Alternative Measures of Capital Flight towards Germany

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ABSTRACT

In this paper, we propose three different measures of capital flight for Germany and analyze their determinants. The measures are based on the concept of trade mis-invoicing, errors and omissions in the balance of payments and the net claims and liabilities in the Eurosystem of central banks. For each measure, we propose refinements to enhance the assessment of capital flight. We find that capital flight towards Germany has been quite sizable, summing up to about 1-2% of GDP annually. Regarding the determinants, our preliminary results suggest that the three measures of capital flight are driven by different factors. Both, traditional determinants including covered interest differentials and crisis-specific factors including policy uncertainty and redenomination risk in the Euro Area play a role, and there is evidence of a flight-to-safety motivation.

JEL Classifications: F3; F32; G15.

Keywords: Capital Flight; Flight-to-safety; Trade Mis-invoicing; TARGET2; Covered Interest Disparity.

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Alternative Measures of Capital Flight to Germany

1. Introduction

Germany's ballooning current account surplus experienced after the 2007/8 global financial crisis (see Figure 1) has been widely discussed from a trade or fiscal policy perspective.[1] As Germany does not accumulate reserves via current account surpluses, the large surpluses, backed by an outflow of goods and services, imply a substantial corresponding capital outflow. There is a parallel movement, however, which has received much less attention and that appears to go in the opposite direction: There exists substantial capital flight towards Germany via either illicit flows across borders, or flows which have been facilitated by central banks' reserve-like policies.

An astute reader may question the relevance of studying capital flight to Germany, which has in principle an open capital account. The potential economic and quantitative importance of capital flight to Germany, however, is illustrated by anecdotal evidence presented in some studies on illicit economic activities. Schneider and Buehn (2018), for instance, estimate the size of Germany's shadow economy to be 12%. The magnitude is slightly larger than the 10% Schneider estimated for China, which is widely considered to be a country with considerable illicit capital inflows and outflows (Cheung, Steinkamp and Westermann, 2016). Furthermore, Seitz (1995) and Sinn and Westermann (2001) have illustrated that about 40% of Deutsche Mark in circulation could not be explained by standard factors including aggregate output and interest rates. The unexplained amount is typically assumed to be circulating outside Germany, and be used to facilitate black-market activities.

The raids at Deutsche Bank by police in 2018 attest the seriousness of the illicit capital flow to Germany.[2] The German business newspaper Handelsblatt coined Germany the "Gangsters Paradise" in an article entitled "How Germany became the stronghold for Money Laundry."[3] The newspaper report is more than an isolated instance. The "Financial Action Task Force (FATF)," a joint initiative of the OECD and the IMF has repeatedly criticized Germany for its lenient stance on controlling illicit capital inflows.[4]

Note that not all capital flight to Germany is illicit. The capital movements via the Target2 clearing system is legal and simply a by-product of asymmetric liquidity provision across central banks. The process involves either a swap of eligible collateral items in crisis prone countries into assets in safe

[1] See, for example, Felbermeyer *et al.* (2017) and Kollmann *et al.* (2015), and the references therein.
[2] See "Deutsche Bank Raided in Laundering Probe Going Into 2018", Bloomberg, Business, November 29, 2018,
[3] See "Gangster's Paradise – wie Deutschland zur Hochburg für Geldwäscher wurde", Handelsblatt, July 25 2018. It highlights the rising number of convictions, which may only be a small part of the actual cases. A particular focus is on the real estate sector, where two institutional aspects play a role: (i) not all transactions are documented by an official notary, and (ii) the burden of proof is on the authorities. The practice is in contrast to that of, for example, Italy that requires buyers and sellers to prove the source of the money is legal.
[4] See, for example, Financial Action Task Force (2010, 2014).

countries, or a direct withdrawal of loans from countries in crisis; see Garber (1999, 2010), Sinn and Wollmershäuser (2012), Cecchetti *et al.* (2012), Reinhart (2016) and Steiner *et al.* (2017). Importantly, these transactions are not accommodating any trade in goods. This is why they need to be distinguished from regular capital flows. Practitioners have been using this indictor to identify private sector capital flight within Europe, in particular when analyzing the recent capital outflows from Italy and Spain.[5]

For devising initiatives and policies to curb capital flight to Germany, it is important to understand the mechanism and determinants of these capital flows. In this paper, we aim to accomplish three goals. First, we use three proxies to measure the unobserved capital flight, and study their properties. Second, we document the institutional setting that gives rise to illicit capital inflows, despite an open capital account. Finally, we investigate the determinants of capital flight. In addition to the canonical determinants that include covered interest differentials, macroeconomic factors, and monetary policies, we distinguish between factors pertaining to Europe and those to the rest the world. We further consider several uncertainty measures to assess the flight-to-safety motivation.

Our three proxy measures of capital flight are: (1) a trade-cost adjusted measure of trade mis-invoicing (TMI), (2) errors and omissions (E&O), and (3) private Euro Area capital flight (PEAF), as measured by the (adjusted) changes in net claims and liabilities arising from open positions in the Eurosystem's clearing system, called TARGET2. The three measures capture capital flight activities that are triggered by different motivations and considerations. For instance, TMI is likely to be associated with trade intensity and economic conditions while TARGET is mostly finance in nature. Table 1 show that TMI displays a weaker degree of association measured by correlation coefficient with E&O and TARGET2 than the association between these two other measures. Compared with TMI and E&O, PEAF has not been used in academic research on capital flight.

We find that, during our (maximum) sample period, 1991Q1 to 2018Q3, capital flight to Germany has been rising according to all three measures and is economically not negligible after the 2007/8 global financial crisis. Specially, the capital flight to Germany varies from 0.42% of GDP annually according to E&O to 1.02% according to TMI. Given the size of the German economy, the capital flight has accumulated to several hundred billion euros over the past decade. It is also interesting to consider the sum of these three measures over time. After 2008, the three measures added up to 2% of GDP; but before 2008, the sum is quite close to zero. If the three measures represent different facets or components of capital flight, their sum suggests that the capital flight to Germany is a rather recent phenomenon.

[5] See, for instance, "Capital flight from Italy surges, pushing Target2 imbalances to danger level", The Telegraph, June 07 June 2018; "The euro zone crisis - capital flight.", The Economist (Buttonwood's notebook), 21 May 2012.

2. Measures of capital flight

As there is little agreement on the exact definition of capital flight and its measurement,[6] we consider three conceptually different measures; each captures different types and motives of capital flight.

2.1 Trade Mis-invoicing

Our first measure captures trade mis-invoicing (TMI). In principle, each country's exports (and imports) are reported twice: by the country itself and by its trading partner. It is well-known, however, that often sizable differences between these mirror statistics can be observed, which are frequently attributed to the intentional mis-invoicing of international goods (Bhagwati, 1981, 1964; Cardoso and Dornbusch, 1989).[7] An economic agent can either underinvoice its exports or overinvoice its imports in order to move capital out of the country (and *vice versa*). Consequently, we measure trade mis-invoicing as the sum of export underinvoicing (EUI) and import overinvoicing (IOI); that is, *TMI = EUI + IOI*. Export underinvoicing and import overinvoicing are defined as

$$EUI = \Sigma_i^p \, [XW_{i,t} - XC_{i,t}*(1+CIF_{i,j,t})], \tag{1}$$

and

$$IOI = \Sigma_i^q \, [MC_{i,t} - MW_{i,t}*(1+CIF_{i,j,t})], \tag{2}$$

where, at time t, $XW_{i,t}$ is country *i*'s reported value of imports from Germany, $XC_{i,t}$ is Germany's reported value of exports to country *i, p* is the number of countries importing from Germany, $MC_{i,t}$ is Germany's reported value of imports from country *i,* $MW_{i,t}$ is country *i*'s reported value of exports to Germany, and *q* is the number of countries exported to Germany. Either a positive *EUI* or *IOI* implies (illicit) capital flows out of Germany. Note that, while export values are reported free on board (fob), import values are commonly reported including the costs of insurance, freight, …, etc. (cif). The variable *CIF* accounts for this wedge and is thus crucial for a precise estimation of trade mis-invoicing.

Exploiting a new dataset by the OECD, we are able to infer and back out the CIF estimate that accounts for differences between trading partners, product types and periods.[8] For a given year, the country-pair *CIF* is a weighted average of the product-specific *CIF* with the weights given by trade-volume values of individual products,

$$CIF_{i,j,t} = \sum_{g=1}^{m} \widehat{CIF}_{i,j,t,g} \, \frac{v_{t,i,g}}{\frac{1}{m}\sum_{g=1}^{m} v_{t,i,g}}, \tag{3}$$

[6] See, among others, the discussions in Claessens and Naude (1993), Kant (1996), Kar and Cartwright-Smith (2009), Schneider (2003), and Zhao et al. (2013).

[7] We do not take a stance on which country's agents report the true economic value and which one's mis-invoice.

[8] A small subset of countries reports their imports in both, cif and fob. This allows the OECD to estimate the missing values from gravity-type equation model (Miao and Fortanier, 2017).

where $\widehat{CIF}_{t,i,g}$ is the year's product- and country-pair-specific *CIF* estimate of the OECD, $i = [1, \dots, p]$ and j= $[1, \dots, p]$ are the partner and trading-partner country indices, respectively. v is the trade volume and $g = [1, \dots, m]$ the index of different OECD HS-92 product categories.

Other papers analysing trade mis-invoicing either explicitly or implicitly assume $CIF_{i,j,t} = 10\%$, $\forall i, j, t$.[9] The assumption does not match the empirical reality in several ways. First, Germany's freight costs are on average very likely to be considerably lower.[10] Second, freights costs are likely to vary over time (Hummels, 2007; Jacks *et al.,* 2008). Third, the actual value of CIF can depend on which is the exporting and which one the importing country (Wei *et al.* 2018). Fourth, CIF varies with the geographical distance between countries. Based on a standard gravity model, trade volumes and freight costs are inversely related to the distance between countries. Not taking this into account can systematically bias trade mis-invoicing estimates.

2.2 Errors and Omissions

Our second measure of capital flight is the "errors and omissions" (E&O) of the German balance of payments statistics. The double-entry principle of accounting theoretically assures a country's balance of payments (as the sum of the current account, financial account and capital account) to be zero at all times. In practice, data of different subaccounts are derived independently from different sources, giving rise to the residually derived, balancing item E&O (IMF Balance of Payments Manual, 6th edition, 2010). E&O is often referred to as unrecorded capital flows (Lane and Milesi-Ferretti, 2001, 2007) and used to study capital flight (Kant, 2002; Loungani & Mauro, 2001; Cuddington, 1986, 1987; Garibaldi *et al.,* 2001).

2.3 Private Euro Area Capital Flight (PEAF)

Our third, and final, measure is private euro area capital flight (PEAF) measure that captures private capital flight within the Euro Area via the Target2 clearing system. It is reminiscent of the capital flight typically analysed in the literature on balance of payments crises. Sachs, Tornell and Velaso (1996),for instance, describe this mechanism for the well-known case of Mexico. In Mexico 1994/5, the central bank provided credit to the domestic economy by buying assets and lending to banks. This liquidity was used by investors to convert Peso-investments into US-Dollar investments at a – by the central bank guaranteed – fixed exchange rate of about 3:1. This capital flight was essentially a flight from risky assets (Mexican governments bonds) into safe assets (US Treasury Bills). The expansionary policy stance of the central bank of Mexico facilitated this process.

[9] See, for example, Beja (2008), Buehn and Eichler (2011), Patnaik *et al.* (2012), Kar and Freitas (2012). The CIF = 10% assumption is usually justified by an older estimate of the IMF. The International Monetary Fund (2015), for instance, argues "the 10 percent c.i.f./f.o.b. factor represents a simplified estimate of these costs, which vary widely across countries and transactions".

[10] OECD (2018), for example, cites official national sources on the German cif-fob margin to have been 2.3% in 2014 over all products and partner countries.

Similarly, in Europe, investors have been taking advantage of the expansionary policy stance of the ECB. In the Eurosystem they have pledged, for instance, Italian government bonds as collateral at the Bank of Italy, and used the central-bank money to buy safer assets in Germany. The net capital outflows, from Italy to Germany in these cases, are recorded as a TARGET2-liability for the Central Bank of Italy and a TARGET2-claim for the Bundesbank. Target2 has therefore become one of the key indicators of financial market observers to monitor the intra-Euro Area capital flight.

While changes in TARGET2-balances are sometimes already by themselves interpreted as a measure of capital flight within the euro area, the TARGET2 clearing system also includes capital flows by official institutions (e.g. the German government's payments into the European Stability Mechanism) and capital flows accommodating current account imbalances. We adjust the negative change in German's TARGET2-claims (*T2*) accordingly to obtain our third measure of capital flight:

$$PEAF = -(\Delta T2) + CA^{EA} + CAP^{EA} + FA^{EA,Gov}, \tag{4}$$

where CA^{EA} and CAP^{EA} are Germany's current account and capital account balances vis-à-vis the other member countries of the European Monetary Union, respectively, and $FA^{EA,Gov}$ are intra Euro Area financial transactions of the German government.

3. Preliminary analysis

Each of our capital flight variables captures unique channels and motives for capital flight to Germany. It is thus not surprising to see positive, but less than unity, pairwise correlation coefficients among them (see Table 1). The largest correlation estimate of 0.535 is found between *PEAF* and *E&O*. The degree of comovement is surprisingly large and may indicate some common factors influencing both variables. The c.i.f adjusted TMI measure is also positively correlated with the *PEAF* and *E&O* measures, albeit less strong, with correlation coefficient estimates of -0.265 and 0.174, respectively.

In order to correctly specify the regressions in the subsequent analysis, we first test for stochastic trends in our capital flight measures. Table 2 reports unit root tests according to several definitions. At the 5% level of statistical significance, we can reject the hypothesis of a unit root for all three variables, over different sample periods and using different test statistics. Cross-checking this result with the reversed Null of stationarity confirms a consistent picture. Evaluating the test statistics at the same level of statistical significance, stationarity do not need to be rejected in any of the tests. Consequently, we treat our variables as I(0) in the following regression exercise.

4. Regression analysis – Preliminary Results

The Econometric analysis of the dataset is still work in progress and will be finalized until the conference. Please note that all regressions are estimated with a linear time trend and quarterly dummy variables that capture a possible seasonal pattern. Tables 3-10 report some preliminary results. They suggest that:

A) E&O is influenced by CID variations

B) PEAF is influenced by policy uncertainty measures

C) TMI is influenced by macro-factors and a crisis effect

The final version of the paper will take into consideration further explanatory variables (incl. tax and tariff motives, geopolitical risk, breakdown of uncertainty indices by type, denomination risk), various trend-break methods, Seemingly Unrelated Regression, potential measurement error (e.g. changes in data quality over time), and a more multivariate regression approach. The tables below are organized as follows:

4.1 Covered interest differential / arbitrage motive (Tables 3 and 4)

We derive our first specifications from a portfolio balance approach, where outward capital flight is expected to react negatively to positive deviations from the covered interest parity (Cuddington, 1986; Dornbusch, 1984).

Indeed, our first two capital flight measures, E&O and PEAF standardized by GDP, respond significantly negative to covered interest differentials (CIDs), which are displayed in Figures 3 and 4. The CID effect reported in Table 3 is robust to the presence of crisis dummy variables (Table 4). The dummies include an early crisis dummy (2007), a GFC/Lehmann crisis dummy (2008), and a euro crisis dummy (2010).

The TMI variable, on the other hand, is affected by crisis dummy variables but not by CIDs (Tables 3 and 4). The most significant variable is the post-2007 dummy, capturing the early crisis period, in column 4A, which is statistically significant at the one percent level.

Tables 3 and 4 show that the three capital flight measures are affected by the selected explanatory variables differently. For the E&O, only 2% of the variance is explained by a trend and seasonal dummies, and another 5% is explained by the CID. For the PEAF, the explanatory power is somewhat larger, as up to 14% can be explained. The TMI variable, relatively speaking, has a much better fit. While the CID does not offer any significant explanatory power, the trend and seasonal dummies explain 40% of TMI's variability; the post-crisis dummy variables improve the adjusted R^2 to 46%.

4.2 Flight to safety motives

In order to investigate the flight to safety motivation for our three capital flight measures, we consider three different types of variables: (a) Economic policy uncertainty, (b) volatility, and (c) monetary policy.

(a) Economic policy uncertainty (Table 5)

We start by considering different indices of economic policy uncertainty index. The majority of the measures are news-based, following the newly developed methodology of Baker *et al.* (2016), while some are based on reports of the Economist Intelligence Unit (Ahir and Furceri, 2018). The appendix provides more detailed descriptions.

The results are reported in Table 5. We find that in particular the PEAF measure is responding to the news-based uncertainty index. In columns 1A and 2A of the PEAF measure, we see that global policy uncertainty is statistically significant at the 1%, and the adjusted R^2 rises from 0.11 to 0.18 and 0.19, respectively. Only the report-based uncertainty index is insignificant. The negative sign indicates that a high uncertainty is responsible for larger Capital flight towards Germany. For the TMI measure, on the other hand, the global uncertainty index does not raise the R^2, and is only significant in the last regression (column 3A).

(b) Volatility (Table 6)

As a next step we investigate both, exchange rate volatility and stock market volatility as financial market-based uncertainty measures. Table 6 shows that the exchange rate uncertainty is insignificant for all regressions, while the stock-market uncertainty, as measured by the VSTOXX and VDAX are marginally significant at the 10% level only for the PEAF measure. Interestingly, both coefficients have a positive sign, which is consistent with a retrenchment motive (Broner *et al.* 2013; Caballero and Simsek, 2016). The marginal R^2 is, however, lower than for the previous policy-uncertainty measures.

(c) Monetary policy (Table 7)

A further source of uncertainty might the monetary policy stance of the ECB vis-à-vis the United States, which is analyzed in Table 5. Here we find that the E&O as well as PEAF measures do not have a significant response, but the TMI measure reacts significantly to the relative M1, the difference between M1/GDP between the two regions, and the relative M3 at the 1% level. The reaction to the difference in M3/GDP is significant at the 5% level.[11] In the best fitting regression, Column 3C, this raises the R^2 to 0.53.

[11] These results resemble earlier results of Cheung *et al.* (2016) for China.

4.3 Macroeconomic fundamentals (Tables 8 and 9)

Other Macroeconomic fundamentals are analyzed in Tables 8 and 9. In Table 8, the evidence confirms our impression from Table 7, as only the TMI measure is influenced by macro-factors. Aside from the monetary policy stance documented above, we find that the relative GDP and Government Debt variables are each statistically significant at the 5% level. They do not however provide a better fit regarding the R^2 compared to the previous set of tables. Regarding currency misalignment, Table 9, display the same pattern. As another macro-variable, it is insignificant for E&O as well as PEAF, but is highly significant for the TMI measures and raises the R^2 above 50% in regressions 3B and 3C.

4.4 Economic policy uncertainty – regional breakdown (Tables 10A, 10B, and 10C)

In Tables 10 (A–C), we perform a further breakdown of economic policy uncertainty by region. Interestingly we observe that it is not the US policy uncertainty, but rather the EU policy uncertainty itself that drives the intra-European capital flight. Particularly, policy uncertainty in Spain and Greece are statistically significant at the 5% level for PEAF measure. The latter (Greece) increases the R^2 to 0.22. The other CF measures are largely unaffected by either global or country-specific policy uncertainty.

5. Policy conclusions and contribution to the literature

Our results suggest that different types of capital flight can be captured by different proxies; and these proxies each have different determinants. This information is important for policy makers. If they aim to curb illicit capital flows, it is not sufficient to implement national regulatory reforms, as suggested by the FATF task force. It is instead important to take macroeconomic developments into accounts that are ultimately driving the capital flight towards Germany. Also, if Germany intends to limit intra-Euro Area capital flight, it is important to be aware of the policy uncertainty, which is driving the capital inflows via central banks. The correct measurement of these channels and a first assessment of their determinants is the main contribution this paper makes to the literature. Furthermore, it is the first paper that considers capital flight from the recipients or “safe heavens” perspective. In this regard, our paper may be relevant for other regions, such as Switzerland, the Netherlands or Norway, which all became the target of similar capital flight movements.

Appendix A: Variable Definitions and Data Sources

Capital Flight	Germany's capital flight. Positive values indicate outward capital flight, negative values indicate inflows. Capital flight is measured either (i) by trade mis-invoicing (*TMI*), (ii) the balance of payments' errors and omissions (*E&O*), or (iii) the adjusted change in TARGET2-claims (PEAF). See below for details.
D(T2)	Negative change in Germany's TARGET2-claims as a percentage of nominal GDP (both in EUR). Excluding claims/liabilities from under-/over-issuance of banknotes. Data source: Steinkamp & Westermann (2014) available on http://www.eurocrisismonitor.com.
Private EA Flight (PEAF)	Private capital flight of Germany against the euro area countries, defined as PEAF = D(T2) + CA_EA – CapA – FA_Gov, where CA_EA, CapA and FA_Gov are the following balance of payments items of Germany vis-à-vis today's euro area member countries (EA19, fixed composition): CA_EA is the current account balance, CapA, the capital account and FA_Gov are financial account transaction of the German government (e.g. payments to the European Stability Mechanism). PEAF is expressed as a percentage of nominal GDP. Data sources*:* Bundesbank (Codes: BBFI1.M.N.DE.4F.S121.S1.LE.A.FA.O.F2___T2 .S._T.N.N; BBFB1.Q.N.DE.I8.S1.S1.T.B.CA._Z._Z._Z._T._X.N; BB FB1.Q.N.DE.I8.S1.S1.T.C.KA._Z._Z._Z._T._X.N; BBFB1.Q.N.DE.I8 .S1.S1.T.D.KA._Z._Z._Z._T._X.N; BBFB1.Q.N.DE.I8.S13.S1.T.A.FA .O.F2.T._T. N.N).
E&O	Germany's net Errors and omissions of its balance of payments statistics. It is derived residually as to balance the accounts. Expressed as a percentage of nominal GDP (both in national currency). Data source*:* Bundesbank (Code: BBFB1.Q.N.DE.W1.S1.S1.T.N.EO._Z._Z. _Z._T._ X.N).
TMI	Germany's capital flight measured by the net trade misinvoing method given by the sum of export underinvoicing and import overinvoicing, i.e. $TMI = \sum_i^p [XW_{i,t} - XC_{i,t}*(1+CIF)] + \sum_i^q [MC_{i,t} - MW_{i,t}*(1+CIF)]$, where $XW_{i,t}$ is economy i's reported value of imports from Germany, $XC_{i,t}$ is Germany's reported value of exports to country i, $MC_{i,t}$ is Germany's reported value of imports from country i, $MW_{i,t}$ is economy i's reported value of exports to Germany, p is the number trading partners, and *CIF* is the c.i.f./f.o.b. *CIF* estimates are from the OECD (see separate appendix for details). *TMI* is expressed as a percentage of nominal GDP. Positive values indicate outward capital flight. Data sources: Directions of Trade Statistics (IMF), International Transport and Insurance Costs of Merchandise Trade (OECD) by Miao and Fortanier (2017).
CID	Quarterly average of Germany's daily covered interest differentials. It is given by the nominal interest rate differential (*RDiff*) plus the forward premium (*FP*), i.e. $CID = RDiff + FP = (r-r^*)/(1+r^*) + (F-S)/S$, where r is the London interbank offer rate (DM-based until 1998; then EUR-based), r^* is the US$ LIBOR, F is the forward rate and S is the spot exchange rate (DM/USD until 1998; then EUR/USD). r, r^* and F are annualized three-month rates in daily frequency. Data sources: Bundesbank (Codes: BBK01.ST0268; BBK01.ST0316); ICE Benchmark Administration Ltd. via Datastream (B5DEM3M; B5EUR3M; B5USD3M), Datastream (Codes: WG90DUS; TDEUR3M).
Currency Misalignment	Deviation from estimated equilibrium exchange rate (in %). Positive values indicate overvaluation, negative undervaluation. Quarterly frequency interpolated from annual data using cubic splines. Data source: CEPII EQCHANGE (average index), see Couharde et al. 2017 for details.
Current Account	Germany's current account balance from its balance of payments statistics as a percentage of nominal GDP (both in

	national currency). Seasonally adjusted using US Census' X-11 method. Data source: Bundesbank (Code: BBFB1.Q.N.DE.W1.S1.S1.T.B.CA._Z._Z._Z._T. _X.N).
Current Account (EA)	Germany's current account balance vis-à-vis today's euro area member countries (EA19, fixed composition) from its balance of payments statistics as a percentage of nominal GDP (both in national currency). Seasonally adjusted using US Census' X-11 method. Data source: Bundesbank (Code: BBFB1.Q.N.DE.W1.S1.S1.T.B.CA._Z._Z._Z._T. _X.N).
Data Quality Trend	Number of countries that fulfil an IMF statistical dissemination standard (e-GDDS, SDDS, SDDS plus). Data source: IMF's Dissemination Standards Bulletin Board.
Gov. Debt	Germany's gross consolidated general government debt as percentage of nominal GDP (seasonally adjusted). Data before 2000Q1 have been interpolated from annual to quarterly frequency using cubic splines. Data source: Federal Statistical Office (Destatis), Eurostat (Code: gov_10q_ggdebt).
Economic Policy Uncertainty	Global and US indexes of economic policy uncertainty based on normalized newspaper coverage frequencies. Source and description: Baker et al. (2016) and updates from their website.
Economic Policy Uncertainty (report-based)	Global and regional indexes of economic policy uncertainty based on the frequency counts of the term „uncertainty" in country reports of the Economist Intelligence Unit (EIU). Source and description: Ahir et al. (2018).
EMP Index	Exchange Market Pressure Index. Source and description: Patnaik et al. (2017).
Exr. Volatility	Empirical standard deviation of the i) log-level or ii) changes in the log-level of the daily nominal exchange rate of the German currency (DM/EUR) vis-a-vis the USD. Data sources: Bundesbank (Codes: BBEX3.D.USD.DEM.AA.AC.000; BBEX3.D.USD.EUR.BB.AC.000).
Financial Stress Indicator	News-based measure of negative financial sentiment. Normalized number of words with negative connotations per article about financial market topics in large US-newspapers. Source and detailed description: Püttmann (2018).
FP	Quarterly average of Germany's daily forward premium given by *(F-S)/S*, where *S* is the spot rate and *F* the 3-month forward rate (DM/USD until 1998; then EUR/USD). An $FP > 0$ indicates an expected \$ appreciation. Data sources: Bundesbank (Codes: BBK01.ST0268; BBK01.ST0316), Datastream (Codes: WG90DUS; TDEUR3M).
Geopolitical Risk Index	Normalized number of newspaper articles related to geopolitical risk in 11 large US and international newspapers. Source and detailed description: Caldara and Iacoviello (2018).
Gov. Balance	Germany's general government balance as percentage of nominal GDP, both in national currency. Seasonally adjusted. Two outliers have both been replaced by linearly interpolated values to match the mean of the last (t-1) and the following (t+1) quarter: In 1995Q1 the German government assumed liabilities of the Treuhandanstalt (an agency charged with liquidating assets formerly owned by the East German government). In 2000Q3 extraordinary revenue was generated by auctioning of UMTS-licences. Data source: Federal Statistical Office (Destatis).
Gov. Bond Spread	Difference between the 10-year government bond yield of Germany and a reference country/country-group (EA, USA, IIPS). Quarterly averages of daily data in per cent per annum. Data Source: OECD (Finance, Long-term interest rates).
Inflation	Annualized inflation rate in percentage points. Based on the quarter-to-quarter relative change in the consumer price index. Data source: IMF's International Financial Statistics (Code: PCPI_PC_PP_PT).
Inflation Diff.	The difference between the German and US annualized inflation rate in percentage points. Data source: IMF's

	International Financial Statistics (Code: PCPI_PC_PP_PT).
Money Growth M1 (M3)	Quarter-to-Quarter change of (seasonally adjusted) monetary aggregate M1 (M3, respectively) as percentage of nominal GDP (series in national currency). Data source: OECD (Finance).
Misalignment differential	Germany‘s currency misalignment (see above) minus a benchmark country’s/country-group’s (GIIPS, EA, USA) currency misalignment. Data source: CEPII EQCHANGE (“average index”).
Net Official Flows	German’s net financial account balance as a percentage of nominal GDP. Positive values indicate outward capital flows, negative values in-dicate inflows. Data Source: German Bundesbank (Codes: BBFB1. Q.N.DE.W1.S1.S1.T.A.FA._T.F._Z._T._X.N, BBFB1.Q.N.DE.W1.S1. S1.T.L.FA._T.F._Z._T._X.N).
Nominal GDP	Gross Domestic Product at current prices. Derived from expenditure approach and seasonally adjusted. Data sources: Federal Statistical Office (Destatis).
Oil Price	Crude Oil-Brent Spot FOB U$/BBL. Quarterly average of daily data. Data source: Datastream.
RDiff	Quarterly average of the daily interest rate differential given by *(r-r*)/(1+r*)*, where *r* is the relevant London interbank offer rate (DM-based until 1998; then EUR-Based), r* is the US$ LIBOR. All as annualized three-month rates. Positive values of *RDiff* indicate a higher nominal return on investment in Germany. Data sources: ICE Benchmark Administration Ltd. via Datastream (B5DEM3M; B5EUR3M; B5USD3M).
Relative Money M1 (M3)	Monetary aggregate M1 (M3, respectively) of Germany relative to the US, both seasonally adjusted and in percentage of nominal GDP. After the Euro introduction Germany’s monetary aggregates refers to its contribution to the Euro Area’s total. Data sources: Bundesbank, OECD, US Federal Reserve.
Rel. Money Growth M1 (M3)	Quarter-to-quarter change of the variable *Relative Money M1 (M3).* Data sources: Bundesbank, OECD, US Federal Reserve.
Real GDP Growth	Quarter-to-quarter growth rate of Germany’s real GDP. Real GDP is derived from nominal GDP adjusted for changes in consumer prices and seasonal patterns. Data sources: Federal Statistical Office (Destatis), IMF’s International Financial Statistics (Code: PCPI_IX).
REER	CPI-based real effective exchange rate index. Data Source: IMF’s International Financial Statistics (Code: EREER_IX).
Stock Volatility	(Option-)implied stock market volatility. We use the VDAX for Germany, the VOXX for the Euro Area, and the VIX for the US. Quarterly averages of daily data. Data source: Datastream.
Trade Openness	Measure of de facto trade openness, given by the value of the total trade volume (see below) as a percentage of nominal GDP. Data source: IMF’s International Financial Statistics (Code: TXG_FOB_USD, TMG_CIF_USD).
Trade Volume	Sum of the value of exports and imports (goods) as a percentage of nominal GDP. Data source: IMF’s International Financial Statistics (Code: TXG_FOB_USD, TMG_CIF_USD).

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Table 1: Correlation Matrix of Capital Flight Measures (1991q1 – 2018q3)

	Private EA Flight (PEAF)	Errors & Omissions Measure	Trade Mis-invoicing Measure (CIF-adjusted)
Private EA Flight (PEAF)	1.000 (0.000)	–	–
Errors & Omissions Measure	0.535 (0.000)	1.000 (0.000)	–
Trade Mis-invoicing Measure (CIF-adjusted)	0.265 (0.020)	0.174 (0.093)	1.000 (0.000)

Notes: Paiwise correlation coefficients, p-values in parentheses. See data appendix for details on definitions and data sources.

Table 2: Unit Root Tests

	DF-GLS	PHILLIPS-PERRON	KPSS	
	H0: Has a Unit Root		H0: Is stationary	
Variable	t-stat	Adj. t-stat	LM-stat	Sample
PEAF	-7.022***	-7.806***	0.201	1999Q1-2018q3 (Full/Common)
E&O	-9.93***	-10.735***	0.151	1991Q1-2018q3 (Full
	-7.845***	-9.099***	0.165	1999Q1-2018q3 (Common)
TMI	-1.978**	-10.316***	0.277	1996Q1-2018q3 (Full)
	-2.390**	-9.761***	0.367*	1999Q1-2018q3 (Common)

Notes: All specifications include a constant (and no deterministic trend). AR(p)-choice in Dickey Fuller test based on SIC. PP/KPSS tests based on Bartlett-kernel estimation with Newey-West automatic bandwidth selection

Table 3: CID

Dep. Var.	E&O			PEAF			TMI		
Variables	(1A)	(1B)	(1C)	(2A)	(2B)	(2C)	(3A)	(3B)	(3C)
CID		-0.472**			-1.213**			0.080	
		(2.50)			(2.02)			(1.27)	
Lagged CID			-0.151			-1.024			0.008
			(0.66)			(1.56)			(0.13)
Constant	0.163	0.033	0.116	1.364	1.080	0.992	-0.225**	-0.216**	-0.223**
	(0.63)	(0.13)	(0.45)	(1.16)	(0.94)	(0.85)	(2.61)	(2.46)	(2.51)
R-Squared (adj)	0.02	0.07	0.02	0.07	0.12	0.10	0.40	0.41	0.39
Observations	111	111	111	77	77	77	94	94	94

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 4: Crisis Effect

Dep. Var.	E&O			PEAF			TMI		
Variables	(1A)	(1B)	(1C)	(2A)	(2B)	(2C)	(3A)	(3B)	(3C)
CID	-0.462**	-0.439**	-0.478**	-1.183*	-1.139*	-1.218**	0.061	0.061	0.080
	(2.45)	(2.37)	(2.53)	(1.97)	(1.90)	(2.07)	(1.09)	(1.08)	(1.37)
I(Date>=2007)	-0.193			-0.287			0.161***		
	(0.79)			(0.65)			(2.79)		
I(Date>=2008)		-0.342			-0.413			0.101*	
		(1.50)			(0.86)			(1.74)	
I(Date>=2010)			-0.134			-0.818			-0.086
			(0.64)			(1.42)			(1.60)
Constant	-0.340	-0.611	-0.204	0.185	-0.254	-1.599	0.183	0.035	-0.420***
	(0.71)	(1.36)	(0.49)	(0.11)	(0.14)	(0.82)	(1.17)	(0.21)	(2.64)
R-Squared (adj)	0.07	0.08	0.06	0.11	0.11	0.14	0.46	0.43	0.42
Observations	111	111	111	77	77	77	94	94	94

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 5: Global Economic Policy Uncertainty

Dep. Var.	E&O			PEAF			TMI		
Variables	(1A)	(2A)	(3A)	(1A)	(2A)	(3A)	(1A)	(2A)	(3A)
CID	-0.503*	-0.504*	-0.504**	-0.813	-0.792	-1.222**	0.111*	0.113*	0.086
	(1.94)	(1.95)	(2.01)	(1.30)	(1.30)	(2.02)	(1.67)	(1.70)	(1.45)
Global Policy Uncertainty	-0.001			-0.012***			-0.001		
	(0.39)			(2.71)			(1.46)		
Global Policy Uncertainty (ppp-weighted)		-0.001			-0.012***			-0.001	
		(0.40)			(2.84)			(1.65)	
Global Policy Uncertainty (report-based)			0.003			-0.006			-0.002***
			(1.21)			(1.19)			(3.28)
Constant	0.028	0.018	0.283	-0.151	-0.331	0.244	-0.316***	-0.331***	-0.376***
	(0.05)	(0.03)	(0.56)	(0.13)	(0.29)	(0.20)	(2.92)	(3.01)	(3.21)
R-Squared (adj)	0.06	0.06	0.07	0.18	0.19	0.12	0.43	0.44	0.46
Observations	87	87	91	77	77	77	86	86	90

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 6: Volatility

Dep. Var.	E&O				PEAF				TMI			
Variables	(1A)	(1B)	(1C)	(1D)	(2A)	(2B)	(2C)	(2D)	(3A)	(3B)	(3C)	(3D)
CID	-0.398**	-0.400**	-0.419	-0.442**	-0.994	-0.842	-0.801	-0.880	0.055	0.049	0.085	0.080
	(2.06)	(2.01)	(1.43)	(2.09)	(1.37)	(1.19)	(1.15)	(1.29)	(0.96)	(0.93)	(1.41)	(1.38)
Exr. Volatility	-0.262				-0.509				0.060			
	(1.33)				(1.00)				(0.98)			
VIX		-0.009				-0.036				0.003		
		(1.40)				(1.60)				(1.48)		
VSTOXX			-0.011				-0.034*				0.002	
			(1.37)				(1.94)				(0.82)	
VDAX				-0.004				-0.029*				-0.000
				(0.69)				(1.70)				(0.05)
Constant	-1.204	0.249	0.617	0.066	-1.247	2.673*	2.591*	2.488	0.078	-0.329***	-0.297*	-0.213**
	(1.22)	(0.89)	(0.74)	(0.22)	(0.48)	(1.76)	(1.74)	(1.61)	(0.25)	(2.74)	(1.79)	(1.99)
R-Squared (adj)	0.07	0.07	0.08	0.06	0.12	0.15	0.15	0.14	0.41	0.43	0.48	0.40
Observations	111	111	79	107	77	77	77	77	94	94	78	94

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 7: Monetary Policy

Dep. Var.	E&O				PEAF				TMI			
Variables	(1A)	(1B)	(1C)	(1D)	(2A)	(2B)	(2C)	(2D)	(3A)	(3B)	(3C)	(3D)
CID	-0.470**	-0.472**	-0.445**	-0.475**	-1.265**	-1.262*	-1.269**	-1.333**	0.063	0.055	0.038	0.062
	(2.48)	(2.48)	(2.27)	(2.42)	(2.09)	(1.94)	(2.09)	(2.13)	(1.12)	(0.98)	(0.81)	(1.23)
Rel. M1 EA	-0.030				0.683				0.245***			
	(0.09)				(0.89)				(3.31)			
Diff. M1/GDP EA		0.032				0.213				0.124***		
		(0.27)				(0.50)				(3.39)		
Rel. M3 EA			-0.425				0.980				0.758***	
			(0.75)				(0.89)				(4.90)	
Diff. M1/GDP EA				0.016				0.692				0.148**
				(0.13)				(1.61)				(2.57)
Constant	0.029	0.279	0.600	-0.020	0.577	2.689	-0.501	-3.262	-0.239**	0.817***	-1.365***	-0.996***
	(0.11)	(0.30)	(0.74)	(0.05)	(0.48)	(0.74)	(0.24)	(1.28)	(2.61)	(2.64)	(5.16)	(2.98)
R-Squared (adj)	0.06	0.06	0.06	0.06	0.11	0.11	0.11	0.12	0.46	0.46	0.53	0.46
Observations	111	110	111	110	77	77	77	77	94	94	94	94

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 8: Macroeconomic Fundamentals

Dep. Var.	E&O			PEAF			TMI		
Variables	(1A)	(2A)	(3A)	(2A)	(2B)	(2C)	(3A)	(3B)	(3C)
CID	-0.463**	-0.473**	-0.458**	-1.235**	-1.214*	-1.211*	0.063	0.075	0.076
	(2.39)	(2.48)	(2.41)	(2.02)	(1.99)	(1.98)	(1.23)	(1.16)	(1.19)
Real GDP Growth	0.012			-0.020			-0.019**		
	(0.41)			(0.36)			(2.52)		
Gov. Balance		-0.001			-0.003			-0.010	
		(0.04)			(0.05)			(1.12)	
Gov. Debt			-0.008			0.006			0.006***
			(0.97)			(0.15)			(2.89)
Constant	0.036	0.021	0.145	0.989	1.036	0.940	-0.260***	-0.329**	-0.387***
	(0.14)	(0.05)	(0.51)	(0.80)	(0.70)	(0.55)	(2.83)	(2.45)	(3.50)
R-Squared (adj)	0.06	0.06	0.06	0.11	0.11	0.11	0.45	0.41	0.43
Observations	111	111	110	77	77	77	94	94	94

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 9: Currency Misalignment (CM)

Dep. Var.	E&O				PEAF				TMI			
Variables	(1A)	(1B)	(1C)	(1D)	(2A)	(2B)	(2C)	(2D)	(3A)	(3B)	(3C)	(3D)
CID	-0.477**	-0.479**	-0.479**	-0.478**	-1.232**	-1.227**	-1.224**	-1.208**	0.059	0.063	0.063	0.073
	(2.43)	(2.46)	(2.46)	(2.47)	(2.07)	(2.06)	(2.05)	(2.01)	(1.01)	(1.12)	(1.12)	(1.17)
CM DE	-0.097				3.845				1.288***			
	(0.10)				(1.00)				(3.18)			
CM GIIPS		-0.108				2.206				0.817***		
		(0.14)				(1.36)				(4.06)		
CM EA			-0.089				3.562				1.300***	
			(0.08)				(1.44)				(4.36)	
CM USA				0.532				-0.789				-0.606***
				(0.47)				(0.24)				(2.83)
Constant	0.070	0.008	0.026	0.048	-0.257	2.121*	1.851	1.389	-0.774***	0.149	0.039	-0.204**
	(0.13)	(0.03)	(0.10)	(0.17)	(0.14)	(1.69)	(1.54)	(0.99)	(3.94)	(1.29)	(0.40)	(2.30)
R-Squared (adj)	0.06	0.06	0.06	0.06	0.12	0.12	0.12	0.11	0.47	0.51	0.51	0.44
Observations	108	108	108	108	76	76	76	76	92	92	92	92

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 10A: Regional Economic Policy Uncertainty

Dependent Variable: E&O						
Variables	(1A)	(1B)	(1C)	(1D)	(1E)	(1F)
CID	-0.435**	-0.462**	-0.469**	-0.515**	-0.305	-0.481*
	(2.12)	(2.43)	(2.08)	(2.09)	(1.20)	(1.97)
US Financial Stress Indicator	-0.092					
	(1.31)					
EU Economic Policy Uncertainty		-0.001				
		(0.43)				
German Economic Policy Uncertainty			-0.001			
			(0.93)			
Italy Economic Policy Uncertainty				-0.002		
				(0.92)		
Spain Economic Policy Uncertainty					-0.001	
					(0.59)	
Greece – Economic Policy Uncertainty (composite)						-0.006*
						(1.98)
Constant	9.612	-0.012	-0.143	0.229	-0.155	0.285
	(1.34)	(0.05)	(0.44)	(0.39)	(0.22)	(0.45)
R-Squared (adj)	0.07	0.06	0.07	0.07	0.15	0.12
Observations	104	111	103	87	71	83

Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 10B: Regional Economic Policy Uncertainty

Dependent Variable: PEAF						
Variables	(2A)	(2B)	(2C)	(2D)	(2E)	(2F)
CID	-0.903	-0.973	-0.935	-1.187*	-0.901	-0.964
	(1.22)	(1.59)	(1.40)	(1.99)	(1.42)	(1.64)
US Financial Stress Indicator	-0.330					
	(1.32)					
EU Economic Policy Uncertainty		-0.008**				
		(2.22)				
German Economic Policy Uncertainty			-0.007*			
			(1.71)			
Italy Economic Policy Uncertainty				-0.005		
				(0.77)		
Spain Economic Policy Uncertainty					-0.008**	
					(2.04)	
Greece – Economi Policy Uncertainty (composite)						-0.020***
						(2.87)
Constant	36.063	-0.730	0.328	1.272	1.342	1.636
	(1.37)	(0.60)	(0.29)	(0.98)	(1.06)	(1.37)
R-Squared (adj)	0.13	0.17	0.15	0.12	0.19	0.22
Observations	72	77	77	77	69	77

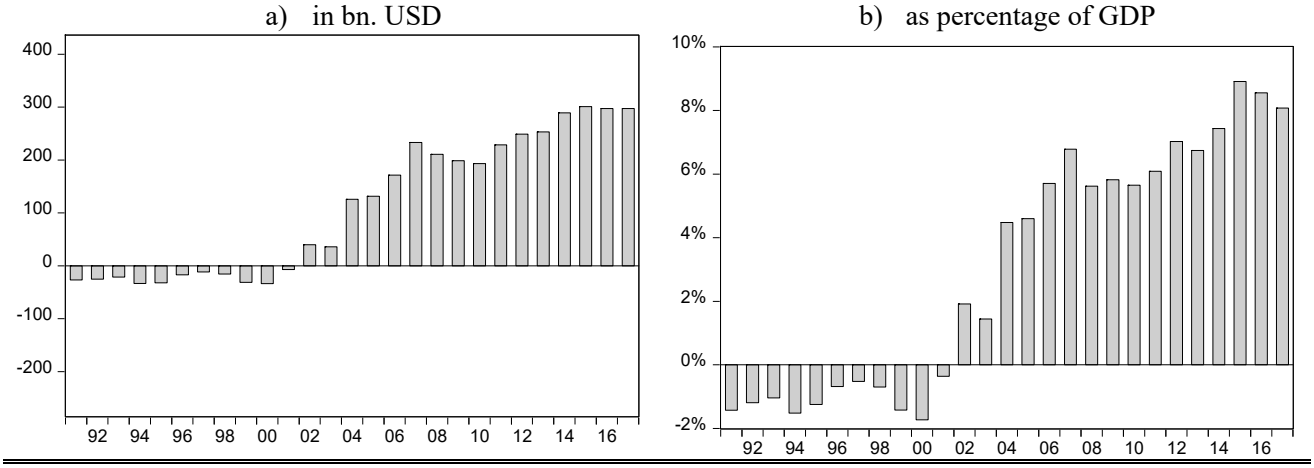
Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend.
*, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Table 10C: Regional Economic Policy Uncertainty

Dependent Variable: TMI						
Variables	(3A)	(3B)	(3C)	(3D)	(3E)	(3F)
CID	0.064	0.093	0.091	0.093	0.145**	0.102
	(1.18)	(1.46)	(1.42)	(1.44)	(2.09)	(1.64)
US Financial Stress Indicator	0.031					
	(1.19)					
EU Economic Policy Uncertainty		-0.000				
		(1.55)				
German Economic Policy Uncertainty			-0.000			
			(0.86)			
Italy Economic Policy Uncertainty				-0.000		
				(0.22)		
Spain Economic Policy Uncertainty					-0.001	
					(1.28)	
Greece – Economic Policy Uncertainty (composite)						-0.000
						(0.17)
Constant	-3.486	-0.285***	-0.244***	-0.259**	-0.157	-0.213*
	(1.29)	(2.95)	(2.73)	(2.20)	(1.04)	(1.71)
R-Squared (adj)	0.40	0.42	0.41	0.42	0.54	0.46
Observations	88	94	94	86	70	82

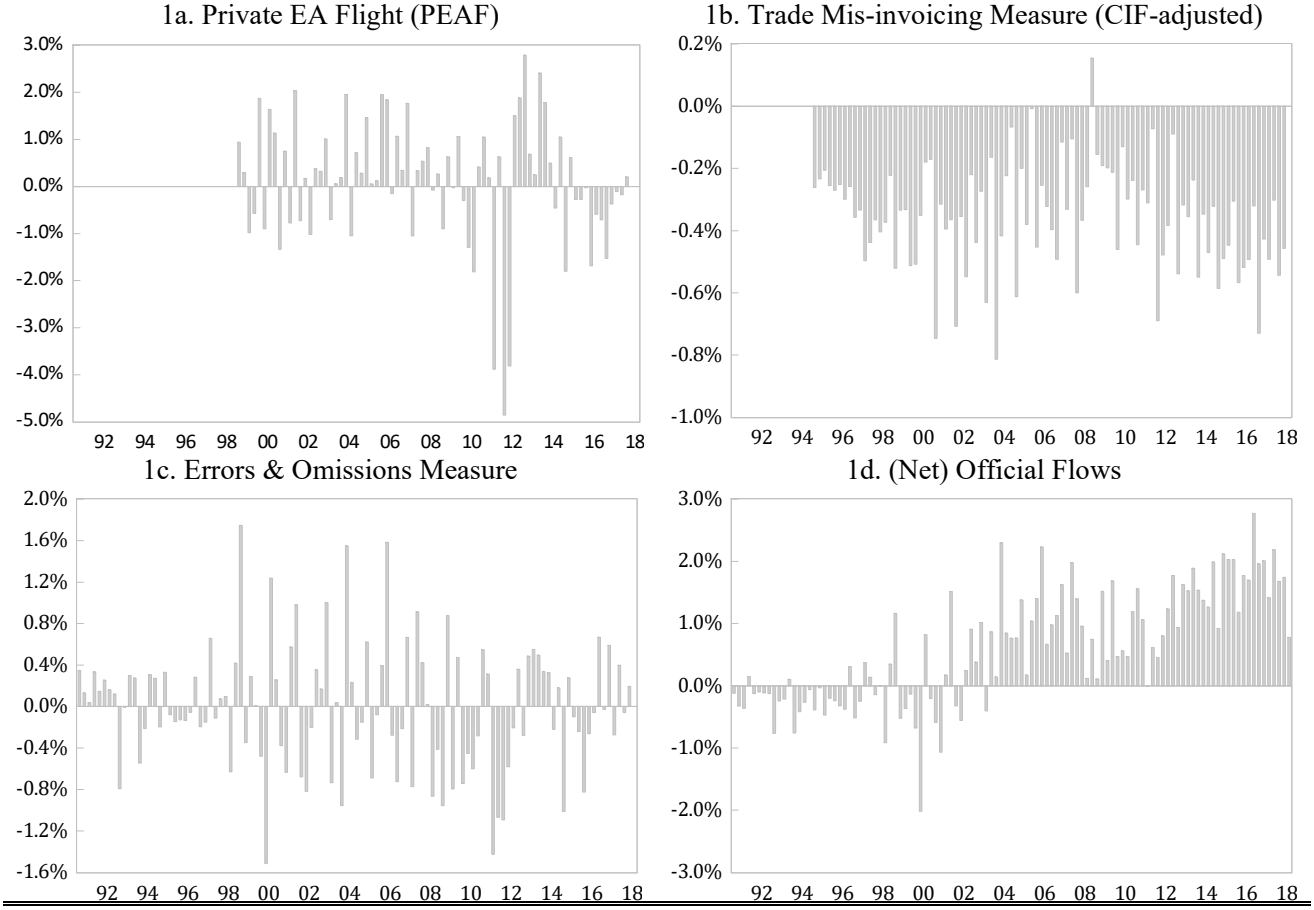
Notes: OLS estimates with robust t-statistics in parentheses. All specifications include quarterly dummies and a linear time trend. *, **, *** indicate variables significant at 10%, 5%, and 1% level respectively.

Figure 1: Germany's net current account position



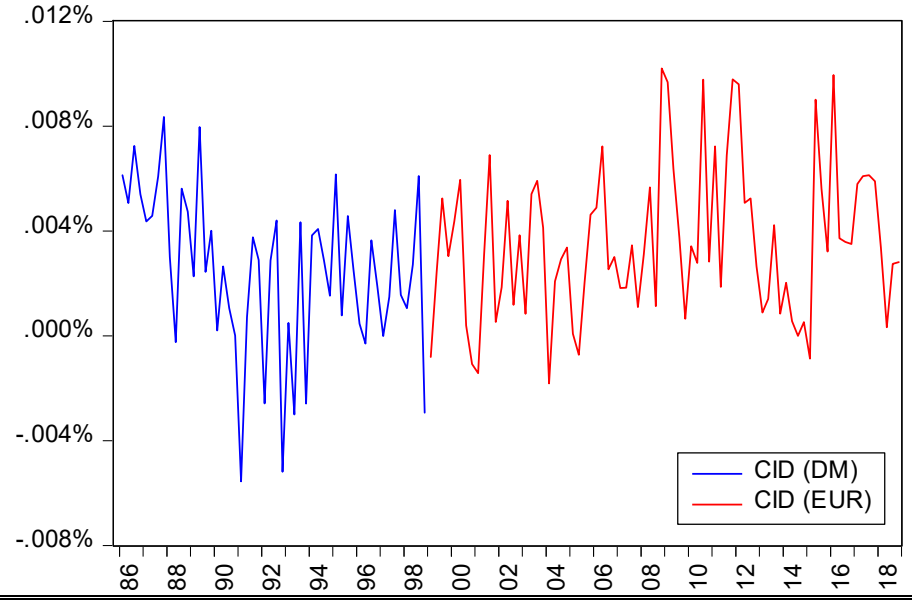
Data sources: World Bank WDI (Codes: BN.CAB.XOKA.CD; BN.CAB.XOKA.GD.ZS).

Figure 2: Capital Flight Measures and Official Flows



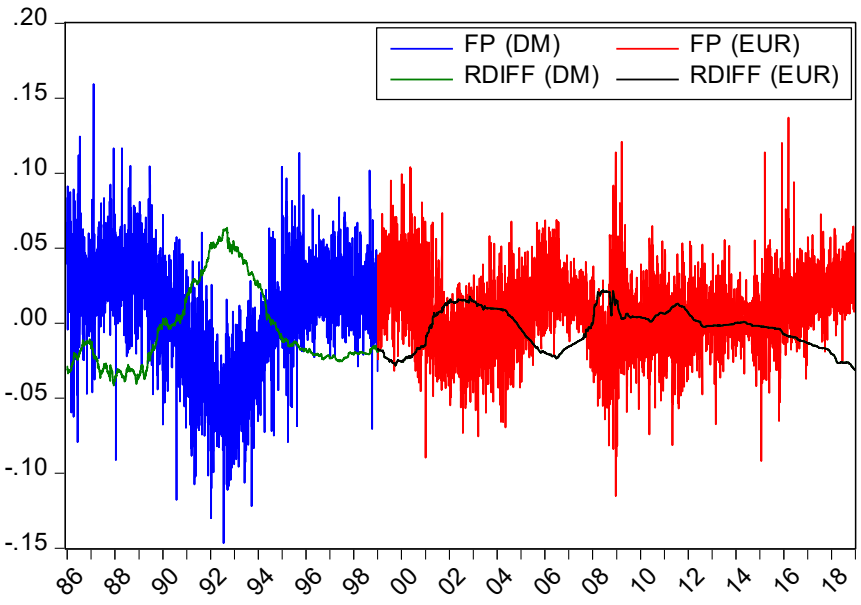
Notes: Different measures of capital flight based on the (a) adjusted negative change in Target2-claims (PEAF), (b) the CIF-adjusted trade mis-invoicing method, and (c) errors and omission from the balance of payments. Panel (d) compares the capital flight measures with the financial account. All series as percentage of (annualized) nominal GDP. See data appendix for details on definitions and data sources.

Figure 3: Deviations from the Covered Interest Parity (CID)



Notes: Quarterly average of Germany's daily covered interest differentials (blue: DM; red: EUR). It is given by the nominal interest rate differential (*RDiff*) plus the forward premium (*FP*), i.e. $CID = RDiff + FP = (r-r^*)/(1+r^*) + (F-S)/S$, where r is the London interbank offer rate (DM-based until 1998; then EUR-based), r^* is the US$ LIBOR, F is the forward rate and S is the spot exchange rate (DM/USD until 1998; then EUR/USD). r, r^* and F are annualized three-month rates in daily frequency. Data sources: Bundesbank (Codes: BBK01.ST0268; BBK01.ST0316); ICE Benchmark Administration Ltd. via Datastream (B5DEM3M; B5EUR3M; B5USD3M), Datastream (Codes: WG90DUS; TDEUR3M).

Figure 4: Components of CID (in daily frequency)



Notes: FP is Germany's annualized forward premium given by *(F-S)/S*, where *S* is the spot rate and *F* the 3-month forward rate (DM/USD until 1998; then EUR/USD), all in daily frequency (blue: DM; red: EUR). RDIFF is the daily interest rate differential given by (r-r*)/(1+r*), where r is the relevant London interbank offer rate (DM-based until 1998; then EUR-Based), r* is the US$ LIBOR. All as annualized three-month rates (green: DM; black: EUR). Data sources: ICE Benchmark Administration Ltd. via Datastream (B5DEM3M; B5EUR3M; B5USD3M), Bundesbank (Codes: BBK01.ST0268; BBK01.ST0316), Datastream (Codes: WG90DUS; TDEUR3M).