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Twin deficits in CEEC economies: evidence from panel unit root tests

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Abstract

This paper analyses the relation between the external and government deficits in a panel of CEEC economies. We first assess by panel unit root tests whether the fiscal and external intertemporal budget constraints hold, and then examine the role of public and private expenditure in the dynamics of external indebtedness by panel regression. The results show that government deficit is a significant but relatively minor source of external imbalances, and that the external indebtedness of CEEC economies is sustainable.

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1. Introduction

Since the fall of the Soviet Union, the large and persistent external imbalances experienced by Eastern economies have raised some concern in the applied literature (Roubini and Wachtel 1999). The external indebtedness of these countries could be seen as an intertemporal phenomenon: it is widely held that less developed countries will feature current account deficits during the "catching up" process (Obstfeld and Rogoff 1995), mostly because of the increased investment needs. However, theoretical as well as empirical analyses suggest that whenever the external deficits are driven by unhealthy fiscal policies, or by persistent imbalances between private investment and saving, they can result in unsustainable outcomes, leading to sudden capital stops and current account reversals. We recall that a "sustainable balance of payments" is expressly mentioned among the "guiding principles" of the member states by Article 3A of Maastricht Treaty, while article 109j states that besides the four convergence criteria, the Commission shall also consider the developments of the current account balance. Interestingly enough, no operational "convergence" criterion is defined on external indebtedness: while we have an "excessive (government) deficit" procedure, we do not have an "excessive external deficit" procedure, possibly triggered by some ceiling analogous to the 3% Maastricht parameter. However, the recent experience shows that all the European countries that incurred in severe financial crises (among which Iceland and some Eurozone "periphery" countries) featured a high level of *external* indebtedness, more often than not in presence of sustainable (at least by Maastricht criteria) levels of *public* indebtedness, Greece being perhaps the only significant exception. To make a few examples, in 2006 the public debt of Spain and Iceland was equal to 46.7 and 30.2 GDP points (well below Maastricht reference criterion), while their external debt was equal to 70.9 and 121.5 GDP points, and rising.[1]

This stresses the importance of investigating carefully the related issues of external indebtedness determinants and sustainability, with a special focus on the behaviour of the private sector.

This paper focuses on Central and Eastern European Countries (CEEC).[2] These countries share a common historical experience as members of the Soviet empire[3] and have nowadays a mixed status as far as their accession to the European Union is concerned: Slovakia and Slovenia belongs to the Eurozone already, the three Baltic states (Estonia, Latvia and Lithuania) belong to the European Exchange Rate Mechanism (ERM II) agreement, with Estonia expected to join the euro in 2011, Bulgaria, Czech Republic, Hungary, Poland and Romania belong to the EU but did not yet enter the ERM II agreement, Croatia and the Former Yugoslavian Republic of Macedonia are candidate countries for

[1] Data sources: "General government gross financial liabilities as a percentage of GDP", OECD (2008), and "Net foreign assets", coming from the updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007). Remark that we use the "gross financial liabilities" definition for the sake of comparability. The harmonized "Maastricht criterion gross public debt" figure for Spain was even more reassuring, at 39.6 GDP points in 2006 (of course, this figure is not available for Iceland).

[2] CEEC countries include Albania, Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia, Slovakia and Slovenia. Due to data limitations, we exclude three countries belonging to the former Yugoslavia, namely Bosnia-Herzegovina, Montenegro and Serbia. This leaves us with a panel of 13 countries.

[3] More precisely, since 1961 Yugoslavia took part in the Non-Aligned Movement, therefore the former Yugoslavian countries followed a different path than the other CEEC countries.

accession to the EU, and at the other end of this range Albania is not even candidate to EU. However, most of these countries are already, or will become very soon, Eurozone “periphery” countries. In other words, these countries have already, or will acquire very soon, a status similar to that of the countries whose behaviour has recently put the euro under a severe stress. It is therefore all the more interesting to investigate the issue of their external and fiscal sustainability.

The empirical evidence on “twin deficits” in Western countries is rather mixed: while most macroeconomic models imply a causal nexus between the budget and the external deficit, this relation appears in most studies to be weak and subject to structural break (Obstfeld and Rogoff 1995, Leachman and Francis 2002, Bagnai 2006). Evidence for transition economies is even scarcer, due mostly to the limited amount of data. Using quarterly data from 1994 to 2001 and a sample including six transition countries (Bulgaria, Czech Republic, Estonia, Hungary, Poland and Slovakia), Fidrmuc (2003) finds that the current account and the fiscal balance are driven by a unit root process in most countries, and that a significant long-run relation between the two deficits emerges only in Hungary and Poland. According to sustainability tests in the tradition of Trehan and Walsh (1988), a unit root in the government deficit implies unsustainability of the public debt; likewise, a unit root in the current account implies unsustainability of a country external debt (Trehan and Walsh 1991). In the light of these well known results, the findings of Fidrmuc (2003) are rather worrisome, as they imply that the external and public indebtedness of some leading CEEC countries are unsustainable (thus violating the basic principles set out by the Treaty on European Union).

In this paper we argue that the results of Fidrmuc (2003) could depend on the lack of power of the unit root tests in small samples, which is especially severe in the presence of slow reversion to the mean. We decide therefore to investigate further the issue by adopting the panel unit root tests developed by Levin *et al*. (2002) (henceforth, LLC) and Im *et al*. (2003) (henceforth, IPS). These tests are known to perform much better than their time series analogues when the number of observation in the time dimension is moderate. Having ascertained the nature of the data generating process, we go on by estimating the relation between the two deficits using the appropriate panel estimation techniques. This allows us to gauge the role of the public and private sector behaviour in the dynamics of external indebtedness.

The remainder of the paper falls in four sections. Section 2 sets out the twin deficits relation. Section 3 illustrates the panel unit root tests. Section 4 presents the results. Section 5 draws some conclusions.

2. Twin deficits model

The twin deficits relation derives from the national account identity

$$Y^N = C + I + G + NX + NFI \tag{1}$$

where Y^N is the gross national product, C private consumption, G government consumption, NX net exports and NFI the net factor income from abroad. The sum of the last two items defines the current account balance $CA = NX + NFI$. Taking it to the left-hand side and remembering the definition of national saving we have

$$CA = S - I \qquad (2)$$

Eq. (2) considers two sources of financial capital, an internal one (national saving), and an external one (the current account deficit), but only one use, domestic investment. By subtracting the net direct taxes T from both sides of (1) and rearranging we get:

$$S^P - CA = I - S^G \qquad (3)$$

where $S^P = Y^N - T - C$ is private saving, and $S^G = T - G$ is government saving (i.e., the budget *surplus*). The left-hand side of (3) displays the two main sources of financial capital, namely private saving and the current account deficit, while the right hand side displays its uses: private investment, and public deficit.

Eq. (3) can be rearranged as follows:

$$CA = S^G + S^P - I \qquad (4)$$

Eq. (4) shows that if the difference between private saving and investment is stable, then the current account and government balance must move together by arithmetic (i.e., they are "twins"). Starting from the extended relation (4), Fidrmuc (2003) estimates the following equation:

$$ca_t = \beta_0 + \beta_1\, s_t^G + \beta_2\, i_t + u_t \qquad (5)$$

where small letters indicate the ratios of the relevant variables to GDP and u_t is a disturbance, and we expect $\beta_1>0$ and $\beta_2<0$. Eq. (5) was taken as the starting point of our empirical analysis.

3. Methodology

In order to correctly estimate Eq. (5) we first need to assess the stochastic nature of the variables. In particular, if they are generated by unit roots processes, Eq. (5) could be spurious, and cointegration methods would be needed for assessing the statistical significance of its parameters. As a first step, therefore, we perform unit root tests on the three time series ca_t, s_t^G and i_t. According to Trehan and Walsh (1991), the presence of a unit root in the fiscal or the external deficit implies that the public or external debt, respectively, does not respect the present value borrowing constraint, i.e., is unsustainable. Therefore, the results of the unit root tests are not only of statistical interest: they also allow us to establish whether the pattern of the external or public indebtedness is sustainable, while Eq. (5) allows us to further investigate the reasons of the external indebtedness unsustainability (if any).

The unit root tests were performed in the framework of the following auxiliary regression:

$$\Delta y_{it} = \delta_i y_{i,t-1} + \alpha_{mi}\, d_{mt} + \sum_{L=1}^{p_i} \theta_{iL} \Delta y_{i,t-L} + u_{it} \qquad (6)$$

where $i = 1, ..., N$ are the individuals, $t = 1, ..., T$ are the observations in the sample, and d_{mt} is a vector of individual-specific deterministic variables; as in the usual ADF regression, three different specification are possible: $d_{1t} = \{0\}$, $d_{2t} = \{1\}$, $d_{3t} = \{1, t\}$, each giving rise to a different test. The order p_i of the autoregressive component may differ across individuals. Using Eq. (6) the null hypothesis of unit root:

H_0: $\delta_i = 0$

was tested against two alternative hypotheses:

H_{1A}: $\delta_i = \delta < 0 \quad i = 1, ..., N$

H_{1B}: $\delta_i < 0$ $i = 1, ..., N_1$; $\delta_i = 0$ $i = N_1+1, ..., N$

Under the alternative H_{1A} the individual time series in the sample display the same properties (i.e., they are all generated by stationary processes with the same autoregressive root); this gives rise to the LLC test. The alternative H_{1B} allows for more heterogeneity in the sample: in particular, each individual is allowed to behave following a different (possibly unit) autoregressive root; this specification is considered in IPS test. The two tests follow a different approach but give rise to statistics having the same asymptotic $N(0, 1)$ distribution.

The results of the unit root tests may be affected by the wrong choice of either the deterministic component (the d_{mt} in Eq. 6) or the number of lags (p_i in Eq. 6), leading in general to non-rejections of the unit root null (i.e., loss of power; see Campbell and Perron 1991).[4] Several formal strategies have been proposed for tackling this issue: most of them, however, involve repeated testing of the unit root hypothesis, and are therefore plagued by pre-testing problems, resulting in over-rejections of the null. To avoid these undesirable outcomes, we conduct the tests by exploiting prior knowledge on the growth status of the series, according to Elder and Kennedy's (2001) suggestion. Broadly speaking, Eq. 6 must be specified in such a way as to provide a representation of the data consistent with the observed pattern of the data, under both the null and the alternative hypothesis. In practice, this rules out immediately the d_{1t} specification when testing for a unit root in i_t, as gross investment is incompatible with a zero mean process. As for the other time series, an inspection of their graphs is needed in order to verify whether they are growing or not. A growing pattern would call for a d_{3t} deterministic component, otherwise a d_{2t} or d_{1t} specification would be more suited.[5]

The number of lags was automatically selected using Schwartz information criterion starting from a maximum lag length of 2.

According to the outcomes of the unit root tests, Eq. (5) will then be estimated by usual or cointegration panel techniques.

4. Results

Using the *WDI* database (World Bank 2008) we constructed a balanced panel of annual data running from 1995 through 2006 including the following countries: Albania, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania,

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[4] In case of panel unit root tests, LLC point out that excluding from the Eq. 6 a deterministic component present in the *DGP* leads to an inconsistent test, while including a component that is not present in the data results in a loss of power. IPS stress that the finite sample properties of the test depend on the choice of a large enough order of lag p_i in Eq. 6.

[5] Elder and Kennedy (2001) rule out the d_{1t} specification *a priori*, as being inconsistent with variables like "interest, unemployment and inflation rates". However, we cannot rule *a priori* the hypothesis that the mean of variables like the government or current account balances be not significantly different from zero. An inspection of the time series graphs is needed to settle this issue.

Slovakia and Slovenia, resulting in 156 observations.[6] The three variables of the model were defined as follows: ca_t, current account balance, s_t^G, general government balance, i_t, gross fixed investment; all the variables were expressed as a percentage of GDP. Their patterns are reported in Figures 1 to 3. A glance at the ca_t and s_t^G series (Figures 1 and 2 respectively) does not allow us to rule out the presence of a trend, although their pattern could also be consistent with a d_{2t} specification. Gross investment, instead, displays a distinct increasing pattern (Figure 3). No observed behaviour is consistent with a zero mean process. Summing up, we rule out the d_{1t} specification for every series, we adopt the d_{3t} specification for gross investment, and we test for a unit root under both the d_{2t} and d_{3t} specification the other series.[7] Remark that the twin deficits model (Eq. 5) implies that an increasing trend in the investment series determines *ceteris paribus* a decreasing trend in the current account. This implies that in the absence of an offsetting pattern in the government balance, the most likely specification for the ca_t series is d_{3t}.

The results of the panel unit roots tests are reported in Table I.

Table I – Results of the unit root tests on the model variables

	LLC		*IPS*	
deterministic component	*trend and drift*	*drift*	*trend and drift*	*drift*
ca_t	-4.47^{**}	-4.29^{**}	-1.65^{*}	-2.70^{**}
s_t^G	-10.05^{**}	-3.65^{**}	-2.73^{**}	-1.72^{*}
i_t	-3.56^{**}		-2.41^{**}	

Note: the test statistics are asymptotically distributed as a N(0,1). One or two asterisks indicate, respectively, 5% or 1% significance (one-sided distribution).

The unit root null is strongly rejected in all cases, the only possible exceptions being the government balance in the IPS test with drift, and the current account balance in the IPS test with trend and drift, where rejection occurs only at the 5% significance level. All in all, we can reject the hypothesis that the DGPs of the series considered possess a unit root. As a consequence, we can estimate the twin deficits relation (5) using standard panel regression techniques.

Table II – Panel estimates of the coefficient of the twin deficits relations

	parameter estimates$^{(1)}$			*F-test*$^{(2)}$	
	β_1	β_2	R^2	*time effect*	*individual effect*
time and individual fixed effect	0.19	–0.60	0.92	1.15	12.80
	(2.3)	(10.9)		[0.32]	[0.00]
individual fixed effect	0.21	–0.64	0.91		13.85
	(2.8)	(11.5)			[0.00]

Notes: (1) *t-stats in parentheses;* (2) *p-values in square brackets.*

[6] A few missing data, mostly on government balances, were extracted from the Economist Intelligence Units online database.

[7] Elder and Kennedy (2001) advocate the use of *F*-type tests (Dickey and Fuller 1981) for assessing the significance of the deterministic component and discriminate between d_{2t} and d_{3t} specifications. We do not know of similar tests in a panel setting.

The results are shown in Table II. We started from a general specification, including both individual and time effects:

$$ca_{i,t} = \beta_{0i} + \beta_1\, s^G_{i,t} + \beta_2\, i_{i,t} + \lambda_t + u_{i,t} \qquad (7)$$

The time effects λ_t were introduced to take into account the possible presence of common shocks across the sample countries. They are not significant at the F test and were therefore dropped from the regression. The preferred specification has strongly significant coefficients and individual effects, with an adjusted R^2 equal to 0.91.

5. Conclusions

Several remarks are in order.

First, using the more powerful panel approach to unit root tests we are able to reject the null hypothesis of non stationarity for both the external and the government deficit of the CEEC. Interpreted in the framework of the sustainability definitions grounded on the intertemporal borrowing constraint this result implies that the external and the public debt of these economies are sustainable. Moreover, this allows us to estimate the twin deficits relation (5) using the usual panel estimators.

Second, the two deficits appear to be tied by a statistically significant relation, although strictly speaking they are not twins: the β_1 coefficient is less than unity, as envisaged in some recent open-economy macroeconomic models (Makin 2004). This result confirms also for CEEC economies what has been found in previous studies like Chinn and Prasad (2003) or Bagnai (2006), that do not take into account transition economies.

Third, private investment appears to be a much stronger determinant of external imbalances than public deficits: its coefficient is both larger and more significant. This reinforces the conclusion that the negative external balances of the transition economies are determined mostly by medium-term intertemporal dynamics related to the catching-up process and should therefore be considered as sustainable.

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7. Figures

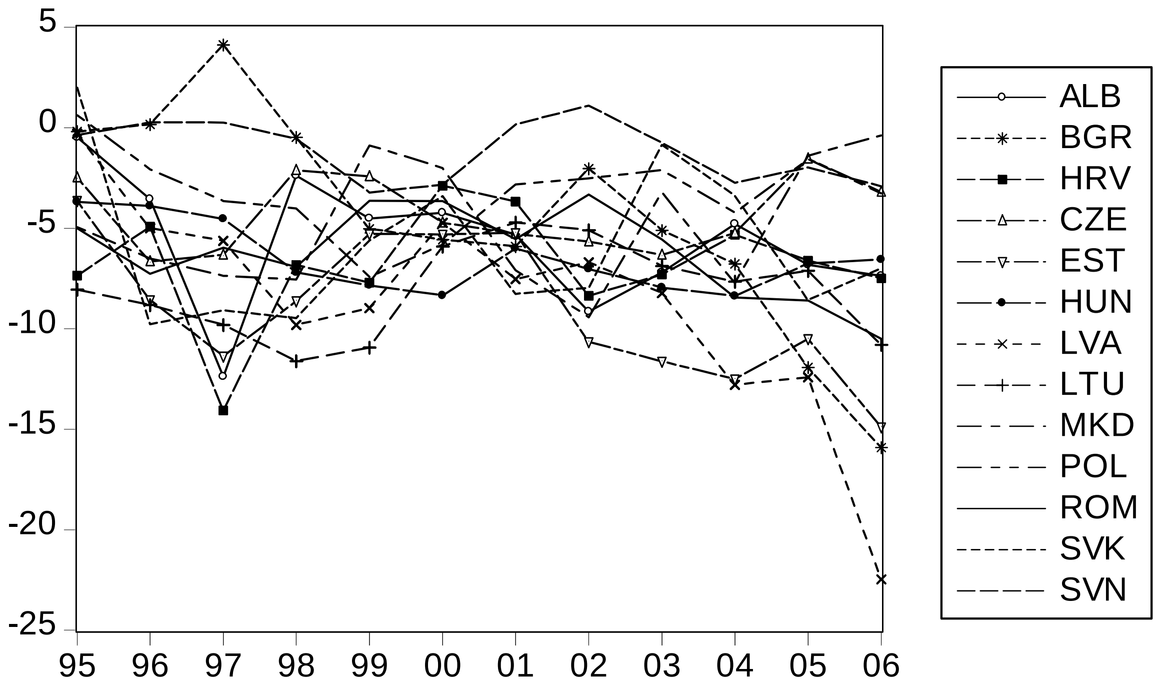

Figure 1 – The current account balance to GDP ratio.

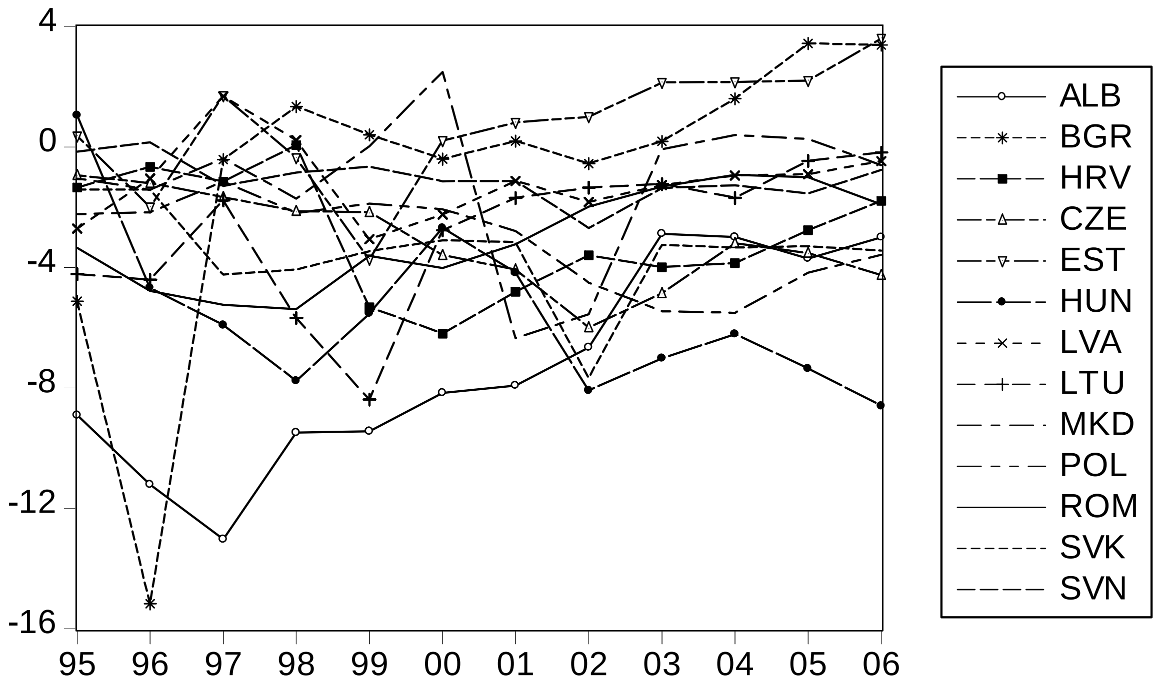

Figure 2 – The government balance to GDP ratio.

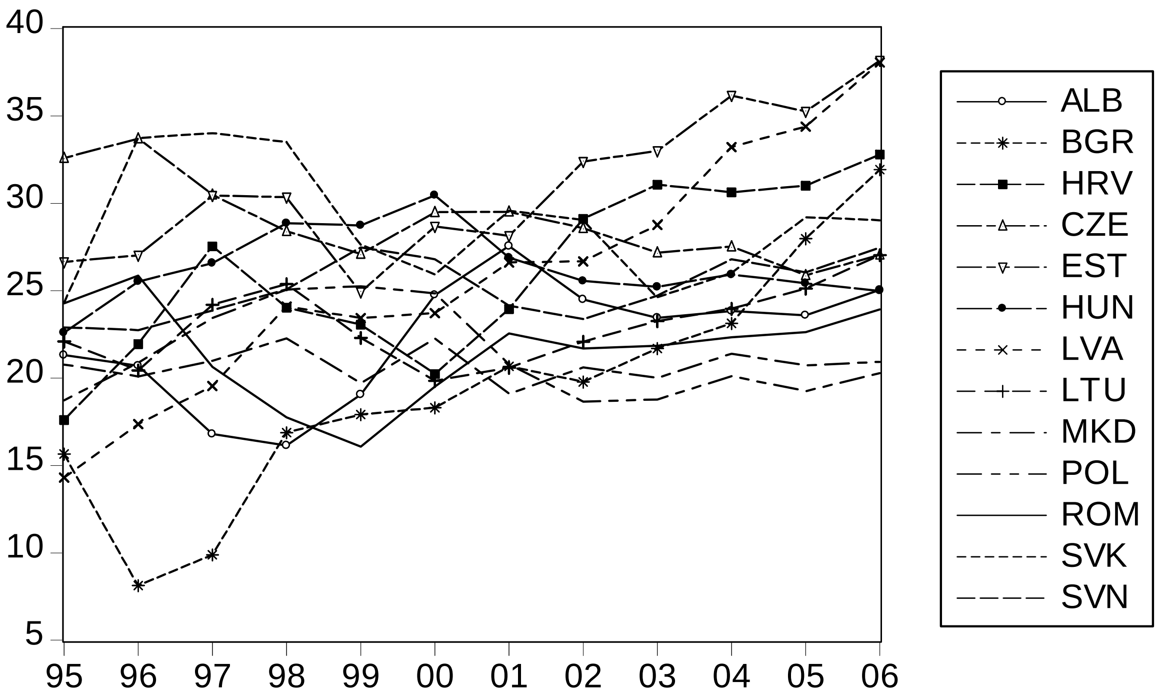

Figure 3 – The gross investment to GDP ratio.