to the repatriation of net foreign assets cumulated by West Germany prior to unification.

According to the common view, Germany imported more real resources and capital as domestic investment exceeded saving. The current account and financial account are, in other words, implicitly assumed to be jointly determined by the saving-investment balance. By resorting to the national income identity, past research dispensed with the analysis of how domestic capital outflows and foreign capital inflows affected the German current account deficits in the 1990s.

Figure 3 shows the bonanzas of foreign bond investment in Germany after reunification.[14] Along with the emergence of the German current account deficits, the 1990s recorded the cumulated foreign bond investment in Germany of 622.7 billion euros, substantially surpassing the cumulated German bond investment abroad of 268.9 billion euros.[15] The foreign financing of the German government debt relieved the financing conditions for the rebuilding of the new eastern territory (Seitz 1999; Sinn 2002).

Figure 4 also shows that in the 1990s, German and foreign interbank flows followed a similar development as in bond flows. After unification, foreign interbank lending to banks in Germany increased from 21.7 billion euros in 1990 to 142.8 billion euros in 1998. By contrast, German interbank lending abroad fell from 30.8 billion

14 The literature in international finance refers to a sharp increase of foreign capital inflows as bonanzas or surges of foreign capital inflows and a sharp decline of foreign capital inflows as sudden stops (Forbes and Warnock 2012; Reinhart and Reinhart 2009).

15 Shortly before reunification, foreign purchases of German bonds were deregulated. Until then, purchases of government, bank and corporate bonds were limited mainly to domestic residents (Börsch-Supan and Eymann 2002).

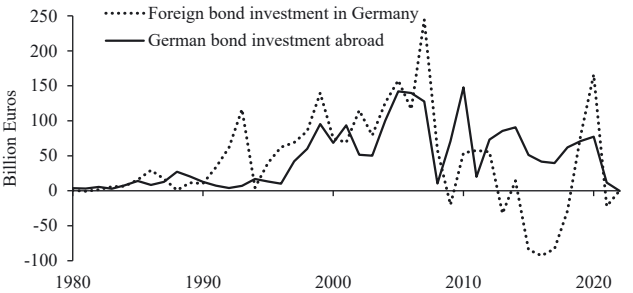

Figure 3: German and foreign portfolio bond flows. Source: Deutsche Bundesbank. Notes: Positive values mean foreign capital inflows and domestic capital outflows. Negative values mean foreign capital outflows and domestic capital inflows.

euros in 1990 to –17.5 billion euros in 1994, which suggests that German banks brought back funds which had been lent to foreign banks. Overall, the 1990s saw the cumulated foreign interbank inflows of 586.6 billion euros, which were greater than the cumulated German interbank outflows of 335.7 billion euros.

Macroeconomic theory suggests that the current account tends to improve in recession and deteriorate in boom (Baxter 1995; Glick and Rogoff 1995; Sachs 1981). While Germany was in a recession in the late 1990s the German current account deficits persisted (see Figure 2).[16] From a gross capital flow perspective, the German experience implies that a recession does not necessarily improve the current account when foreign capital inflows contribute to the financing of domestic consumption and investment. The foreign purchases of German government debt and the foreign bank lending freed up the domestic saving for the financing of domestic expenditures in Germany, which sustained the German current account deficits.[17]

16 It is a period of low growth, high unemployment rates and fiscal deficits. The German economy during this period is sometimes labelled "sick man of Europe". See Hein and Truger (2005) and Young (2020).

17 The German current account deficits in the 1990s were not profound because the increase of capital inflows in Germany was partially counteracted by German capital outflows. The dotcom bubble (1999/2000) involved the German purchases of bonds and shares in the US. With the growing demand for capital in emerging markets, the German foreign bank lending, mainly to firms in Russia, South Korea, Thailand and other East Asian countries, also increased before the 1997/1998 Asian financial crisis. German bank lending was focused on South Korea and Thailand (Heid et al. 2004).

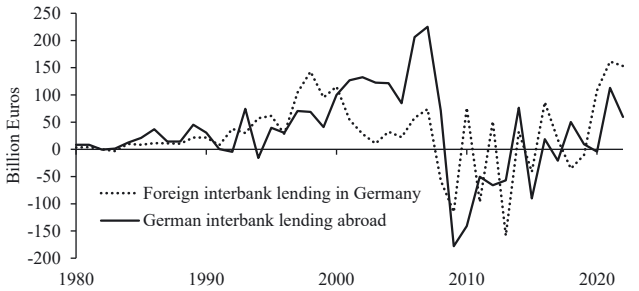

Figure 4: German and foreign interbank flows. Source: Deutsche Bundesbank. Notes: Positive values mean foreign capital inflows and domestic capital outflows. Negative values mean foreign capital outflows and domestic capital inflows.

4.2 Surges of German Capital Outflows, Stops of Foreign Capital Inflows and Current Account Surpluses in the Early 2000s

The phenomenon of the German persistent and large current account surpluses dates back to the 2000s (see Figure 3). Three macroeconomic factors substantially changed the behavior of Germany's gross capital flows which drove the current account into surplus. First, the dotcom bubble created the so-called "Neuer Markt" in Germany, a German equivalent of the US Nasdaq, opened in 1997 and closed in 2003. The Neuer Markt allowed German technology firms with low creditworthiness to obtain access to the international capital market (Taylor 2006; Vitols 2001). Figure 5 shows that the bonanza of foreign capital inflows from the end of the 1990s to the turn of the millennium was followed by a sudden stop of foreign capital inflows.[18] The sharp decline of foreign investment inflows weakened aggregate investment in Germany (Koo 2013).

Second, the process of the euro-area interest rate convergence involved a decline of interest rate levels in the southern European countries relative to Germany (Figure 6). From the European Exchange Rate Mechanism crisis in September 1992 to the end of the euro-area interest rate convergence in December 1999, the Bundesbank cut its policy rate by 5.75 % points, whereas central banks in southern Europe cut their policy rates in average by 10.8 % points.[19] Immediately after the start of the

18 The balance of payments statistics categorizes stock investment as direct investment if residents or nonresidents own more than 10 % of the equity issued by firms (International Monetary Fund 2009).

19 In December 1999, central banks of 11 countries – Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain – set the policy rate to 3 % for the

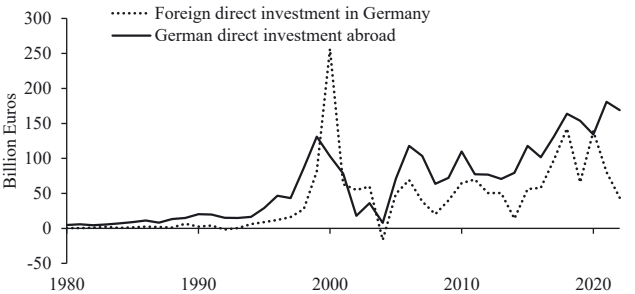

Figure 5: German and foreign direct investment flows. Source: Deutsche Bundesbank. Notes: Positive values mean foreign capital inflows and domestic capital outflows. Negative values mean foreign capital outflows and domestic capital inflows.

common monetary policy in 1999, the ECB cut the policy rate from 3.75 % in October 2000 to 1.0 % by June 2003 in response to the bust of the dotcom bubble. The transition from a high to low interest rate level eased the financing constraints in southern Europe, resulting in region-specific Mises-Hayek-type overinvestment booms (Schnabl 2017). The high demand for the financing of consumption and investment expenditures in the southern European countries led to the surges of German capital outflows from the late 1990s, inter alia via German purchases of foreign bonds and German interbank lending (see Figures 3 and 4; see also Bonatti and Fracasso 2013).[20]

Third, the economic reforms "Agenda 2010" under Chancellor Gerhard Schröder, started from the year 2003, increased aggregate saving in Germany. The structural reforms curtailed government expenditure and cut the future obligations of the social security system. It promoted household saving by giving subsidies to the retirement saving plans (Riester-Rente) and by raising consumption tax. It increased corporate saving as a result of the wage austerity triggered by the structural reforms (see Murai and Schnabl 2021). The harsh structural reforms in Germany not only curbed domestic consumption and investment, but also raised aggregate saving which equals the amount of income not consumed or invested. The low demand for the financing of domestic expenditures resulted in the decline of foreign interbank

common monetary policy (McCauley 1999). From September 1992, the Banque de France cut the policy rates by 6.6 % points, the Banca d'Italia by 10.25 % points, the Banco de España by 10 % points and the Banco de Portugal by 13.02 % points; the Bank of Greece completed the convergence in December 2000 by cutting 14.25 % points in total.

20 A sharp increase of domestic capital outflows is also referred to as "capital flight", "sudden diversification" or "sudden starts". A sharp decrease of foreign capital inflows is called "sudden stop" (Cowan et al. 2008; Forbes and Warnock 2012).

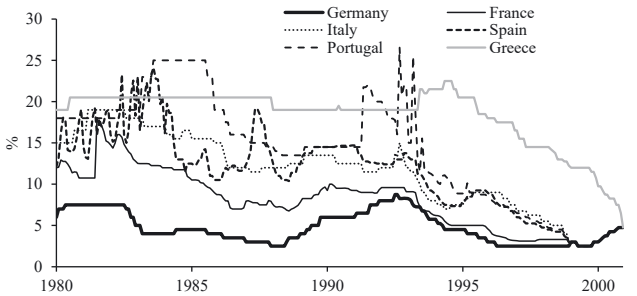

Figure 6: Policy rate convergence in Europe. Source: ECB.

lending (see Figure 4). The resulting increase of German saving supported German capital outflows.[21]

Seen through the lens of gross capital flows, the mix of German fiscal tightening and the ECB's monetary easing led to the surges of German capital outflows and the declines of foreign capital inflows from the late 1990s. The rise of German capital outflows and the fall of foreign capital inflows tightened the domestic financing constraints and eased the financing constraints abroad, in particular in other parts of the euro area. As Tinbergen's (1962) gravity theory suggests that the volume of bilateral trade is closely linked to the economic size and the distance of two countries, the development of German capital outflows and foreign capital inflows was linked to the strong growth of German net exports, inter alia vis-à-vis other European countries (Murai and Schnabl 2021). The outcome is the sharp improvement of the German current account in the early 2000s and the deterioration of the current account in the southern European countries, giving rise to the emergence of the intra-euro area current account imbalances.

4.3 Gross Capital Flows and Persistent Current Account Surpluses from the Late 2000s

The US subprime crisis in 2008 triggered a sharp contraction of international capital flows (Borio and Disyatat 2015; Forbes and Warnock 2012) which led to the outbreak

21 In the early 2000s, Spain, Italy and France rapidly increased the supply of covered bonds. The share of German covered bonds, or Pfandbriefe, in the European covered bond market fell from 80 % in 2001 to below 50 % in 2007 (Packer, Stever, and Upper 2007). The rise of foreign capital inflows to the German bond market before 2008 occurred on the corporate bond market. German small- and medium-sized enterprises (Mittelstands) increased debt financing as the Basel II Accord presented in 2004 signaled an increase of bank borrowing costs (Schindele and Szczesny 2016).

of the European financial and debt crisis (Litsios and Pilbeam 2017; Unger 2017). Nevertheless, Germany continued to record the huge current account surpluses which persisted even during the coronavirus crisis and the Russia-Ukraine war. There are three macroeconomic channels through which German capital outflows and foreign capital inflows have contributed to sustaining the persistent German current account surpluses since the late 2000s.

The first channel is the German public capital outflows via Target2, or the euro-area interbank payment system which allows commercial banks to settle cross-border transactions with central bank money. The Eurosystem's national central banks are responsible for the creation of central bank money in their own jurisdiction in accordance with the ECB's monetary policy. If, for instance, central bank money created in Italy is transferred to Germany, the Deutsche Bundesbank acquires Target2 claims and the Banca d'Italia acquires Target2 liabilities. From a balance of payments perspective, the Bundesbank's Target2 claims can be seen as German public capital outflows as they de facto equal public credit from the Bundesbank to other central banks, which automatically occurs in the Target2 system.[22] The balance of payments statistics records Target2 claims as an increase of domestic assets abroad in the financial account.

A rising Target2 imbalance thus reflects a creation of central bank money for commercial banks in one part of the euro area, allowing for the transfer of central bank money to commercial banks in another part of the euro area. As the creation of central bank money is closely linked to the ECB's monetary policy, the Target2 imbalances developed along with a series of the ECB's monetary policy measures in the European financial and debt crisis (Reinhart 2017, 2018; Sinn 2020).[23] It included inter alia unlimited credit provision to banks at a fixed interest rate from 2008 (full allotment policy), the Securities Market Programme (SMP) from 2010, subsidies for bank lending to firms and households from 2014 (targeted longer-term refinancing operations, TLTROs) and the Asset Purchase Programme

22 The nature of loans of Target2 claims can be made evident by analogy with the European Monetary System (1978–1998). The Deutsche Bundesbank then provided Deutschmark loans to the Bank of England and Banca d'Italia. Both central banks run out of Deutschmark to keep their exchange rates stable against Deutschmark as outflowing payments to Germany led to strong devaluation pressures on their currencies. After the Bundesbank closed the credit line to secure control over its own monetary base, both countries were unable to stabilize their currencies and thus forced to leave the EMS in 1992, known as "Black Wednesday". See Homburg (2012, 2018).

23 Reinhart (2017, 2018) argues that Target2 balances should be counted as public sector debt as Target2 liabilities are external liabilities of the central bank. Sinn (2020) stresses the nature of loan inherent to the Target2 system.

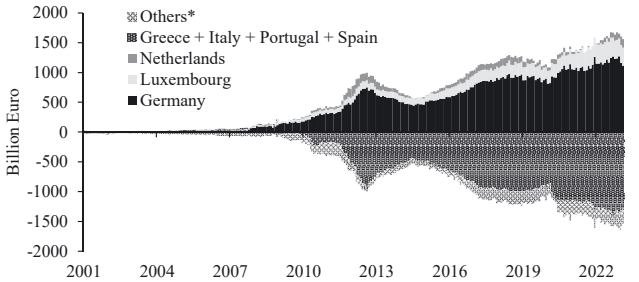

Figure 7: Target2 Balances of the Eurosystem. Source: ECB. Notes: Others include ECB, Austria, Belgium, Cyprus, Estonia, France, Croatia, Lithuania, Latvia, Malta, Slovenia, Slovakia, Out-NCBs.

(APP) from 2015.[24] In 2020, the ECB started with the Pandemic Emergency Purchase Programme (PEPP) in response to the coronavirus crisis.[25] Figure 7 shows that the Bundesbank's Target2 claims mainly reflects the Target2 liabilities of central banks in Greece, Italy, Portugal and Spain.

The effects of German public capital outflows via Target2 on the German current account percolate through the financial system. When the financial crises dried up intra-euro area private capital flows, banks in southern Europe resorted to the borrowing from the Eurosystem (Merler and Pisani-Ferry 2012). Thus Target2 sustained the financing of the imports of German goods as well as the purchases of German financial assets by southern European countries, as reflected in the close correlation between the Target2 claims and the German current account surpluses until the early 2010s (Sinn and Wollmershäuser 2012).

The ECB's asset purchases under the APP from 2015 and the PEPP from 2020 expanded the Target2 imbalances (see Figure 7). The ECB's quantitative easing led to the transfer of the bulk of newly created euro deposits to Germany (Eisenschmidt et al. 2017) as commercial banks inside as well as outside the euro area often access Target2 via the Bundesbank (Hristov, Hülsewig, and Wollmershäuser 2019). If, for

24 The central banks in Greece, Cyprus, Portugal and Ireland provided lending to commercial banks via Emergency Liquidity Assistance (ELA), which is discretionary central bank lending against collateral unrelated to the ECB's collateral framework. Under the SMP from May 2010 to September 2012, the ECB purchased government bonds of Greece, Ireland, Portugal, Spain and Italy amounting to 218 billion euros. See Murai and Schnabl (2021) for an analysis of fiscal rescue funds – Greek Loan Facility, European Financial Stabilization Mechanism (EFSM), the European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM) – for southern European countries. The ECB has repeatedly loosened its collateral framework (Legroux et al. 2022). Nyborg (2017) shows that distressed banks in the southern European countries deposited increasingly lower quality of collateral for central bank money.

25 Under the PEPP the ECB purchased Greek government bonds, which were extended from the APP.

instance, a US commercial bank holds a current account at the Bundesbank, the Banca d'Italia's purchases of the Italian government bonds from this US bank involve the transfer of euro deposits from Italy to Germany. Accordingly, the Bundesbank acquires the Target2 claims and the Banca d'Italia acquires the Target2 liabilities.

The ECB's asset purchases may have blurred a close relationship between the intra-euro area Target2 imbalances and current account imbalances. German exports, for instance, can result in the transfer of deposits from foreign creditors' bank accounts at the Bundesbank to the banks of German exporters which also have bank accounts at the Bundesbank. The transactions do not involve the Target2 system. Seen through this lens, it is not surprising that the close relationship between the Target2 imbalances and the intra-euro area current account imbalances pointed out by Sinn and Wollmershäuser (2012) weakened with the start of the ECB's asset purchases. What remains unchanged from a gross capital flow perspective is that the Eurosystem's asset purchases contributed to more favorable financing conditions in the euro area (Hristov, Hülsewig, and Wollmershäuser 2019) with a positive impact on the German current account balance.

The second channel is the fall of private foreign capital inflows and the rise of private German capital outflows. The German restrictive fiscal policy stance since the late 1990s (Deutsche Bundesbank 2005; Murai and Schnabl 2021; OECD 1998; Rodden 2003) has been a major impediment to foreign capital inflows in Germany. Prominently, the debt brake introduced in 2009 limited the supply of new German government bonds to roughly 0.35 % of annual GDP. Figure 8 shows the decrease of the German government debt from 2012 to 2020. Moreover, the Bundesbank's government bond purchases via the ECB's Public Sector Purchase Programme (PSPP) from 2015 decreased the foreign investors' holdings. From Q1.2015 to Q4.2018, the German government bond holdings by foreign investors decreased by 347 billion euros, which corresponds to the increase of 344 billion euros in the bond holdings by the Bundesbank.

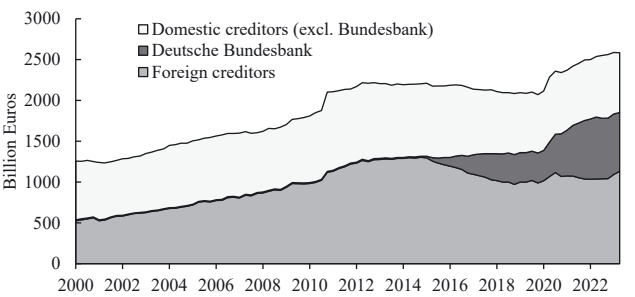

Figure 8: Outstanding German government debt by holders. Source: Deutsche Bundesbank.

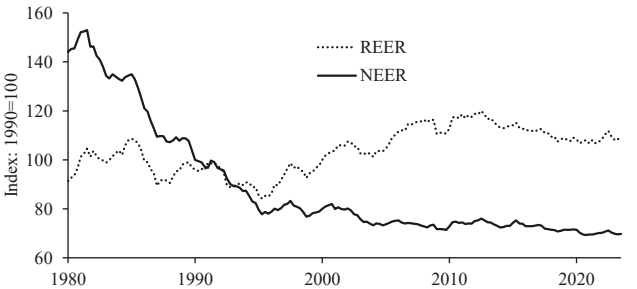

Figure 9: Nominal and real effective exchange rates. Source: OECD. Notes: The NEER is calculated as the geometric weighted average of bilateral exchange rates with 27 countries; the REER is adjusted by unit labor costs in manufacturing. An increase of the index shows depreciation and a decrease of the index shows appreciation.

The debt brake has restricted foreign capital inflows from the late 2000s (see Figure 3) and curbed the wage growth in Germany which had been under pressure from the late 1990s.[26] Figure 9 shows that a devaluation of the real effective exchange rate (REER) occurred since the late 1990s relative to the nominal exchange rate. From 1995 to 2012, the REER depreciated by 34.4 %, while the nominal effective exchange rate (NEER) appreciated by 3.6 %.

Moreover, the ECB's monetary easing from 2008 led to the fall of interest rate levels in the euro area. The fall of returns on domestic saving products encouraged

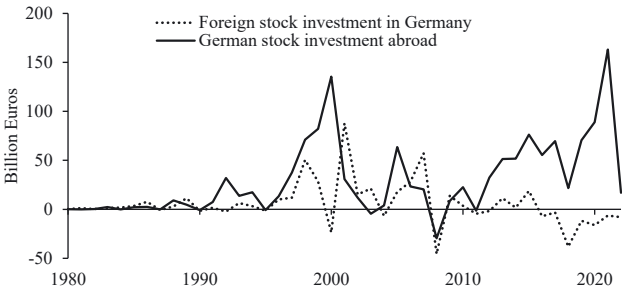

Figure 10: German and foreign equity investment flows. Source: Deutsche Bundesbank. Notes: Positive values mean foreign capital inflows and domestic capital outflows. Negative values mean foreign capital outflows and domestic capital inflows.

26 Eleftheriou and Müller-Plantenberg (2018) argue that the real exchange rate is not driven by relative prices of traded or nontraded goods, but by international capital flows. The view is also in line with Engel (1999). See also Coughlin and Koedijk (1990) for conventional determinants of the long-term real exchange rate.

German capital outflows, inter alia to foreign stock markets.[27] Figure 10 shows that until the coronavirus crisis, the German foreign stock investment from the late 2000s was at historical highs.

From a gross capital flow perspective, the mix of fiscal tightening and monetary easing restrained foreign capital inflows and stimulated German capital outflows. It implies an impediment to the circulation of German and foreign capital into the German economy, putting the growth of domestic wage levels under pressure. The resulting real devaluation contributed to the international competitiveness of German export industries at the expense of domestic-market-oriented industries, sustaining the German current account surpluses.

The third channel is the substantial increase of Germany's net foreign assets. Assuming no revaluation effects arising from changes in asset prices or exchange rate movements, net foreign assets display the accumulated net purchases of foreign assets.[28] Put differently, in the absence of revaluation effects, net foreign assets can be seen as the accumulation of an excess of domestic capital outflows over foreign capital inflows from the past to the present.

With the persistent excess of German capital outflows over foreign capital inflows from the 2000s, Germany's net foreign assets have grown. Figure 11 shows that the growth of net foreign assets is closely related to the growth of the primary income balance which records the net investment income received and paid via-a-vis the rest of the world. From 2004 to 2022, the average growth rate for Germany's net foreign assets and primary income balance was 24.6 and 19.7 %.

Since the primary income balance is part of the current account balance, Germany's large net foreign assets have gradually developed as a key determinant of the persistent German current account surpluses. In fact, the year 2022 recorded the primary income surplus of 150 billion euros, surpassing the trade surplus of 111.9 billion euros. Seen through the lens of gross capital flows, the growing importance of primary income in the German current account surplus is not only a long-term outcome of strong German capital outflows and weak foreign capital inflows. It also points at the growing dominance of the financial account over the current account.

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27 Bonfim and Capela (2020) show a portfolio rebalancing from corporate bonds eligible for the ECB's APP to those not eligible, which expose higher risks and returns. It hints at a portfolio rebalancing from German corporate bonds to corporate bonds outside of the euro area, e.g. the US corporate bonds.

28 As net foreign assets measure the stock of foreign assets held by domestic residents less the stock of domestic assets held by nonresidents, changes in asset prices and exchange rates induce changes in net foreign assets. An increase of foreign bond or stock prices positively affects net foreign assets, whereas an increase of domestic bond or stock prices negatively affects net foreign assets. Likewise, a depreciation of domestic currency against foreign currencies positively affects net foreign assets in terms of domestic currency, whereas a domestic currency appreciation negatively affects net foreign assets in terms of domestic currency.

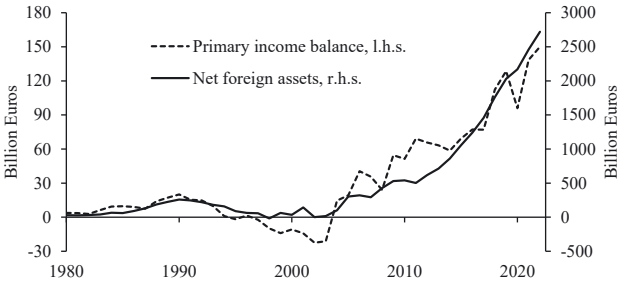

Figure 11: Primary income balance and net foreign assets. Source: Deutsche Bundesbank.

5 Outlook

Following a decade of current account deficits after unification in 1990, Germany has persistently run large current account surpluses. The common approaches, inter alia the saving-investment approach, pay scant attention to the causal relationship between the current account and financial account. By superimposing the national income identity on the causal relationship between the current account and financial account, the common explanation dispenses with the analysis on the role of domestic capital outflows and foreign capital inflows in international trade. Put differently, the behaviors of gross capital flows and real resource flows are assumed to be jointly determined by imbalances between domestic saving and investment.

Using the Toda-Yamamoto Granger procedure in a multivariate framework, the paper finds that from Q1.1980 to Q2.2023 for Germany, the causality runs from the financial account to the current account. Given the real exchange rate, both German capital outflows and foreign capital inflows granger-cause German exports and imports, but not the other way around. This implies that the effect of gross capital flows can be assumed to be translated into the German current account through the real exchange rate because both German capital outflows and foreign capital inflows granger-cause the real exchange rate, which in turn granger-causes German exports and imports. Overall, the real exchange rate is a key linking variable for the causal relationship running from the financial account to the current account in Germany.

The development of gross capital flows has shaped the development of the German current account. The surges of foreign capital inflows after 1990 unification turned the German current account into deficits as the foreign financing of domestic expenditures freed up domestic saving, which expanded the financing capacity for domestic expenditures. The fall of foreign capital inflows and the rise of German capital outflows from the early 2000s tightened the financing constraints, resulting in the excess of saving over investment. The transfer of purchasing power from

Germany to the rest of the world was accompanied by the depressed wage growth, as reflected in the long-term depreciation of the German wage-based real exchange rate.

The real devaluation improved the international competitiveness of German export industries at the expense of domestic-market-oriented industries, supporting the current account surpluses from the early 2000s. The German current account surpluses have since then become persistent because the persistent excess of domestic capital outflows over foreign capital inflows led to the accumulation of net foreign assets. As a result, the primary income surplus has strongly grown and became the main driver of the German current account surplus in the year 2022.

As once argued by several prominent economists, such as Mises (1912), Böhm-Bawerk (1914), Ohlin (1929), Machlup (1964), and Kindleberger (1976), the paper showed that international capital flows recorded in the financial account interact with the real economic development and act as a central determinant of the current account balance. Given the fact that the persistent German current account surplus has been a frequent source of political conflicts in Europe and beyond (Belke and Schnabl 2013), the effect of macroeconomic policymaking on German capital outflows and foreign capital inflows should deserve more attention. In fact, the German fiscal expansions from 2020, e.g. the suspension of debt brake, led to the expansion of foreign capital inflows and domestic spending, which resulted in the decline of the German current account surplus in 2022.

The German current account surpluses might further be reduced if the ECB would create a higher interest rate environment. The impact of monetary tightening on gross capital flows between Germany and other parts of the euro area might not be significant as an increase of the interest rate level by the ECB affects all euro area countries. By contrast, the impact of monetary tightening on gross capital flows between Germany and other industrialized countries outside the euro area might be significant if the ECB would raise the interest rate level to a stronger extent than other central banks of major currencies, inter alia the US Federal Reserve, the Bank of England or the Bank of Japan. In this scenario, less German capital would drain out of the German economy and more foreign capital would be invested in the German economy.

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