REVERSE CAUSALITY IN GLOBAL CURRENT ACCOUNTS

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CONTENTS

Abstract:

The paper discusses global imbalances under the aspect of an asymmetric world monetary system. It identifies the US and Germany as center countries with rising / high current account deficits (US) and surpluses (Germany). These are matched by current account surpluses of countries stabilizing their exchange rates against the dollar (dollar periphery) and current account deficits of countries stabilizing their exchange rate against the euro (euro periphery). Meanwhile, the aggregate current account balance of the euro area has been by and large balanced. The paper finds that changes of world current account positions are affected by the macroeconomic policy decisions both in the centers and peripheries, albeit the centers – due to structural characteristics related to size – are argued to have a higher degree of freedom in macroeconomic policy making. In specific, expansionary monetary policy in the US as well as exchange rate stabilization and sterilization policies in the dollar periphery are found to have contributed to global current account imbalances. Given that the sample period for the analysis extends from 1981-2008, the results for Germany mostly capture the situation before the euro was created.

Non-technical summary

The paper investigates the determinants of asymmetric current account behaviour of center and periphery countries within an asymmetric world monetary system. The argument is built upon the fact that the dollar is the dominant international money and the euro has become an important regional international currency (section 2). The macroeconomic policy behaviour of center and periphery countries is argued to be asymmetric. The US and Germany focus their macroeconomic policy decisions on domestic targets such as price stability and growth. In contrast, the countries at the periphery of the US and Germany stabilize their exchange rates against dollar and the German mark/euro.

Given the asymmetric nature of the world monetary system, the paper identifies a current account asymmetry matrix, which is characterized by rising US current account deficits and rising current account surpluses of the countries stabilizing their exchange rates against the dollar. In Europe, a rising current account surplus of Germany is matched by current account deficits of Emerging Europe and many industrialized European countries. This implies an asymmetric current account behaviour between the dollar and the euro peripheries as well as between the US and Germany. Twin deficits in US are matched by twin surpluses in some dollar periphery countries.

In section 3 the theoretical estimation frameworks and data are presented. To test for unidirectional causalities from center interest rates to periphery reserve accumulation and from periphery reserve accumulation to center interest rates panel GMM frameworks are used. To trace possible bi-directional relationships between center interest rates and periphery reserves a panel Granger causality framework is chosen. Finally, to test for the impact of center and periphery macroeconomic policies on current account positions again a panel GMM framework is used. It is stressed that a proxy for sterilization operations is next to reserve accumulation an important possible determinant of periphery current account positions as non-market-based sterilization affects saving-investment balances.

In section 4, panel estimations test for a set of 93 countries the direction of causalities between center interest rates and periphery reserve accumulation as well as for the macroeconomic determinants of current accounts. Granger causality tests reveal a mutual interdependence of center monetary and periphery exchange rate policies for US and East Asia 10. The estimations confirm the crucial role of the US monetary policy as well as of periphery exchange rate stabilization and sterilization policies as determinants of current account (im-)balances. For Germany and Emerging Europe, the interdependence is less evident, albeit interest rates levels in Germany rather than Emerging European exchange rate or sterilization policies seem to have an impact on the Emerging European current account balances.

Section 5 concludes stressing the macroeconomic policy interaction between center and periphery countries and their impact on current account positions. With respect to Germany, the relationship of Germany vis-à-vis most of Europe has substantially changed after 1999 and therefore the results mostly capture the situation before the euro was created.

1. Introduction

Albeit world current account imbalances have shrunk during the recent crisis, they are likely to re-emerge once the world economy recovers (Baldwin and Taglioni 2009). Originating in a persistent current account imbalance between the United States and China, a controversial discussion about global imbalances continues. The origins of the trade imbalances have been attributed to an East Asian saving glut (Bernanke 2005) combined with mercantilist trade strategies (Dooley, Folkerts-Landau and Garber 2003). In contrast Chinn (2008) and Chinn and Ito (2008) point to a US saving deficiency and US fiscal policies. McKinnon and Schnabl (2004a,b) attribute the trade imbalances between the US and East Asia to US macroeconomic policies with expansionary monetary policy causing periphery reserve accumulation. The economic policy discussion concerning global imbalances has focused on the adjustment of exchange rates, in particular, if the Chinese dollar peg should be loosened (Frankel 2006, McKinnon and Schnabl 2006, Feldstein 2008, Cline 2005, McKinnon 2007, Fratzscher 2008 and Cheung, Chinn and Fujii 2009). The discussion has remerged during the recent Chinese recovery (Thorbecke and Smith 2009).

Up to the present, comparatively few papers have scrutinized global imbalances from a broader perspective beyond the US and China/East Asia and have addressed the direction of causality (Cheung and Qian 2007). During the new millennium current account surpluses have not only emerged in East Asia, but also in other regions such as Latin America, the Commonwealth of Independent States, or other raw material exporting countries which peg their currencies to the dollar. In contrast, the emerging European countries – which peg their currencies to the euro – have been running current account deficits (Herrmann und Winkler 2008). Whereas the current account positions of the Emerging European countries are in line with Lucas' (1990) assumption that capital should flow from rich to poor countries where the marginal return to investment is higher, in the dollar periphery the capital is flowing uphill from the periphery to the center. Figure 1 shows this asymmetry in world current account development as the percentage of countries of periphery country groups, which are running current account surpluses. Up to year 2008, this percentage has increased for all country groups except for Emerging Europe where most countries had current account deficits.

To analyse this asymmetry in world current account we put a focus on macroeconomic policies beyond exchange rate stabilization and on the direction of causality in macroeconomic policy decisions. For this purpose three approaches are used. First, we theoretically subdivide the world into centers and peripheries and scrutinize the implications for the macroeconomic policy behavior.

Second, we perform panel GMM regressions and Granger causality tests to trace econometrically the direction of causality in global imbalances. Third, we link national current account balances to macroeconomic policies in center and periphery countries.

2. Asymmetries in the World Monetary System

The imbalances in the world monetary system can be linked to structural criteria such as size and political criteria such as macroeconomic policy behavior. Structural asymmetries arise from the very fact that international transactions tend to be – due to network externalities and economies of scale – denominated in a few international currencies. As will be argued, this has implications for the macroeconomic policy behavior in anchor and periphery countries and therefore the current account positions.

2.1. Structural Asymmetries

The present prominent role of the dollar as international money originated in the post-war political and economic US hegemony under the Bretton Woods System. It persists due to network externalities and economies of scale which determine the currency habitat of emerging markets and developing countries with underdeveloped capital markets. Backed by the large size of US goods and financial markets – outside of Europe – the dollar is the dominating international means of payment, unit of account and store of value. Due to the substantial size of the European goods and financial markets, the euro has steadily gained importance within the EU and countries linked to the European integration process (ECB 2009). An increasing number of countries have redirected their exchange rate strategies towards the euro and foreign reserves are increasingly held in euro denominated assets. Beyond the European Union the euro has gained a prominent role in the issuances of international debt securities, cross border loans and foreign exchange trading (Chinn and Frankel 2008 and ECB 2009).

Given the asymmetric use of national monies for international exchange a stylized pattern of the world monetary system is shown in Figure 2. The US dollar is the dominant world currency with a large number of countries pegging their currencies more or less tightly to the dollar. The most important regions which maintain common dollar pegs (and therefore informal dollar standards) are East Asia, the Middle East, (Latin) America and the Commonwealth of Independent States includ-

ing Russia.[1] The euro is the second (regional) international currency with a flexible rate against the dollar. In the backyard of the euro area an increasing number of countries are pegging their currencies to the euro. This implies flexible exchange rates between the euro periphery and the dollar periphery.

The dominant international role of center currencies is reflected in international trade flows and the size of financial markets. The global trade matrix as shown in Table 2 reveals the leading role of the US and Europe as trade hubs. For most parts of the world the US and the EU are the most important trading partners. But also East Asia 10 (including China) has become a center of international trade with (bilateral) trade volumes having become equivalent to the US and Europe. This picture changes with respect to the international role of the national currencies as proxies for the size of financial markets (Table 3). Clearly the dollar is the leading international currency with 43% of worldwide foreign exchange transactions involving the US dollar, followed by the euro with 19%. In contrast, the international role of the Japanese yen (9%) and the Chinese yuan (listed among others in Table 3) are small, clearly reflecting the asymmetric pattern of the world monetary system.

2.2. Macroeconomic Policy Asymmetries

The structural asymmetries of the world monetary system influence the macroeconomic policy behavior of anchor and periphery countries, in particular with respect to the weight of the exchange rate in monetary policy reaction functions. The US and Germany (backed by the euro area since 1999) as large, comparatively closed economies with deep financial markets focus their monetary policy decisions on domestic targets such as price stability, output and financial stability. External targets such as exchange rate stability and export competitiveness are subordinated, with the exchange rate being left to float freely.[2]

The left panels of the central bank balance sheet matrix in Figure 3 visualize the process of money creation in center countries. In the case of the Federal Reserve (up to the crisis) outright purchases of US government bonds are reflected by rising claims on the central government on the asset side of the balance sheet and an increase of reserve money on the liability side (upper left panel of Fig-

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[1] The composition of the single country groups is listed in Table 1. The African countries partly peg to the euro and partly to the dollar. They are not included in the sample for parsimony reasons. Although Russia has adopted a currency basket containing both euro and dollar we list it as a member of the dollar periphery.

[2] Foreign exchange intervention takes place only on discretionary basis and is rare. Japan, which adopted a flexible exchange rate regime in the early 1970s, is treated here as a periphery country because the exchange rate plays a

ure 3). Foreign assets remain widely unchanged. The European Central Bank controls money supply via repurchase agreements for a predefined set of euro area bonds (as represented by claims on the private sector in Figure 3). Whereas stocks of foreign reserves in the Eurosystems' balance sheets are higher, changes in foreign reserves holdings are small and mainly due to valuation effects.

Different monetary policy behavior of Fed and ECB can be linked to different institutional settings. The Federal Reserve follows pari passu a set of targets, namely price stability, growth, and financial stability with a considerable leeway for discretionary monetary policy decisions. In contrast, the European Central Bank follows a clear hierarchy in monetary policy targets. Growth is subordinated to price stability and a reference value for inflation is fixed. The leeway to respond to short-term (financial market) developments is smaller. The national fiscal policies of the EMU member states are – in contrast to the United States – subject to restrictions as defined in the Maastricht Treaty and the Stability and Growth Pact.

Given these different institutional settings there are different scopes for monetary and fiscal policy coordination to ensure the effectiveness of macroeconomic policies in an open economy (Mundell 1962, Fleming 1962). Such coordination is suggested for the US by the upper right panel of Figure 4 which shows declining interest rates in times of fiscal expansion and vice versa. In contrast for Germany, the scope for such coordination is small because deficit spending is restricted by EU legislation, the European Central Bank is independent and a supranational one-size monetary policy is unable to take idiosyncratic national fiscal policy stances into account.

The monetary and exchange rate policies of the periphery countries mirror the monetary policies of the center countries because they are oriented externally. Exchange rates are pegged more or less tightly to dollar or euro to import macroeconomic and microeconomic stability (Calvo and Reinhart 2002). This is reflected on the asset side of the periphery central banks' balance sheets as foreign reserves are the main counterpart for reserve money creation (left hand side of Figure 3). Even in the case of freely floating periphery economies the asset side of the balance sheet is dominated by foreign rather than domestic assets.[3] In Figure 3, the Peoples Bank of China's (dollar periphery) and the Esto-

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crucial role for monetary policy decision making (McKinnon and Ohno 1997). As a result Japan is the world's second largest holder of foreign (dollar) reserves.

[3] In many periphery countries, domestic government bonds or claims on the private sector on the asset side of the balance sheet reflect quasi government financing or bailouts in response to the financial market crisis rather than monetary policy operations which aim to keep prices stable (Schnabl and Schobert 2009).

nian Central Bank's (euro periphery) reserve money creation is due to foreign reserve accumulation with the gap between both being linked to sterilization operations (as outlined in section 3).

2.3   Current Account Asymmetries, Twin Deficits and Twin Surpluses

Since the turn of the millennium, the asymmetries in the use of international currencies and in macroeconomic policies have been accompanied by rising global imbalances as shown in the current account asymmetry matrix in Figure 5. Along the upper horizontal axis the current account deficit of the US is matched by a current account surplus of the aggregated dollar periphery[4] as represented by the current account imbalance between China and the US. The lower horizontal axis represents the intra-European imbalances. The rising German current account surplus is since the turn of the millennium accompanied by a rising current account deficit of Emerging Europe. On the right vertical axis the current account surplus of the dollar periphery is matched by a current account deficit of Emerging Europe. The left vertical axis shows that the rising current account surplus of Germany goes along with a rising US deficit since the turn of the millennium.

An additional asymmetry would be revealed if Western Europe would be decomposed into Germany and Industrialized Europe excluding Germany. While Germany as the largest EMU member (and the former center country of European Monetary System) and some smaller northern European countries exhibit rising current account surpluses, most southern European countries (e.g. Italy, Greece, Portugal, Spain, and France) have moved into deficits. The current account balance of the euro area remains widely balanced. All in all, whereas the imbalance between the US and the dollar periphery are visible since the 1980s, Germany joins the asymmetry matrix at the turn of the millennium.

3.   Estimation Frameworks and Data

The question concerning the determinants of world current account imbalances is addressed in two ways. First, in the academic discussion (section 1) periphery reserve accumulation and interest rates in the centers are acknowledged to play an important role for global current account balances. Therefore, we aim to disentangle the question of causality between interest rate changes in centers and reserve accumulation in the peripheries. Second, we strive to identify the macroeconomic determinants of the world current account imbalances with a focus on macroeconomic economic poli-

cies in center and periphery countries (in particular center monetary and periphery exchange rate policies).

3.1 Estimation Frameworks

To address the question of causality between center monetary and periphery exchange rate policies and their impact on current accounts we use three theoretical frameworks. (1) First, we test for uni-directional causalities from periphery reserve accumulation to center interest rates and from center monetary policies to periphery reserve accumulation based on panel estimations. (2) Then we acknowledge possible bidirectional causality and aim to identify the direction of causality based on panel Granger causality tests. (3) Finally, we test for the impact of both center and periphery macroeconomic policies on current account positions.

(1) First, we assume the peripheries to be exogenous and estimate the impact of reserve accumulation on the interest rate levels in the center countries. This approach is in line with Dooley, Folkerts-Landau and Garber (2003) and Bernanke (2005) who assume mercantilist trade strategies and a global saving glut, which depresses US interest rates. Alternatively, following McKinnon and Schnabl (2009) who base their argument on the structural characteristics of center and periphery countries as presented in section 2 causality from the centers to the peripheries is assumed.

We apply the following cross-country panel model:

$$w_{it} = \gamma_i + v'_{it}\,\delta_i + \varepsilon_{it}\ ,$$

where w_{it} is the vector of the dependent variables from 1981 to 2008. The explanatory variable v_{it} consists of the explanatory variables and controls. The estimations are made for the world as a whole and the regional subsamples as shown in Figure 2 and specified in Tables 1 and 4. Every country in the sample is treated in the same way as one policy choice without being weighted by country size. To control for possible reverse causality among macroeconomic variables in the center and periphery countries, GMM estimators (Arellano and Bond 1991, Blundell and Bond 1998) are applied. The regressors lagged by one period are used as instruments. The number of instruments equals the number of regressors. As the null hypothesis of the Hausmann specification tests can be rejected fixed effects models are applied. This allows controlling for country specific characteristics.

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[4] East Asia 10, Middle East, (Latin) America and Commonwealth of Independent States.

(2) To merge both approaches we perform a panel Granger causality test for interest rates in the centers and reserve accumulation in the peripheries. The Granger test aims to provide evidence in favor of either the Bernanke (2005) or McKinnon-Schnabl (2009). Alternatively, bidirectional causality between center interest rates and periphery reserve accumulation may be revealed.

Granger causality tests (Granger 1969) are a standard tool to analyze causality linkages in applied econometrics. More recently Granger causality tests have been applied to a panel context (Holtz-Eakin et al. 1988, Hurlin and Venet 2004). In formal terms variable A does not Granger-cause variable B, if the prediction error of a forecast of B based on lagged information on B is the same as the prediction error of B based on lagged values of variables A and B. If all past values of variable B are found to be jointly statistically significant in explaining variable A the null hypothesis of non-Granger causality can not be rejected. If so variable A Granger-causes variable B.

GMM estimators are applied to cope with the inherent endogeneity problem. Because the standard errors of two-step estimators tend to be biased downwards (Arellano and Bond 1991), Blundell and Bond (1998) one-step estimation results are reported. The Hansen test of overidentifying restrictions checks for the validity of the applied GMM instruments. The Hansen test statistic is rejected if the GMM instruments are exogenous (uncorrelated with the error term). The Hansen test is robust to heteroskedastic error terms and autocorrelation, which are common in the context of GMM estimations (Roodman 2009). As instruments lagged values of both variables (A and B) are applied. The Granger causality is verified based on the Wald test. The null hypothesis of the Wald test assumes that the effect of the lagged variable A (explanatory variables) on variable B (dependent variable) is jointly zero. If the null hypothesis can be rejected Granger causality is assumed.

(3) We aim to trace the impact of center and periphery macroeconomic policies on the national current account positions. Monetary and exchange rate policies are at the core of global imbalances as suggested by the literature. Fiscal policies have an impact on government savings for some countries or country groups, as they affect the private and public saving patterns (Freitag and Schnabl 2010). On the side of the periphery countries, the main policy variable is widely assumed to be the exchange rate as assumed by Dooley, Folkerts-Landau and Garber (2003), Cline (2005) and Fratzscher (2008). We use foreign reserve accumulation as a proxy for exchange rate stabilization. In addition – given nominal exchange rate stabilization – current account balances can be affected by sterilization operations for two reasons (Freitag and Schnabl 2010): First, as in the case of China

before the crisis non-market based sterilization depresses investment without stimulating saving. Second, as in the case of many raw material exporting countries, sterilization via government deposits at the central bank has a positive impact on government saving and a negative impact on private investment. Therefore in raw-material exporting countries twin surpluses (in government budgets and current accounts) can be observed.

3.2 Data

The sample contains the US and Germany as center countries and 91 periphery countries. The periphery sub-samples correspond to the six peripheries as identified in Table 1. The dollar periphery is subdivided into (Latin) America including Canada (19 countries), East Asia (10 countries), the Middle East (14 countries), and the Commonwealth of Independent States (CIS) (12 countries). The periphery of Germany is subdivided into Emerging Europe (20 countries) and Industrialized Europe excluding Germany (16 countries).

The time period for all estimations and tests starts – if data are available - in 1981 and goes up to the year 2008. For the former socialist economies (CIS and Emerging Europe) the samples starts in 1994 when a wider set of data became available for most countries in the sample. Monthly and yearly data are applied for the estimations depending on the data frequency being available. Yearly data are the highest frequency for which data are available for all macroeconomic variables including governments deficits. Panel Granger causality tests are based on monthly data as interest rates and reserves are available in higher frequencies and more robust information can be gained due to the larger sample size.

All data are from the IMF (WEO, IFS) or national central bank statistics. Yearly current account data, government deficits and foreign reserves are measured in percent of GDP. Yearly interest rates are included in levels. The proxy for sterilization is calculated as the gap between net foreign assets and currency in circulation as percent of GDP.[5] Panel unit root tests reveal that there is no concern about stationary in the data set. In monthly data the interest rates are also measured in levels. While the reserves measured as a percentage of GDP are stationary for yearly data, the same proxy is not stationary for monthly data. Therefore, monthly foreign reserves are proxied as the absolute first differences divided by GDP.

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[5]   Concerning more information with respect to the choice of this sterilization proxy see Schnabl and Schobert (2009).

4. Estimation Results

To test for the determinants of the current account asymmetry matrix as shown in Figure 5 we perform panel GMM and Granger estimations for the world as a whole and single country groups. As China is of particular policy interest with respect to global imbalances we report isolated results for China albeit (like US and Germany) the sample size is very small and therefore have to be treated with caution.

4.1. Unidirectional Causalities

First, we test for possible causalities between center monetary policies and periphery foreign reserve accumulation, i.e. international monetary policy transmission, based on a GMM framework as specified in section 3. Table 5 shows the estimation results with periphery foreign reserve accumulation being treated as exogenous and the interest rate of the center country as endogenous. The interest rate of the other center country is used as a control variable. In line with Bernanke's (2005) global saving glut hypothesis reserve accumulation in the peripheries seem to have in many cases a statistically significant impact on short-term interest rates in the center countries.

For the US interest rate, as shown in the upper part of Table 5, the β_2-coefficients of all regions including Emerging Europe (but excluding industrialized Europe) turn out highly significant with negative signs: Rising reserves in the peripheries are linked to declining short-term interest rates in the US. This finding also holds for China (albeit at a slightly lower significance level) and the world as a whole. Foreign US government bond purchases seem to remain unsterilized and US short-term interest rates decline. Alternatively, low-price East Asian imports keep US inflation low which allows the central bank to maintain a low interest rate.

The lower part of Table 5 shows the impact of periphery reserve accumulation on German/euro area interest rates while controlling for US interest rates. The significance levels are substantially lower than in the case of the US. Only East Asian and Emerging European reserve accumulation is linked to interest rates in Germany/euro area at the common significance levels. The coefficient is only highly significant for Emerging Europe where exchange rates are tightly pegged to the German mark/euro. In particular, Chinese reserve accumulation and reserve accumulation of the world as a whole does not seem to have any impact on German/euro area interest rates. Combining the upper and the lower part of Table 5, the results suggest that on aggregated levels world foreign reserves

have been to large extend invested in the US rather than in Germany/euro area. This was accompanied by a significant impact on the US interest rate level. This is in line with the stylized facts that US is a net capital importer whereas Germany (and the euro area) are not.

The estimation results for an assumed causality running from center interest rates to periphery reserve accumulation are reported in Table 6. The upper part of Table 6 shows the impact of US interest rates on periphery reserve accumulation. The mostly negative signs indicate that declining US interest rates lead to increasing reserve accumulation in the periphery countries (as private capital is flowing downhill and puts the periphery currencies under appreciation pressure thereby triggering reserve accumulation).[6] This finding holds for all peripheries including Emerging Europe and China at highly significant levels. In contrast, for Industrialized Europe and Germany the signs of the β_2 coefficients are positive[7] and in the case of industrialized Europe insignificant.

Assuming Germany as a center country the pattern remains unchanged. Note that the major part of the sample refers to Germany. It can be assumed that the relationship of Germany vis-à-vis most of Europe has substantially changed after 1999, and that the results mostly capture the situation before the euro was created (given that the data sample period in the paper starts in 1981). Declining German/euro area interest rates are associated with rising reserves in all peripheries, China in specific and the world as a whole at highly significant levels. Again, the negative signs represent hunt for yield and carry trades, which gain momentum in a low interest rate environment in large financial markets. In contrast, for the industrialized European countries[8] and the US the sign is inversed or insignificant. Estimating Germany and the US simultaneously there is a highly significant impact of US interest rates on interest rates in East Asia, (Latin) America and the world as a whole. For Germany as an important capital exporter the impact seems even stronger, exhibiting a strong impact on most peripheries including Emerging Europe and the world as a whole.

All in all, the estimations reported in Table 5 and Table 6 suggest that there is a strong correlation between center interest rates and periphery reserve accumulation going into one or the other direc-

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[6]   To this end, primarily public capital is flowing uphill.

[7]   The positive sign for German reserves (which are measured in dollars) may reflect valuation effects, i.e. an appreciation of non-dollar currencies against the dollar.

[8]   Many countries of this country group are members of the euro area and therefore foreign reserves are widely constant. The significant positive coefficient may reflect valuation effects.

tion. This may indicate a bi-directional, self-reinforcing relationship, which is tested based on a panel Granger causality framework.

4.2 Granger Tests

The results for the Granger causality tests are reported in Table 7. Note that in contrast to the GMM estimations monthly data are used, which helps to increase the robustness of the results. Furthermore, we assume in line with the tests above that monetary policy decisions are represented by interest rates in the center countries and by reserve accumulation in the peripheries. In the upper part of Table 7, the reserves in the peripheries were regressed on lagged reserves and lagged center interest rates. If adding lagged center interest rates to the autoregressive terms adds explanatory power to the regression, center interest rates Granger-cause periphery foreign reserves. The respective test statistics are represented by the Wald test for joint significance of the lagged interest rate variables. The US is used as a center country for the dollar peripheries; Germany is used as a center country for Emerging Europe and Industrialized Europe excluding Germany.

For the US and the dollar peripheries (East Asia 10, Latin America, Middle East and CIS) the Granger test provides evidence only in favor of a panel Granger causality from US interest rates to periphery reserve accumulation for East Asia 10 at the common significance levels. For the Middle East and the CIS the Wald test is close to the ten percent significance level. With respect to Germany, center interest rates do not Granger cause reserve accumulation in Emerging Europe. For Industrialized Europe, the Wald test is close to the common significance level.

In the lower part of Table 7 the results for causality from periphery reserves to center interest rates are reported. The Wald test indicates strong evidence in favor of causality from East Asian reserve accumulation to US interest rates. This could imply a bidirectional causality for the US and East Asia: As the US keep interest rates low, the East Asian countries attract private capital inflows which trigger reserve accumulation, for instance to maintain competitiveness of exports (Dooley, Folkerts-Landau and Garber 2003) and to sustain the domestic value of foreign currency denominated reserves (McKinnon and Schnabl 2009). As periphery reserve accumulation is linked to substantial purchases of US government bonds and the lower US import prices the interest rate level in the US is kept low (Bernanke 2005). Note, however, that such a bidirectional causation as suggested by the Granger test, does not allow for an assessment which side has initiated or started this circle of center interest rate cuts and periphery reserve accumulation. For Europe, a self-energizing bidi-

rectional causality is found for Industrialized Europe but not for Emerging Europe with respect to Germany.

4.3 Policy Transmission

Macroeconomic policies were identified in section 2 and section 3 as crucial determinants of current account positions. Building upon the discussion above we test for the transmission of center and periphery macroeconomic policies on the overall current account positions. On the side of the center countries we use monetary and fiscal policies as determinants of the current accounts. On the side of the periphery countries reserve accumulation and sterilization policies are used as determinants of the current account. The results are reported in Table 8.

The upper part of Table 8 models macroeconomic policy transmission on current account positions treating the US as center. The strongest evidence in favor of an impact of macroeconomic policies on current account positions is found for the US and East Asia. US interest rates cuts are associated with rising current account positions of the East Asian countries (significant at the ten percent level). A declining US deficit, for instance triggered by rising growth in the face of low interest rates, is linked to rising current account surpluses in East Asia. East Asian exchange rate stabilization as represented by reserve accumulation is accompanied by higher East Asian current account surpluses at a highly significant level. Sterilization policies, measured by the gap between foreign reserves and currency in circulation as percent of GDP, have a highly significant statistical impact on the East Asian current accounts. The transmission could be via saving and investment patterns. As non-market-based sterilization tightens investment and leaves saving unaffected the saving surplus and therefore the current account surpluses increase.

From the point of view of the US, only US monetary policies are linked to the US current account position. As US interest rates fall, the current account balance deteriorates (position coefficient, significant at the 5% level). Estimating China separately renders only the sterilization coefficient statistically significant. All in all, the results for East Asia and the US mostly support the finding of the panel Granger causality test, i.e. a bidirectional self-reinforcing causality originating in expansionary US monetary policies and real exchange rate stabilization in East Asia. Real exchange rate stabilization in East Asia is due to both nominal exchange rate stabilization as represented by reserve accumulation and real exchange rate stabilization as represented by the combination of nominal exchange rate stabilization and sterilization.

For the other country groups with respect to the US, the evidence for the impact of center and periphery macroeconomic policies on current accounts is mixed. For (Latin) America, the current account positions seem to be driven by US monetary policies, periphery reserve accumulation and periphery sterilization policies (but the latter with the wrong sign). In the Middle East only sterilization policies, represented by general government surpluses and government deposits at the central bank, turn out highly significant. This is in line with the twin surpluses of the oil exporting countries and the low price elasticity of raw material exports. As sterilization slows down domestic consumption, investment and imports while public saving hikes, current account surpluses increase.

In the CIS, only US interest rates are significant at the common significance levels. For Emerging Europe, neither US macroeconomic policies nor sterilization patterns seem to have an impact on the current account positions. In contrast to East Asia and Latin America, reserve accumulation is linked to rising current account deficits. Finally, for the world as a whole both US monetary and fiscal policies as well as periphery sterilization and exchange rate stabilization policies seem to have an impact on current accounts at the common significance levels.

In the lower part of Table 8 the estimation results with Germany as a center country are reported. In general, there is strong indication for a negative correlation between German interest rates and the current account balances of the dollar peripheries, Industrialized Europe and Germany itself. With respect to Germany, Emerging Europe is of specific interest. In sharp contrast to the dollar periphery, declining interest rates in the Germany are linked to rising current account deficits in Emerging Europe (and US) at high significance levels. A declining government deficit in Germany (for instance in economic upswings) is accompanied by declining current account deficits in Emerging Europe. In contrast to East Asia sterilization policies in Emerging Europe have a no significant impact on the Emerging European current account balances. Thus, the main difference between East Asia and Emerging Europe may not be the fact that nominal exchange rates are stabilized but that there are different attitudes with respect to sterilization and thereby real exchange rate stabilization.

5. Conclusion

In the recovery after the global crisis – as represented by the revived conflict about the Chinese dollar peg – global imbalances can be expected to strengthen again. Our paper aimed to trace the origins and transmission channels of global imbalances based on the assumption that the world can be

subdivided into two center and many periphery countries. We have shown that there is no mono-causal, unidirectional explanation to global imbalances. Instead, global imbalances are seen as the outcome of macroeconomic policy interaction of center and periphery countries.

In the US, low interest rates have contributed to the current account deficit as private saving declined and rising government deficits tended to be accompanied by interest rate cuts. In the dollar peripheries, both nominal **and** real exchange rate stabilization can be associated with current account surpluses. Current account surpluses in the dollar peripheries have tended to rise, as nominal exchange rates were stabilized via reserve accumulation and real exchange rates were stabilized via sterilization operations. In this context, the periphery countries have few degrees of freedom concerning sterilization, as without such policy intervention these countries - including China – would be victims to (even stronger) inflation and overheating as in Emerging Europe prior to the recent crisis (as well as the East Asian crisis countries prior to the Asian crisis).

To this end, as partially reflected in the econometric exercises, imbalances within the dollar bloc are the outcome of a mutual self-reinforcing process. Nevertheless, it remains unclear from the econometric exercise if the center or the periphery has triggered the circle of interest rate cuts and reserve accumulation. Our theoretical analysis would suggest that only the center countries have the necessary structural characteristics to give momentum to such a process. If this is the case, global imbalances could be only cured if the US would returns to tighter monetary and fiscal policy stances.

With respect to Germany and Emerging Europe the econometric exercise does not yield sufficient evidence to answer the question of why Emerging Europe have continued to run current account deficits while Germany has moved into current account surpluses. One answer could be that, in contrast to the dollar periphery, sterilization operations had a smaller scope and exchange rates were allowed to appreciate in real terms. Then, the main determinant of periphery current account balances would be real rather than nominal exchange rate stabilization. It should be noted that the relationship of Germany vis-à-vis most of Europe has substantially changed after 1999, and therefore the results mostly capture the situation before the euro was created, given that the sample period used for estimation in the paper starts in 1981.

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Figure 1: Shares of Countries with Current Account Surpluses in Periphery Regions

Legend:
- CIS
- East Asia 10
- EMU
- Emerging Europe
- (Latin) America
- Middle East

y-axis: as a fraction on all countries in region

x-axis: 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008
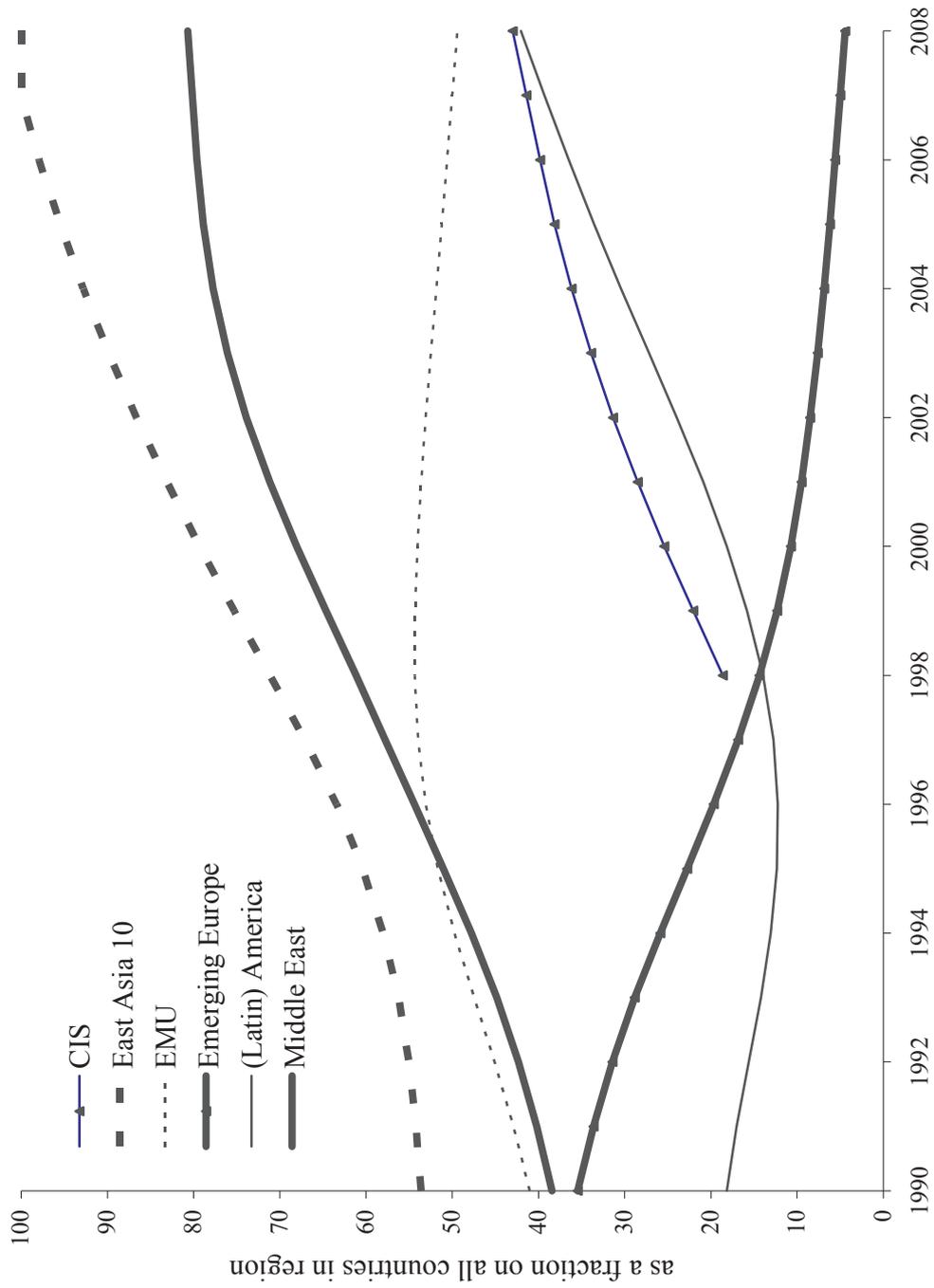
Source: IMF 2009. To reveal trends time series are smoothed by the HP filter.

Figure 2: Stylized World Monetary System*

Periphery Ia: East Asia (15,854)

Perihery Ib: Middle East (1,814)

Periphery Ic: Latin America (6,107)

Periphery Id: CIS (4,172)

Periphery II: Emerging Euope (4,431)

Center I (United States) (14,265)

Center II (Euro Area) (13,633)
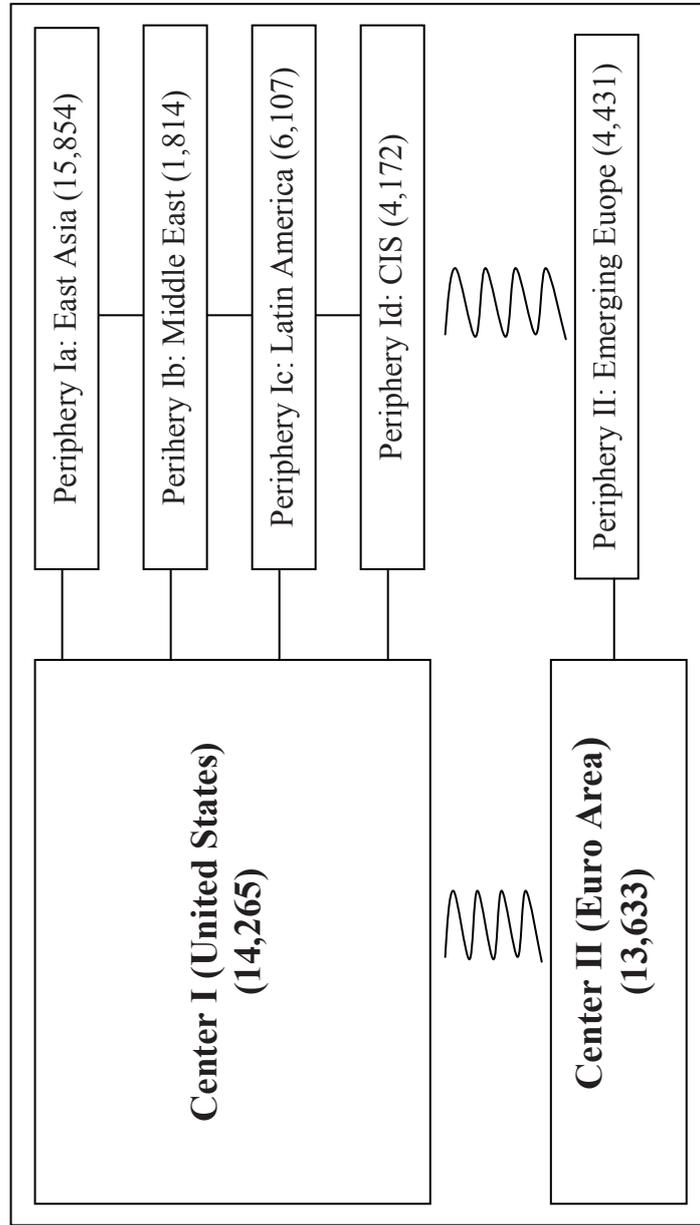
* The aggregated GDP (2008) is given in billions of US dollars in the brackets.

Figure 3: Central Bank Balance Sheet Matrix
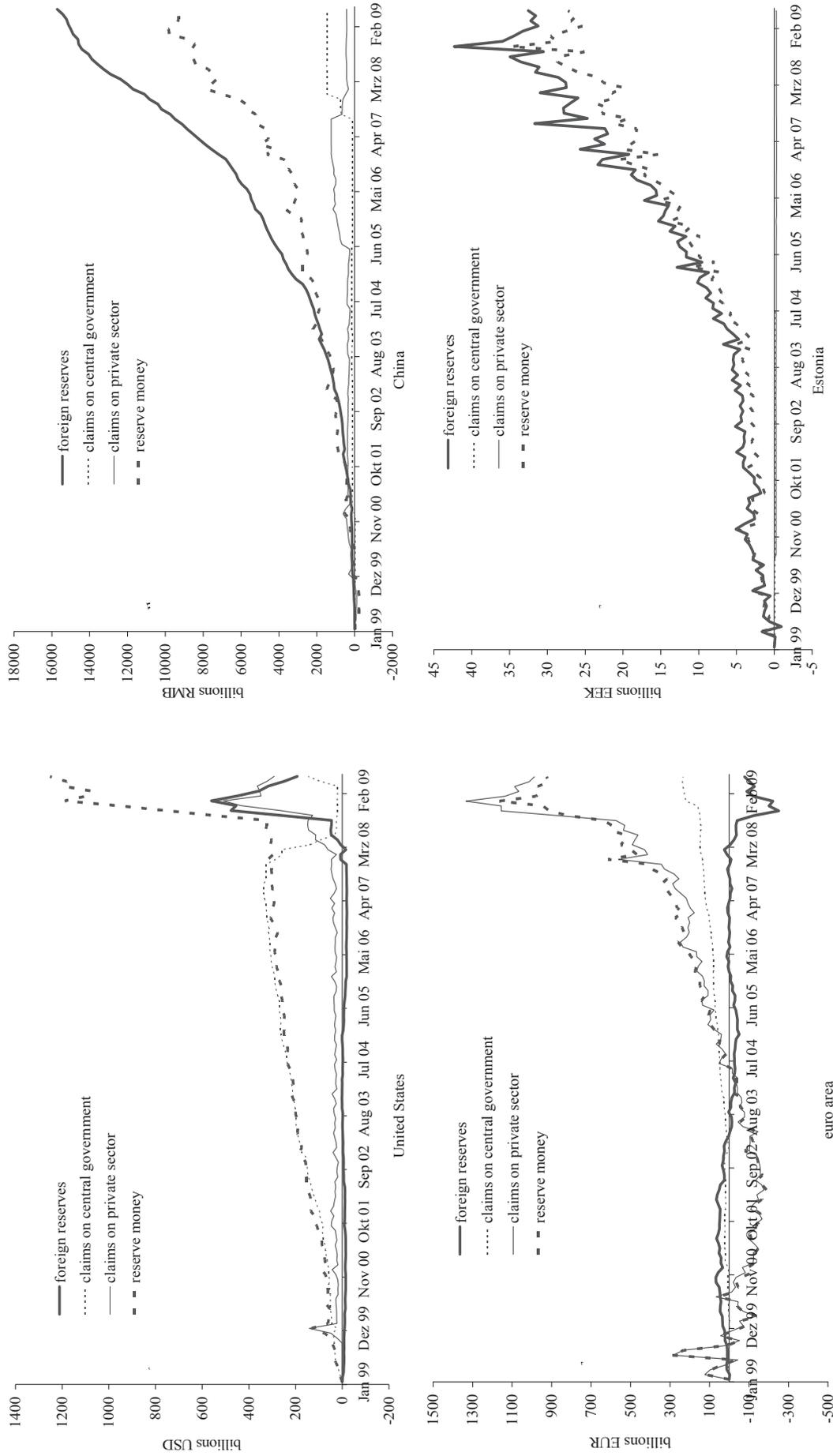
Source: IFS and WEO 2009.

Figure 4: Macroeconomic Policy Behavior of Center Countries (1990-2008)

US, euro area and German general government deficits

euro area and German macro policies
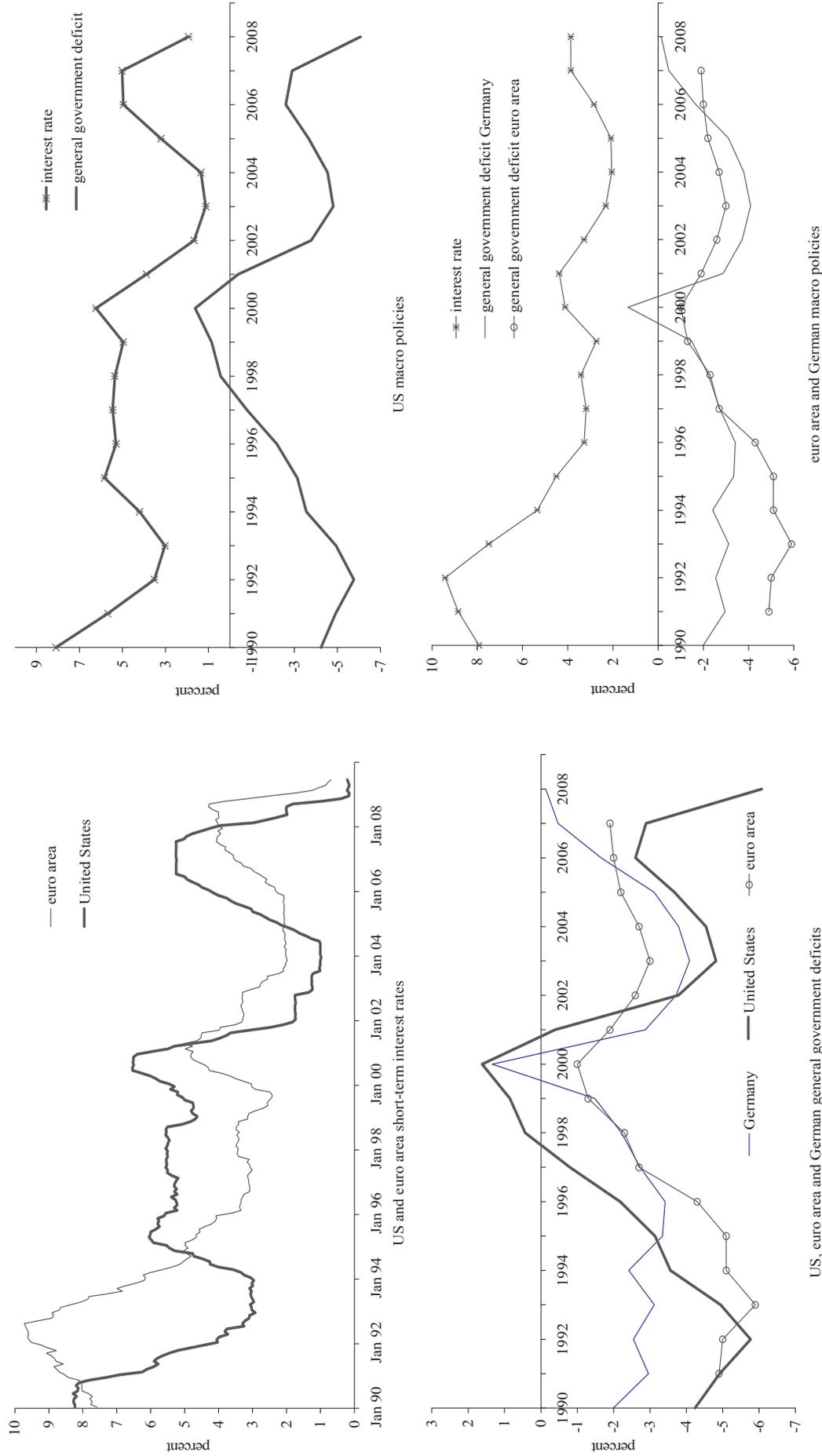
Source: IFS and WEO 2009. The general government deficits are measured as a percent of domestic GDP.

Figure 5: Current Account Asymmetry Matrix

United States

USD Periphery

Germany

Emerging Europe
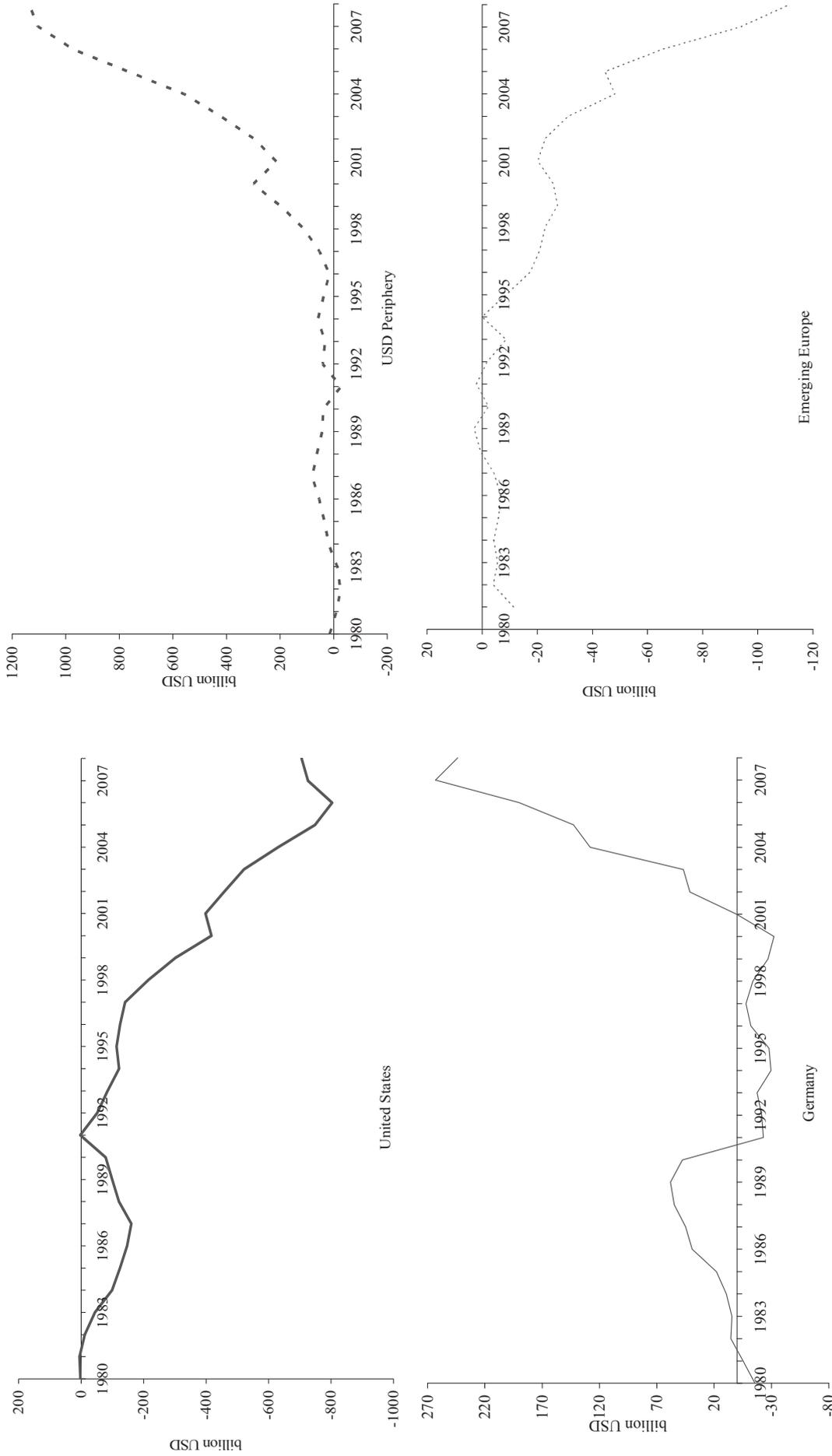
Source: IFS and WEO 2009.

Table 1: Country Groups

Region	Countries
(Latin) America ($)	Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela
East Asia 10 ($)	China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Taiwan, Thailand
Middle East ($)	Algeria, Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Lebanon, Libya, Oman, Saudi Arabia, Syria, United Arabian Emirates, Yemen
CIS ($)	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
Emerging Europe (€)	Albania, Bosnia, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Iceland, Latvia, Lithuania, Macedonia, Malta, Morocco, Poland, Romania, Slovak Republic, Slovenia, Tunisia, Turkey
Industrialized Europe excl. Germany (€)	Austria, Belgium, Denmark, Finland, France, Greece, Italy, Ireland, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom

Table 2: Matrix of Global Trade

	United States	Rest of America	East Asia 10 (China)	Middle East	Russia	EU-25 (Germany)	Σ
United States		1168	965 (303)	92	18	605 (148)	**2848**
Rest of America	1168		351 (100)	28	14	299 (64)	1860
East Asia 10 (China)	965 (303)	351 (100)		500 (99)	92 (40)	299 (64) — East Asia 1057 (261) | China 353 (94)	**2965**
Middle East	92	28	500 (99)		12	294 (48)	926
Russia	18	14	92 (40)	12		312 (77)	448
EU-25 (Germany)	605 (148)	299 (64)	EU-25* 1057 (353) | Germany+ 261 (94)	294 (48)	312 (77)		**2567**
Σ	**2484**	1860	**2965**	926	448	**2567**	

Source: IMF: DOTS. All data for 2007 are in billion USD. *The East Asian trade volume with the EU-25 countries equals 1057 billion dollars, whereas the Chinese trade volume with the EU-25 countries equals 353 billion dollars. +The trade volume of East Asia 10 with Germany equals 261 billion dollars, whereas the trade volume between China and Germany equals 94 billion dollars.

Table 3: Matrix of Foreign Exchange Turnover

	U.S. dollar	euro	yen	pound sterling	Swiss franc	Canadian dollar	Australian dollar	other	Σ
United States	41%	19%	8%	7%	3%	4%	2%	15%	100%
Rest of America	48%	5%	2%	3%	1%	23%	1%	17%	100%
East Asia	45%	9%	18%	4%	1%	1%	4%	18%	100%
Middle East	47%	5%	2%	3%	1%	0%	0%	41%	100%
Russia	48%	19%	2%	4%	0%	0%	0%	25%	100%
EU-27	43%	23%	6%	9%	5%	1%	2%	11%	100%
World	43%	19%	9%	7%	4%	2%	2%	14%	100%

Source: Bank of International Settlement 2009. Foreign exchange turnover in April 2007 based on daily averages.

Table 4: Structure of the Panel

Area	Region	Array	Number
US	0	0	1
(Latin) America (LA)	1	1-19	19
East Asia 10 (EA)	2	20-29	10
Middle East (ME)	3	30-43	14
CIS (CIS)	4	44-55	12
Emerging Europe (EE)	5	56-76	20
Industrialized Europe excl. Germany	6	77-92	16
Germany	7	93	1

Table 5: Determinants of World and Regional Interest Rates (1981*-2008)

Regression on interest rates	World	East Asia-10	(Latin) America	Middle East	CIS	Emerging Europe	Ind. Eur. ex. GER	China
Dependent Variable: US interest rate								
Constant (α)	6.012***	10.026***	6.357***	5.019***	11.158***	12.447***	5.830***	12.703***
	(0.208)	(0.922)	(0.452)	(0.487)	(1.288)	(1.114)	(0.412)	(4.948)
Periphery Reserves (β_2)	-9.256***	-15.687***	-14.742***	-3.296***	-25.011***	-23.955***	-0.867	-27.338*
	(0.807)	(2.207)	(2.152)	(1.192)	(4.207)	(3.330)	(4.671)	(14.431)
German interest rate (β_1)	0.652***	0.340***	0.677***	0.767***	-0.658**	-0.380**	0.512***	-0.163
	(0.030)	(0.101)	(0.061)	(0.070)	(0.306)	(0.191)	(0.062)	(0.642)
Adj. R-squared	0.389	0.409	0.404	0.367	-0.156	0.018	0.166	-0.255
Dependent Variable: German interest rate								
Constant (α)	0.657***	1.717**	0.562	0.702*	0.846	2.185***	-0.438	1.340
	(0.181)	(0.858)	(0.443)	(0.409)	(0.657)	(0.661)	(0.498)	(2.730)
Periphery Reserves (β_2)	-0.966	-3.163*	-0.535	-0.987	3.085	-5.191***	7.220*	-2.830
	(0.607)	(1.821)	(1.743)	(0.879)	(2.349)	(1.697)	(4.206)	(7.355)
US interest rate (β_1)	0.528***	0.481***	0.542***	0.541***	0.347***	0.294***	0.579***	0.485**
	(0.016)	(0.061)	(0.035)	(0.038)	(0.072)	(0.059)	(0.050)	(0.223)
Adj. R-squared	0.359	0.380	0.339	0.330	-0.304	0.234	0.130	0.435
Observations	2364	270	528	376	172	254	390	28
Countries	93	10	19	14	12	20	16	1

Two-step Arellano-Bond estimators with country fixed effects are applied. Standard errors in parentheses. ***, **, * denotes significance at 1%, 5% and 10% level. J-Statistics for all estimates < 0.001, $\chi2(1)$, p-value > 0.99. All variables are stationary. Aggregates of the CIS and Emerging Europe are based on data from 1994 to 2008.

Table 6: Determinants of World and Regional Reserve Accumulation (1980*-2008)

Regression on reserves:	World	East Asia-10	(Latin) America	Middle East	CIS	Emerging Europe	Ind. Eur. ex. GER	United States	Germany	China
Constant (α)	0.197***	0.401***	0.176***	0.265***	0.166***	0.258***	0.058***	-	-0.024*	0.307***
	(0.005)	(0.038)	(0.008)	(0.022)	(0.020)	(0.018)	(0.004)		(0.008)	(0.068)
US interest rate (β_1)	-0.009***	-0.021***	-0.009***	-0.010***	-0.011***	-0.013***	0.0001	-	0.007***	-0.021**
	(0.001)	(0.004)	(0.001)	(0.002)	(0.003)	(0.002)	(0.001)		(0.001)	(0.007)
Adj. R-squared	0.688	0.886	0.449	0.420	0.556	0.549	0.566		0.295	0.126
Constant (α)	0.182***	0.366***	0.149***	0.252***	0.217***	0.292***	0.051***	0.003***	-	0.312***
	(0.004)	(0.029)	(0.007)	(0.019)	(0.023)	(0.019)	(0.003)	(0.001)		(0.536)
German interest rate (β_2)	-0.012***	-0.028***	-0.010***	-0.014***	-0.036***	-0.035***	0.001**	0.0002	-	-0.036***
	(0.001)	(0.005)	(0.001)	(0.003)	(0.006)	(0.005)	(0.001)	(0.0001)		(0.009)
Adj. R-squared	0.682	0.876	0.410	0.414	0.472	0.540	0.568	0.134	-	0.260
Constant (α)	0.202***	0.411***	0.178***	0.270***	0.281***	0.310***	0.057***	-	-	0.323***
	(0.005)	(0.035)	(0.008)	(0.022)	(0.024)	(0.020)	(0.004)			(0.064)
US interest rate (β_1)	-0.004***	-0.010***	-0.007***	-0.004	-0.0001	-0.003	-0.001*	-	-	-0.002
	(0.001)	(0.004)	(0.001)	(0.003)	(0.003)	(0.003)	(0.001)			(0.009)
German interest rate (β_2)	-0.009***	-0.020***	-0.004**	-0.011**	-0.036***	-0.034***	0.002***	-	-	-0.034**
	(0.001)	(0.005)	(0.001)	(0.004)	(0.007)	(0.005)	(0.001)			(0.013)
Adj. R-squared	0.692	0.897	0.453	0.421	0.470	0.556	0.559			0.296
Observations	2399	271	529	378	175	296	444	28	28	28
Countries	93	10	19	14	12	20	16	1	1	1

Two-step Arellano-Bond estimators with country fixed effects are applied. Standard errors in parentheses. ***, **, * denotes significance at 1%, 5% and 10% level. J-Statistics for all estimates < 0.001, $\chi_2(1)$, p-value > 0.99. All variables are stationary. Aggregates of the CIS and Emerging Europe are based on data from 1994 to 2008.

Table 7: Panel Granger Causality Test for the Center Interest Rates and Periphery Foreign Reserves (Jan 1981 – Dec 2008)

Dependent Variable: Reserves of Periphery Countries

	East Asia-10	Latin America	Middle East	CIS	Emerging Europe	Ind. Eur. excl.GER
Interest Rates(-1)	-0.1658**	-0.1265	0.3585**	-0.4350	-0.1412	0.5127*
	(0.0767)	(0.08073)	(0.1722)	(0.5065)	(0.1683)	(0.3136)
Interest Rates(-2)	0.0754	0.0008	-0.3345**	0.5611	0.0883	-0.6135*
	(0.0753)	(0.0682)	(0.1721)	(0.5733)	(0.1500)	(0.3462)
Reserves(-1)	-0.9402***	-0.2541*	-0.9144***	-0.2401	-0.2509**	0.3114***
	(0.0083)	(0.1756)	(0.3080)	(0.2270)	(0.1106)	(0.1328)
Reserves(-2)	-0.8101***	-0.5550***	-0.0621	0.0701	-0.0018***	-0.0310**
	(0.0358)	(0.1202)	(0.0681)	(0.0582)	(0.0005)	(0.0144)
Number of obs.	2889	5531	3444	1188	2480	4832
Wald-Test (p-level)	0.008	0.9366	0.114	0.140	0.457	0.1073
Hansen-Test (p-level)	0.288	0.276	0.243	0.215	0.340	0.405

Dependent Variable: Interest Rates of Center Countries

	East Asia-10	Latin America	Middle East	CIS	Emerging Europe	Ind. Eur. excl.GER
Interest Rates(-1)	1.3607***	1.3438***	1.2519***	1.7957***	1.0826***	1.3580***
	(0.0009)	(0.0060)	(0.0424)	(0.0749)	(0.0525)	(0.0150)
Interest Rates(-2)	-0.2992***	-0.3592***	-0.2461***	-0.7830***	-0.0255	-0.3310***
	(0.0007)	(0.0057)	(0.0395)	(0.0832)	(0.0397)	(0.0160)
Reserves(-1)	-0.0023***	0.0101	0.1688	0.0669	0.2737	0.0216**
	(0.0002)	(0.0407)	(0.1257)	(0.0563)	(0.3150)	(0.0113)
Reserves(-2)	-0.0008***	-0.0122	0.0046	-0.0069	0.0016	-0.0026**
	(0.0002)	(0.0220)	(0.0101)	(0.0154)	(0.0021)	(0.0011)
Number of obs.	2889	5535	3455	1190	2484	4842
Wald-Test (p-level)	0.000	0.7802	0.248	0.430	0.647	0.073
Hansen-Test (p-level)	0.109	0.211	0.148	0.193	0.243	0.136

Standard errors in parentheses. ***, **, * denotes significance at 1%, 5% and 10% level. Estimates for constant terms are not reported. The Arellano-Bond one-step estimator was applied. East Asia-10 encompasses China, Hong Kong, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Taiwan and Thailand. The US is used as a center country for the dollar peripheries; Germany is used as a center country for Emerging Europe and Industrialized Europe excluding Germany.

Table 8: Transmission of Center Macro Policies to Current Accounts (1981*-2008)

Regression on current accounts:	World	East Asia-10	(Latin) America	Middle East	CIS	Emerging Europe	Ind. Eur. ex. GER	United States	Germany	China
Constant (α)	-0.016	-0.011	-0.029**	0.020	0.241**	0.046	0.033***	-0.061***	0.087	-0.014
	(0.012)	(0.029)	(0.013)	(0.042)	(0.110)	(0.042)	(0.007)	(0.047)	(0.082)	(0.020)
US interest rate (β1)	-0.002*	-0.003**	-0.002**	-0.0002	-0.034***	-0.004	-0.003***	0.028**	-0.003	0.002
	(0.001)	(0.001)	(0.001)	(0.003)	(0.011)	(0.004)	(0.0006)	(0.001)	(0.003)	(0.001)
US Deficit (β2)	0.310**	0.359*	-0.007	0.851	1.148	0.205	0.317***	-0.142	-0.094	0.272
	(0.134)	(0.190)	(0.152)	(0.573)	(0.756)	(0.232)	(0.108)	(0.237)	(0.521)	(0.224)
Sterilization in Periphery (β3)	0.087***	0.072***	-0.137***	0.1675**	-0.209	-0.025	-	-0.370+	0.939***++	0.235***
	(0.029)	(0.023)	(0.051)	(0.083)	(0.201)	(0.096)		(0.349)	(0.481)	(0.045)
Periphery Reserves (β4)	0.121***	0.250***	0.128**	0.145	0.278	-0.413***	0.275***	0.097+	-0.558++	0.096
	(0.036)	(0.054)	(0.051)	(0.091)	(0.250)	(0.107)	(0.069)	(0.296)	(0.428)	(0.056)
Adj. R-squared	0.347	0.637	0.603	0.202	0.135	0.317	0.566	0.700	0.429	0.747
Constant (α)	-0.007	-0.004	-0.011	0.061	0.008	-0.066***	0.010	-0.054***	0.144***	-0.040
	(0.010)	(0.021)	(0.010)	(0.038)	(0.081)	(0.025)	(0.006)	(0.014)	(0.031)	(0.033)
EMU/German interest rate (β2)	-0.004***	-0.005**	-0.005***	-0.009*	-0.008	0.010***	-0.005***	0.004***	-0.011***	-0.006
	(0.001)	(0.002)	(0.001)	(0.005)	(0.013)	(0.003)	(0.0009)	(0.001)	(0.003)	(0.007)
German Deficit (β2)	0.520	0.984**	0.256	0.645	1.844*	-0.726**	-0.339	-0.165	-0.299	0.440
	(0.327)	(0.449)	(0.376)	(1.480)	(1.156)	(0.306)	(0.270)	(0.242)	(0.651)	(1.368)
Sterilization in Periphery (β3)	0.081***	0.075***	-0.138***	0.145*	-0.263	-0.012	-	-0.309***+	0.131***++	0.147
	(0.029)	(0.023)	(0.050)	(0.082)	(0.198)	(0.083)		(0.013)	(0.256)	(0.111)
Periphery Reserves (β4)	0.112***	0.252***	0.104	0.108	0.163	-0.231**	0.306***	0.045+	-0.931***++	0.237
	(0.034)	(0.045)	(0.047)	(0.092)	(0.206)	(0.096)	(0.070)	(0.113)	(0.217)	(0.207)
Adj. R-squared	0.354	0.641	0.617	0.215	0.210	0.418	0.545	0.874	0.478	0.636
Observations	1754	214	526	346	143	276	442	28	28	28
Countries	76	8	19	13	10	19	16	1	1	1

Two-step Arellano-Bond estimators with country fixed effects are applied. Standard errors in parentheses. ***, **, * denotes significance at 1%, 5% and 10% level. J-Statistics for all estimates < 0.001, χ2(1), p-value > 0.99. Aggregates of the CIS and Emerging Europe are based on data from 1994 to 2008. +: Dollar Periphery, ++: Emerging Europe and industrialized Europe excluding Germany.