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# Long-run relationship between exports and imports: current account sustainability tests for the EU\*

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António Afonso<sup>s</sup>   Florence Huart<sup>+</sup>   João Tovar Jalles<sup>#</sup>   Piotr Stanek<sup>±</sup>

## ABSTRACT

We assess the sustainability of external imbalances for EU countries using panel stationarity tests of Current Account (CA) balance-to-GDP ratios and panel cointegration of exports and imports of goods and services, for the period 1970Q1-2015Q4. We find that: i) the country panel is non-stationary; ii) cross-sectional dependence plays an important role; iii) there is non-stationarity of the CA, imports, and exports with cross-sectional panel dependence and multiple structural breaks; iv) however, there is a stable long-run relationship between exports and imports in the panel. Hence, trade imbalances can be less unsustainable but this is not sufficient to make current account imbalances sustainable.

**Keywords:** current account, exports, imports, unit roots, cointegration

**JEL Codes:** C23, F32, F41.

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## 1. Introduction

A decade ago, the financial crisis originating from the United States caused a sharp recession in a number of countries, both developing and developed, including the European Union (EU). This revealed and accentuated large macroeconomic imbalances characterizing most of the economies. At the time, public authorities, focused on public deficits and debts in developed countries (particularly the euro area, which was hit by a sovereign debt crisis) and external position in emerging economies. Yet, some economists had warned that external imbalances in the form of growing current account deficits and external debt should not be overlooked also in more advanced economies, including the EU.<sup>1</sup> In particular, at the onset of the financial crisis (2007Q3), some countries were already recording double digit current account deficits (-10% of GDP in Portugal and Spain, -14% in Greece, -15% in Estonia, -18% in Latvia) whereas some others enjoyed large current account surpluses (6% of GDP in the Netherlands and Finland, 7% in Germany, 8% in Sweden, 10% in Luxembourg).<sup>2</sup>

The sustainability of external deficits is indeed a matter of concern for governments and it is related to the issue of long-run solvency of a nation. This has been notably acknowledged by the European Commission, which included the ratio of current account to GDP in the scoreboard of its Macroeconomic Imbalance Procedure (MIP), established in 2011. However, this MIP has not been very successful in correcting imbalances between countries with the largest external surpluses and countries with the largest external deficits, and this despite some rebalancing in the countries hardest hit by the crisis. In this context, an empirical assessment of whether external imbalances pose sustainability issues is crucial for policy-making, and the focus of our analysis.

In this paper, we want to assess the sustainability of external imbalances in the EU. In this field, there are two main approaches, which both rely on the intertemporal budget (current account) constraint. Either one uses the macroeconomic determinants of this constraint in order to compute the required adjustments.<sup>3</sup> Alternatively, one carries out time-series / panel data

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<sup>1</sup> The relation between global external disequilibria and the financial crisis is discussed at length in Obstfeld and Rogoff (2010).

<sup>2</sup> Source: OECD data. The Appendix provides more detailed descriptive statistics for the current account, export and import series.

<sup>3</sup> This has been done by Afonso et al. (2019) following a methodology proposed by Milesi-Ferretti and Razin (1996).

tests to identify the behavior of the current account balance, exports and imports of goods and services over time. Our work falls under the second approach.

In the literature, various tests are employed to assess the sustainability of external balances. There are unit root tests or stationary tests of the current account-to-GDP ratio (Raybaudi, Sola, and Spagnolo 2004; Chen 2011). There are also tests of cointegration between exports and imports of goods and services (Camarero, Carrion-i-Silvestre, and Tamarit 2013). Some works use both unit root tests and cointegration tests (Holmes 2006). Some authors use nonlinear approaches to account for structural breaks, regime shifts or threshold values (Chen 2014; Camarero, Carrion-i-Silvestre, and Tamarit 2015; Afonso et al. 2019). Finally, error-correction models are used (Durdu, Mendoza, and Terrones 2013; Bajo-Rubio, Díaz-Roldán, and Esteve 2014) to check whether net exports react to the net foreign asset position, as it has been done in the literature of public debt sustainability (Bohn 2007). However, these later works implicitly assume that net exports can be considered as a policy instrument.

Among nonlinear approaches, Chen (2014) found evidence of sustainability of the current account for 7 countries out of 10 OECD countries (among which four are EU countries) using quarterly data over a period up to 2012. Lanzafoame (2014) carried out a sequential panel stationarity analysis for 27 advanced economies prior to the crisis and spotted only a group of 7 countries, for which the current account trajectories were sustainable prior to the global financial crisis (until 2008). Camarero et al. (2015) looked at the net foreign asset position of 11 Euro area countries over the 1972-2011 period (annual data) and concluded that there was evidence of sustainability for only 5 countries and the panel. A comparison between the G-7 and BRICS countries in the framework of a long-memory model with multiple smooth and sharp structural breaks lead Andre et al. (2018) to a conclusion that current accounts are sustainable in both groups. Finally, Afonso et al. (2019) considered quarterly data for individual EU countries and series of current account, exports and imports (as a percentage of GDP) over the period 1970-2015. They found evidence of sustainability of the current account-to-GDP ratio in only eight EU countries and cointegration between exports and imports in only seven countries.

Against this background, we aim at investigating the issue of the sustainability of external imbalances by considering a wide panel of EU countries and taking into account the impact of the crisis. The intertemporal current account constraint is the theoretical framework

underlying the different tests of panel stationarity of current account-to-GDP ratios. We make use of an extensive set of (panel data) tests that take into account multiple (endogenously determined) structural breaks using recent techniques that also address cross-sectional dependence. In addition, we also test for panel cointegration between exports and imports of goods and services (ratios-to-GDP). Specifically, we rely on quarterly OECD data for 22 EU countries over the period 1970:Q1-2015:Q4.<sup>4</sup> To our knowledge, such tests have not been carried out for a large sample of EU countries or over a period covering the Euro area crisis. Indeed, the literature dealing with external debt sustainability has mainly focused on a subset of OECD countries, the United States, or emerging economies.

The remainder of the paper is organized as follows. Section 2 outlines the analytical framework while Section 3 discusses the empirical methodology. Section 4 presents our main results. The last section concludes.

## **2. Analytical Framework**

A current account deficit is regarded as sustainable when, if maintained in the indefinite future, it does not violate the nation's solvency constraint; and a nation is said to be solvent if the present-value budget constraint, i.e., its intertemporal budget constraint holds. Now, the usual way to analyzing current account imbalances makes use of the intertemporal approach to the current account (Sachs 1981; Obstfeld and Rogoff 1995; Razin 1995). According to this approach, given that, from the perspective of the national accounts, the current account equals the difference between savings and investment, and, because savings and investment decisions are based on intertemporal factors (such as life-cycle features, the expected returns of investment projects, and the like) the current account is necessarily an intertemporal phenomenon. Against this background, our analysis comprises of two steps. 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). Second, 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). Specifically, a current account would be sustainable if the series for exports and imports are

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<sup>4</sup> Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, UK.

found to be cointegrated (for earlier contributions see, e.g., Husted (1992), Wickens and Uctum (1993), Wu, Fountas, and Chen (1996) or Apergis, Katrakilidis, and Tabakis (2000)).

More technically, to assess the sustainability of external imbalances we use the present value borrowing constraint following Trehan and Walsh (1991) and Hakkio and Rush (1991).<sup>5</sup> Our panel analysis generalizes the country-specific framework. The budget constraint in  $t$  is given by:

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

with:  $Y$  - GDP,  $C$  - private consumption,  $I$  - private investment,  $G$  - government spending,  $F$  - net foreign assets,  $r$  - interest rate. In addition, GDP in an open economy, is:

$$Y_t = C_t + I_t + G_t + X_t - M_t \quad (2)$$

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

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

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

Solving (4) recursively for subsequent periods, assuming that the interest rate is stationary, with mean  $r$ , leads to the Present Value Borrowing Constraint:

$$F_{t-1} = - \sum_{s=0}^{\infty} \frac{1}{(1+r)^{s+1}} (NX_{t+s}) + \lim_{s \rightarrow \infty} \frac{F_{t+s}}{(1+r)^{s+1}}. \quad (5)$$

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<sup>5</sup> The intertemporal model of the current account originates in the works of Sachs (1981; 1982), Obstfeld (1982), as well as Svensson and Razin (1983).

A sustainable path for the external position should ensure that the present value of the stock of net foreign assets goes to zero in infinity. Hence, the economy will have to achieve future net exports whose present value adds up to the current value of net foreign assets.

Recalling equation (5), we present two complementary definitions of sustainability for empirical testing:

- i) Current net foreign assets must equal the sum of future net exports:

$$F_{t-1} = - \sum_{s=0}^{\infty} \frac{1}{(1+r)^{s+1}} (X_{t+s} - M_{t+s}); \quad (6)$$

- ii) Present value of current net foreign assets is zero in infinity:

$$\lim_{s \rightarrow \infty} \frac{F_{t+s}}{(1+r)^{s+1}} = 0. \quad (7)$$

To test empirically the absence of Ponzi games, we test the stationarity of the first difference of the stock of current net foreign assets. In practice we test if  $F_t - F_{t-1} = CA_t$  is stationary, where  $CA$  is the current account balance. Nevertheless, stationarity rejection does not necessarily imply the absence of sustainability (Trehan and Walsh, 1991).

From an empirical perspective it is possible to test for sustainability through cointegration tests. The implicit hypothesis concerning the real interest rate, with mean  $r$ , is also stationarity. When assessing current account sustainability through cointegration tests, the intertemporal constraint is, by taking first differences:

$$M_t - X_t = \sum_{s=0}^{\infty} \frac{1}{(1+r)^{s+1}} (\Delta X_{t+s} - \Delta M_{t+s}) + \lim_{s \rightarrow \infty} \frac{F_{t+s}}{(1+r)^{s+1}}, \quad (8)$$

and  $M_t$  and  $X_t$  must be cointegrated variables of order one for their first differences to be stationary.

Therefore, we can test the cointegration regression:  $X_t = a + bM_t + u_t$ . If the null of no cointegration is rejected one should accept the alternative hypothesis of cointegration. This

would imply that the current account is sustainable. In practice, the higher the estimated coefficient in the cointegration relationship, the lower would be existence of sustainability issues. Moreover, if  $X$  and  $M$  are non-stationary variables in levels, the condition  $0 < b < 1$  is a sufficient condition for the intertemporal constraint to be obeyed. More precisely, any positive but smaller than one value of the coefficient  $b$  ensures that trade balance worsens, but remains bounded as a ratio to GDP and thus remains sustainable. Analogically, if  $b$  exceeds 1, the trade balance improves and ultimately turns into a surplus, which could be seen as sustainable from the perspective of the panel of countries, even if potentially imposing a risk of unsustainable trade position for the rest of the world. This, however, remains outside of the scope of our research.

However, large international investment flows, unrelated directly to financing of international trade, might undermine sustainability of the current account via the impact on its primary income component.

### **3. Empirical Methodology**

We implement a second generation panel unit root test – the Pesaran (2007) CIPS test – accounting for cross-sectional dependences. This test is associated with the fact that first generation tests do not account for cross-sectional dependence of the contemporaneous error terms, and not considering it may cause substantial size distortions in panel unit root tests (Pesaran 2007).<sup>6</sup>

Notice that cross-section dependences are to be expected also from an economic perspective given the intense multilateral trade and financial flows between the EU member states, and because most of the countries in our panel share a common currency.

Afterwards, we employ a recent panel data stationarity test, which under the null of panel stationarity considers multiple structural breaks (Carrion-i-Silvestre, Del Barrio-Castro, and López-Bazo 2005, CBL hereafter). Following Bai and Perron (2003), we estimate the number of structural breaks associated with each country using the modified Schwarz information criteria.<sup>7</sup>

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<sup>6</sup> Available on request are the results of two different first generation panel unit root tests, namely the Im, Pesaran, and Shin (2003) test (IPS) as well as the Maddala and Wu (1999) test (MW).

<sup>7</sup> CBL (2005) suggested the specified maximum number of structural breaks to be five. We compute the finite sample critical values using Monte Carlo simulations (20,000 replications).



Additionally, we inspect whether exports and imports are cointegrated within the panel, using a number of recent tests. First, we implement the panel cointegration tests proposed by Pedroni (2004), a residual-based test for the null of no cointegration in heterogeneous panels, which does not consider neither structural breaks in the cointegrating relationship nor cross-sectional dependence.

Next, we rely on the Westerlund (2007) error correction-based panel cointegration test. As shown by Banerjee et al. (1998), the invalid common factor restriction in residual-based tests can lead to severe power loss. Westerlund (2007) develops two group mean statistics and two panel statistics to test for the null of no cointegration against two distinct alternatives such that under one of them at least one cross section is cointegrated allowing for heterogeneity, and under the other one, the panel is cointegrated as a whole assuming homogeneous long-run relation among the cross sections, respectively.

Subsequently, we consider the error correction-based cointegration test by Gengenbach et al. (2016), which augments Westerlund (2007) by adding cross-sectional averages. Gengenbach et al. (2016) test allows for persistent cross-sectional dependence in the data in the form of unobserved common factors. Finally, we run the panel cointegration of Banerjee and Carrion-i-Silvestre (2017). This test runs a standard CIPS panel unit root test on residuals stemming from Pesaran (2006) CCEP model estimation, and controls for cross-unit dependence in the panel using an unobserved common factor structure proxied by cross-sectional averages.

#### **4. Empirical Results**

Figure 1 and Figure 2 depict the variables under analysis, while the key descriptive statistics by country may be found in the Appendix – Table A1. We can briefly highlight some stylised facts: there seems to be a strong co-movement between exports and imports in all the countries with growing openness over time. Trade balance is clearly the main driver of the current account in most of the countries (the only exception being Luxembourg). Specifically, the correlation between these variables is around 0.7 for the full country sample. In many countries a visible adjustment of the current account occurred after the GFC, especially in those experiencing large deficits (as the Baltics or those affected by the sovereign debt crisis), which

implies a sizable degree of interdependence between the EU members. We examine this question ahead with recent panel data techniques (notice that the panel is unbalanced).

There has been a lot of work on testing for cross-sectional dependence in the spatial econometrics literature.<sup>8</sup> Pesaran (2004) proposes a test (called CD test) for cross-sectional dependence using the pairwise average of the off-diagonal sample correlation coefficients in a seemingly unrelated regressions model. Results from performing the CD test on our three variables of interest reveal that the test statistic is 13.09, 98.13 and 101.91, respectively for the current account, exports and imports (not shown but available upon request). These correspond to p-values close to zero, therefore rejecting the null hypothesis of no or weak (non-pervasive) cross-sectional independence (Pesaran 2015) and motivating the use of Pesaran's (2007) CIPS test for unit roots. This assumption makes the test more appealing from an applied perspective because when estimating a model, only strong cross-sectional correlation may pose serious problems, that is, inconsistency of estimation.<sup>9</sup>

Table A2 in the Appendix displays the results of such analysis. When we run the CIPS that accounts for cross-sectional dependence, our previous results are strengthened particularly as lags increase. Hence, we conclude that most conservatively: i) our panel is non-stationary<sup>10</sup> and ii) cross-sectional dependence seems to play an important role. This means that during the recent crisis, a worsening of the current account balance or drop in exports could not be corrected unless a radical change in economic policy was implemented. And this is what happened in reality in the countries most hit by the crisis. Furthermore, strong cross-sectional dependence implies that imbalances in the EU cannot be fixed without a coordination of policy measures between countries with large surpluses and countries with large deficits. In reality, such coordination was missing in the EU, and it is thus no wonder that such imbalances between both groups of countries have not completely disappeared yet.

Applying the CBL (2005) panel data stationarity test, we find that, when allowing for cross-section dependence and utilizing the bootstrap critical values (see Table 1), the null of stationarity can be rejected at usual levels by either the homogeneous or heterogeneous long-run version of the test. Overall, evidence points to non-stationarity of the three variables of

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<sup>8</sup> See Anselin and Bera (1998) for cross-sectional data and Baltagi et al. (2003) for panel data.

<sup>9</sup> See Chudik et al. (2011) for exact definitions of weak and strong dependence.

<sup>10</sup> Since we have non-stationarity present in the panel the deterministic component used in test statistics is the constant as we first difference relevant series.

interest in levels even after multiple structural breaks and cross-sectional dependence are allowed for.

[Table 1]

Table A3 in the Appendix shows the outcomes of Pedroni's (2004) cointegration tests between exports and imports (in percent of GDP).<sup>11</sup> We use four within-group tests and three between-group tests to check whether the panel data are cointegrated.

Results show that the null hypothesis of no cointegration can be rejected. Therefore, there exists a stable long-run relationship governing the dynamics between exports and imports for the full panel. Hence, these results support the idea that trade imbalances are to some extent less unsustainable. However, this does not imply that current account imbalances are sustainable.

Moreover, Table 2 shows that the null of no cointegration is rejected at the 10 percent level when cross-sectional dependencies are accounted for and this is true irrespectively of the tests under scrutiny.

[Table 2]

The results of the ECM cointegration test suggested by Gengenbach et al. (2016) are reported in Table 3. The test statistic under Model 2 (including only a constant term) rejects the null of no cointegration at the 10 percent level.

[Table 3]

Finally, in Table 4, when we compare the values of the cointegration test -  $CADFC_p$  - statistic with the critical values, the null hypothesis of no cointegration is rejected in both Models 1 and 2 under zero lags at the 10 percent level of significance.

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<sup>11</sup> We also applied Pesaran's (2004) CD test to the residuals of this Pedroni (2004) panel cointegration test. We obtained a CD test statistic of 23.07 which is statistically significant at the 1 percent level. We thank an anonymous referee for this suggestion.

Overall, the imports and exports may drift apart in the short-run but have a tendency to converge towards equilibrium in the long-run. The long-run intertemporal budget constraint itself seems to have been the major driving force behind the long-run equilibrium relationship between imports and exports.

[Table 4]

## **5. Conclusion**

We have assessed the sustainability of the CA balance in a panel of EU countries using panel stationarity tests of CA balance-to-GDP ratios and panel cointegration tests of exports and imports of goods and services, in the period 1970Q1-2015Q4.

Our results can be summarized as follows: i) the country panel is non-stationary; ii) cross-sectional dependence plays an important role; iii) with multiple structural breaks and cross-sectional panel dependence evidence points to non-stationarity of the CA, imports, and exports; iv) there is a stable long-run relationship between exports and imports for our panel.

The implication of our analysis is that trade imbalances are less unsustainable than current account imbalances. In other words, growing current account imbalances have lately been more related to net factor income than to trade flows in the EU. In particular, the increase in the indebtedness of the private sector and the public sector in some countries have been made possible by increasing borrowing from other countries (net capital inflows via portfolio investment or bank loans) which has led to increasing investment income payments in the current account balance. On the contrary, in countries with large current account surpluses, lending to foreign countries generates investment income receipts that contribute further to nourishing these surpluses. Therefore, large adjustments (rebalancing) in trade flows would be needed to compensate for the influence of net factor income on current account balances.

In general, the country-sample under analysis depicted a good performance from an intertemporal perspective. Indeed, the macroeconomic stabilisation strategies seem to have been effective in correcting the market failures and maintaining the steady-state equilibrium relationship between the inflow and outflow of resources, at least in the countries hardest hit by the crisis. In sum, even if the risks of external lack of sustainability seem to have been contained in the past, for the EU as a whole, the importance of cross-sectional dependence

implies a need of mutual surveillance, as implemented in the Macroeconomic Imbalances Procedure of the European Commission.

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**Table 1. CBL (2005) Panel Unit Root Tests with multiple breaks**

<b>Variable</b>		<b>Current Account</b>			
<i>KPSS test</i>		<i>Test statistics</i>	<i>Bootstrap critical values</i>		
			90%	95%	97.5% 99%
Homogeneity		3.582	2.506	3.386	4.515 5.397
Heterogeneity		2.947	2.252	2.952	3.509 4.425
<b>Variable</b>		<b>Exports</b>			
<i>KPSS test</i>		<i>Test statistics</i>	<i>Bootstrap critical values</i>		
			90%	95%	97.5% 99%
Homogeneity		3.689	2.093	3.007	3.951 5.129
Heterogeneity		2.681	2.010	2.696	3.586 4.444
<b>Variable</b>		<b>Imports</b>			
<i>KPSS test</i>		<i>Test statistics</i>	<i>Bootstrap critical values</i>		
			90%	95%	97.5% 99%
Homogeneity		3.221	2.403	3.154	4.199 5.596
Heterogeneity		2.412	2.314	2.865	3.701 4.210

Notes: The number of break points for each country is estimated using the modified Schwarz information criteria allowing for a maximum of 5 structural breaks. The long-run variance is estimated using the Barlett kernel with automatic spectral window bandwidth selection. We present both the case where disturbances are assumed to be heteroscedastic across the cross-sectional dimension as well as the test statistic which assumes homogeneous long-run variance. The null is panel stationarity. The finite sample critical values were obtained through Monte Carlo simulations with 20,000 replications.

**Table 2. Westerlund (2007) Cointegration Test**

<b>Exports and Imports</b>				
Test	Value (a)	Z-value (a)	Value (b)	Z-value (b)
<b><math>G\tau</math></b>	<b>-1.062</b>	<b>-0.385</b>	<b>-1.371</b>	<b>-1.782*</b>
<b><math>G\alpha</math></b>	<b>-4.926</b>	<b>-1.159</b>	<b>-6.222</b>	<b>-2.496*</b>
<b><math>P\tau</math></b>	<b>-4.023*</b>	<b>-1.395</b>	<b>-6.643</b>	<b>-3.640*</b>
<b><math>P\alpha</math></b>	<b>-2.988*</b>	<b>-3.177</b>	<b>-5.293</b>	<b>-6.912*</b>

Note: The Westerlund (2007) test takes no cointegration as the null hypothesis. Westerlund (2007) presents four different panel cointegration tests with a null of no cointegration. While  $G\tau$  and  $G\alpha$  test the alternative hypothesis of least one unit is cointegrated,  $P\tau$  and  $P\alpha$  test if the panel is cointegrated. Short-run dynamics are restricted to one lag and one lead. (a) The test regression is fitted with four lags. The critical values are for a one-sided test based on the Normal distribution. (b) The test regression is fitted with a constant and one lag and lead. The p-values are for a one-sided test based on 100 bootstrap replications. An asterisk (\*) indicates rejection at the 10 percent level.

**Table 3. Gengenbach et al. (2016) Cointegration Test**

Model 2		Model 3	
ECM t-statistic	Critical Value 10%	ECM t-statistic	Critical Value 10%
<b>-2.558*</b>	<b>-2.544</b>	<b>-2.500</b>	<b>-2.965</b>

Note: \* indicate a rejection of the null of no cointegration at the 10% level. The number of lags was determined by the Schwarz criterion. Model 2 includes a constant term; Model 3 includes a constant term and a time trend. Mention to “Model 2” and “Model 3” follow from authors’ original paper’s notation; refer to original source for further details.

**Table 4. Banerjee and Carrion-i-Silvestre (2017) cointegration test**

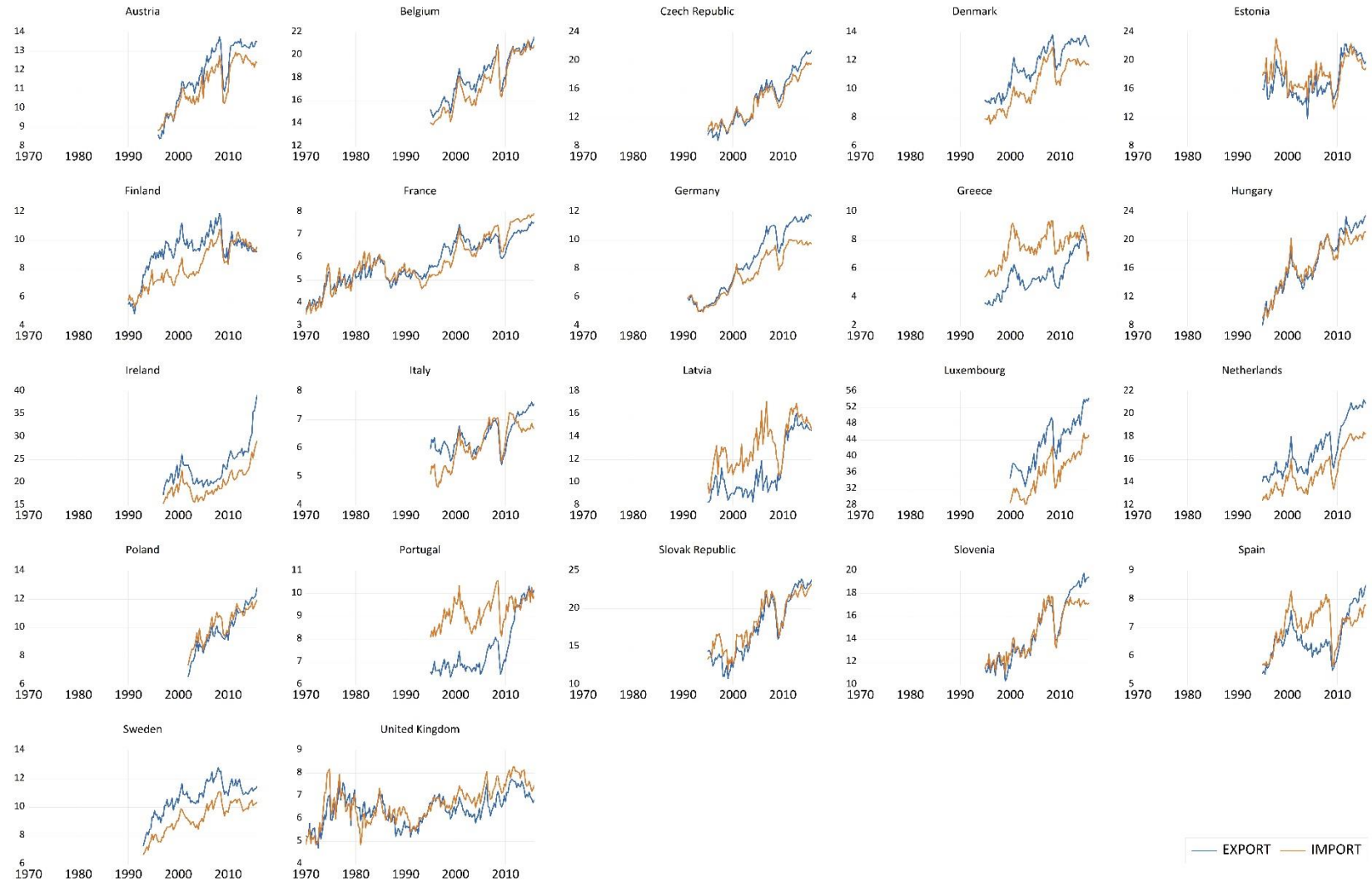
Model 1: constant	CADFC <sub>p</sub>	Critical value 5%	Critical value 10%
<b>lags</b>			
<b>0</b>	<b>-4.103*</b>	<b>-2.34</b>	<b>-2.24</b>
<b>1</b>	<b>-0.631</b>	<b>-2.36</b>	<b>-2.26</b>
<b>2</b>	<b>-0.025</b>	<b>-2.31</b>	<b>-2.20</b>
Model 2: constant and trend		Critical value 5%	Critical value 10%
<b>0</b>	<b>-4.560*</b>	<b>-2.93</b>	<b>-2.84</b>
<b>1</b>	<b>-0.866</b>	<b>-2.97</b>	<b>-2.87</b>
<b>2</b>	<b>-0.128</b>	<b>-2.90</b>	<b>-2.79</b>

Note: Reported values correspond to the CADFC<sub>p</sub> test statistic developed by Banerjee and Carrion-i-Silvestre (2017). We consider one factor when conducting the test statistic. The null is that of no cointegration relationship. Critical values have been obtained from their Tables 1 and 2. An asterisk (\*) indicates rejection at the 10 percent level or better. Mention to “Model 1” and “Model 2” follow from authors’ original paper’s notation; refer to original source for further details. Note that “Model 2” in this table is not the same as “Model 2” in Table 3.

**Figure 1. Current account and trade balance to GDP ratios**



Figure 2. Exports and Imports to GDP ratios



## APPENDIX

**Table A1. Descriptive statistics by country**

Country	CA/GDP				Trade to GDP						Correlation between CA and trade balance		
	Mean	Std.	Obs.	Period	Exports/GDP		Imports/GDP		Obs.	Period	r	t-stat	Obs.
		Dev.			Mean	Std. Dev.	Mean	Std. Dev.					
Austria	0.761	2.299	96	1992Q1-2015Q4	11.782	1.555	11.197	1.219	80	1996Q1-2015Q4	0.9354	22.9005	77
Belgium	4.207	4.135	84	1995Q1-2015Q4	18.213	1.979	17.511	2.230	84	1995Q1-2015Q4	0.6818	8.4389	84
Czech Republic	-2.870	2.483	88	1994Q1-2015Q4	14.604	3.699	14.291	2.929	84	1995Q1-2015Q4	0.6530	7.8075	84
Denmark	3.874	2.251	76	1997Q1-2015Q4	11.650	1.548	10.318	1.558	84	1995Q1-2015Q4	0.5052	5.0354	76
Estonia	-6.002	6.126	84	1995Q1-2015Q4	17.415	2.610	18.291	2.147	84	1995Q1-2015Q4	0.8545	14.8992	84
Finland	0.931	3.909	144	1980Q1-2015Q4	9.189	1.495	8.205	1.431	104	1990Q1-2015Q4	0.8822	18.9244	104
France	0.202	1.281	122	1985Q3-2015Q4	5.771	0.963	5.793	1.088	184	1970Q1-2015Q4	0.8442	17.2540	122
Germany	2.121	3.014	180	1971Q1-2015Q4	8.487	2.301	7.654	1.685	100	1991Q1-2015Q4	0.9628	35.2928	100
Greece	-6.797	4.611	84	1995Q1-2015Q4	5.512	1.293	7.574	1.051	84	1995Q1-2015Q4	0.7042	8.9818	84
Hungary	-3.766	4.426	84	1995Q1-2015Q4	17.132	4.088	16.832	3.430	84	1995Q1-2015Q4	0.9343	23.7410	84
Ireland	-0.848	3.902	76	1997Q1-2015Q4	23.561	4.321	19.761	2.989	76	1997Q1-2015Q4	0.6963	8.3447	76
Italy	-0.258	1.840	184	1970Q1-2015Q4	6.435	0.566	6.153	0.718	84	1995Q1-2015Q4	0.9459	26.3961	84
Latvia	-6.628	7.944	64	2000Q1-2015Q4	11.085	2.404	13.308	1.981	84	1995Q1-2015Q4	0.8690	13.8313	64
Luxembourg	8.654	4.521	84	1995Q1-2015Q4	43.346	5.888	36.142	4.911	64	2000Q1-2015Q4	-0.3202	-2.6613	64
Netherlands	4.970	2.808	136	1982Q1-2015Q4	17.038	2.219	15.050	1.851	84	1995Q1-2015Q4	0.6312	7.3689	84
Poland	-3.178	3.111	104	1990Q1-2015Q4	9.898	1.466	10.236	1.140	56	2002Q1-2015Q4	0.6659	6.5583	56
Portugal	-7.058	4.165	80	1996Q1-2015Q4	7.601	1.221	9.238	0.616	84	1995Q1-2015Q4	0.9184	20.5021	80
Slovak Republic	-5.673	4.247	76	1997Q1-2015Q4	17.579	4.024	18.267	3.285	84	1997Q1-2015Q4	0.7613	10.0988	76
Slovenia	-0.191	3.145	84	1995Q1-2015Q4	14.797	2.808	14.650	2.190	84	1995Q1-2015Q4	0.8076	12.4022	84
Spain	-3.147	3.106	104	1990Q1-2015Q4	6.704	0.789	7.083	0.678	84	1995Q1-2015Q4	0.9691	35.5962	84
Sweden	3.076	3.548	136	1992Q1-2015Q4	10.723	1.148	9.278	1.080	92	1993Q1-2015Q4	0.5920	6.9689	92
United Kingdom	-1.524	1.783	184	1970Q1-2015Q4	6.405	0.656	6.663	0.815	184	1970Q1-2015Q4	0.7804	16.8377	184
All	-0.445	5.232	2354		12.312	7.818	11.913	6.549	2032		0.7243	46.0907	1927

**Table A2. Second Generation Panel Unit Root Tests**

Pesaran (2007) Panel Unit Root Test (CIPS)

<b>Variable</b>	<b>Current Account</b>		<b>Exports</b>		<b>Imports</b>	
<i>Lags</i>	$p_{\lambda}$	( $p$ )	$p_{\lambda}$	( $p$ )	$p_{\lambda}$	( $p$ )
<i>in levels</i>						
0	-6.53	0.00	-2.52	0.01	-5.03	0.00
1	-2.64	0.00	-1.94	0.03	-3.58	0.00
2	-1.20	0.11	-0.61	0.27	-2.25	0.01
3	-1.33	0.09	0.12	0.55	-1.46	0.07
<i>in first differences</i>						
0	-22.47	0.00	-22.39	0.00	-22.47	0.00
1	-22.01	0.00	-21.82	0.00	-22.06	0.00
2	-18.44	0.00	-18.80	0.00	-19.55	0.00
3	-16.07	0.00	-12.40	0.00	-14.83	0.00

Notes: Null hypothesis of non-stationarity. We further report the p-values for each of the CIPS tests.

**Table A3. Pedroni (2004) panel cointegration tests**

	Statistic	Exports and Imports	
		No trend	Trend
Within dimension	<b>Panel v</b>	<b>2.49</b>	<b>0.26</b>
	<b>Panel p</b>	<b>-3.36*</b>	<b>-1.14</b>
	<b>Panel PP</b>	<b>-2.42*</b>	<b>-1.27</b>
	<b>Panel ADF</b>	<b>0.23</b>	<b>0.26</b>
Between dimension	<b>Panel p</b>	<b>-5.25*</b>	<b>-3.09*</b>
	<b>Panel PP</b>	<b>-4.29*</b>	<b>-3.49*</b>
	<b>Panel ADF</b>	<b>-1.20</b>	<b>-1.29</b>

Notes: The null is that there is no cointegration. Under the null all the statistics are distributed as standard Normal distributions. An asterisk (\*) indicates rejection at the 10 percent level or better.

The columns labelled within-dimension contain the computed value of the statistics based on estimators that pool the autoregressive coefficient across different countries for the unit root tests on the estimated residuals. The columns labelled between-dimension report the computed value of the statistics based on estimators that average individually calculated coefficients for each country.