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Assessing the sustainability of external imbalances in the European Union

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KEYWORDS

cointegration, current account, error correction, exports, imports, net foreign assets, structural breaks, unit roots

1 | INTRODUCTION

Following the Global Financial Crisis (GFC), the Euro Area (EA) crisis highlighted the need to improve macroeconomic surveillance in the European Union not only with regard to the nature of macroeconomic imbalances but also with regard to the institutional framework. Besides concerns about public deficits and public indebtedness, there has been increasing attention to other sources of imbalances such as external imbalances (current account balances and indebtedness of the nation).

In particular, the European Commission's (EC) Macroeconomic Imbalance Procedure (MIP), established in 2011, is based on an alert mechanism and uses a scoreboard of headlines indicators with indicative thresholds that intend to cover potential sources of macroeconomic imbalances. One of such indicators is the current account imbalance, which is assessed via a 3-year backward moving average of the current account balance (in per cent of GDP), with thresholds of +6% and −4%. Another indicator is the net international investment position (NIIP; in per cent of GDP), with a threshold set at −35%. In addition, the net external debt (NED) is an auxiliary indicator of the scoreboard with no threshold that is used for complementing the economic interpretation of the NIIP.[1] In fact, by ensuring the sustainability of the current account balance, countries are also contributing to meet the headline thresholds implicit in the EC's MIP.[2] According to the 2018 Alert

[1]Note that the difference between NIIP and NED is that in the latter the position of direct investment (non-debt components) and financial derivatives are not counted.

[2]For the EA, Bénassy-Quéré (2016) discusses the current objectives in relation to the improvement of the fiscal stance. Afonso, Rault, and Estay (2013) address the relevance of the links between fiscal and current account imbalances.

Mechanism Report of the European Commission, the CA thresholds were breached by five countries in 2016 (four of them with surpluses), while the NIIP threshold was breached by 15 countries.

It is worth assessing such thresholds, and whether they are relevant, because whenever an EU member country does not meet the criteria, the EC has to launch a MIP and the country concerned has to implement economic policy measures in order to address the ensuing MIP recommendations.[3] Yet, the approach of the European Commission (2012a) is open to question. First, it indicates that these thresholds were derived from a simple statistical distribution analysis, without going down to specifics. Second, in economic terms, it is more relevant to focus on the NED rather than the NIIP. Indeed, the NED gives information on potential risks insofar as debt liabilities have to be repaid at a certain point in time. Hence, it becomes paramount notably for EU countries, to understand how far, from a sustainable external position, an economy might be.

Against that backdrop, this paper assesses the sustainability of external imbalances in a sample of EU countries. We consider the sustainability of both external deficits and external surpluses, because the MIP aims at avoiding growing external surpluses as well.[4] Without questioning, the idea is that the burden of adjustment for deficit countries would not be so high if current account surpluses in surplus countries were not that large. Indeed, the persistence of large current account surpluses in some EA countries (notably Germany, the Netherlands and Luxembourg) may go along with weak domestic absorption and low inflation. This can lead to an appreciation of the euro and make external rebalancing harder for deficit countries.[5] Furthermore, even if the export structure of EA periphery economies might not be suitable to respond to higher domestic consumption or investment in Germany, those countries could nevertheless export more to Germany's main trading partners if the latter could benefit from higher demand from Germany.

Our analysis is twofold. First, we use the intertemporal current account constraint as a theoretical framework underlying the different tests of stationarity of current account-to-GDP ratios (also allowing for structural breaks). In that context, we also test for cointegration between exports and imports of goods and services (ratios to GDP), along the lines of the works by Trehan and Walsh (1991) and Afonso (2005). For this approach, we rely on quarterly data for 22 EU countries over the period 1970:Q1–2015:Q4. To our knowledge, such tests have not been carried out for a large sample of EU countries and let alone over a period covering the EA crisis. The literature dealing with external debt sustainability has mainly focused on a subset of OECD countries, the United States alone, or emerging economies in America and Asia (see Section 2).

Second, we use the dynamic external debt constraint to assess the trade balance-to-GDP ratio that stabilises the net foreign assets-to-GDP ratio (predicted or stabilising trade balance). This section of the paper draws from the analysis of the "operational solvency condition" by Milesi-Ferretti and Razin (1996). An original feature of our approach is to consider not only that foreign assets are not necessarily denominated in foreign currency but also that foreign liabilities are not necessarily denominated in domestic currency as it is commonly done in the literature (based on the case of the United States). We thus introduce two new parameters, which cover the share of foreign assets denominated in foreign currency in total foreign assets, and the share of foreign

[3]European Commission (2012a) presents the set-up of the scoreboard and gives some information about the choice of the thresholds.

[4]The European Commission has not set any threshold for NIIP in credit position. Nevertheless, we look at the sustainability of NIIP and NED in countries with credit positions as well as in countries with debit positions, because persistent CA surpluses go along with persistent positive (negative) NIIP (NED).

[5]The quantitative easing programs implemented by the ECB have probably counteracted this effect so far.

liabilities denominated in foreign currency in total foreign liabilities. With such parameters, we can highlight the role of valuation effects through the exchange rate in the dynamics of net foreign assets (NIIP or NED), and particularly in the size of the predicted trade balance.[6] Due to data availability constraints, in this exercise, we are bound to use annual data over the period 1999–2015 (22 EU countries).[7]

The remainder of the paper is organised as follows. Section 2 reviews the literature. Section 3 outlines the analytical framework. Section 4 explains the empirical analysis and discusses the main results. The last section concludes.

2 | LITERATURE

We can identify three main strands of literature that deal with the analysis of sustainability of external imbalances: (i) time-series and panel data behaviour of trade balance, current account or external debt; (ii) macroeconomic determinants of the dynamic external debt constraint; and (iii) growth effects of external debt. Our work falls under the first two branches.

There are numerous empirical studies relying on time-series analysis to address the topic under scrutiny. The main idea is that if the current account is stationary, then the intertemporal budget constraint of the country holds (see Section 3.1). In Table A1 in the Appendix, we provide a review of recent contributions to the literature dealing with OECD countries.[8] There are two main empirical strategies commonly used: unit root tests and cointegration tests (Camarero, Carrion-i-Silvestre, & Tamarit, 2013; Chen, 2011; Holmes, 2006; Raybaudi, Sola, & Spagnolo, 2004) and error-correction models (Bajo-Rubio et al., 2014; Durdu, Mendoza, & Terrones, 2013).

Some researchers use non-linear approaches, such as structural breaks, regime shifts or threshold values. In Chen (2014), various linear and non-linear tests in CA/GDP series pointed to sustainability in a sample of 10 OECD countries. Camarero, Carrion-i-Silvestre, and Tamarit (2015) tested for the presence of structural breaks in the net foreign assets (NFA) series in 11 EA countries. The null of stationarity was not rejected for the panel and for five countries only over the period 1972–2011.

Error-correction models are also used following the approach of fiscal reaction functions advocated by Bohn (2007) in the study of public debt sustainability. In a specific manner, a sufficient condition for the intertemporal constraint to hold is that there is a negative relationship between net exports and NFA. However, these reaction functions are estimated while taking for granted that net exports could be treated as a variable under the control of countries' authorities (just like the primary balance in the literature on government debt sustainability).

The literature on time-series analysis points to sustainable external imbalances as long as OECD countries or advanced countries are taken as a group. Such results tend to hold for a period preceding the GFC and Euro Area crisis. Yet the NFA position of some countries has deteriorated markedly since the onset of the crisis. Moreover, at the individual country level, empirical findings are not conclusive (see details in Table A1 in the Appendix). We aim at investigating the issue of

[6]Our paper does not explain the "original sin" (the inability of a country to borrow in its own currency), but focuses on the macroeconomic effects of "currency mismatch" (the differences in the currencies in which foreign assets and liabilities are denominated). For further details, see Eichengreen, Haussmann, and Panizza (2003).

[7]The sample of countries has the same size but not the same composition in the two approaches.

[8]We do not review empirical studies covering the United States only (for that see Edwards, 2005) nor periods before the 2000s (for that see the review by Bajo-Rubio, Díaz-Roldán, & Esteve, 2014). A summary of recent papers is also provided in Chen (2011).

external debt sustainability by taking into account the impact of the crisis at a country level. We also consider most of the EU countries.

Regarding the determinants of the dynamic external debt constraint, for instance, Milesi-Ferretti and Razin (1996) argued that the intertemporal external debt constraint was not sufficient to assess the external debt/current account deficits sustainability. They put forward the factors influencing the willingness to pay the debt by the indebted country and the willingness to lend by foreign investors. They also used a dynamic debt constraint based on the balance-of-payment identity between the current account balance and the evolution of the stock of NFA. The dynamic external debt constraint can be used to assess the trade balance, which is consistent with a stable external debt-to-GDP ratio, and to analyse the role of macroeconomic variables in the dynamics of debt. Using the equation of the predicted trade balance (stabilising trade balance), one can compare the actual trade balance with the predicted one (trade balance gap) and assess the extent of the required macroeconomic adjustments.

Some studies have focused on the trade balance gap. Corsetti, Pesenti, and Roubini (1998) used this approach in the context of the Asian crisis. Chortareas, Kapetanios, and Uctum (2004) applied it to Latin American countries. The European Commission (2012b) used it for eight EA countries with large negative NIIPs. However, in these studies, computations are made without taking into consideration valuation effects of exchange rate changes on the NIIP. We aim to address this problem (see Section 3.3).

Other studies in this literature have focused on the required macroeconomic adjustments. Many works have been done since the early 2000s to assess what would be the required depreciation of the US dollar to stabilise the NIIP of the United States (see a review in Edwards, 2005). In particular, the exchange rate adjustment of the US dollar could cause a large negative wealth effect on European countries depending on their NFA position and the weight of the dollar in their foreign assets and liabilities (Lane & Milesi-Ferretti, 2007; Obstfeld & Rogoff, 2005).

In conclusion, we are also aware of yet another strand of literature, which has focused on the composition of NIIP. This literature has pointed out significant differences between asset classes and implications of their imbalances (e.g., Catão & Milesi-Ferretti, 2013; Gourinchas & Rey, 2007; Lane & Milesi-Ferretti, 2001; Rogoff, 1999). More specifically, Catão and Milesi-Ferretti (2013) and Calvo, Izquierdo, and Mejia (2004) find that only foreign debt instruments are a significant predictor for crises in contrast to equity assets. More recently, Zorell (2017) also shows that not only the level of the NIIP but also its composition play a relevant role. Looking at subcomponents of NIIP goes beyond the scope of this paper (we focus on the overall net position) but should be subjected to further research.

3 | ANALYTICAL FRAMEWORK

3.1 | Present value borrowing constraint

To assess the sustainability of external imbalances, we use the so-called PVBC, along the lines set up notably by Trehan and Walsh (1991) and Hakkio and Rush (1991) for the assessment of the sustainability of both external and fiscal imbalances. The budget constraint in period t is given by the following equation:

$$C_t + I_t + G_t + F_t = Y_t + (1 + r_t)\, F_{t-1}, \tag{1}$$

where we have: Y—GDP, C—private consumption, I—private investment, G—government spending, F—NFA, r—interest rate. We also have the usual identity for GDP in an open economy, defined as:

$$Y_t = C_t + I_t + G_t + X_t - M_t, \tag{2}$$

where we have X—exports of goods and services and M—imports of goods and services. Defining net exports as $NX_t = X_t - M_t$, from (1) and (2), we get the following:

$$F_t = (1 + r_t)F_{t-1} + Y_t - C_t - I_t - G_t, \tag{3}$$

$$F_t = (1 + r_t)F_{t-1} + NX_t. \tag{4}$$

Rewriting (4) for subsequent periods, and recursively solving that equation leads to the following intertemporal constraint:

$$F_t = \sum_{s=1}^{\infty} \frac{NX_{t+s}}{\prod_{j=1}^{s}(1 + r_{t+j})} + \lim_{s\to\infty} \frac{F_{t+s}}{\prod_{j=1}^{s}(1 + r_{t+j})}. \tag{5}$$

When the second term from the right-hand side of Equation (5) is zero, the present value of the existing NFA will be identical to the present value of future net exports. For empirical purposes, if we assume that the interest rate is stationary, with mean r, then it is possible to obtain the following so-called PVBC:

$$F_{t-1} = \sum_{s=0}^{\infty} \frac{1}{(1 + r)^{s+1}}(NX_{t+s}) + \lim_{s\to\infty} \frac{F_{t+s}}{(1 + r)^{s+1}}. \tag{6}$$

A sustainable path for the external position should ensure that the present value of the stock of net assets, the second term of the right-hand side of (6), goes to zero in infinity, constraining the debt to grow no faster than the interest rate. In other words, it implies imposing the absence of Ponzi games and the fulfilment of the intertemporal budget constraint. Faced with this transversality condition, the economy will have to achieve future net exports whose present value adds up to the current value of NFA. In other words, NFA cannot increase indefinitely at a growth rate beyond the interest rate (a similar conclusion is drawn for fiscal imbalances, see Ahmed & Rogers, 1995; Quintos, 1995; Afonso, 2005).

3.2 | Assessment of sustainability based on the intertemporal constraint

Recalling the PVBC, Equation (6), it is possible to present analytically two complementary definitions of sustainability that set the background for empirical testing:

1. The value of current NFA must be equal to the sum of future net exports:

$$F_{t-1} = \sum_{s=0}^{\infty} \frac{1}{(1 + r)^{s+1}}(X_{t+s} - M_{t+s}). \tag{7}$$

2. The present value of current NFA must approach zero in infinity:

$$\lim_{s\to\infty} \frac{F_{t+s}}{(1 + r)^{s+1}} = 0. \tag{8}$$

To test empirically the absence of Ponzi games, one can test the stationarity of the first difference of the stock of current NFA, using unit root tests. Notice that in practice, we can test if F_t–$F_{t-1} = CA_t$ is stationary, where CA is the current account balance (CA/Y must be stationary for positive GDP growth rates, see Trehan & Walsh, 1991).

Nevertheless, the rejection of the stationarity hypothesis does not mean that the external accounts are not sustainable, since the stationarity of the variation of the stock of current NFA is a sufficient condition, and stationarity rejection does not necessarily imply the absence of sustainability (Trehan & Walsh, 1991).[9]

It is also possible to assess current account sustainability through cointegration tests. The intertemporal constraint may also be written as:

$$M_t - X_t = \sum_{s=0}^{\infty} \frac{1}{(1+r)^{s-1}} (\Delta X_{t+s} - \Delta M_{t+s}) + \lim_{s \to \infty} \frac{F_{t+s}}{(1+r)^{s+1}}, \quad (9)$$

and with the no-Ponzi game condition, M_t and X_t must be cointegrated variables of order one for their first differences to be stationary.

Therefore, the procedure to assess the sustainability of the intertemporal external budget constraint involves testing the following cointegration regression: $X_t = a + bM_t + u_t$. If the null of no cointegration, the hypothesis that the two I (1) variables are not cointegrated is rejected, and this implies that one should accept the alternative hypothesis of cointegration. For that result to hold true, the series of the residual u_t must be stationary and should not display a unit root.

Moreover, when expressed as a percentage of GDP or in per capita terms, it is necessary to have $b = 1$ in order for the trajectory of the current NFA-to-GDP not to diverge in an infinite horizon.

3.3 | Assessment of sustainability based on the dynamic constraint

The net foreign asset position (F_t) depends on the trade balance (net exports NX_t)[10] and the return on NFA defined as the difference between gross foreign assets (A_t) and gross foreign liabilities (L_t). A share (υ_t of foreign assets is denominated in foreign currency, and a share (μ_t) of foreign liabilities is denominated in foreign currency as well, with S_t the exchange rate (domestic price of foreign currency). The nominal rate of return on foreign assets or liabilities in foreign currency is i_t^*, whereas foreign assets or liabilities in domestic currency earn a return depending on the domestic nominal rate i_t.

It is generally assumed that foreign assets are all denominated in foreign currency whereas foreign liabilities are assumed to be all denominated in domestic currency (Milesi-Ferretti & Razin, 1996). While in the case of the United States, it makes sense (Gourinchas & Rey, 2007), and in the case of Latin American countries, it is debatable (especially on the liabilities side; Chortareas et al., 2004). In our case, looking at European countries, there are large differences depending on whether countries are members of the EA or not (see Table A2 in the Appendix). Indeed, according to data retrieved from the dataset built by Bénétrix, Lane, and Shambaugh (2015) (hereafter BLS dataset), foreign assets are in foreign currency in non-EA countries but mostly in domestic currency in EA countries. As for foreign liabilities, the same pattern has emerged: The share of foreign liabilities denominated in foreign currency in total foreign liabilities has decreased sharply for EA countries but remained high for most non-EA countries (especially as regards the debt components of the NIIP). The EA countries are not as exposed to exchange rate risk as the other

[9]We are also aware of the criticisms made by Bohn (2007) about unit root tests and integration tests. In this paper, we address such criticisms by adopting a two-stage approach (intertemporal constraint, dynamic constraint).

[10]Other items of the current account such as transfers and net labour income are ignored.

EU countries as regards the evolution of their NFA position.[11] These differences across European countries explain why we introduce the two parameters υ_t and μ_t in the specification of the NFA position F_t.

Using A_{Ft} (L_{Ft}) to denote foreign assets (liabilities) denominated in foreign currency and A_{Dt} (L_{Dt}) to denote foreign assets (liabilities) denominated in domestic currency, we have:

$$A_t = S_t A_{Ft} + A_{Dt}, \nu_t = \frac{S_t A_{Ft}}{A_t} \text{ and } (1-\nu_t) = \frac{A_{Dt}}{A_t}, \tag{10}$$

$$L_t = S_t L_{Ft} + L_{Dt}, \mu_t = \frac{S_t L_{Ft}}{L_t} \text{ and } (1-\mu_t) = \frac{L_{Dt}}{L_t}. \tag{11}$$

We can write the NFA position as follows:

$$\begin{aligned} F_t = NX_t + \Big[&\textstyle\sum_j \nu_{j,t}\left(1+i^*_{j,t-1}\right) S_{j,t} A_{t-1} + \left(1-\sum_j \nu_{j,t}\right)(1+i_{t-1}) A_{t-1} \\ &-\textstyle\sum_j \mu_{j,t}\left(1+i^*_{j,t-1}\right) S_{j,t} L_{t-1} - \left(1-\sum_j \mu_{j,t}\right)(1+i_{t-1}) L_{t-1}\Big], \end{aligned} \tag{12}$$

where the second term in the RHS of Equation (12) denotes the return on NFA. In the BLS dataset, the shares of foreign assets and liabilities in foreign currency are decomposed into five foreign currencies: US dollar, euro, British pound, Japanese yen and Swiss franc. We use this decomposition and we have: $\nu_t = \sum_j \nu_{j,t}$ and $\mu_t = \sum_j \nu \mu_{j,t}$ where the subscript j denotes one of the five currencies.[12]

Deflating by nominal GDP ($P_t Y_t$), rearranging terms and taking lower case letters for variables expressed as a ratio to nominal GDP, we obtain:

$$\begin{aligned} f_t = nx_t + &\left[\frac{\sum_j \nu_{j,t}\left(1+i^*_{j,t-1}\right)\left(1+e_{j,t}\right) + \left(1-\sum_j \nu_{j,t}\right)(1+i_{t-1})}{(1+\pi_t)(1+\gamma_t)}\right] a_{t-1} \\ &- \left[\frac{\sum_j \mu_{j,t}\left(1+i^*_{j,t-1}\right)\left(1+e_{j,t}\right) + \left(1-\sum_j \mu_{j,t}\right)(1+i_{t-1})}{(1+\pi_t)(1+\gamma_t)}\right] l_{t-1}, \end{aligned} \tag{13}$$

where e is the rate of depreciation of the domestic currency, π is the rate of inflation, and γ is the real GDP growth rate.

The ratio of net foreign asset position-to-GDP depends on the ratio of trade balance-to-GDP and the growth-adjusted return on NFA. A depreciation of the domestic currency vis-à-vis the foreign currency does not necessarily improve the net foreign asset position (via a higher return on foreign assets held by domestic residents) because a share μ of external debt is also denominated in foreign currency (a depreciation would increase the value of liabilities in domestic currency).

[11] In 2012, the Euro was the prime foreign currency of denomination in foreign assets of the Czech Republic (75%), Poland (51%) and Romania (59%), and in foreign liabilities of Denmark (33%), Sweden (21%), Hungary (28%) and Romania (26%). The share of the US dollar was relatively important in foreign debt assets of the United Kingdom (42%) and Denmark (32%), and in foreign debt liabilities of the Czech Republic and Hungary (51%). Exchange rate valuation effects matter for non-EA countries, no matter how important the share of the euro, because they had a floating exchange rate regime (except Denmark, Latvia and Lithuania).

[12] Data on the weights of other foreign currencies are not available. Therefore, in our empirical analysis, the shares of foreign assets and liabilities in domestic currency are somewhat overestimated as long as they are computed as unity minus the sum of the weights of the five main foreign currencies (Equations 10 and 11).

We can use Equation (13) to derive the trade balance consistent with a stable NFA-to-GDP ratio ($f_t - f_{t-1} = 0$):

$$nx_t = nx_{t-1} - \left[\frac{(1+i^*_{j,t-1})(1+e_{j,t})}{(1+\pi_t)(1+\gamma_t)}\right]\left(\sum_j \nu_{j,t}\Delta a_{t-1} - \sum_j \mu_{j,t}\Delta l_{t-1}\right) - \left[\frac{(1+i_{t-1})}{(1+\pi_t)(1+\gamma_t)}\right]\left((1-\sum_j \nu_{j,t})\Delta a_{t-1} - (1-\sum_j \mu_{j,t})\Delta l_{t-1}\right) \quad (14)$$

To stabilise the ratio of external debt-to-GDP, the trade balance should be in surpluto cover past trade deficit or negative real return of NFA. We can use Equation (14) to highlight the role of both domestic and foreign macroeconomic variables in external imbalances.

We disregard the influence of the exchange rate on net exports as it is commonly done in the literature (Gourinchas & Rey, 2007; Milesi-Ferretti & Razin, 1996).[13] As for valuation effects, we look at the influence of exchange rate (and interest rate) changes and ignore other sources of valuation effects such as the role of the composition of foreign assets and liabilities (equity, FDI, debt) and asset prices (changes in market indices).[14]

4 | EMPIRICAL ANALYSIS

4.1 | Data

The analysis of time-series properties of current account-to-GDP ratio as well as export and import-to-GDP ratios is based on the quarterly OECD dataset. It covers a relatively large time span (going back to 1970:Q1 for some countries),[15] but some new EU countries are not considered in this dataset (Bulgaria, Croatia, Cyprus, Lithuania, Malta and Romania). Figure 1 illustrates current account balance-to-GDP ratio in the countries under scrutiny.

We can summarise the evolution of CA/GDP ratios displayed in Figure 1 as follows: there are 11 countries with CA deficits, with a deterioration or downward trend in the series (United Kingdom), an improvement or upward trend (Slovakia and Czech Republic), or no discernable trend over the whole period due to a structural break, most of the time during the recent crisis (Estonia, Greece, Hungary, Ireland, Latvia, Poland, Portugal and Spain). There are three countries with CA/GDP close to balance on average over the whole sample period (Italy, France and Slovenia). There are also eight countries with CA surpluses, showing a downward trend (Belgium and Luxembourg), an upward trend (Denmark, Germany, the Netherlands and Sweden) or no trend (Austria and Finland).

With regard to the second approach based on the dynamic external constraint, we use annual data over 1999–2015 for 22 EU countries. This period is chosen so that the group of countries is as large as possible given the availability of data. As mentioned in the previous section, we use

[13]Gourinchas and Rey (2007, p. 682) write that "we remain agnostic about the role of the exchange rate in eliminating U.S. [trade] imbalances." In addition, introducing the trade effects of exchange rate changes would require that we used the shares of local, producer and vehicle currencies in invoicing currency.

[14]Lane and Shambaugh (2010) and Bénétrix et al. (2015) showed that most of valuation effects come from currency valuation effects. That being said, we are aware of the literature arguing that valuation effects from prices also play a role. While ignored in much of the earlier literature, Balli, Kalemli-Ozcan, and Sorensen (2011) show that the importance of stock-flow adjustment has grown tremendously in importance since 1980. Schmitz (2010) and Bracke and Schmitz (2011) find significant and stabilising valuation effects from the change in the value of equity.

[15]Details of sample ranges are provided in the different tables of results.

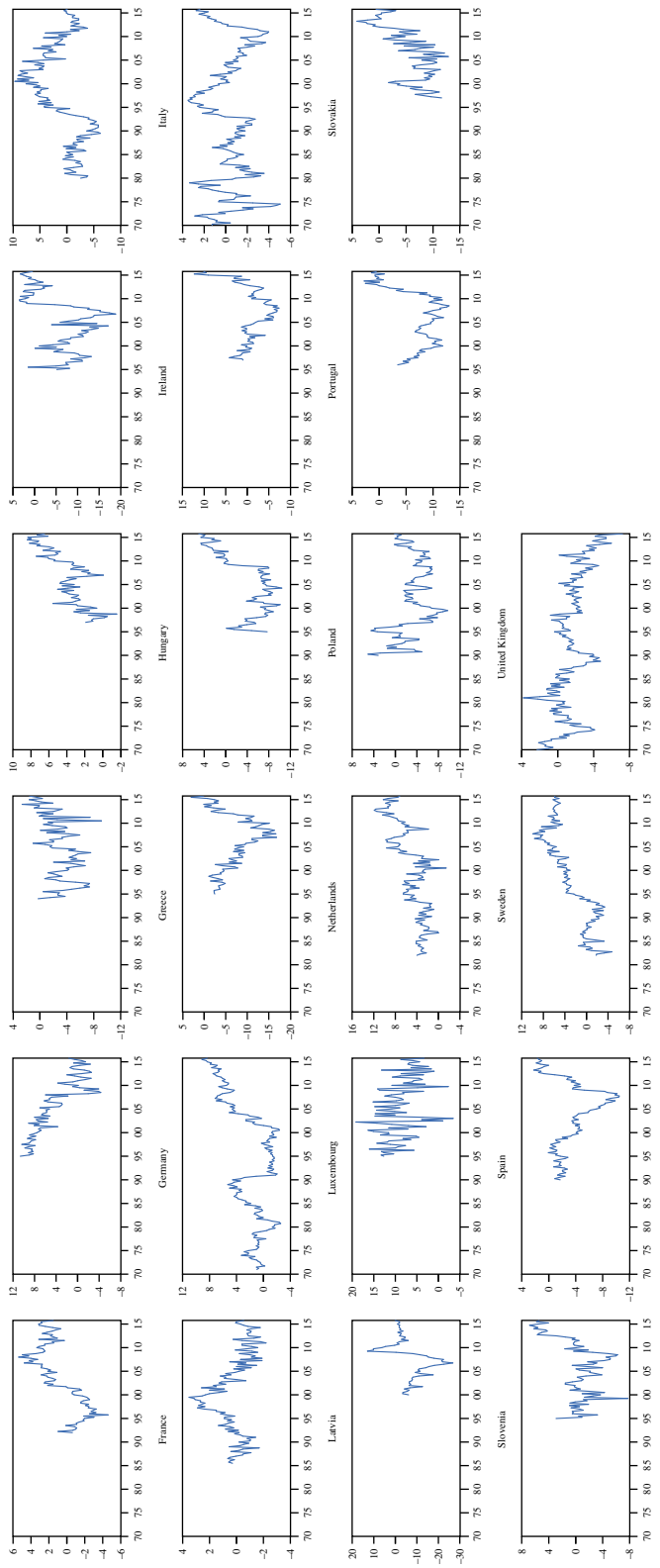

FIGURE 1 Current account-to-GDP ratio

Source: Data retrieved from OECD stats [Colour figure can be viewed at wileyonlinelibrary.com]

the dataset by Bénétrix et al. (2015) for the shares of foreign assets and liabilities (in the NIIP and NED) in foreign currency.[16] There are four missing countries in their dataset: Bulgaria, Cyprus, Luxembourg and Malta. We thus do not retain these countries, neither Croatia nor Estonia, because of too many missing monetary data.

Lane and Milesi-Ferretti (2017) provide data for foreign assets and liabilities, and foreign debt assets and debt liabilities. From European Commission (AMECO database), we take data on trade balance, GDP at current prices, GDP deflator annual percentage change, real GDP growth rate and exchange rates.[17] For nominal long-term interest rates, we use IMF data (International Financial Statistics) and complement the series with data from AMECO for some countries (Romania, Slovakia and Slovenia).[18]

Figure 2 displays the evolution of NFA (NIIP and NED) as a percentage of GDP. It is worth mentioning that Ireland has a large negative NIIP, but an even larger negative NED (meaning that the value of assets exceeds that of liabilities). On the contrary, the Netherlands has increasingly been in a credit position with regard to the NIIP, but in a debit position with regard to the NED.

For most of the countries, however, one may notice that the behaviour of the NIIP and NEED follows a mirror pattern, implying that the debt is usually the key component of the NIIP. The other main discernible trends are a sharp deterioration of both the NIIP and NED in some old Member States with large debit positions (Greece, Portugal and Spain) and some new Member States with smaller debit positions (Czech Republic, Latvia, Poland, Romania and Slovenia); a credit position of the NIIP and NED in Belgium (steady) and Germany (growing); an improvement of both the NIIP and NED in Denmark; a close-to-balance NIIP with a rather stable NED in Austria, Sweden and the United Kingdom; a small debit position for the NIIP along with a growing debit position for the NED in France and Italy (because of the high level of public indebtedness); and a fairly stable NED with either an improvement in the NIIP (Finland and Hungary) or a worsening (Lithuania and Slovakia).

4.2 | First empirical strategy: time-series unit root and cointegration tests

In line with theoretical arguments exposed in Section 3, we begin with time-series diagnostics of current account-to-GDP ratio. We proceed with two standard unit root tests: augmented Dickey–Fuller (ADF, 1979) and Phillips-Perron (PP, 1988).[19] The detailed results of these tests are provided in the Appendix (Table A3).[20]

As accurately pointed out by Perron (1989), standard tests tend to fail to reject unit root even if a series is stationary but contains a structural break. We consider two types of structural breaks:

[16]Their dataset covers a period up to 2012. We take the values of ν and μ observed in 2012 for the following years 2013–15.

[17]We use end-of-period exchange rates for stock variables and period-average exchange rates for macroeconomic variables.

[18]Short-term interest rates are used for some countries: in 1999 (Czech Republic, Hungary, Slovakia), 1999–2000 (Latvia, Lithuania, Poland) and 1999–2001 (Slovenia).

[19]We also employed one stationarity test—Kwiatkowski, Phillips, Schmidt and Shin (1992) whose results yield similar conclusions and are available upon request.

[20]There is evidence of sustainability in only eight countries according to these standard unit root tests: three deficit countries (the Czech Republic, Poland and Slovakia), two countries with CA close-to-balance (France and Italy) and three surplus countries (Belgium, Finland and Luxembourg). The stationary tests confirm sustainability for Italy, Belgium and Luxembourg. Among deficit countries, sustainability is not rejected for Greece, Ireland, Latvia and Spain.

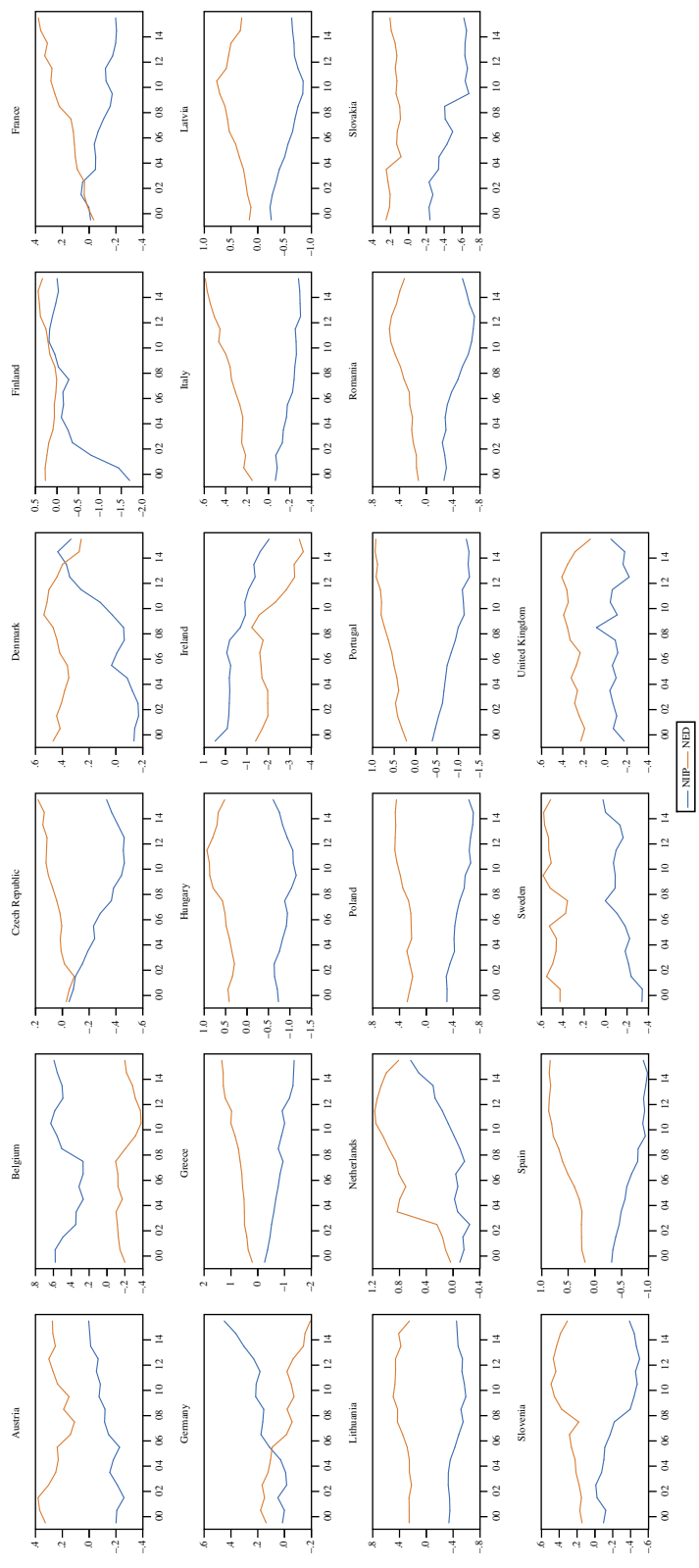

FIGURE 2 Net foreign assets and net foreign debt (both as percentage of GDP), 1999–2015

Note: A positive value means a credit position for the NIIP but a debit position for the NED

Source: Data from Lane and Milesi-Ferretti (2017)[Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 1 Results of unit root tests of the CA-to-GDP ratio with endogenously determined structural break

		Innovation outlier			Additive outlier		
Country	**Sample period**	**Break**	***t*-Stat**	***p***	**Break**	***t*-Stat**	***p***
Austria	1992Q1–2015Q4	2001Q2	−3.5611	0.6547	2000Q4	−4.0922	0.3166
Belgium	1995Q1–2015Q4	2008Q1	−7.8117	<0.01	2005Q2	−5.4945	<0.01
Czech Rep.	1994Q1–2015Q4	2002Q1	−5.3310	0.0109	2000Q1	−6.7270	<0.01
Denmark	1997Q1–2015Q4	2006Q1	−6.2907	<0.01	2005Q3	−6.1959	<0.01
Estonia	1995Q1–2015Q4	2008Q3	−4.7831	0.0620	2008Q1	−4.4242	0.1586
Finland	1980Q1–2015Q4	1993Q1	−4.0546	0.3380	1993Q4	−3.8565	0.4641
France	1985Q3–2015Q4	2002Q4	−2.7796	0.9571	2003Q1	−2.8502	0.9465
Germany	1971Q1–2015Q4	1990Q1	−4.1483	0.2876	2003Q2	−3.4326	0.7319
Greece	1995Q1–2015Q4	2011Q3	−3.3175	0.7937	2011Q3	−5.2282	0.0162
Hungary	1995Q1–2015Q4	2008Q4	−4.9989	0.0333	2008Q4	−5.0235	0.0308
Ireland	1997Q1–2015Q4	2012Q4	−3.2570	0.8220	2012Q2	−2.9206	0.9332
Italy	1970Q1–2015Q4	1992Q3	−3.6620	0.5893	1992Q3	−3.6978	0.5658
Latvia	2000Q1–2015Q4	2008Q4	−5.4220	<0.01	2009Q3	−3.4643	0.7144
Luxembourg	1995Q1–2015Q4	2003Q1	−9.4019	<0.01	2003Q2	−9.1936	<0.01
The Netherlands	1982Q1–2015Q4	2009Q1	−5.4099	<0.01	2006Q1	−5.2416	0.0155
Poland	1990Q1–2015Q4	1995Q4	−4.6979	0.0777	1996Q4	−4.7617	0.0656
Portugal	1996Q1–2015Q4	2011Q2	−4.5273	0.1221	2011Q3	−3.4563	0.7199
Slovakia	1997Q1–2015Q4	2001Q2	−5.5976	<0.01	2000Q3	−6.0774	<0.01
Slovenia	1995Q1–2015Q4	2012Q1	−3.9697	0.3911	2012Q2	−5.6242	<0.01
Spain	1990Q1–2015Q4	2008Q4	−3.2518	0.8241	2009Q3	−2.6687	0.9703
Sweden	1982Q1–2015Q4	2011Q3	−3.6665	0.5863	2008Q3	−3.1794	0.8527
UK	1970Q1–2015Q4	2011Q2	−3.6009	0.6287	2012Q1	−5.3358	0.0106

Notes: Denote $DU_t(T_b)$ as the intercept break variable, $DT_t(T_b)$ as the trend break variable, $D_t(T_b)$ as one-time break variable, y_t as the CA-to-GDP ratio, $\psi(L)$ as a lag polynomial and ε_t as IID innovations. The innovation outlier specification tests the null of $y_t = y_{t-1} + \beta_t + \psi(L)(\theta DU_t(T_b) + \gamma DT_t(T_b) + \varepsilon_t)$, against the alternative hypotheses which are nested in a general Dickey–Fuller test equation of $y_t = \mu + \beta t + \theta DU_t(T_b) + \gamma DT_t(T_b) + \omega D_t(T_b) + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + u_t$. The *t*-statistic is used for comparing $\hat{\alpha}$ to $1(t_{\hat{\alpha}})$ to evaluate the null hypothesis. The "trend and intercept, break in intercept" model sets $\gamma = 0$. Other options (just "intercept" or "trend and intercept, break in both" yield similar results and are available upon request. The additive outlier tests the null of $y_t = y_{t-1} + \beta t + \theta D_t(T_b) + \gamma DU_t(T_b) + \psi(L)\varepsilon_t$ against a general alternative of $y_t = \mu + \beta t + \theta DU_t(T_b) + \gamma DT_t(T_b) + \psi(L)\varepsilon_t$. In a two-step procedure, the model is first adequately detrended and then the Dickey–Fuller test is performed. See Vogelsang and Perron (1998) and Kim and Perron (2009) for discussion. Optimal lag length is chosen according to Akaike information criterion and selected break minimises Dickey–Fuller *t*-statistics.

innovational outlier, where since the break the series diverges progressively from its previous behaviour; or an additive outlier, where a sudden shift in the series occurs (Perron & Vogelsang, 1992). Results of these two types of tests are presented in Table 1. The null hypothesis is of a unit root against an alternative of stationarity with structural break.

Our inference on sustainability of the CA is based on the following decision criteria: Rejection of a unit root under either innovational or additive outlier with intercept only is interpreted

as indicating sustainability. Rejection of a unit root in either set-up under assumption of a trend is indicating sustainability only if an upward trend is detected in a deficit country or a downward trend in a surplus country. The results indicate that the CA is sustainable in 11 countries. Among deficit countries, there are the Czech Republic, Greece (with a break in 2011Q3),[21] Hungary, Latvia (break in 2008Q4), Slovakia, Portugal and the United Kingdom. Among close-to-balance countries, there is Slovenia.[22] Among surplus countries, there are Belgium, Denmark (stationary with a break in the intercept under the additive outlier approach) and Luxembourg.

Cointegration tests as a means of assessing current account sustainability are also run. To inspect it further, we rely on the traditional Johansen-Juselius cointegration test. This is possible, as unit roots are present in almost all exports and imports-to-GDP series, except for the United Kingdom (see Table A4 in the Appendix). Cointegration tests are thus performed for all the countries in the sample (relying on both trace and maximum eigenvalue), except the United Kingdom.[23] If cointegration is detected, the vector error-correction model with cointegration vector restricted to (1, −1) is tested, which would be a proof of sustainability (Quintos, 1995; Westerlund & Prohl, 2010). The results displayed in Table 2 indicate that there is no evidence of sustainability, in spite of cointegration identified in seven countries.

Overall, we can summarise the results from the various tests as follows. There is evidence of sustainability of the current account balance in eight countries. In a specific manner, these countries are as follows: Belgium, Luxembourg and Denmark (with a break in intercept) among surplus countries; Italy (no break) among close-to-balance countries; the Czech Republic, Slovakia, Greece (break in 2011Q3) and Latvia (break in 2008Q4) among deficit countries.

Contrasting our findings with the literature, it is important to note that our sample covers more EU countries than in other studies (cited in Table A1 in the Appendix). Our results are consistent with those of Chen (2014) for the Czech Republic and Greece, Camarero et al. (2015) for Italy and Belgium (but not Greece), Bajo-Rubio et al. (2014) for Italy, and Holmes (2006) for Belgium (but not Italy).

4.3 | Second empirical strategy: simulations

Table 3 shows the results from our second approach tackling external accounts' sustainability. We compare the actual trade balance in percentage of GDP on average over the 1999–2015 period with the predicted trade balance that stabilises the NFA position (NIIP or NED). The latter is based on Equation (14). We made simulations under three scenarios depending on the values of parameters ν_t and μ_t (the shares of foreign assets and liabilities denominated in foreign currency in total foreign assets and liabilities, respectively). In the baseline scenario, we use the (time-varying) values retrieved from the BLS dataset (Bénétrix et al., 2015). In a second scenario—dubbed "safe scenario" à la Portuguese—the values of parameters for all countries and all years are those of

[21]The adjustment in the current account of Greece (see Figure 1) can be explained by a marked contraction in imports, a reduction in government interest payments, and transfers of profits made by national central banks on Greek bond holdings. *Source*: European Commission (2014).

[22]In case of Italy, we rely on standard unit root and stationarity tests because, even if tests allowing for structural break fail to reject the unit root, the Bai and Perron (2003) test indicates no break in the series.

[23]The lag structure is selected on a basis of AIC criterion in a corresponding VAR model in levels. The choice of AIC is robust, as in all the cases the optimal number of lags according to AIC criterion overlapped with the majority among LR, FPE, AIC, SC and HQ.

TABLE 2 Time-series Johansen cointegration tests and cointegration vectors

Country	Obs. (adj.)	Lags	No. Coint. Eq.	Trace statistic	*p*	Max eigen. statistic	*p*	Normalised coint. vector	*p* of restricted m.
Austria	78	1	0	11.180	0.2006	6.5628	0.5421	1.0000	
			1	4.618	0.0316	4.6180	0.0316	−0.7900	
			2					(0.0574)	
Belgium	81	5	0	6.1923	0.6728	5.5620	0.6698		
			1	0.6303	0.4272	0.6303	0.4272	−1.1719	
			2					(0.0749)	
Czech Republic	79	4	0	22.215	0.0042	21.891	0.0026	1.0000	0.000006
			1	0.3233	0.5696	0.3233	0.5696	−0.7760	
			2					(0.0149)	
Denmark	83	0	0	11.071	0.2071	0.10214	0.2909	1.0000	
			1	2.1286	0.1446	0.02532	0.1446	−1.0136	
			2					(0.0743)	
Estonia	83	0	0	12.987	0.1153	10.938	0.1573	1.0000	
			1	2.0485	0.1524	2.0485	0.1524	−0.3954	
			2					(0.1636)	
Finland	102	1	0	10.945	0.2149	9.7310	0.2302	1.0000	
			1	1.2143	0.2705	1.2143	0.2705	12.603	
			2					(4.2699)	
France	177	6	0	5.8364	0.7148	4.6081	0.7902	1.0000	
			1	1.2282	0.2677	1.2282	0.2677	−1.1109	
			2					(0.1810)	
Germany	99	0	0	11.146	0.2026	11.108	0.1489	1.0000	
			1	0.0389	0.8435	0.0389	0.8435	−0.7250	
			2					(0.0307)	
Greece	83	0	0	9.0649	0.3594	7.9375	0.3851	1.0000	
			1	1.1274	0.2883	1.1274	0.2883	−0.3328	
			2					(0.2112)	
Hungary	83	0	0	8.0333	0.4619	6.7213	0.5226	1.0000	
			1	1.3120	0.2520	1.3120	0.2520	−0.7054	
			2					(0.0843)	
Ireland	71	4	0	9.2084	0.3465	9.0111	0.2852	1.0000	
			1	0.1972	0.6569	0.1972	0.6569	−0.4931	
			2					(0.1034)	
Italy	82	1	0	14.096	0.0803	12.232	0.1022	1.0000	0.002260
			1	1.8647	0.1721	1.8647	0.1721	1.4182	
			2					(0.7219)	

(Continues)

TABLE 2 (Continued)

Country	Obs. (adj.)	Lags	No. Coint. Eq.	Trace statistic	*p*	Max eigen. statistic	*p*	Normalised coint. vector	*p* of restricted m.
Latvia	79	4	0	7.6542	0.5031	7.6245	0.4182	1.0000	
			1	0.0297	0.8630	0.0297	0.8630	−0.4618	
			2					(0.1737)	
Luxembourg	63	0	0	36.928	0.0000	35.890	0.0000	1.0000	0.000000
			1	1.0377	0.3084	1.0377	0.3084	−0.8260	
			2					(0.0164)	
The Netherlands	78	5	0	5.6093	0.7411	5.5976	0.6652	1.0000	
			1	0.0116	0.9138	0.0116	0.9138	−0.7956	
			2					(0.0369)	
Poland	51	4	0	9.1848	0.3486	9.0428	0.2826	1.0000	
			1	0.1419	0.7063	0.1419	0.7063	−0.6737	
			2					(0.0768)	
Portugal	83	0	0	14.274	0.0757	13.436	0.0673	1.0000	0.000676
			1	0.8374	0.3601	0.8374	0.3601	−0.2387	
			2					(0.1075)	
Slovakia	83	0	0	18.917	0.0146	18.680	0.0094	1.0000	0.000813
			1	0.2369	0.6264	0.2369	0.6264	−0.7715	
			2					(0.0469)	
Slovenia	77	6	0	5.9875	0.6970	5.9875	0.6148	1.0000	
			1	3.90E-05	0.9969	3.90E-05	0.9969	−0.6604	
			2					(0.0872)	
Spain	78	5	0	13.317	0.1037	12.860*	0.0823	1.0000	0.003370
			1	0.4562	0.4994	0.4562	0.4994	−0.2490	
			2					(0.2010)	
Sweden	86	5	0	19.991	0.0098	17.382	0.0156	1.0000	0.000227
			1	2.6085	0.1063	2.6085	0.1063	−14.250	
			2					(3.2760)	

Notes: The critical values at 5% significance level for trace statistics are as follows: 15.41 rejecting the null of no cointegration and 3.76 rejecting at most 1 cointegrating relation. For max eigenvalue statistics, these are, respectively, 14.07 and 3.76.

Portugal (in 2012):[24] $\nu = 0.07$ and $\mu = 0.01$ in the NIIP, and $\nu = 0.04$ and $\mu = 0.01$ in the NED.[25] In such a case, the dynamics of the NFA is not too much influenced by valuation effects due to exchange rate movements. We expect that there could be noticeable differences between the

[24]The values of ν and μ are not exactly the same as those of Table A2 in the Appendix, because they are derived from the sum of the weights of the five main foreign currencies (see section 3.3).

[25]The decomposition by foreign currency is the following: on the asset side of the NIIP, there is a weight of 4% for the US dollar, 2.3% for the British pound, 0.2% for the Japanese yen and 0.4% for the Swiss franc; on the liability side of the NIIP, the foreign currency is mostly the US dollar. As for the asset side of the NED, the weight of the US dollar is 2.3% and that of the British pound is 1.5%, whereas on the liability side, the US dollar represents the most part.

TABLE 3 Trade balance stabilising NIIP and NED

Net international investment position (NIIP)					
	NIPP (% of GDP) 2015	Average trade balance (% of GDP) 1999–2015	Predicted trade balance (% of GDP)		
			Baseline	Safe scenario	Risky scenario
Austria	0.3	3.0	1.8	1.8	1.3
Belgium	59.4	2.7	0.8	1.2	0.2
Czech Republic	−33.1	2.2	3.7	0.8	3.4
Denmark	33.5	5.9	0.9	−3.7	0.9
Finland	−0.1	3.8	2.5	2.1	1.6
France	−19.8	−0.6	1.3	1.4	0.9
Germany	45.0	4.8	2.4	2.6	1.9
Greece	−136.1	−8.2	−1.8	−1.9	−1.1
Hungary	−61.0	1.5	0.8	−1.0	1.3
Ireland	−203.2	15.3	19.7	22.4	20.9
Italy	−28.1	0.5	1.9	1.6	1.6
Latvia	−63.4	−8.9	−6.3	−6.3	−6.2
Lithuania	−45.1	−5.0	−3.8	−4.0	−3.9
The Netherlands	63.3	8.3	4.4	5.4	3.3
Poland	−63.4	−2.1	0.4	−1.0	0.3
Portugal	−118.5	−6.3	−0.9	−1.0	−0.7
Romania	−54.1	−6.7	−4.4	−6.6	−4.4
Slovakia	−62.1	−1.8	0.6	0.8	0.8
Slovenia	−38.7	1.0	3.2	3.1	3.1
Spain	−90.4	−1.8	2.8	2.7	2.9
Sweden	2.4	5.9	3.9	−2.0	3.4
United Kingdom	−4.9	−2.2	−1.4	−13.3	−1.6
Net external debt (NED)					
	NED (% of GDP) 2015	Average trade balance (% of GDP) 1999–2015	Predicted trade balance (% of GDP)		
			Baseline	Safe scenario	Risky scenario
Austria	27.5	3.0	−2.4	−2.3	−2.4
Belgium	−19.9	2.7	−3.2	−3.2	−3.2
Czech Republic	18.2	2.2	−0.9	−2.5	−0.9
Denmark	25.9	5.9	−6.6	−8.1	−6.6
Finland	33.8	3.8	−3.2	−3.1	−3.2
France	37.9	−0.6	2.6	2.7	2.6
Germany	−19.3	4.8	−5.5	−5.4	−5.5
Greece	134.5	−8.2	15.7	15.4	16.1
Hungary	52.3	1.5	1.0	0.4	1.0

(Continues)

TABLE 3 (Continued)

Net external debt (NED)					
	NED (% of GDP) 2015	Average trade balance (% of GDP) 1999–2015	Predicted trade balance (% of GDP)		
			Baseline	Safe scenario	Risky scenario
Ireland	−344.4	15.3	−27.7	−27.7	−27.7
Italy	59.0	0.5	2.2	2.2	2.2
Latvia	29.8	−8.9	11.1	11.1	11.2
Lithuania	25.0	−5.0	7.2	7.2	7.2
The Netherlands	81.5	8.3	−1.7	−1.5	−1.7
Poland	44.6	−2.1	3.9	3.8	3.9
Portugal	92.8	−6.3	11.6	11.5	11.7
Romania	32.6	−6.7	8.6	7.6	8.6
Slovakia	20.8	−1.8	2.8	2.8	2.8
Slovenia	30.8	1.0	1.2	1.2	1.2
Spain	83.5	−1.8	6.1	6.1	6.1
Sweden	51.3	5.9	−5.6	−6.4	−5.6
United Kingdom	14.2	−2.2	2.9	−0.7	2.9

Notes: A positive value means a credit position for the NIIP but a debit position for the NED. The predicted value of the trade balance is the one that stabilises NIIP/NED on average over the sample period based on Equation (14). Baseline: The values of parameters ν and μ (shares of foreign assets and liabilities denominated in foreign currency in total foreign assets and liabilities) are the national ones as computed in Bénétrix et al. (2015). Safe scenario: the values of both parameters ν and μ are those of Portugal in 2012 (low vulnerability to exchange rate changes with a very low share of net foreign assets in foreign currency in total net foreign assets). Risky scenario: the values of both parameters nu and mu are those of the United Kingdom in 2012 (high vulnerability to exchange rate changes with a very high share of net foreign assets in foreign currency in total net foreign assets).

Source: Own calculations using data from Bénétrix et al. (2015), Lane and Milesi-Ferretti (2017), European Commission (AMECO) and IMF (IFS).

predicted balance of the baseline scenario and that of this scenario particularly for non-EA countries. In a third scenario, a "risky scenario" à la British—the values of the parameters are the same as in the United Kingdom in 2012.[26] This country is very vulnerable to any exchange rate movements. Indeed, the values are $\nu = 0.81$ and $\mu = 0.56$ in the NIIP, and $\nu = 0.85$ and $\mu = 0.74$ in the NED.[27] Here, any notable difference between the results of the baseline and those of the third scenario is likely to concern mostly EA countries.

These three scenarios do not differ by the currency composition of foreign assets and liabilities only. They also differ by the role of interest rates. In this respect, Euro Area membership matters. In a specific manner, for any EA country, the domestic interest rate applied to foreign assets/liabilities in domestic currency (euro) is not necessarily the country-specific interest rate because any member country can borrow (or lend) funds in euros from (to) a partner in the monetary union at

[26]In this "British scenario," we replace the weight of the euro by a weight of the pound for EA countries.

[27]The weights by foreign currency are the following: 38% for the US dollar, 38% for the euro, 3% for the yen and 2% for the Swiss franc on the asset side of the NIIP; 23% for the US dollar, 29% for the euro, 3% for the yen and 1% for the Swiss franc on the liability side of the NIIP; 42% for the US dollar, 39% for the euro, 3% for the yen and 1% for the Swiss franc on the asset side of the NED; and 30% for the US dollar, 39% for the euro, 4% for the yen and 1% for the Swiss franc on the liability side of the NED.

an interest rate that prevails in the partner country. For example, Portugal may borrow funds in euros from Germany at a lower rate (German rate) than the national one (Portuguese rate). One difficulty in the empirical analysis relates to the fact that we do not have a fine decomposition of foreign assets/liabilities in euros by partner country. We are thus left with two options for the choice of the domestic interest rate in each EA country: we can choose either the country-specific interest rate or the average EA interest rate.

We use the EA interest rate in the baseline scenario but the domestic interest rate in the "risky scenario." In addition, we apply the EA interest rate to liabilities in domestic currency in the "safe scenario." In doing so, we consider an expected benefit from EA membership related to lower borrowing costs.[28] Note, however, that the "safe scenario" may not be so safe in comparison with the "risky scenario" if domestic interest rates are notably lower than foreign ones in countries with a credit position or EA interest rates are higher than foreign ones in countries with a debit position. Likewise, the "risky scenario" might not be so risky if an appreciation (depreciation) of the domestic currency has led to a reduction (an increase) in the value of foreign liabilities (assets) denominated in foreign currency.

According to our results, the predicted balance is a trade surplus in most countries.[29] The factors that explain why some countries could instead afford a trade deficit to stabilise the NIIP or NED are various: improvement in the actual trade balance and lower interest rates for the last few years (Greece, Portugal), high inflation (Latvia, Romania), high real GDP growth (Lithuania), positive effect of a depreciation of the domestic currency on the asset side of the NIIP (UK), credit position in the NED (Belgium, Germany, Ireland) or small debit position (Austria, Czech Republic, Denmark, Finland), and a combination of favourable exchange rate movements, lower foreign interest rates and a decrease in the share of the US dollar and British pound since 2009 (the Netherlands, Sweden). From the NIIP standpoint, it is worth noting that non-EA countries (except Romania) would benefit from a participation in the European monetary union ("safe scenario") insofar as the predicted balance would be a deficit or a smaller surplus indeed. As for the "risky scenario," it is less risky than predicted. This confirms that valuation effects through exchange rates may prove profitable, depending on the variation of exchange rates and the composition by foreign currency of both assets and liabilities.

From the baseline results, we draw conclusions about sustainability of the NFA position by considering three dimensions: the gap between the actual trade balance and the predicted trade balance, the NFA position in the last year of the sample (2015) and its trend since 1999 (Figure 2).

With regard to the NIIP, there is evidence of sustainability in four countries: three countries with a close-to-balance position (Austria, Finland and Sweden) and one country with a debit position (Hungary). These countries have had on average a trade surplus above the predicted surplus. It is therefore not surprising that the NIIP has improved or been close-to balance in these countries. On the contrary, there is a lack of sustainability in six countries: four countries with large and growing debit positions (Greece, Ireland, Portugal and Spain) and two countries with large and growing credit positions (the Netherlands and Germany). Trade deficits have been too large on average in the former countries (the trade balance should even be in surplus in Spain for stabilising

[28]For robustness checks, we did simulations of the three scenarios under three different cases of interest rates applied to foreign assets/liabilities in domestic currency (euro): country-specific rate, average EA rate and country-specific rate applied to assets and average EA rate applied to liabilities. The predicted trade balance may differ across the nine configurations, but the final conclusions about sustainability are not affected. All results are available upon request.

[29]We do not consider that a trade surplus is an optimal trade balance. A deficit could indeed be needed for other purposes (e.g., consumption smoothing, importing capital goods, inter alia).

the NIIP/GDP ratio), whereas trade surpluses have exceeded the predicted trade surplus in the latter. Therefore, the debit positions of the former and the credit positions of the latter have kept on increasing.

Concerning the NED, there is evidence of sustainability in seven countries: six countries with a debit position (Austria, Denmark, Finland, Hungary, the Netherlands and Sweden), and one country with a credit position (Belgium). There is also a lack of sustainability in eight countries: six countries with a debit position (Greece, Portugal, Spain, Italy, France and Poland) and two countries with a credit position (Ireland and Germany).

In summary, considering the NIIP and NED together, there is evidence of sustainability in four countries (Austria, Finland, Sweden, Hungary) and a lack of sustainability in five countries (Greece, Ireland, Portugal, Spain and Germany, the latter being in a credit position). A special case is the situation of the Netherlands: The debit position of the NED is found to be sustainable but not the credit position of the NIIP.

In conclusion, it is interesting to look at the implications of the MIP in terms of the efforts needed to comply with the commitment to reduce macroeconomic imbalances.[30] In the MIP scoreboard, the threshold of the NIIP/GDP ratio is −35%. We computed the required trade balance to reach the threshold by a target date in countries whose debit position is above 35% of GDP. The time-horizon is set to 1, 5 or 10 years.[31] We did the same exercise with the NED (for countries whose NED is above 35% of GDP) although there is no explicit threshold applied to this indicator in the MIP. Yet, as mentioned before, we consider that this indicator is worth being monitored more closely (although we do not endorse the 35% threshold). Results are reported in Table 4.

In an evident manner, reaching the threshold within 1 year is not feasible. One exception is Slovenia: The required trade surplus to reduce the NIIP (−39% of GDP in 2015) to 35% of GDP would be 3.5%. This is smaller than that the actual trade surplus in 2015 (8.6%). Given the track record of countries since 1999, bringing down the NFA to the threshold is achievable within a 5-year horizon in five countries (Hungary, Ireland, France, the Netherlands and Sweden) and a 10-year horizon in three countries (Lithuania, Slovakia and Italy). Also, Poland could realistically reach the target in 5 years for the NED but 10 years for the NIIP. On the contrary, required macroeconomic adjustments would be excessive in five countries: Greece, Latvia, Portugal, Romania and Spain. In this respect, there is a lack of sustainability in external indebtedness in these countries (NIIP only for Latvia and Romania).

Information based on Table 4 can be combined with that of Table 3 to make an ultimate assessment of sustainability of the NFA position. In this area, evidence of sustainability is confirmed for Hungary, Sweden and the Netherlands (NED only in the latter case). Evidence of a lack of sustainability is verified for Greece, Portugal and Spain. In the case of Romania and Latvia, results from Table 4 indicate a lack of sustainability in the short or medium run. Since the results from Table 3 suggest that the actual trade deficit was on average two points of percentage higher than the stabilising one, a lack of sustainability can be suspected. In contrast, the NIIP of Ireland and the NED of Poland, France and Italy appear to be sustainable within a 5-year horizon (or 10 years in the Italian case) although results from Table 3 pointed to a lack of sustainability. This suggests that

[30]We gratefully acknowledge a suggestion made by an anonymous referee that we assess the efforts of countries to reduce external indebtedness.

[31]Our approach is similar to the one that was used to compute the required primary government budget balance to reduce the public debt/GDP ratio to the 60% norm of the Maastricht treaty by a given target date (Buiter, Corsetti, Roubini, Repullo, & Frankel, 1993). The difference is that we consider various exchange rates and interest rates according to the decomposition of the foreign assets and liabilities by foreign currency.

TABLE 4 Required trade balance to reach the MIP threshold within a given time span

	NIPP (% of GDP) 2015	Actual trade balance (% of GDP) 2015	Required trade balance (% of GDP)		
			1-year horizon	5-year horizon	10-year horizon
Greece	−136.1	0.1	110.9	30.4	20.8
Hungary	−61.0	8.9	25.4	4.5	1.9
Ireland	−203.2	33.1	141.4	9.8	−3.8
Latvia	−63.4	−0.5	27.8	5.1	2.2
Lithuania	−45.1	−0.5	11.1	3.0	2.0
Poland	−63.4	3.1	28.1	5.4	2.5
Portugal	−118.5	0.6	82.5	15.7	7.4
Romania	−54.1	−0.6	17.9	2.7	0.8
Slovakia	−62.1	1.6	26.0	4.4	1.7
Slovenia	−38.7	8.6	3.5	0.5	0.2
Spain	−90.4	2.3	54.2	9.9	4.4
	NED (% of GDP) 2015	**Actual trade balance (% of GDP) 2015**	**Required trade balance (% of GDP)**		
			1-year horizon	**5-year horizon**	**10-year horizon**
France	37.9	−1.5	3.1	0.8	0.5
Greece	134.5	0.1	109.1	30.0	20.5
Hungary	52.3	8.9	18.5	4.7	3.0
Italy	59.0	2.9	24.1	4.9	2.5
The Netherlands	81.5	10.6	46.4	9.3	4.6
Poland	44.6	3.1	9.6	1.9	1.0
Portugal	92.8	0.6	57.1	10.8	5.0
Spain	83.5	2.3	47.4	8.7	3.8
Sweden	51.3	4.9	14.7	1.6	0.0

Notes: A positive value means a credit position for the NIIP but a debit position for the NED. The required value of the trade balance is the one that brings down NIIP to −35% of GDP and NED to 35% of GDP within 1, 5 or 10 years.
Source: Own calculations using data from Bénétrix et al. (2015), Lane and Milesi-Ferretti (2017), European Commission (AMECO) and IMF (IFS).

there is a need to account for the implications of reducing external imbalances in terms of macroeconomic adjustments.

5 | CONCLUSION AND POLICY IMPLICATIONS

External imbalances are a greater source of concern than public deficits and debts in some countries of the European Union, given their size and evolution. The new macroeconomic imbalance procedure (MIP), which aims at preventing these imbalances, relies on the surveillance of macroeconomic indicators. Some thresholds have been defined for the current account balance and the net international investment position (NIIP), but not for the NED which is taken as an auxiliary

indicator in the MIP scoreboard. Prompted by these thresholds, we carried out an analysis of external debt sustainability of EU countries.

We used two approaches. First, we computed unit root tests of current account balance-to-GDP ratios and cointegration tests of exports and imports of goods and services. From this first assessment, we can summarise the main results as follows: (i) generally, the null of a unit root in the time-series of current account balance-to-GDP cannot be rejected for most countries; and (ii) sustainability is found for Czech Republic, Slovakia, Greece (with a break in 2011.Q3) and Latvia (break in 2008.Q4) among deficit countries, Italy among close-to-balance countries, and Belgium, Luxembourg and Denmark among surplus countries.

Then, we used a dynamic external debt constraint to compute the trade balance that stabilises the net foreign asset (NFA) position (NIIP or NED) over a given period. It is fair to say that based on this analysis, there is some concern about the sustainability of external imbalances not only in some debtor nations but also in some creditor nations. Still, the global picture is not alarming.

Both the NIIP and NED can be considered as being sustainable in four countries only (Austria, Finland, Sweden and Hungary), but not sustainable in three debtor nations (Greece, Portugal, Spain) and one creditor nation (Germany). There is evidence of sustainability of the NED in Belgium, Denmark, France, Poland and Italy. The negative NIIP is not found sustainable in Romania and Latvia. It is also worth noting that there are two countries with distinctive opposite features: Ireland is a debtor nation by NIIP (sustainable) but a creditor nation by NED (not sustainable), whereas the Netherlands is a creditor nation by NIIP (not sustainable) but a debtor nation by NED (sustainable).

Overall, there is some consistency between the two approaches. The first exercise assesses whether a country is in a steady state (or balanced growth path) or not by looking at the existence of a stable long-run relationship between exports and imports. The second exercise is arguably more interesting since it uses the dynamic external constraint of a country as a tool by taking into account valuation effects. From the two approaches, there is evidence of sustainability of current account balances and NED in Belgium, Denmark and Italy.[32] Given the relationship between flows and stocks, and the existence of important structural breaks in the recent period, our first approach points to sustainability of the current account-to-GDP ratio in Greece and Latvia, whereas the second approach indicates nonsustainability of their NFA position (only the NIIP in the case of Latvia). This reinforces the case for surveillance of the evolution of external imbalances, insofar as it takes time to adjust stocks. Furthermore, due to valuation effects—via exchange rate and interest rate changes in our approach—there might well be sustainable current account balances along with unsustainable net foreign asset positions.

In comparison, the European Commission (2012b) led a sustainability assessment for eight countries. They were selected because they were EA countries and had large negative NIIPs. Its conclusion pointed towards some sustainability risks in some countries (without naming them).

Sustainability of external imbalances mostly prevail in small open economies, and conversely, a lack of sustainability is predominant in least open economies of the EU. Sustainability is also prevalent in economies with the highest shares of foreign direct investment stocks in GDP (with investment income)—with the exception of the Netherlands whose positive NIIP has become very large. But most of all, sustainability exists in general in countries where large increases in private sector indebtedness have been compensated for by small increases (or decreases) in public sector indebtedness since the early 2000s.

[32]Luxembourg is not included in the second empirical approach due to a lack of data.

Policy-wise, it would be advisable that EU policymakers care more about the issue of sustainability of the NED than that of the NIIP. As acknowledged, there is a need to improve the availability of data on foreign debt assets and liabilities. They could also contemplate distinguishing between EA countries and non-EA countries in the analysis (as it is done for other indicators such as the real effective exchange rate and nominal unit labour costs in the MIP) because EA countries are, in principle, far less vulnerable to exchange rate valuation effects than non-EA countries. To be fair, our results indicate that sustainability risks are more prevalent in the Euro area than in the rest of the EU.[33] As discussed in our analysis, exchange rate changes may prove beneficial depending on the debit/credit position and the structure of foreign assets/liabilities by foreign currency. Nevertheless, exchange rate variability is still a risk.

External imbalances concern surplus countries as well. According to our results, credit positions of Germany (NIIP and NED), Ireland (NED) and the Netherlands (NIIP) are not sustainable insofar as they have recently kept on growing at a fast pace.[34] This gives grounds for the surveillance of current account surpluses within the MIP framework (although there is no rationale for the +6% figure). In terms of policy implications, inasmuch as intra-EA trade is non-negligible, the rebalancing process in the deficit countries (price, wage and expenditure adjustments) could be eased if macroeconomic adjustments also took place in surplus countries (boosting domestic demand).[35]

In conclusion, for reasons of parsimony, we did not consider the relationship between sustainability and (i) the sectoral composition, (ii) geographical exposures and (iii) maturity and currency mismatches of external imbalances, but these could be interesting avenues for future research.

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[33]Blanchard and Giavazzi (2002) had predicted a link between financial integration and growing current account imbalances in poorer countries of the Euro area, with expected increases in investment along with decreases in saving.

[34]They are linked to recent current account surpluses, which are mostly based on trade surpluses in goods and positive foreign direct investment income. There have also been notable decreases in household indebtedness in these countries.

[35]See Blanchard, Erceg, and Lindé (2017).

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APPENDIX

TABLE A1 Summary of recent contributions in time-series and panel data analysis of external sustainability

Authors	Countries	Period	Data frequency	Method	Sustainability holds	No evidence of sustainability
Raybaudi et al. (2004)	JP, UK, US	1970–2002	Quarterly	Nonlinear unit root tests of the TB and the CA	JP, UK	US
Holmes (2006)	11 OECD countries	1980–2002	Quarterly	Unit root tests Cointegration tests	Yes for the panel + AU and UK AU, BE, CAN, JP, UK, US	FR, DE, IT, NO, ES
Chen (2011)	8 OECD countries	Up to 2009	Quarterly	Linear and nonlinear unit root tests		AU, CZ, FI, HU, NZ, PT, ES
Camarero et al. (2013)	23 OECD countries	1970–2012	Annual	Cointegration tests	AT, PT, JP, NZ, NL, ES	
Durdu et al. (2013)	50 countries (21 industrial countries, 29 emerging markets)	1970–2006	Annual	Reaction functions of NX to NFA	Yes for the full sample and the two subsamples	
Bajo-Rubio et al. (2014)	11 OECD countries	1970–2007	Annual	Reaction functions of NX to NFA	AT, CAN, IT, NZ	
Chen (2014)	10 OECD countries	Up to 2012	Quarterly	Linear and nonlinear unit root tests	AU, CZ, NZ, EL	FI, PT, ES
Camarero et al. (2015)	11 Euro Area countries	1972–2011	Annual	Nonlinear stationarity tests of NFA/GDP series	Yes for the panel Yes for 5 countries (BE, FR, IT, NL, PT)	AT, FI, DE, EL, IE, ES

Note: AT: Austria; AU: Australia; BE: Belgium; CA: current account; CAN: Canada; CZ: Czech Republic; DE: Germany; EL: Greece; ES: Spain; FI: Finland; FR: France; HU: Hungary; IE: Ireland; IT: Italy; JP: Japan; NX: net exports; NFA: net foreign assets; NL: the Netherlands; NO: Norway; NZ: New Zealand; PT: Portugal; TB: trade balance; UK: United Kingdom; US: United States.

TABLE A2 Share of foreign assets and liabilities in foreign currency

	Net international investment position				Net external debt			
	Share of assets denominated in foreign currency in total foreign assets		Share of liabilities denominated in foreign currency in total foreign liabilities		Share of debt assets denominated in foreign currency in total foreign debt assets		Share of debt liabilities denominated in foreign currency in total foreign debt liabilities	
	1998	2012	1998	2012	1998	2012	1998	2012
EA countries (in 2012)								
Austria	0.71	0.26	0.68	0.13	0.58	0.02	0.81	0.18
Belgium	0.77	0.19	0.39	0.03	0.64	0.03	0.58	0.06
Finland	0.86	0.39	0.39	0.35	0.70	0.24	0.80	0.47
France	0.79	0.24	0.31	0.14	0.59	0.07	0.58	0.19
Germany	0.64	0.24	0.44	0.20	0.43	0.06	0.58	0.28
Greece	1.00	0.27	0.71	0.02	1.00	0.20	0.98	0.02
Ireland	0.78	0.40	0.36	0.11	0.72	0.26	0.63	0.25
Italy	0.71	0.19	0.46	0.03	0.59	0.03	0.65	0.04
The Netherlands	0.79	0.39	0.30	0.16	0.63	0.08	0.59	0.23
Portugal	0.97	0.11	0.69	0.01	0.96	0.04	0.99	0.01
Slovenia	1.00	0.45	0.68	0.08	1.00	0.33	1.00	0.11
Slovakia	1.00	0.44	0.77	0.61	1.00	0.38	1.00	0.11
Spain	0.68	0.34	0.38	0.04	0.47	0.04	0.60	0.06
Non-EA countries (in 2012)								
Czech Republic	1.00	1.00	0.55	0.41	1.00	1.00	1.00	1.00
Denmark	0.86	0.96	0.67	0.54	0.74	0.91	0.86	0.75
Hungary	1.00	1.00	0.52	0.55	1.00	1.00	1.00	1.00
Latvia	1.00	1.00	0.62	0.72	1.00	1.00	1.00	1.00
Lithuania	1.00	1.00	0.66	0.64	1.00	1.00	1.00	1.00
Poland	1.00	1.00	0.66	0.60	1.00	1.00	1.00	1.00
Romania	1.00	1.00	0.68	0.57	1.00	1.00	1.00	1.00
Sweden	0.90	0.87	0.53	0.39	0.72	0.67	0.88	0.67
United Kingdom	0.92	0.93	0.61	0.58	0.89	0.90	0.84	0.76

Source: Data retrieved from the dataset made by Bénétrix et al. (2015).

TABLE A3 *p*-Values of the ADF and PP unit root tests for the current account-to-GDP ratio

		At level		At first difference	
Country	**Sample period**	**ADF**	**PP**	**ADF**	**PP**
Austria	1992Q1–2015Q4	0.8587	0.1879	0.0000	0.0000
Belgium	1995Q1–2015Q4	0.0010	0.0008	0.0000	0.0000
Czech Rep	1994Q1–2015Q4	0.0272	0.0000	0.0013	0.0000
Denmark	1997Q1–2015Q4	0.1560	0.0011	0.0001	0.0001
Estonia	1995Q1–2015Q4	0.2424	0.1149	0.0014	0.0000
Finland	1980Q1–2015Q4	0.8353	0.3386	0.0000	0.0000
France	1985Q3–2015Q4	0.5624	0.0790	0.0000	0.0000
Germany	1971Q1–2015Q4	0.6545	0.6545	0.0000	0.0000
Greece	1995Q1–2015Q4	0.9864	0.6538	0.0000	0.0000
Hungary	1995Q1–2015Q4	0.5921	0.6836	0.0000	0.0000
Ireland	1997Q1–2015Q4	0.9810	0.9575	0.0000	0.0001
Italy	1970Q1–2015Q4	0.0921	0.0787	0.0000	0.0000
Latvia	2000Q1–2015Q4	0.2206	0.4948	0.0000	0.0000
Luxembourg	1995Q1–2015Q4	0.0000	0.0000	0.0000	0.0001
The Netherlands	1982Q1–2015Q4	0.0192	0.0003	0.0000	0.0000
Poland	1990Q1–2015Q4	0.0870	0.0870	0.0000	0.0000
Portugal	1996Q1–2015Q4	0.8519	0.6126	0.0001	0.0001
Slovakia	1997Q1–2015Q4	0.1375	0.0047	0.0000	0.0001
Slovenia	1995Q1–2015Q4	0.7930	0.0425	0.0000	0.0000
Spain	1990Q1–2015Q4	0.9613	0.9541	0.0000	0.0000
Sweden	1982Q1–2015Q4	0.7303	0.0989	0.0000	0.0000
UK	1970Q1–2015Q4	0.1644	0.0013	0.0000	0.0000

Notes: Both tests are carried out with constant and trend. Other options yield similar results and are available upon request. In ADF tests, the lag length is automatically selected according to Schwartz information criterion whereas in Phillips-Peron test spectral estimation method is based on Bartlett kernel and bandwidth is automatically selected following Newey-West method. Detailed results are available upon request.

TABLE A4 *p*-Values of the ADF and PP unit root tests for the export-to-GDP ratio

Variable		Exports				Imports			
Country	**Sample period**	**ADF**	**PP**	**ADF**	**PP**	**ADF**	**PP**	**ADF**	**PP**
Austria	1996Q1–2015Q4	0.3468	0.2863	0.0005	0.0000	0.0040	0.1405	0.0005	0.0000
Belgium	1995Q1–2015Q4	0.0004	0.0424	0.0001	0.0000	0.0511	0.1619	0.0001	0.0000
Czech Rep.	1995Q1–2015Q4	0.0651	0.1710	0.0216	0.0000	0.0236	0.1705	0.0360	0.0000
Denmark	1995Q1–2015Q4	0.1671	0.3311	0.0000	0.0000	0.3712	0.4304	0.0000	0.0000
Estonia	1995Q1–2015Q4	0.4019	0.3035	0.0292	0.0000	0.1627	0.1579	0.0304	0.0000
Finland	1990Q1–2015Q4	0.4012	0.5106	0.0000	0.0000	0.1411	0.1100	0.0000	0.0000
France	1970Q1–2015Q4	0.0952	0.0211	0.0021	0.0000	0.6260	0.1180	0.0008	0.0000
Germany	1991Q1–2015Q4	0.0838	0.1435	0.0000	0.0000	0.0651	0.1364	0.0007	0.0000
Greece	1995Q1–2015Q4	0.1286	0.3995	0.0011	0.0000	0.2739	0.2782	0.0000	0.0000
Hungary	1995Q1–2015Q4	0.2183	0.0497	0.4098	0.0000	0.0235	0.1288	0.0374	0.0000
Ireland	1997Q1–2015Q4	0.9979	0.9985	0.3349	0.0000	0.9701	0.9334	0.0092	0.0000
Italy	1995Q1–2015Q4	0.2871	0.3394	0.0009	0.0000	0.1099	0.1836	0.0000	0.0000
Latvia	1995Q1–2015Q4	0.4713	0.4113	0.0354	0.0000	0.0436	0.0410	0.0489	0.0000
Luxembourg	2000Q1–2015Q4	0.1928	0.1666	0.0048	0.0000	0.1955	0.0811	0.0018	0.0000
The Netherlands	1995Q1–2015Q4	0.2734	0.2277	0.0004	0.0000	0.3118	0.2903	0.0004	0.0000
Poland	2002Q1–2015Q4	0.2513	0.0536	0.1188	0.0000	0.0543	0.0398	0.0097	0.0000
Portugal	1995Q1–2015Q4	0.5128	0.7790	0.0000	0.0000	0.0202	0.0173	0.0000	0.0000
Slovakia	1995Q1–2015Q4	0.0540	0.1135	0.0128	0.0000	0.0310	0.1452	0.0088	0.0000
Slovenia	1995Q1–2015Q4	0.0509	0.1335	0.0033	0.0000	0.0232	0.0713	0.0142	0.0000
Spain	1995Q1–2015Q4	0.8378	0.8664	0.0218	0.0000	0.1563	0.3268	0.0023	0.0000
Sweden	1993Q1–2015Q4	0.7200	0.1702	0.0038	0.0000	0.2706	0.2121	0.0001	0.0000
UK	1970Q1–2015Q4	0.0266	0.0024	0.0534	0.0000	0.0343	0.0051	0.0201	0.0000

Notes: Both tests are carried out with constant and trend. Other options yield similar results and are available upon request. In ADF tests, the lag length is automatically selected according to Schwartz information criterion, whereas in Phillips-Peron test spectral estimation method is based on Bartlett kernel and bandwidth is automatically selected following Newey-West method. Detailed results are available upon request.