An assessment of the sustainability of current account imbalances in OECD countries

Mariam Camarero*
Department of Economics
Jaume I University

Josep Lluís Carrion-i-Silvestre
Department of Econometrics, Statistics and Spanish Economy
University of Barcelona

Cecilio Tamarit
Department of Economics
University of Valencia

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Abstract

In this paper we empirically test the ability of an economy to satisfy its long-run intertemporal budget constraint without a drastic change in private sector behavior or policy shifts. This is a general concept and does not depend on any particular model with the advantage of its easy testability. For this purpose we use individual-by-individual as well as panel data unit root and stationarity tests that allows for the presence of structural breaks and cross-section dependence, features that are shown to be present in the analyzed data. The evidence points towards the I(0) stationarity of the current account (i.e., the solvency constraint is met) that would evolve around a shifting deterministic component implying, hence, the non sustainability of the current account for most of the considered countries.

Keywords: Current account, panel data, structural breaks, cross-section dependence

JEL codes: F32, F41, C23

*Corresponding author: Department of Economics, Jaume I University, Campus Riu Sec, E-12071 Castellon (Spain). Phone: 34+964728595. Fax: 34+964728591. e-mail: camarero@eco.uji.es; http://www3.uji.es/~camarero

1 Introduction

Since the beginning of the 1990s, current account (CA) imbalances have been widening considerably in the world economy. Economic globalization has meant an increase in international trade and capital mobility facilitating the financing of larger and more persistent current account imbalances. Among the OECD countries there is a clear trend toward larger imbalances, i.e. by 2007, the current account imbalances, wether surplus or deficit, of the OECD countries were more than twice as large as in 1988. However, the trend towards large imbalances is not confined to the OECD countries. These imbalances have been more acute between China and the oil exporter countries, on the one hand, and the US, on the other. Many emerging economies now show larger surpluses in their current accounts, although it may be necessary to distinguish between those who are enjoying a temporary surplus due to a favorable movement in the prices of their exports (as in the recent run-up in commodity prices) and those whose surpluses are the result of the pursuit of a particular development strategy. According to the World Trade Report 2008 (WTO, 2008), emerging East Asia has followed an export-led development strategy which was supported by exchange rate policies that anchored domestic currencies to the US dollar. It has been a successful development strategy resulting in the rapid mobilization and employment of tens of millions of workers. The means to bring this about is the cross-border transfer of goods and services to the centre country in exchange for financing its deficits (Dooley et al., 2007).

The flow of savings to developed countries has also been encouraged by the lack of financial and capital market development in emerging Asian economies. The underdeveloped nature of the domestic financial or capital markets has become a bottleneck preventing the effective channelling of domestic savings into worthwhile investment projects at home. But the size of the imbalances has raised the key question of their sustainability and the nature of the adjustment process. Therefore, there has been a renewed interest in the study of the determinants of the dynamic adjustment of external imbalances. In part, larger current account imbalances reflect the impact of greater capital and financial market integration. A current account deficit reflects dissaving by domestic residents, an excess of absorption over income. The fact that it is occurring reflects a willingness by foreigners to finance that excess absorption by accumulating future claims on the earnings of domestic residents. As a consequence, net foreign liabilities have also been growing, generating concern that policy measures may be required if costly and destabilizing shifts in market sentiment are to be avoided.

The weight of experts' opinion suggests that these imbalances will ultimately decline although there is no consensus on when or on the manner, whether smoothly or abruptly, in which it would occur (Clarida, 2007). But there seems to be broad agreement that some combination of exchange rate and asset price changes would play a role during the process of adjustment. Studies of past adjustments in industrial countries point to the challenges ahead. Larger deficits take longer to adjust and are associated with significantly slower income growth during the current account recovery (Freund and Warnock, 2007). Consumption-driven current account deficits involve significantly larger depreciations than deficits financing investment. Obstfeld and Rogoff (2006) suggest that a large depreciation of the US dollar, something in the order of 30 per cent, could accompany the process.

While temporary current account deficits may simply reflect the reallocation of capital to countries where capital is more productive, persistent deficits may be regarded as more serious. Deficits may lead to increased domestic interest rates to attract foreign capital. However, the accumulation of external debt due to persistent deficits will imply increasing interest payments that impose an excess burden on future generations. Now, adjustments to large current account imbalances are complex processes. The speed and economic effects depend on many factors. How much of the adjustment takes place through changes in asset valuation? How much through a reduction in absorption? How much in the form of expenditure switching? It will also matter how much international coordination among financial and central bank authorities takes place to ensure a supportive policy environment. Thus, the discussion above should not be seen as simplifying the challenges that are involved. If one can take a specific example, the "soft-landing" scenario requires that the acceleration of US export growth be matched by increased demand for US goods from the rest of the world. This would need to be triggered by just the right kinds of movements in exchange rates, asset and goods prices.

Mann (2002) considers that sustainability should be viewed both from the domestic and international finance point of view. A sustainable current account is one that does not trigger feedback effects on domestic variables (investment and savings) or does not lead to significant international portfolio reallocations leading to changes in interest rates. We can distinguish three approaches in the theoretical literature that analyzes the current account balance. First, the conventional non-optimizing models, that comprises the Keynesian and monetary views, generally using reduced-form solutions and examining aggregated macroeconomic aspects. Although these models *à la Mundell-Fleming-Dornbusch* provide a useful policy framework, the main drawback is that they are not based on microeconomic foundations and optimizing behavior of the economic agents. A second approach is the micro-founded intertemporal optimizing models developed in the 1980's that use the intertemporal budget constraint. The major advantage of these models is that they deal with current and capital account behavior simultaneously through direct and portfolio investment flows across border along with trade in goods and services. The use of these models have facilitated the analysis of the sustainability of current account deficits. The intertemporal models developed until the late 1980's generally assumed perfectly flexible domestic prices and ignored the short-term price rigidities in product and factor markets. Finally, a third theoretical approach is the extension of the intertemporal models developed during the 1990's that introduced nominal rigidities and market imperfections into the dynamic general equilibrium models, being the Obstfeld-Rogoff Redux model the major milestone in the intertemporal approach to open-economy macroeconomics.

These models provide a sound micro-theoretical framework, although they lack a matching empirical validation of the theoretical propositions. The empirical content in some of the models remains restricted to only calibrated simulations. The policy formulations at the central banks, government organizations, International Monetary Fund and the World Bank require an empirically tractable and econometrically estimable model to verify the theoretical propositions.

More recently, some studies have extended the modern portfolio optimization theory to the current account and suggest that the marginal unit of wealth arising from a positive productivity shock is allocated according to the existing portfolio choices, and that changes in saving lead to changes in current account proportional to the share of foreign assets in total assets.

Kraay and Ventura (2002) suggest that, in the long run, countries invest a marginal unit of saving in domestic and foreign assets in the same proportions as in their initial portfolios. In the short run, countries invest a marginal unit of saving mostly in foreign assets, and only gradually do they rebalance their portfolio back to its original composition. Countries not only try to smooth consumption, but also domestic investment, and they use foreign assets as a buffer stock.

Lane and Milesi-Ferretti (2001, 2002) have examined the relationship between current account and changes in net foreign asset position at market value, and showed that the correlation between them is low or even negative. Lane and Milesi-Ferretti (2004) suggest that currency fluctuations influence the rates of return on inherited stocks of foreign assets and liabilities, in addition to operating through the traditional trade adjustment channel. The large gross cross-holdings of foreign assets and liabilities suggest that the valuation channel of exchange rate adjustment has grown in importance, relative to the traditional trade balance channel. More recently, Gourinchas and Rey (2007) have decomposed the external adjustment into a financial (valuation) channel and a trade (net export) channel and show that the deteriorations in net exports or net foreign asset position of a country have to be matched either by future net export growth (trade adjustment channel) or by future increases in the returns of net foreign asset portfolio (financial adjustment channel). The valuation channel is important in the medium-term and the net export channel is important in a long-time horizon.

The aim of this research is to test for sustainability following the framework defined in Milessi-Ferretti and Razin (1996) and Taylor (2002). According to this stream of the literature, it is possible to define two key concepts regarding the stochastic properties of the current account. First, the current account is said to be solvent if it is I(0) stationary. Second, the current account is sustainable if the economy is able to satisfy its long-run intertemporal budget constraint without a drastic change in private sector behavior or policy shifts. This is a more general concept and does not depend on any particular model. At the same time this concept of sustainability is a sufficient condition for other concepts to hold, with the advantage of its easy testability. According to Trehan and Walsh (1991), current account stationarity is a sufficient condition for the intertemporal budget constraint to hold.

For this purpose we use a panel data unit root test that allows for the presence of structural breaks and cross-section dependence. From an econometric point of view the contribution of this paper is twofold. First, we test for the presence of structural breaks affecting the CA time series, considering as a particular case the situation with no structural breaks. Once the presence of structural breaks has been investigated, then individual stationarity test statistics are computed. Second, such individual tests can be pooled to define panel data based test statistics, which permit an assessment of the CA stochastic properties using more powerful statistical tools. The statistical inference is conducted taking into account the presence of cross-section dependence through the computation of the bootstrap distribution and the use of approximate common factor models.

The remainder of the paper is organized as follows. Section 2 displays a revision of the previous empirical literature, emphasizing the main issues related to the relationship between increasing economic integration and the external imbalances. In Section 3 we discuss the theoretical framework that guides our empirical investigation on the mechanisms of international financial adjustment. Section 4 presents our econometric methodology and describes the construction of our annual database for the OECD countries. The empirical results are presented in Section 5 and, finally, Section 6 concludes.

2 Brief literature review

As the current account represents the rate at which a country accumulates or decumulates foreign assets, one approach to judging whether an external balance of a given size is a problem or not is to see whether it is consistent with the assumption that all external debts will ultimately be repaid. This is the notion of intertemporal solvency. This concept, however, is a relatively weak criterion as far as giving warning of an emerging problem. The reason is that solvency requires only that, in the very long run, all debts be repaid. Since this is equivalent to saying that large trade deficits today will be offset by equally (in present value terms) large trade surpluses in some future period, a country can remain technically solvent even while running large external deficits as long as policies are adjusted as needed in the future to bring about the required surpluses that enable debts to be repaid. Therefore, it can be argued that intertemporal solvency imposes too few restrictions on the evolution of the current account and external debt over the medium term to be of much operational value in telling us when a country's external position warrants attention from policy makers.

A more demanding criterion is sustainability. This concept adds on to the notion of solvency the idea that policies remain constant for the indefinite future. Thus, an external position is sustainable if, under the assumption that policies do not change, the country does not violate its intertemporal solvency constraint. The problem with the sustainability concept is that what matters for the current account are people's expectations of future policies rather than the policies themselves. These expectations are notoriously difficult to observe and measure, which makes the sustainability concept difficult to apply operationally.

Economists do not agree on a precise definition of a "sustainable" current account. In general, sustainability refers to a stable state in which a current account deficit generates no economic forces of its own to change its trajectory. In this article, a country's current account deficit is defined as unsustainable when it triggers a sharp hike in domestic interest rates, a rapid depreciation or some other abrupt domestic or global economic disruption. Using this definition, a sustainable current account is one that changes in an orderly fashion through market forces without causing jarring movements in other economic variables, such as the exchange rate.

The *traditional Keynesian* approach to the current account put the emphasis on international price competitiveness and relative demand in explaining current account movements. However, the intertemporal approach that appeared from the beginning of the 1980's has emphasized the role of forward-looking expectations in explaining current account patterns. The current account of a country is treated as a reflection of consumption and investment decisions that span over long-term horizons. Thus, the standard intertemporal model of the current account considers the current account from the saving-investment perspective and features an infinitely lived representative agent who smooths consumption over time by lending or borrowing abroad. As the global integration of the financial markets increased from mid 70's, there was a rapid expansion of two-way capital flows and gross external asset and liability positions that contributed to the creation and sustainability of current account imbalances. Therefore, the intertemporal approach became a more appropriate framework to analyze the dynamics of the current account.

The *intertemporal approach* to the current account stresses that, since the current account is the difference between national saving and investment, external deficits or surpluses result from intertemporal investment and consumption decisions by firms, households and the government.[1] Thus, when international markets provide limited insurance opportunities, borrowing and lending enables economic agents to smooth consumption through intertemporal trade, enhancing economic efficiency. The empirical applications of this approach evolved along two main lines of research.

The first strand of the literature applied the "present value test", as developed by Campbell and Shiller (1987). Under some simplifying assumptions and using a methodology developed by these authors in a different context, one can estimate the current account series that would have been optimal from a consumption smoothing perspective. The standard model implication is that the current account balance equals the present value of expected future declines in net output (output less investment and government spending). The intertemporal approach to the current account was first popularized by Sachs (1981) and considers net accumulation of foreign assets as a way for domestic residents to smooth consumption intertemporally in the face of idiosyncratic income shocks. Namely, in response to positive *temporary shocks* to net output, domestic house-

[1]See Obstfeld and Rogoff (1995, 1996) for a survey of the literature.

holds can increase both current and future consumption by lending internationally, either directly or through financial institutions. Conversely, in response to *permanent shocks* that raise net output in the long-run by more than in the short run, domestic households can optimally smooth consumption by borrowing in the international financial markets. To the extent that the permanent increase in net output is driven by shocks to productivity, borrowing in international financial markets allow the domestic economy to sustain higher rates of domestic investment without cutting current consumption.

For more that two decades, these basic propositions have been tested using variants of the present-value model originally conceived by Campbell (1987) and Campbell and Shiller (1987) with mixed results. Starting with Ahmed (1986) and Sheffrin and Woo (1990), economists have compared actual current account data with this optimal benchmark leading to the general result that while the model-predicted current account is positively correlated with the actual series, the latter is substantially more volatile, what implies a statistical rejection of the model. Although the positive correlation means that consumption-smoothing plays a role in the dynamics of the current account, the finding of excess current account volatility has been used to reject the proposition of limited international capital mobility, as stated by Feldstein and Horioka. The present value framework was then extended in several directions in more recent papers. These studies have tried to generate extra predicted volatility through real exchange rates and interest rates variability (Bergin and Sheffrin, 2000), by incorporating consumption habits (Gruber, 2004) or by adding an exogenous world real interest rate shock (Nason and Rogers, 2006). The extent to which the model performance is driven by the empirical failure of the auxiliary assumptions commonly adopted to make the model testable is unclear but has been claimed as the main reason for that. In addition, present-value tests do not distinguish between temporary or permanent shocks driving the dynamics of a country's net foreign liabilities.

The second strand of the literature has applied standard econometric techniques to establish if there is a long-term relationship between the current account and macroeconomic fundamentals – i.e. relative GDP per capita, the demographic structure or fiscal policy.[2] Recent literature addressing these issues has used DSGE models with non conclusive results.[3] Moreover, due to the lack of a precise definition, no universally accepted measure of sustainability exists. Many economists gauge sustainability by examining the value of a country's external obligations. In this context, two commonly used measures are the ratio of the country's current account deficit to GDP and the ratio of the country's net international debt to GDP. Insight into the causes of the deficit can be gained by looking at how the deficit is financed. In balance of payments terminology, net capital inflow is the financial counterpart of the current account deficit. Thus, current account positions which appear justified from such

[2] See, for example, Debelle and Faruquee (1996), Chinn and Prasad (2003) or Bussiere et al. (2004).

[3] See, for instance, Blanchard and Giavazzi (2002), Fagan and Gaspar (2007) or Bems and Schellekens (2007).

perspective can only materialize subject to the constraints implied by international capital flows In other words, a country that is solvent may nevertheless not be able to finance a particular current account deficit if investors are not willing to provide the required funds, i.e. if the country is liquidity constrained. However, recent empirical literature trying to test for this approach still relies only on flows to assess the dynamics of the adjustment process.[4]

From a theoretical perspective, the above flow approaches have a major drawback, as they ignore valuation effects of stocks of foreign assets and liabilities and assume that the current level of net foreign assets (NFA) is sustainable. Although this mechanism could help to a gradual rebalancing, these benefits could turn into a problem if policies are not consistent with a credible medium-term policy framework aimed at external and internal balances, as expectations may not be well anchored. In this case, investor preferences may quickly change and the fallout from disruptive financial market turbulence would likely be more elevated than it had been otherwise. Moreover, a country running persistent current account deficits might be at the same time improving its NFA position if capital gains on its foreign assets exceed those on its foreign liabilities (Lane and Milesi-Ferretti, 2006). Additionally, if the country is located away from its equilibrium level of NFA, the current account deficit can be sustained precisely because the economy is adjusting to a higher level of long-term liabilities. Edwards (2001) shows that this adjustment process can lead to quite substantial current account deficits.

The mean reversion property of current account has several implications for international macroeconomics. First, a stationary current account is consistent with sustainability of the external debts. In this case, there is no incentive for the government to make drastic policy changes and default on its international debts in the near future. Second, stationarity of the current account validates the modern intertemporal model as, theoretically, the model combines the assumptions of perfect capital mobility and consumption smoothing behavior to postulate that the current account acts as a buffer to smoothing consumption in the event of shocks.

From an empirical point of view, the stationarity and sustainability of OECD current account balances has been the focus of many researchers over a number of years.[5] The literature on the sustainability of the current account examines the question within two alternative frameworks. On the one hand, a time series perspective is employed where researchers investigate either the long-run relationship between exports and imports or the stationarity of the external debt process (see Chortareas et al., 2004).[6] With the exception of Liu and Tanner

[4]For example, Bussière et al. (2004) extend the standard intertemporal model by introducing habit formation and non-ricardian consumers to account for current account behavior in the OECD and in EU acceding countries. Similarly, Zanghieri (2004) extends this analysis by projecting the future level of debt using the forecasts of current account minus FDI flows. Depending on the assumed share of FDI in the current account deficit, CEECs' debt will be stabilized (high share of FDI) or will continue to grow (low share of FDI).

[5]See, inter alia, Trehan and Walsh (1991), Otto (1992), Wickens and Uctum (1993), Liu and Tanner (1996), Wu (2000), Wu et al. (2001), Holmes (2006) and Holmes et al. (2007).

[6]The strand of this empirical literature using single equation unit root tests usually rejects

(1996), who consider the impact of structural breaks, the above mentioned studies generally find that current accounts are non-stationary for OECD countries.

On the other hand, panel unit root techniques have been employed since unit root tests applied to single series suffer from low power. In recent years a number of alternative procedures have been proposed to test for the presence of unit roots in panels that combine the information from the time series dimension with that from the cross-section dimension. Studies that employ panel data methods include Wu (2000), Wu et al (2001), Holmes (2006) using Im, Pesaran and Shin (2003) test (IPS) and cointegration tests. However, due to the heterogeneous nature of the alternative hypothesis in their test, one needs to be careful when interpreting the results, because the null hypothesis that there is a unit root in each cross section may be rejected when only a fraction of the series in the panel is stationary.

3 Theoretical framework

3.1 Sustainability of the current account and the intertemporal budget constraint

According to Taylor (2002) sustainability of the current account can be defined as the ability of an economy to satisfy its long-run intertemporal budget constraint without a drastic change in private sector behavior or policy shifts. As we previously claimed, this is a rather general concept and does not depend on any particular model, with the advantage of its easy testability. According to Trehan and Walsh (1991), current account stationarity is a sufficient condition for the intertemporal budget constraint to hold.

Consider a stochastic model with zero growth. The one period budget constraint is,

$$C_t + I_t + G_t + B_t = Y_t + (1 + r_i)B_{t-1}, \tag{1}$$

where C_t, I_t, G_t, B_t and Y_t are consumption, investment, government consumption, net stock of debt and income respectively. r_t is the world interest rate. Rearranging (1) and from national accounts identities we have that,

$$B_t = (1 + r_i)B_{t-1} + NX_t\,, \tag{2}$$

where NX_t is the net exports. Iterating (2) forward and assuming that the expected value $E(r_t|\varphi_{t-1}) = r$, with φ_{t-1} being the information set available in $t-1$, we get

$$B_t = \sum_{j=0}^{\infty} \left(\frac{1}{1+r}\right)^j E(NX_{t+j} \mid \varphi_{t-1}) + \lim_{T\to\infty} \left(\frac{1}{1+r}\right)^T E(B_{t+T} \mid \varphi_{t-1}). \tag{3}$$

Equation (3) simply states that international agents are able to lend to an economy if they expect that the present value of the future stream of next

the mean reverting behavior of the current account. See, among others, Husted (1992), Ghosh (1995), or Bergin and Sheffrin (2000).

exports surpluses equals the current stock of foreign debt. Hence, the sustainability hypothesis, or long run budget constraint implies that:

$$\lim_{t\to\infty}\left(\frac{1}{1+r}\right)^{T}E(B_{t+T}\mid\varphi_{t-1})=0 \tag{4}$$

This transversality condition means that the present value of the expected stock of debt when t tends to infinity must equal zero, that is, a no-Ponzi game condition. Following Trehan and Walsh (1991), given that the current account $CA_t = B_t - B_{t-1}$, a sufficient condition for (4) to hold is that the current account is an I(0) stationary process. In the more realistic case of an economy with a positive rate of growth of output, we have that the sustainability condition holds if the ratio $y_t = \frac{CA_t}{Y_t}$ is I(0) stationary. This means that sustainability is possible with current account deficits as far as they do not grow faster than output in expected value.

An obvious test of sustainability is hence a unit root test on y_t. This is what most of the literature has previously used as a test of sustainability. However, note that we are dealing here with expected values of future events. Changes in the agents' perceptions about risk, portfolio allocation decisions, future policy changes, transaction costs in international financial flows, among others, can lead to changes in the dynamics of current account mean reversion and, hence, equilibrium values of the current account. As previously mentioned, Taylor (2002) sees the speed of convergence towards equilibrium as a summary statistic of the degree of capital mobility. This is because it reflects how agents are prepared to allow for periods of current account deficits (surpluses) above the perceived equilibrium value. If, given the international financial environment, agent's perceptions about, for instance, the relative risk of US denominated assets changes due to large observed current account deficits, the speed of mean reversion and the mean of the current account itself would also change. That is, changes in the current account affecting the agent's perception can trigger adjustment dynamics leading to discontinuities in the time series. In this sense, it may be the case that tests that do not consider the existence of breaks are misspecified and reach wrong conclusions about the sustainability of the current account or arrive at too simplistic descriptions of the current account dynamics. Moreover, the special nature of the financial markets, characterized by contagion effects may give rise to sudden stops or even reversals in the asset holdings leading again to breaks in the time series and to the existence of cross-section dependence. This fact may again lead to misleading conclusions. In this research we overcome these two problems through a new panel unit root test that considers the existence of multiple breaks and cross-section dependence.

4 Econometric methodology

Concerning the empirical methodology, we have applied panel data based test statistics following a two-step testing strategy that addresses the problems related to the issues of multiple structural breaks and cross-section dependence.[7]

First, we have tested for the sustainability of the current account allowing for multiple structural changes in a panel setting that, to the best of our knowledge, has not been applied yet in this literature. Previous evidence has revealed that there might be some events that affect the current account in a permanent way. It is well known that non accounting for structural breaks biases both unit root and stationarity tests towards concluding in favor of non-stationarity in variance.[8] Thus, this feature should be of special interest in our case, since variables like current account balances have been affected by major events such as currency crises or economic integration processes during the analyzed period. Second, we consider the existence of cross-section dependence amongst the individuals in the panel. Cross-section independence is hardly found in practice, especially when using macroeconomic time series that derive from globalized financial markets, as it is the present case. Moreover, it is worth mentioning that the existing literature has evidenced an increase in the market integration degree, which should lead to higher correlation among financial and macroeconomic aggregates at the international level. As panel data unit root and stationarity tests are known to be biased towards concluding in favor of variance stationarity when individuals are cross-section dependent – see O'Connell (1998) and Banerjee, Marcellino and Osbat (2004, 2005) – the issue of cross-section dependence is of great importance. Therefore, we suggest computing the test statistic in Pesaran (2004) and Ng (2006) to assess whether the individuals in the panel are cross-section independent. Furthermore, Ng's (2006) statistic is quite convenient since, in addition to testing for the null hypothesis of cross-section independence, it provides guidance about the best way to model cross-section dependence.

The application of this statistic reveals that cross-section dependence is present in the panel data sets that are studied. Then, our analysis considers two different ways to accommodate cross-section dependence. First, following the approach by Carrion-i-Silvestre et al. (2005) we compute the bootstrap critical values of the panel data stationarity test statistic, which allows us to consider a wide form of cross-section dependence. Second, we compute the panel data unit root and stationarity test statistics proposed in Harris et al. (2005) and Bai and Carrion-i-Silvestre (2009), which model the presence of cross-section dependence through the estimation of approximate common factor models as in Bai and Ng (2004). In both cases, the analysis considers the existence of multiple structural breaks. In addition the approach that is adopted here is general enough to consider the non-break situation as a particular case embedded in the testing procedure. Therefore, our analysis does not impose the existence of structural breaks, but accounts for the possibility that they are present in the data.

Finally, note that proceeding in this fashion accounts for the existence of a

[7] We have applied as well classical panel unit root and stationarity tests without structural breaks finding mixed results. These results are available upon request from the authors.

[8] See Perron (1989) for univariate statistics, or Carrion-i-Silvestre, del Barrio and López-Bazo (2001) for panel data statistics.

tension or trade-off between cross-section dependence and misspecification concerning the presence of structural breaks: the former introduces a bias towards stationarity in variance while the bias due to the latter goes in the opposite direction. This feature implies that the empirical analysis of the current account balances should be addressed carefully to avoid the effects of this tension.

4.1 Testing for the presence of multiple structural breaks

The first stage of our analysis consists of assessing the presence of structural breaks affecting the CA time series using the following specification:

$$y_{i,t} = \alpha_i + \sum_{k=1}^{m_i} \theta_{i,k} DU_{i,k,t} + e_{i,t}, \tag{5}$$

$t = 1, \ldots, T$, $i = 1, \ldots, N$, with $DU_{i,k,t} = 1$ for $t > T^i_{b,k}$ and 0 elsewhere – $T^i_{b,k}$ denotes the kth break point for the ith individual, $k = 1, \ldots, m_i$ – and where $\{e_{i,t}\}$ are assumed to be a stationary process satisfying the strong-mixing conditions given in Phillips (1987) and Phillips and Perron (1988).

This specification permits a high degree of heterogeneity assuming that the structural breaks may have different effects on each individual time series. For this purpose, the break points are located at different dates for each individual, and the individuals may have different number of structural breaks. Under these conditions, the estimation of the number and position of the structural breaks, if any, can be carried out using the sequential testing procedure proposed by Bai and Perron (1998). When computing the statistic we have to specify a maximum number of structural breaks, which in this case has been set equal to $m_i = 5\ \forall i$. The number of structural breaks is estimated using critical values at the 5% level of significance.

It is worth mentioning that the application of the Bai-Perron methodology to estimate the number and position of the structural breaks requires the variables under analysis to be stationary in variance, which is consistent with the null hypothesis that we have specified, i.e., that the solvency hypothesis holds. Furthermore, the test statistic that is used is consistent against the alternative hypothesis of non-stationarity in variance, even when structural breaks are present in the analysis – see Lee, Huang and Shin (1997), Kurozumi (2002) and, Carrion-i-Silvestre (2003), among others.

Panel A in Table 2 reports the estimated number and position of the structural breaks for each individual in the panel data set. We can see that, except for Italy and New Zealand, the procedure detects at least one structural break for each time series, which indicates that previous analyses in the literature that do not account for the presence of structural breaks may have obtained misleading conclusions. It should be stressed that the estimated number of structural breaks does not attain the maximum that has been defined.

Figure 1 depicts the CA time series for all the countries involved in our analysis along with the estimated deterministic component. The countries have been divided according to their condition of EU members during the studied period. This presentation allows us to establish a comparison of the break dates and the direction of the changes that have been estimated. In Table 3 we present an approximation to the main events explaining the structural breaks found in the data. We have ordered the countries following two criteria: (i) their EMU (or EMS) membership and (ii) their external position in terms of the current account. Two countries, Ireland and France could not be clearly placed in a current account category and, hence, they are considered separately. In the Table we have limited ourselves to the main milestones in European integration and international economic events. Other issues, however, may explain a particular structural break. We next analyze the countries individually.

At the beginning of the 70's, the first oil shock triggered the colapse of the Bretton Woods system inducing effects on different countries. Belgium and Austria, decided to link its currency to the Deutsche Mark at the end of Bretton Woods – therefore, a policy change may have happened in 1974 and 1975 for Belgium and Austria, respectively.

Two non-EMU countries suffered structural changes at the beginning of the eighties. Australia in 1980, when the dollar experienced a depreciation linked to a terms of trade worsening – in 1979 the Australian financial market experienced a process of deregulation, and the dollar freely floated in 1983. The break in Norway in 1979 is possibly linked to the increase in oil prices.

A large group of countries have a structural break in the mid-eighties. Both Belgium and Germany followed recovery programs. For example, president Martens in Belgium devalued the Frank in 1982 and started an export-led policy. Ireland also devalued in 1983 in an answer to a twin deficits problem, followed by a tight fiscal policy.[9] Austria in 1980 started a system of cooperative arrangement for its exchange rate. Finally, Portugal suffered a deep recession, with terms of trade losses, fiscal deficits and increase in foreign debt service.

Concerning non-EMU countries, the Reagan administration started a program at the beginning of the eighties that reduced policy intervention and allowed the free floating of the dollar. In early 1981, the new Reagan Administration decided to move away from what it judged to have been the heavy intervention inherited from the previous administration. From 1981 through early 1985, the dollar continued to strengthen, for several reasons. US monetary conditions were restrictive in the context of a robust recovery, and prospects for continued large US fiscal deficits exerted upward pressure on real interest rates. Meanwhile, monetary authorities abroad initially were reluctant to raise interest rates because their recoveries appeared more fragile. Investment, including foreign investment, boomed in the United States, attracted by the increasingly favorable business climate. In addition, dollar-denominated assets were sought as a "safe haven" following the onset of the international debt crisis and amid apprehensions about the political situations in some European countries.

[9] Membership of the EMS always posed problems for Ireland by virtue of the fact that the UK, the country's major trading partner, is not a member of the system. Such problems became most acute when a depreciation in Sterling put pressure on Irish companies in traditional industrial sectors. Such considerations prompted a devaluation of the Irish pound at the March 1983 re-alignment.

Another large group of structural changes is found during the first half of the nineties. Most of the breaks are linked to the free capital movements in Europe and the German Unification in 1990, together with the EMS crises in 1992 and 1993. Portugal and France suffered a slowdown in economic activity in an effort to fulfill the Maastricht criteria. In the case of Austria, EU membership occurred in 1995, together with Sweden and Finland.The only structural break that Finland suffered occured in 1994, the year of the referendum for EU accession. Sweden presents two structural breaks: the first one (in 1994) can be related to inflation targeting policy that started in 1993, whereas the second one (in 2001) is placed at the peak of an economic expansion.

Finally, the end of the nineties and the beginning of 2000 accumulates another group of structural changes. Those in EMU countries and the US are linked to the creation of the monetary union in 1999, the launching of the euro in 2001 and its effects on the dollar.[10] At the same time, Norway established an inflation targeting strategy, whereas Sweden, also outside the EMU, experienced an economic expansion. In contrast, the Asian crisis affected the demand of commodities and deteriorated Canadian dollar (and its terms of trade, suffering an adverse CA shock). Beginning in the summer of 1997, Malaysia, Indonesia,Thailand and South Korea (and some other Asian countries) fell into a serious recession, sparked by the collapse of their pegged-exchange-rate regimes. As these countries are large users of raw materials, their recessions led to a significant fall in the world's demand for raw materials, and thus a large decline in raw materials prices. In the next year or so, the average prices of raw materials fell by about 30 per cent. All countries that export raw materials experienced a sudden decline in demand for their currencies, which lost value as a result – Canada, New Zealand, Australia. This type of shock is a negative current-account shock, because it reflects a reduction in the demand for Canadian goods or services, the transactions of which are recorded in the country's current account of the balance of payments. In Japan, the real estate bubble burst and the current account was declared to be a monetary policy target.

4.2 Testing I(0) stationarity on individual CA time series

Once the break points have been dated, we proceed to analyze the order of integration of the y_t time series. The estimation of the model in (5) with the break points that have been obtained above can be used to compute the individual stationarity test in Kwiatkowski et al. (1992) – henceforth, KPSS statistics –

[10] The dollar broadly strengthened against other currencies after the mid-1990s because market participants expected to receive higher rates of return on their investments in the U.S. than abroad. For example, consider for a moment the fate of the euro versus the dollar since the euro's launch on January 1, 1999. The dollar strengthened by 30% against the euro primarily because market participants anticipated brighter prospects and higher rates of return in the U.S. than in Euroland, and capital flowed out of euro-denominated assets into equities, bonds and other U.S. investments.

given by

$$\hat{\eta}_i(\lambda_i) = \hat{\omega}_i^{-2} T^{-2} \sum_{t=1}^{T} \hat{S}_{i,t}^2, \tag{6}$$

where $\hat{S}_{i,t} = \sum_{j=1}^{t} \hat{e}_{i,j}$ is the partial sum process that is obtained using the estimated OLS residuals of (5), $\hat{\omega}_i^2$ denotes a consistent estimate of the long-run variance of the error term $e_{i,t}$, which, based on the evidence reported in Carrion-i-Silvestre and Sansó (2006), has been estimated following the procedure described by Sul et al. (2005), using the Quadratic spectral kernel. In (6), λ_i is defined as the vector $\lambda_i = (\lambda_{i,1}, ..., \lambda_{i,m_i})' = \left(T_{b,1}^i/T, ..., T_{b,m_{i,j}}^i/T\right)'$, which indicates the relative position of the dates of the breaks on the entire time period T for each individual. Thus, the computation of the individual KPSS statistic permits to get a first analysis of the stochastic properties of the real interest rates. Table 2 offers the computation of the individual KPSS along with the corresponding simulated critical values at the 5 and 10% level of significance. Focusing on the individual statistics, we can see that the null hypothesis of I(0) cannot be rejected at the 5% level of significance for fifteen out of twenty countries – the exceptions are Ireland, Japan, Netherlands, Portugal, and Sweden. Therefore, the solvency constraint is met for the majority of the countries in the panel data set, although the fact that for these countries the CA is found to be I(0) evolving around a broken deterministic component implies that the CA is not sustainable.

This individual based inference can be improved if we combine the individual statistics through the definition of panel data statistics. Thus, the literature on non-stationary panel data statistics argues that a better characterization of the stochastic properties of the time series can be obtained if we increase the amount of information when performing the inference. However, some cautions have to be taken when computing these panel-data-based statistics, since some of them rely on the critical assumption of cross-section independence. This assumption is investigated in the next section for our panel data set.

4.3 The issue of cross-section independence

The independence assumption imposed in the so-called first generation panel data statistics has been widely criticized in the recent literature, since it has been shown that non accounting for cross-section dependence amongst the individuals might bias the statistical inference in favor of variance stationarity – see Banerjee et al. (2004, 2005). Although it is now common practice to apply panel data unit root and stationarity tests that take into account cross-section dependence, few really test whether the individuals are cross-section dependent.

In this subsection we test the null hypothesis of non correlation against the alternative hypothesis of correlation using the approach suggested in Pesaran (2004) and Ng (2006). Besides, this framework allows us to gain some insight on the kind of cross-section dependence in terms of how pervasive and strong is the cross-section correlation. We can allow for the presence of the structural breaks when testing the null hypothesis of non correlation amongst individuals in the panel. We will then estimate an autoregressive model to isolate cross-section dependence from the autocorrelation that might be driving the individual time series. In addition, the estimation of the autoregressive model includes dummy variables to capture the level shifts that have been detected using Bai and Perron (1998) in the previous section, which aims at isolating cross-section dependence from both autocorrelation and structural breaks in the individual time series.

Pesaran (2004) designs a test statistic based on the average of pair-wise Pearson's correlation coefficients $\hat{p}_j$, $j = 1, 2, \ldots, n$, $n = N(N-1)/2$, of the residuals obtained from an autoregressive (AR) model that include dummy variables to capture the structural breaks. The CD statistic in Pesaran (2004) is given by

$$CD = \sqrt{\frac{2T}{n}} \sum_{j=1}^{n} \hat{p}_j \rightarrow N(0,1).$$

This statistic tests the null hypothesis of cross-section independence against the alternative of dependence.

The procedure proposed by Ng (2006) works as follows. First, we get rid of the autocorrelation pattern in the individual time series through the estimation of an AR model. This allows us to isolate the cross-section regression from serial correlation. Taking the estimated residuals from the AR regression equations as individual series, we compute the absolute value of Pearson's correlation coefficients ($\bar{p}_j = |\hat{p}_j|$) for all possible pairs of individuals, $j = 1, 2, \ldots, n$, where $n = N(N-1)/2$, and sort them in ascending order. As a result, we obtain the sequence of ordered statistics given by $\left\{\bar{p}_{[1:n]}, \bar{p}_{[2:n]}, \ldots, \bar{p}_{[n:n]}\right\}$. Under the null hypothesis that $p_j = 0$ and assuming that individual time series are Normally distributed, $\bar{p}_j$ is half-normally distributed. Furthermore, let us define $\bar{\phi}_j$ as $\Phi\left(\sqrt{T}\bar{p}_{[j:n]}\right)$, where Φ denotes the cdf of the standard Normal distribution, so that $\bar{\phi} = \left(\bar{\phi}_1, \ldots, \bar{\phi}_n\right)$. Finally, let us define the spacings as $\Delta\bar{\phi}_j = \bar{\phi}_j - \bar{\phi}_{j-1}$, $j = 1, \ldots, n$.

Second, Ng (2006) proposes splitting the sample of (ordered) spacings at arbitrary $\vartheta \in (0,1)$, so that we can define the group of small (S) correlation coefficients and the group of large (L) correlation coefficients. The definition of the partition is carried out by minimizing the sum of squared residuals

$$Q_n(\vartheta) = \sum_{j=1}^{[\vartheta n]} \left(\Delta\bar{\phi}_j - \bar{\Delta}_S(\vartheta)\right)^2 + \sum_{j=[\vartheta n]+1}^{n} \left(\Delta\bar{\phi}_j - \bar{\Delta}_L(\vartheta)\right)^2,$$

where $\bar{\Delta}_S(\vartheta)$ and $\bar{\Delta}_L(\vartheta)$ denotes the mean of the spacings for each group respectively. A consistent estimate of the break point is obtained as $\hat{\vartheta} = \arg\min_{\vartheta \in (0,1)} Q_n(\vartheta)$, where some trimming is required. Following Ng (2006) the trimming is set at 0.10.

Once the sample has been split, we can proceed to test the null hypothesis of non correlation in both sub-samples. Obviously, the rejection of the null hypothesis for the small correlations sample will imply also rejection for the large correlations sample as the statistics are sorted in ascending order. Therefore, the null hypothesis can be tested for the small, large and the whole sample using the Spacing Variance Ratio (SVR) in Ng (2006), which under the null hypothesis converges to the standard normal distribution.

The results in Table 1 show that the null hypothesis of independence is rejected for the whole sample of spacings, while it is not rejected for the L and S samples at the 5% level of significance. Since the proportion of non significant correlations in the L and S group is similar, this leads us to conclude that cross-section dependence is not pervasive. In this case, the factor models suggested by Bai and Ng (2004) might not be a suitable approximation to account for the cross-section dependence that appear in the panel data set. Besides, Pesaran's (2004) CD statistic strongly rejects the null hypothesis of independence. Therefore, the evidence that is obtained in this section indicates that cross-section dependence has to be considered when computing the panel data statistics if misleading conclusions are to be avoided.

4.4 Panel data tests with cross-section dependence and structural breaks

The specification estimated above permits the computation of two different panel data stationarity statistics. First, we have applied the approach suggested in Carrion-i-Silvestre et al. (2005) to test the null hypothesis of panel variance stationarity allowing for multiple level shifts. Thus, note that the specification given in (5) is one of the two models considered by these authors. The OLS estimated residuals from (5) are used to obtain the individual KPSS statistics computed in the previous sections, which in turn can be combined to define the panel stationarity test statistic:

$$LM(\lambda) = N^{-1} \sum_{i=1}^{N} \hat{\eta}_i (\lambda_i),$$

with $\hat{\eta}_i (\lambda_i)$ defined in (6). Note that $\hat{\eta}_i (\lambda_i)$ has been defined such that the long-run variance is heterogenous across individuals. However, it would be possible to use an homogeneous estimate of the long run variance, i.e., $\hat{\omega}^2 = N^{-1} \sum_{i=1}^{N} \hat{\omega}_i^2$. Using these elements we can define the panel data statistic $Z(\lambda) = \sqrt{N} \left(LM(\lambda) - \bar{\xi} \right) \big/ \bar{\varsigma}$, where $\bar{\xi} = N^{-1} \sum_{i=1}^{N} \xi_i$ and $\bar{\varsigma}^2 = N^{-1} \sum_{i=1}^{N} \varsigma_i^2$, with ξ_i and ς_i^2 being the individual mean and variance of $\eta_i (\lambda_i)$ respectively. Note that these two possibilities for the definition of the long-run variance estimate gives rise to two different statistics, i.e., the $Z(\lambda)$ when the long-run variance homogeneity is imposed and the $Z(\lambda)$ for heterogeneous long-run variance.

Under the null hypothesis of variance stationarity and assuming cross-section independence, the $Z(\lambda)$ panel data statistics are shown to converge to the standard normal distribution. However, this limiting result is not obtained when individuals are cross-section dependent, as it is in our case. In this situation, we can compute the bootstrap distribution of the $Z(\lambda)$ statistics to account for the presence of a general form of cross-section dependence. The computation of the bootstrap distribution follows the lines given in Maddala and Wu (1999). To be specific, we have defined the $(T \times N)$-matrix of the OLS estimated residuals from (5) $\hat{e} = (\hat{e}_1, \ldots, \hat{e}_N)$, and have resampled with replacement the rows of the $\hat{e}$ matrix so that the first matrix of resampled residuals $\hat{e}^{*(1)}$ is obtained, where the superscript "$*(1)$" indicates the first resampling. Conditional on the estimated parameters and structural breaks, we have computed the bootstrap variables

$$y_{i,t}^{*(1)} = \hat{\alpha}_i + \sum_{k=1}^{\hat{m}_i} \hat{\theta}_{i,k} DU_{i,k,t} + e_{i,t}^{*(1)},$$

for each i, where $\hat{\alpha}_i$ and $\hat{\theta}_{i,k}$ are the OLS estimates of the parameters in (5). This is repeated 20,000 times so that we define $y_{i,t}^{*(1)}, \ldots, y_{i,t}^{*(2,000)}$ series for each individual, which can be used to approximate the empirical distribution of the $Z(\lambda)$ statistics. Table 2 presents the $Z(\lambda)$ statistics as well as the bootstrap critical values. According to these statistics, the null hypothesis of I(0) cannot be rejected regardless of the assumption made about the long-run variance estimation.

Although we have already obtained that CA is an I(0) stationary process, we have checked the robustness of our results computing panel data unit root and stationarity tests that control for the presence of cross-section dependence using approximate common factor models proposed in Bai and Ng (2004), Harris et al. (2005) and Bai and Carrion-i-Silvestre (2009). The common factors approach decomposes the observable variables as follows

$$y_{i,t} = \alpha_i + \sum_{k=1}^{m_i} \theta_{i,k} DU_{i,k,t} + F_t' \pi_i + \xi_{i,t}, \quad (7)$$

$t = 1, \ldots, T$, $i = 1, \ldots, N$, where F_t is a $(r \times 1)$-vector that accounts for the common factors that are present in the panel, and $\xi_{i,t}$ is the idiosyncratic disturbance term, which is assumed to be cross-section independent. Note that the specification given by (7) is similar to the one in (5), where the disturbance term $e_{i,t}$ in (5) has been expressed as $e_{i,t} = F_t' \pi_i + \xi_{i,t}$ giving rise to the specification in (7). The unobserved common factors (F_t) and idiosyncratic disturbance terms $(\xi_{i,t})$ are estimated using principal components on the first difference model. The estimation of the number of common factors is obtained using the panel BIC information criterion in Bai and Ng (2002), with a maximum of five common factors. Table 2 reports the results of applying this method. For both the short-term and long-term interest rates, the ADF statistic computed from the idiosyncratic disturbance terms rejects the null hypothesis of unit root, while the procedure detects at least one non-stationary common factor – r_1 denotes the number of non-stationary common factors so that $r = r_0 + r_1$, with r_0 the number of stationary common factors.

This set-up allows us to compute two panel data test statistics that consider the presence of multiple structural breaks. First, we have the panel data stationarity test statistic in Harris et al. (2005), which is given by $S_k^F = \left(\hat{C}_k + \hat{c}\right) / \hat{\omega}\left\{\hat{a}_{k,t}\right\}$, being $\hat{C}_k = T^{-1/2} \sum_{t=k+1}^{T} \hat{a}_{k,t}$ the autocovariance of order k, $\hat{a}_{k,t} = \sum_{i=1}^{N+\hat{r}} \hat{z}_{i,t}\hat{z}_{i,t-k}$. We define $\hat{z}_{i,t}$ as the ith element of the $(N+\hat{r}) \times 1$ vector $\left(\hat{F}_{1,t}, \ldots, \hat{F}_{\hat{r},t}, \hat{\xi}_{1,t}, \ldots, \hat{\xi}_{N,t}\right)'$ that contains the estimated common factors $\left(\hat{F}\right)$ and the idiosyncratic disturbance $\left(\hat{\xi}_i\right)$, with $\hat{c} = (T-k)^{-1/2} \sum_{i=1}^{N} \hat{c}_i$, being $\hat{c}_i$ a correction term defined in Harris et al. (2005) and, $\hat{\omega}^2\left\{a_t\right\}$ is a consistent estimate of the long-run variance of $\{a_t\}$. Under the null hypothesis of joint variance stationarity of the common and idiosyncratic components the statistic $S_k^F \to^d N(0,1)$. We follow Harris et al. (2005) and use $k = \left[(3T)^{1/2}\right]$. The value of $S_k^F = 2.546$ statistic with p-value of 0.005 leads to the rejection of the null hypothesis of I(0), which contradicts the previous results that have been found using the $Z(\lambda)$ statistics. However, it should be borne in mind that the Ng's statistic has revealed that the cross-section dependence is not pervasive, so that the use of the common factor model might not be correct.

Second, we can compute the panel data unit root test in Bai and Carrion-i-Silvestre (2009), which has been shown to be robust to the presence of multiple structural breaks affecting the level. These authors propose the computation of the panel data version of the modified Sargan-Bhargava (MSB) statistics using the estimated idiosyncratic disturbance term $(\hat{\xi}_i)$, with up to three different ways to pool the individual information. In this case and using the notation in Bai and Carrion-i-Silvestre (2009), we have the $Z \to^d N(0,1)$, $P_m \to^d N(0,1)$ and $P \to^d \chi^2_{2N}$ panel data unit root test statistics. Results in Panel B of Table 2 indicates that the null hypothesis of I(1) can be rejected using the P_m and P statistics at the 5% level of significance, although it is not rejected when using the Z test. Since finite sample analysis in Bai and Carrion-i-Silvestre (2009) reports that the P_m and P statistics are the ones that show better finite sample performance compared to the Z test, provided that the Z test suffers from mild size distortions problems (underrejection) while the P_m and P statistics have the correct size. Taking into account this consideration and relying on the P_m and P statistics, we can conclude that the null hypothesis of panel unit root is rejected.

To sum up, our results show that there is evidence of the current account being an I(0) stationary process once structural breaks and cross-section dependence are allowed for.

5 Conclusions

In this paper we have empirically revisited the debate of the current account sustainability in the OECD countries for the period 1970-2006. Current account imbalances have steadily increased in rich countries over the last 20 years and there appears a widely shared worry that these deficits are too large, and government intervention is required. Using the concept of sustainability as the ability to meet the long run intertemporal budget constraint, we test for stationarity in the current account of the OECD countries. We argue that there are several reasons to believe that the current account may suffer from discontinuities. Previous evidence has revealed that there might be some events that affect the current account in a permanent way. If this is the case, it is well known that non accounting for structural breaks biases both unit root and stationarity tests towards concluding in favor of non-stationarity in variance. Moreover, the independence assumption imposed in the so-called first generation panel data statistics has been widely criticized in the recent literature, since it has been shown that non accounting for cross-section dependence amongst the individuals might bias the statistical inference in favor of I(0) stationarity.

In this research we aim at filling the gap in the literature on external sustainability in several respects. We improve previous empirical work on the intertemporal model by testing for the stationarity of the current account applying new panel tests that allow for multiple structural breaks and cross-section dependence. Our results point that only two countries have not experienced structural changes during the analyzed period, namely, Italy and New Zealand, showing stationarity, and therefore, external sustainability. The rest of the sample countries have experienced up to four breaks in their current account for the period considered. These discontinuities correspond to major institutional changes or policy measures that have induced a series of breaks in the path followed by the variables.

Focusing on the individual statistics, we can see that the null hypothesis of I(0) cannot be rejected at the 5% level of significance for fifteen out of twenty countries – the exceptions are Ireland, Japan, Netherlands, Portugal, and Sweden. In general, the individual country results point to the fact that policy measures or, otherwise, abrupt readjustments, are still needed to keep the sustainability of the current accounts. This evidence would be against a smooth self regulating capacity of the markets, and therefore, against "laissez-faire", the so-called "Lawson doctrine". However, the increasing financial integration process in the OECD countries may be relaxing the external constraint. In fact, the evidence obtained indicates that cross-section dependence has to be considered when computing the panel data statistics if misleading conclusions are to be avoided. Finally, our results show that there is evidence of the current account being an I(0) stationary process once structural breaks and cross-section dependence are allowed for.

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A Appendix

Table 1: Spacing Variance Ratio and CD statistics. Deterministic function given by a constant term with level shifts

Ng's spacing test							Pesaran's CD test	
Whole sample		Small group			Large group			
$svr\ (\eta)$	p-val	$svr\ (\eta)$	p-val	$\hat{\eta}$	$svr\ (\eta)$	p-val	Test	p-val
2.355	0.009	0.674	0.250	120	0.859	0.195	6.825	0.000

Table 2: Results for the model with multiple breaks affecting the mean

Panel A: Individual information

	Tests	m_i	$T^i_{b,1}$	$T^i_{b,2}$	$T^i_{b,3}$	$T^i_{b,4}$	Critical values 10%	5%
Australia	0.122	1	1980				0.197	0.256
Austria	0.037	2	1975	1981			0.179	0.232
Belgium	0.031	4	1974	1984	1992	2000	0.060	0.068
Canada	0.057	1	1998				0.230	0.302
Denmark	0.073	1	1989				0.156	0.190
Finland	0.067	1	1994				0.186	0.237
France	0.041	1	1992				0.169	0.212
Germany	0.034	3	1984	1990	2001		0.091	0.110
Greece	0.096	1	1998				0.231	0.299
Ireland	0.181	3	1984	1991	1998		0.085	0.102
Italy	0.035	0					0.354	0.463
Japan	0.221	2	1982	2001			0.128	0.158
Netherlands	0.256	1	1992				0.168	0.209
New Zealand	0.109	0					0.350	0.453
Norway	0.053	2	1979	1999			0.127	0.161
Portugal	0.160	2	1984	1995			0.100	0.118
Spain	0.269	1	1999				0.244	0.319
Sweden	0.428	2	1994	2001			0.180	0.233
United Kingdom	0.086	1	1986				0.158	0.191
United States	0.042	2	1982	1999			0.114	0.138

Panel B: Panel data based unit root and stationarity test statistics

	Test	Bootstrap dist. 90%	95%
$Z(\lambda)$ (Homog)	-0.521	4.620	5.853
$Z(\lambda)$ (Heterog)	1.904	4.882	5.617

	Test	p-value	Num. of factors
S^F_k	2.546	0.005	1
Z	-0.735	0.231	5
P_m	1.921	0.027	5
P	57.178	0.038	5

Table 3: Main events and breaks found in the data

Main events	**EMU countries**			**Non-EMU countries**	
	CA Surplus	**Both**	**CA Deficit**	**CA surplus**	**CA deficit**
Beginning 70s (Bretton Woods ends)	AUS (75)				
First oil shock	BEL (74)				
Beginning 80s					
Second oil shock	AUS (81)			NOR(79)	AUST(80)
Mid-80s		IRE(84)			
lower oil prices	BEL(84), GER(84)		POR(84)		
Beginning-mid 90s	BEL(92)	IRE(91)			
German unification, K mov, EMS crises	GER(90), FIN(94)	FR(92)	POR(95)	DK(89), SWE(94)	
End 90s, beginning 2000			GRE(98)	CAN(98), NOR(99)	
Asian Crisis, EMU	BEL(00), GER(01)	IRE(98)	SPA(99)	SWE(01), JAP(01)	US(99)

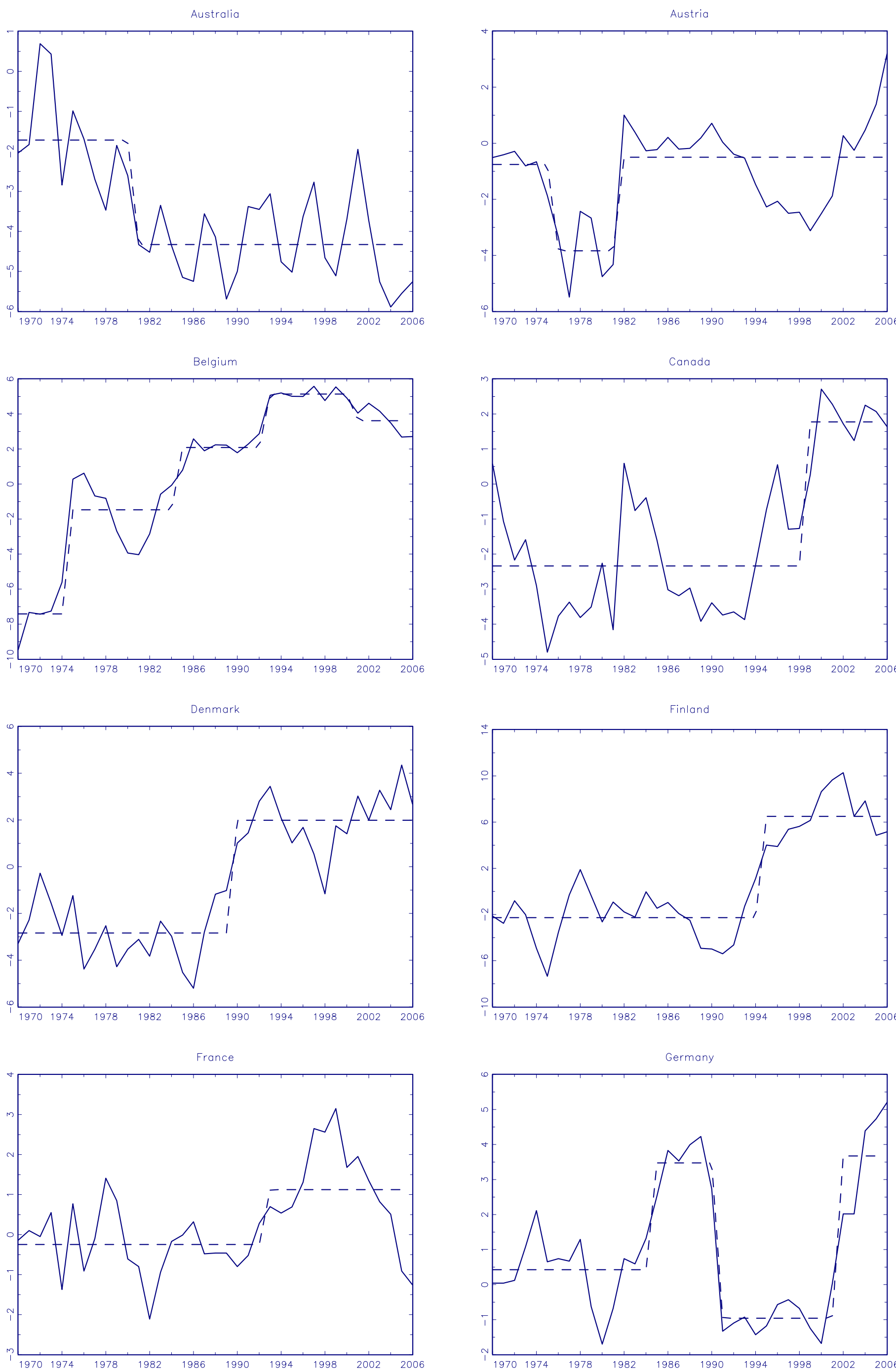

Figure 1. Current account over GDP and estimated break points

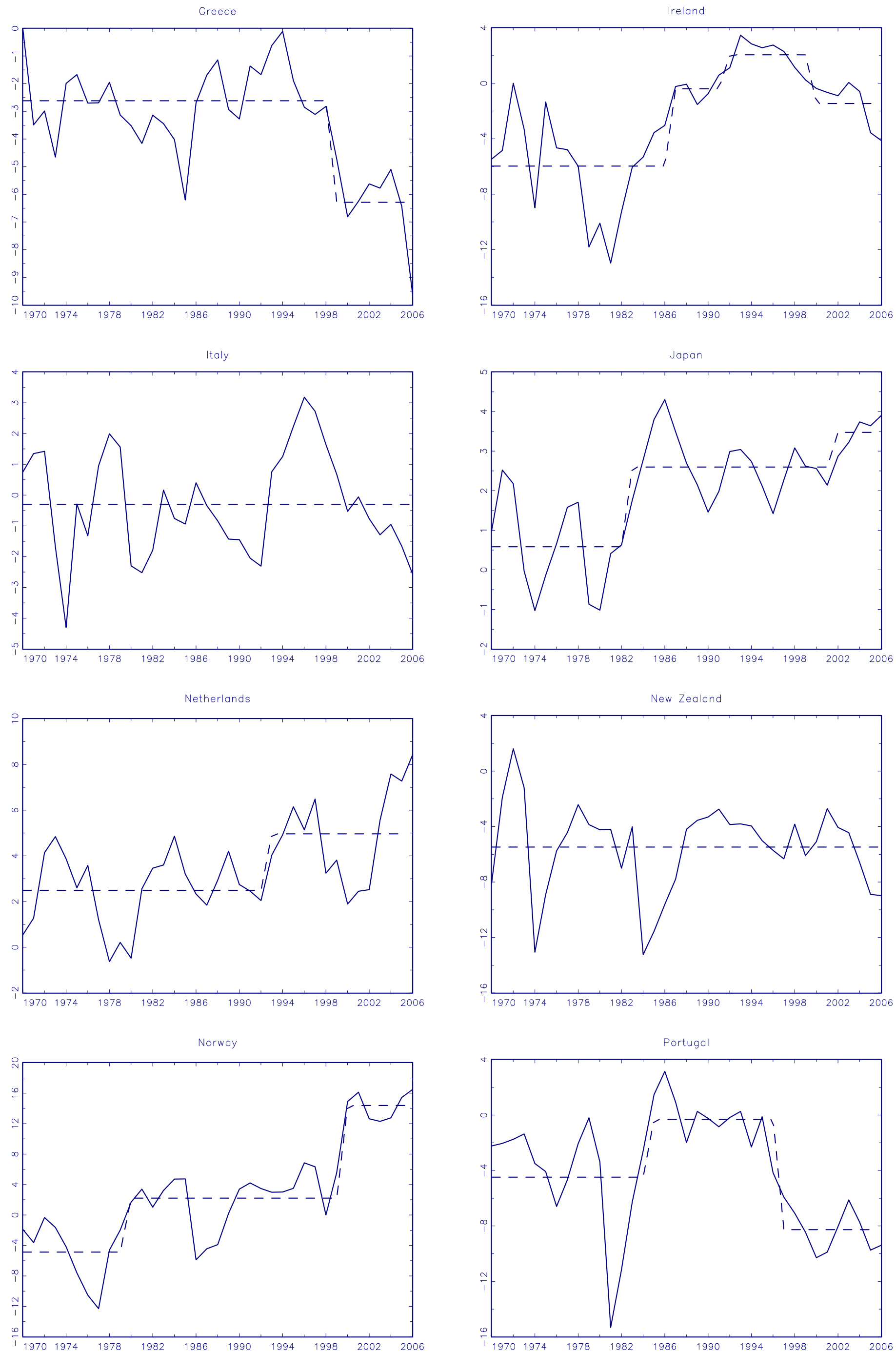

Figure 1 (continued). Current account over GDP and estimated break points

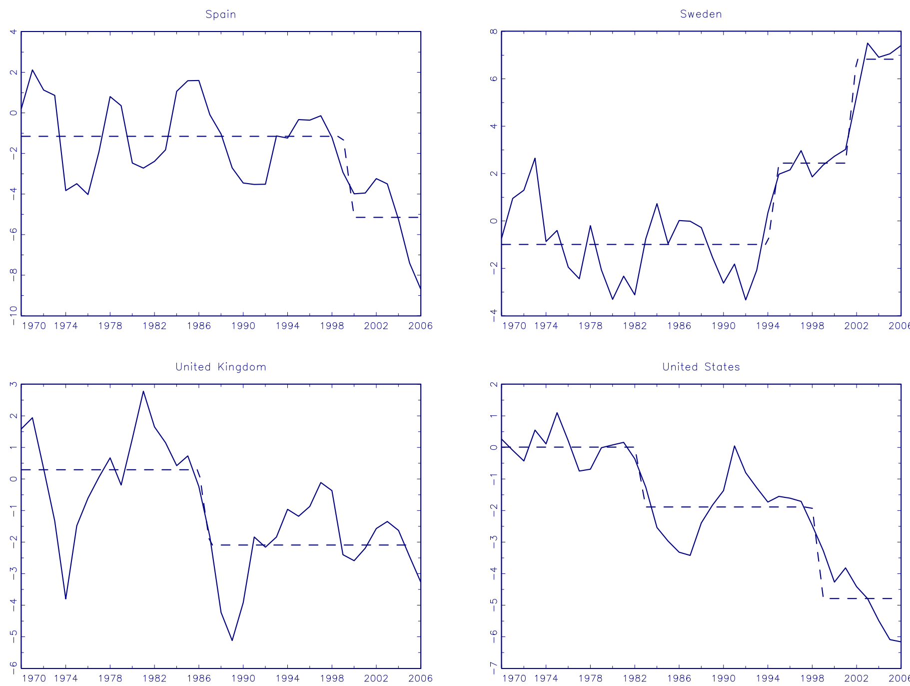

Figure 1 (continued). Current account over GDP and estimated break points