

INTERACTION BETWEEN INCOME — GDP AND INDUSTRIAL OUTPUT  
— AND EXTERNAL BALANCE IN THE EASTERN EUROPEAN AND  
BALTIC COUNTRIES

RESUME

Interaction between income — GDP and industrial output — and external balance, interpreted as the current account and trade balances, is analyzed with the use of OLS and VAR/VEC techniques. Inverse relationship between income and external balance appears to be important, but not unquestionable evidence in favor of intertemporal optimization of private and public consumption.

Keywords: GDP industrial output current account trade balance  
balance-of-payments models OLS and VAR estimations

*Introduction.* Relationship between income and external balance<sup>1</sup> in the Eastern European and Baltic countries is not straightforward. While it is widely assumed that persistent worsening of the current account balance (henceforth CA) mirrors productivity growth and investment attractiveness [10, p. 4], sustainability of the CA deficit is questioned on the grounds of inverse relationship with income, as well as high budget deficit and credit growth, and a decrease in the FDI inflows [11, p. 40]. This paper provides an empirical investigation of the interaction between income and the CA balance (trade balance), with the impact of exogenous internal and external factors. Specifically, the aim is to study long-run linkages between income and CA balance using annual data and estimate dynamic country-specific relationships based on quarterly data, which are important for the assessment of balance-of-payments (BOP) automatic adjustment mechanisms.

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<sup>1</sup> The term ‘income’ refers to GDP and industrial output, while external balance is defined as the current account, which records trade in goods and services, as well as investment income and transfer payments. The trade balance simply records trade in goods, being a part of the current account.

Structure of the paper proceeds as follows. At first specific features of GDP growth, the CA and trade balances are briefly discussed, with the review of relevant literature. Based on standard open economy models, as absorption, monetary, Mundell—Fleming, “dependent” economy, intertemporal ones, necessary explanations on the interaction between income and external balance are provided. Then OLS estimates of the GDP growth and CA balance, using a panel data sample of 11 Eastern European and Baltic countries between 1990 and 2003, are analyzed. Although OLS estimates are wide popular and informative [2; 10, p. 4—15], VAR technique is used for a country-by-country estimates. Our results do not contradict a dynamic intertemporal approach, which is considered to be a dominant modern framework to deal with the income—CA interaction, though with an important reserve considering individual countries.

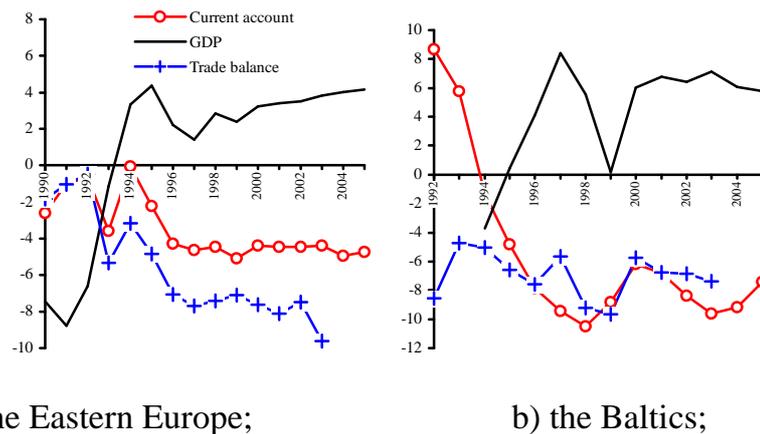


Fig. 1. Selected macroeconomic indicators: GDP (%), CA and trade balances (% of GDP)  
 Source: *International Financial Statistics*; forecasts for 2004—05 [11]

*GDP dynamics and current account (trade balance).* Stable growth path in the former transition economies is associated with a distinct worsening of the CA and trade balances (Fig. 1). For the period 1990—2003, the CA deficit in the Eastern European and Baltic countries averaged 3,3 and 6,2 percent of GDP, respectively. Sustainable CA deficit is considered to be in the range of 4 percent of GDP for Hungary [7, p. 6] to 3,5 percent of GDP for Croatia [4, p. 12, 56—58]; these indicators are below a standard *ad hoc* threshold of 5 percent of GDP [6, p. 509].

Such a level of the CA deficit sustainability may be too conservative for the Baltics, where the ‘safe’ CA deficit is estimated at as high as 7,5 percent of GDP; however, this threshold level decreases to 5 percent of GDP, if the foreign debt ceiling at 70 percent of GDP is imposed [10, p. 9, 13]. Although the net capital inflow still meet financing needs for the CA deficit (Fig. 2), high CA deficits used to increase vulnerability to the so-called sudden stops in capital inflows.

Reasonable concerns about the CA deficit sustainability subsides, if economic growth leads to a subsequent improvement of the external balance. Empirical results are rather ambiguous for the Eastern European countries, as well as in a wider international context. Based on data for the 1967—90 period regarding 58 countries, J. Frenkel, A. Razin and C.-B. Yuen found the existence of a negative correlation between trade balance and income [6, p. 231]. Similar result is obtained by S. Edwards for the relationship between the CA balance and GDP growth in 12 devaluation-experienced countries [5, p. 282]. M. Chinn and E Prasad for the sample of 89 countries found a direct impact of GDP per capita upon the CA balance for industrial countries, but empirical results are mixed regarding LDCs [3]. M. Bussière, M. Fratzcher, and G. Müller established for the OECD and Eastern European countries that an increase of GDP above its equilibrium level leads to improvement of the CA balance, while an opposite outcome is brought about by the increase of investment [2]. In our study of 11 transition economies inverse relationship between income growth and the CA balance had been found [1, c. 44]. On the other hand, a possible two-way causality between the CA balance and economic growth should be counted for. For the sample of 1990—2000, this kind of relationship had not been detected, but recent structural shifts in the way of EU accession could change the situation.

*Theoretical framework.* Analysis of the relationship between income ( $Y$ ) and CA balance implies identification of the type of causality — direct or inverse — and its exact direction ( $CA \Rightarrow Y$ ,  $Y \Rightarrow CA$ ,  $CA \Leftrightarrow Y$ ). The most favorable is situation when GDP or industrial output growth improves the CA balance, which, in turn,

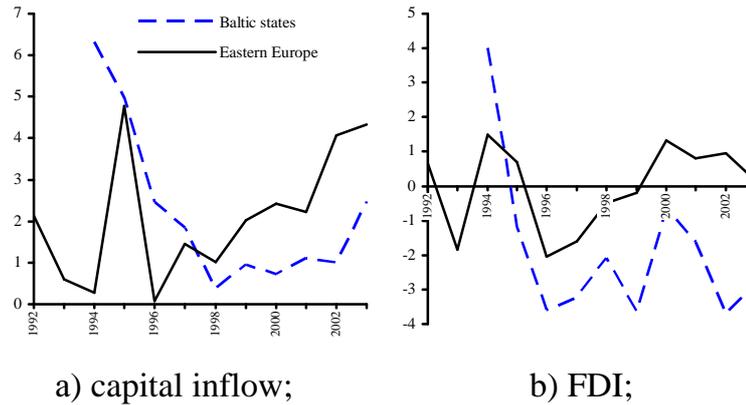


Fig. 2. Financing of the CA deficit (% of GDP)

Source: constructed from raw data obtained from *International Financial Statistics*

provides with incentives to economic growth. Less attractive is an opposite case, when economic growth leads to a worsening of the CA balance, with an unfavorable feedback to follow. Another two cases refer to asymmetric interaction between income and the CA balance. Rich theoretical explanations are not lacking for any of these cases.

A direct relationship between income and the CA balance is proposed by the absorption approach, which implies that economic growth leads to a CA surplus, while an increase of absorption (expenditures on domestic and imported goods) has the opposite effect [6, p. 29—36]. Income growth is not hampered by the BOP constraints. The fiscal-monetary mix is sufficient for the BOP adjustment. Considering money market equilibrium, a positive impact of income upon the CA balance is reinforced through the absorption-reducing increase of interest rate [1, p. 224—228]. Though in a standard absorption model the CA surplus is pro-growth, its extension for the “dependent” economy with supply and consumption of traded and non-traded goods does not rule out that exports “crowd out” demand for non-traded goods and thus decelerate income growth [1, p. 173]<sup>2</sup>. The CA balance is improved the more, the higher is the share of traded goods in aggregate absorption.

<sup>2</sup> The economy is “dependent” in the sense of the reliance of its growth upon the production of non-traded goods, which are not traded on the international markets. However, the CA balance is determined by the demand and supply of the traded goods only. This structural feature may cause obstacles for economic growth, as the CA deficit requires restrictive economic policies, contributing to a decline in the supply of non-traded goods.

However, a demand-led income growth is associated unambiguously with the worsening of the CA balance.

Income-induced demand for money is a main factor of the CA improvement in numerous monetary models of BOP, but this mechanism is of short-term duration, and it becomes ineffective in the long-run in line with monetization of foreign exchange reserves [9, p. 6—7]. However, a monetary model does not reject a sustainable combination of income growth and the CA surplus, if: 1) exports contribute to the increase in demand for money, and 2) there are conditions for sterilization policies via capital outflows. Thus a monetary model provides support to a two-way causality, when income growth contributes to the improvement of CA balance, and this outcome in turn strengthens growth dynamics.

In the Mundell—Fleming model, as an open economy extension of the IS—LM model, the CA balance is modeled as a function of domestic and foreign incomes plus relative price levels in the foreign trade. A general projection is that higher GDP growth leads to a CA deficit as part of the increased income is spent on imports, thus requiring adequate foreign financing. This assumption is supported by data. For example, in 1990—99 the CA deficit of 2,9 percent of GDP in the Eastern European countries and 5,3 percent of GDP in the Baltics was observed against the backdrop of capital inflows at the level of 2,9 and 9,8 percent of GDP, respectively. In 2000—03 the average CA deficit in both groups of countries has increased to 4,4 and 7,7 percent of GDP. The trade deficit in the Eastern European countries has widened to 8,2 percent of GDP, comparing to 4,6 percent of GDP in 1990—99. At the same time the rate of GDP growth increased from 2,8 percent in 1994—99 to 3,5 percent in 2000—03. The International Monetary Fund (IMF) projects for 2004—05 slight decrease in the CA deficit in the Baltics, with no substantial changes in the Eastern Europe [11, p. 40]. Based on 2000—03 data, capital inflow substantially exceeds CA deficit financing needs in Croatia, Slovenia, the Czech Republic, Slovakia, and Romania, but in Hungary, Poland, Estonia, and Latvia such opportunities are exhausted.

In the Mundell—Fleming model, inverse relationship between income and CA balance is combined with a pro-growth impact of the CA surplus. Substantial worsening of the CA balance requires devaluation of the exchange rate. Financing of the CA deficit by capital inflow is assumed to be at most a medium-term phenomenon. This assumption is consistent with the experience of several countries, which financed their CA deficits for quite a long time [6, p. 531—555]. For example, Australia ran a CA deficit for 40 post-war years; since the beginning of 1980s the foreign trade gap exceeded 5 percent of GDP. In 1965—85, the CA deficit was a structural feature of the South Korean economy; only in the second half of 1980s there was a switch to the CA surplus. Similar evolution had been experienced by Ireland, where the CA deficit of 1970—80s was followed by the CA surplus since the beginning of 1990s.

The portfolio model shares with the Mundell—Fleming theoretical framework the same specification of the CA balance (it is dependent upon income and relative prices in foreign trade), but the possibility of indefinite external financing of the CA deficit is rejected on the grounds of financial assets equilibrium (in the long-run,  $CA=0$ ). Capital inflow causes the CA balance to move into deficit through the income growth, caused by decrease in interest rate and increase in the money supply, or exchange rate appreciation. The CA balance does not exert any independent impact upon income, while being dependent upon capital flows.

In the neoliberal spirit, substantial capital inflows into Eastern European and Baltic countries and subsequent worsening of the CA balance are motivated by higher returns on investment. As incentives for capital inflow are gradually eliminated by accumulation of the capital stock to the level of EU countries, a necessary improvement in the CA balance is expected. Surely, this interaction assumes capital account  $\Rightarrow$  CA causality, not the opposite one. Corresponding developments are explained by macroeconomic balance models, which connect income growth to the increase in savings [8]. The higher is sensitivity of savings to income, the faster is improvement in the CA deficit; opposite outcome is brought about by the inverse

income—CA linkage. Preconditions for capital inflow are strengthened by a low foreign debt/GDP share, which ranges from the level of 33,9 percent of GDP in Romania to 45 percent of GDP in Poland (as of 2003). But in a few countries, as Hungary (62,3 percent of GDP), Bulgaria (66,2 percent of GDP), Estonia (74,3 percent of GDP), Latvia (84,2 percent of GDP), or Croatia (83,3 percent of GDP), prospects for further foreign debt accumulation are rather pessimistic.

Worsening of the budget deficit in Poland, Hungary, Croatia and the Czech Republic is an extra argument against sustainability of large capital inflows, with a rapid reverse in the short-run not to be ruled out. Accumulation of foreign liabilities in the government sector increases either risk of the BOP crisis, or the threshold of a “safe” (or equilibrium) CA deficit. Examples of Hungary in 1993—94 (Fig. 3d), or several other international cases are quite convincing. Defaults on foreign debt in Mexico (1994) and Argentina (2000—01) had occurred under relatively low foreign debt/GDP ratios of 50 and 51,6 percent of GDP, respectively. Even more convincing argument against sustainability of large capital inflows is provided by the example of Chile, where neither budget surplus, nor low foreign debt at 34,7 percent of GDP had secured against the 1982 crisis [6, p. 557].

Although capital inflows look sufficient for the CA deficit financing as for now (usually problems become evident in the middle- and long-run), a decrease in FDI inflows cannot but raise concerns. The Eastern European countries still are able to finance the CA deficit with FDI inflows (Fig. 2b), but this is not the case for the Baltic states, where in 2001—03 FDI inflows were on average 2,2 percent of GDP less of the CA deficit financing requirements. In the group of 8 Eastern European countries, the average 1990—2003 levels of the CA deficit and FDI inflows coincide, 3,30 and 3,55 percent of GDP respectively; in the Baltics corresponding figures are 6,2 and 5,4 percent of GDP. For the 2000—03 period, FDI inflows exceeded the CA deficit financing only in Slovakia, Croatia, the Czech Republic, and Slovenia.

More complicated explanation of the interaction between income and the CA balance is offered by intertemporal approach [2; 6, p. 207—218]. A combination of economic growth and the CA deficit is justified on the grounds of investment needs, optimistic growth path and higher capital costs comparing to the world level. Regardless of motivation — *consumption-smoothing* between present and future periods, *consumption-tilting* (this might be resulting from low world interest rate), or *consumption-augmenting*, resulting from high contemporaneous investments, intertemporal approach argues in favor of a debt-financed CA deficit. Future growth should decrease foreign indebtedness and improve the CA balance.

Intertemporal approach does not reject a direct link between growth and the CA balance in the case of *temporary* increase in productivity [6, p. 217]. While a *permanent* increase in productivity worsens the CA balance through an increase in investment and private consumption in excess of production, a temporary increase in productivity is marked by a small increase of private consumption, with no changes to investment. Finally, productivity-led growth leads to improvement of the CA balance. Similar implications are raised by the permanent income hypothesis, which explains increase of savings solely by a stochastic increase of production above equilibrium level. Ultimately, a tendency for worsening of the CA balance in the way of EU accession can be explained by either a steep increase in investments, caused by permanent productivity growth, or slower GDP growth. Empirical support for both assumptions are not lacking [2].

*Empirical results.* The paper analyses determinants of the CA and trade balances, measured as a ratio relative to GDP, GDP and industrial output growth rates (in percent). The sample covers period 1990 to 2003. All annual and quarterly data are obtained from the IMF's *International Financial Statistics*. The set of independent variables encompasses aggregate domestic investment (annual data), exchange rate (quarterly data), and a few variables capturing external factors. Indicators of German's industrial output and consumer price inflation (CPI) controlled for the effects of foreign income and relative prices. The London Inter-Bank Offer

Rate (LIBOR) captures the effect of capital flows. Dummy *CRISIS* controlled for the turbulence of the late 1990s.

The OLS estimation was performed using a fixed-effect procedure, with country specific dummy variables included into each regression. The data set includes Bulgaria, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, Hungary, Croatia, and the Czech Republic. A country-by-country estimations using quarterly data are made with the VAR. Such an approach allows for verification of the OLS estimates and provides with ability to trace dynamic short-term causality between income and the CA (trade balance).

Table 1 shows the estimates for the CA and trade balance determinants. Though the DW statistics reveal some autocorrelation of residuals for the trade balance, all other statistical properties are quite appropriate. The  $R^2$ s are quite high, as independent variables explain 52 percent of the CA balance and 84 percent of the trade balance. Our results in Table 1 are in line with other empirical studies on the Eastern European and Baltic countries. First, an inverse relationship between GDP growth and CA (trade balance) is confirmed; annual GDP growth of 6 percent worsens the CA balance by 1 percent of GDP. The income effect upon trade balance is much weaker, which is a bit puzzling, **as economic growth should lead to higher demand for imported goods comparing to services**. This result might be explained by a substantial debt component of economic growth, so that the foreign debt servicing leads to a deterioration of CA balance. Second, an increase in investment unambiguously worsens the external balance. Once again higher investment sensitivity of the CA comparing to trade balance runs counter to conventional wisdom. Third, both CA and trade balances are dependent of their lagged values. According to the intertemporal models, such a relationship may reflect consumers' habit formation [2]. Reliance of the external balance upon German's industrial output mirrors realities of the EU integration. Dynamics of the LIBOR affects neither CA, nor trade balances.

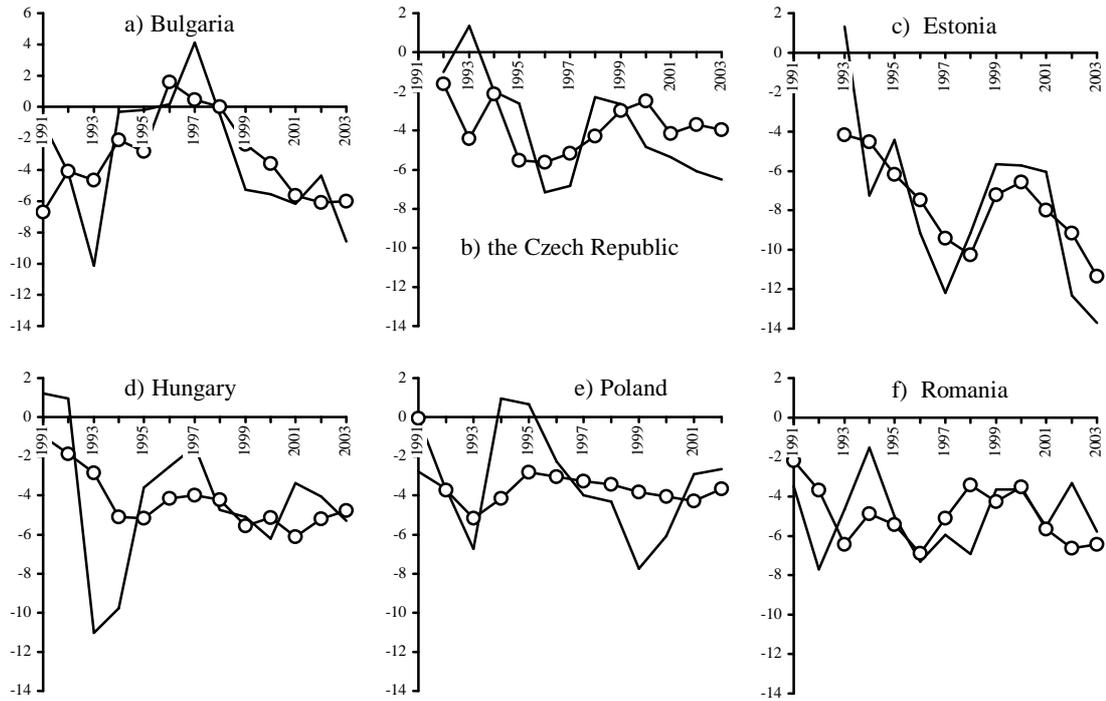


Fig. 3. Actual and fitted (equilibrium) values of the CA balance for individual countries

Note: actual values are shown with a solid line

Table 1 Determinants of the CA and trade balances, 1990—2003  
(OLS estimates for annual data)

Independent variables	Dependent variables	
	CA	Trade balance
Lagged value	0,320 (4,116 <sup>*</sup> )	0,443 (7,374 <sup>*</sup> )
GDP growth	-0,163 (-2,399 <sup>**</sup> )	-0,075 (-1,883 <sup>***</sup> )
Investment	-1,029 (-4,114 <sup>*</sup> )	-0,428 (-3,063 <sup>*</sup> )
Industrial output in Germany	0,126 (1,994 <sup>**</sup> )	0,120 (3,248 <sup>*</sup> )
Adj. $R^2$	0,52	0,84
F-test	10,14 <sup>*</sup>	44,23 <sup>*</sup>
DW	1,92	1,78

Note:  $t$ -statistics are reported in parenthesis;

\* — coefficient is significant at the 1% level (\*\* — 5%, \*\*\* — 10%)

The OLS estimates confirm the existence of CA preconditions for the financial crisis in Hungary in 1993—94, when the CA deficit well exceeded its equilibrium value (Fig. 3d). It is more difficult to explain in the same fashion BOP problems in the Czech Republic in 1996—97 (Fig. 3b), which caused a devaluation of the *krona* in May 1997. However, since 2000 the actual CA balance is set at 2 to 2,5 percent of GDP below the equilibrium level. Similar to Hungary and the Czech Republic, Poland’s equilibrium CA balance looks very stable since the mid-1990s (Fig. 3e). Excessive worsening of the CA did happen in 1999, but the situation has been improved since then. **Despite high deficits**, there is no difference between Estonia’s actual and equilibrium CA balances (Fig. 3c), meaning no CA misalignment. A steep worsening of the Bulgaria’s CA balance also coincides with a downward equilibrium trend (Fig. 3a). It is difficult to distinguish between actual and fitted CA balances in Romania (Fig. 3f).

Based on corresponding dummies, no country-specific conditions for the CA adjustment are detected (not reported here). Domestic conditions worsen the CA balance in Lithuania and Poland (negative coefficients are significant at the 1 percent level), Bulgaria, Croatia, Latvia, Romania (5 percent level), and Estonia (10 percent level). Only in Hungary, the Czech Republic, Slovakia and Slovenia domestic conditions have no impact upon the CA balance. Importance of the country-specific effects somewhat **weakens the analytical congruence of panel estimates, as well as** a likely two-way causality between the CA (trade balance) and GDP growth, which looks quite convincing (Table 2). Intuitively appealing is a positive effect upon GDP growth of German’s industrial output (it is due to higher demand for exports) and of a **decrease in the lagged LIBOR** (a lower level of the foreign interest rate used to stimulate capital inflows).

Statistical properties of GDP growth regression models (Table 2) are somewhat worse comparing to those of CA and trade balances (Table 1). Expansionary effects of the CA or trade balance deficits (Table 2) do not contradict the assumption of their “investment” quality (Table 1), providing support to intertemporal

approach at the stage of a ‘catching-up’ economic growth. In such a context, increase of investment, resulting from permanent productivity growth, causes a worsening of the CA balance, which in turn is favorable for the economic growth. It is not ruled out that a deterioration of the CA balance is caused by the increase of private and government expenditures, induced by consumption-smoothing and consumption-tilting motives. Inverse relationship between the CA balance and GDP growth is supported by the ‘dependent’ economy model, but if growth is centered around the traded goods sector the opposite outcome is more likely. In the Mundell—Fleming model, the CA balance would have an expansionary impact, while in the portfolio model it does not affect the income growth to any extent.

*Table 2* Determinants of GDP growth, 1990—2003 (OLS estimates for annual data)

Independent variables	Dependent variable — GDP growth	
	I	II
Lagged GDP growth	0,163 (1,764 <sup>***</sup> )	0,188 (2,017 <sup>**</sup> )
CA	-0,270 (-2,631 <sup>*</sup> )	—
Trade balance	—	-0,452 (-2,126 <sup>**</sup> )
Lagged trade balance	—	0,338 (2,004 <sup>**</sup> )
Lagged LIBOR	-0,184 (-2,279 <sup>**</sup> )	-0,174 (-1,979 <sup>**</sup> )
Industrial output in Germany	0,131 (1,610)	0,147 (1,669 <sup>***</sup> )
Adj. $R^2$	0,18	0,12
F-test	2,89 <sup>*</sup>	2,04 <sup>*</sup>
DW	2,24	2,37

Deeper insights in respect to the direction of causality, dynamics and magnitude of a few interrelated endogenous factors are provided by the VAR estimates. Country-specific variants of the following VAR model with vector-error correction term (VEC) are estimated:

$$\Delta y_{i,t} = \Gamma_1 \Delta y_{i,t-1} + \dots + \Gamma_k \Delta y_{i,t-k+1} + \Pi \tilde{y}_{i,t-1} + \Psi X_t + \varepsilon_t,$$

where  $\Delta y_t$  are the first differences of endogenous variables,  $\tilde{y}_t$  are the long-term values (in levels),  $X_t$  is the set of independent variables,  $\varepsilon_t$  is a stationary error term.

The VEC models account for the long-run restrictions imposed upon the short-run dynamics, being applied to the cointegrated series only. The Johansen's cointegration analysis is used to test for the presence of long-term relations among income and external balance. For Slovakia, the error-correction is not used in one specification, as the long-term cointegrative relationship between the trade balance and industrial output has not been identified.

In all of the countries long-run relationships of the VEC models confirm an inverse relationship between GDP growth and trade balance<sup>3</sup>, being fully relevant to the OLS estimates. The inverse relationship between GDP growth and the CA balance holds for Latvia, Croatia and Hungary, but in Lithuania, Slovenia and the Czech Republic the direct relationship between two indicators is observed instead; there is no long-run relationship between GDP growth and the CA balance in Estonia (lack of appropriate quarterly data did not allow the analysis for Poland, Romania, and Slovakia). The inverse relationship between industrial output growth and trade balance is found in Poland, Romania, Slovakia, and Croatia, while the opposite appears to be the case in Hungary and Slovenia; there are no any linkages between two indicators in the Czech Republic (estimations for the Baltic countries were not conducted) It is possible to conclude that the VEC estimates do not reject assumptions of the intertemporal models, but they attract attention to the individual components of the CA balance, such as services and investment income, as well as to country-specific features.

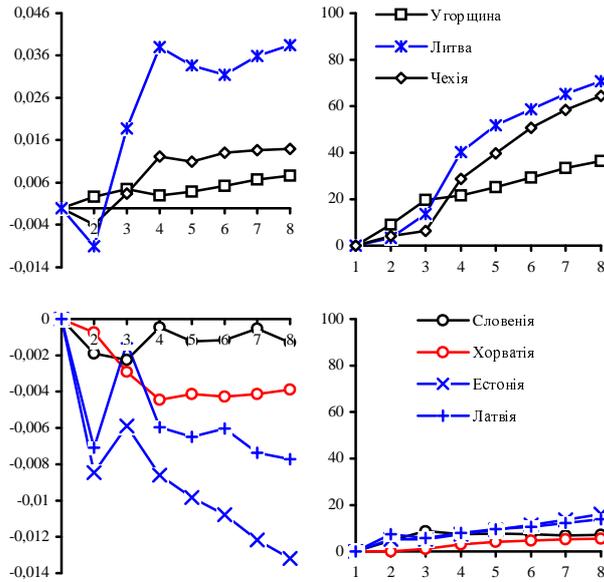
The short-run effects are analyzed using the impulse response functions and variance decomposition (Fig. 4—6). The inverse relationship between GDP growth and the CA balance is observed for the Czech Republic, Estonia and Lithuania, with the direct relationship being a distinct feature of Hungary and Latvia (Fig.

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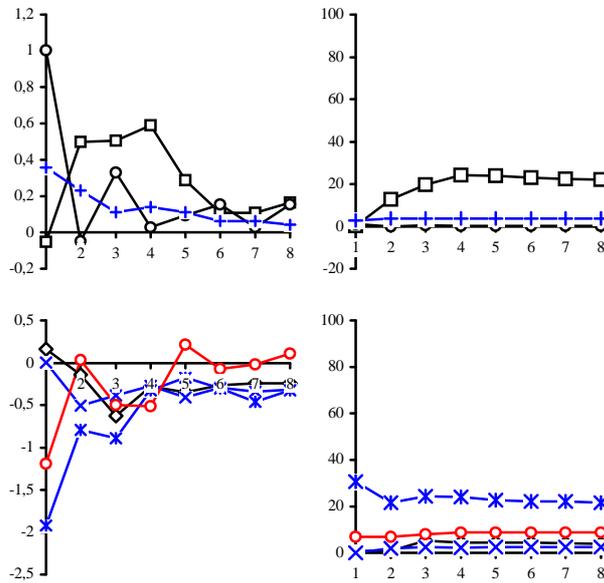
<sup>3</sup> These results are not presented in the paper, but will be provided on request.

4b). It is evident that the VEC estimates allow for asymmetric short-run and long-run CA—GDP relationships. The impulse functions ‘ $Y \Rightarrow CA$ ’ for Slovenia and Croatia differ on impact, but then both ones converge steadily to a neutral position. In all of the cases the impact of GDP growth upon CA balance is substantially weakened in about four quarters. Variance decomposition shows that GDP growth significantly affect the CA balance only in Hungary and Lithuania, where it determines up to 20% of the CA dynamics. The share of the CA balance in GDP growth for Croatia does not exceed 10 percent, even though the impulse function shows income neutrality in respect to the CA balance. Decomposition analysis supports assumption of the lack of any GDP influence upon the CA balance in the Czech Republic, Slovenia, Latvia and Estonia. Economic growth contributes to the CA improvement only in Hungary, but this effect becomes weaker over time. For Lithuania and Croatia, it is possible to argue about the short-run worsening of the CA balance, which disappears over the year.

The impact of GDP growth upon the CA balance is much stronger in the group of countries with the pro-growth CA surplus, i.e. in Lithuania, the Czech Republic and Hungary (Fig. 4a), where the CA improvement triggers a sustainable income growth. The weight of the CA balance in GDP growth ranges from 35 percent in Hungary до 60 percent in the Czech Republic and Lithuania. Corresponding weight is much lower — 10 to 20 percent — in the countries with inverse relationship between both indicators, as Estonia, Latvia, Croatia, and to less extent Slovenia. It worth noting that only in Estonia and Croatia VEC estimates do not differ from the OLS estimates (Tables 1 and 2). It is just the opposite in Hungary, as GDP growth produces improvement in the CA balance, with a positive feedback to growth. In the Czech Republic and Lithuania, GDP growth causes deterioration of the CA balance, while improvement in the external balance contributes to the growth dynamics. In Slovenia and Latvia, GDP growth leads to the CA improvement, but with a negative feedback to the real sector.



a) the effects of CA balance upon the GDP growth;



b) the effects of GDP growth upon the CA balance;

Fig. 4. Interaction between GDP growth and the CA balance (VEC)

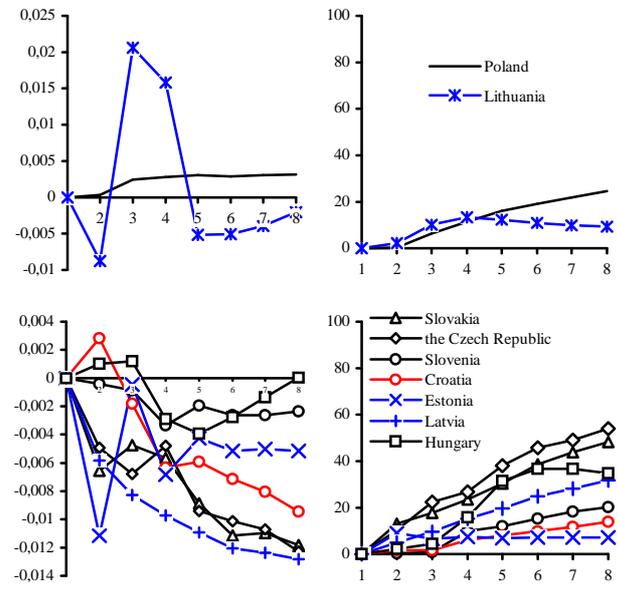
The growth-neutral automatic BOP adjustment seems to be present in Hungary. The situation looks somewhat worse in Latvia and Slovenia, because income-induced improvement in the CA balance has a negative feedback. The least optimistic are predictions for Estonia and Croatia, where a worsening of the CA balance strengthens an inverse relationship with income growth. Although the intertemporal approach assumes a reverse of the functional relationship between income and CA balance with time, estimated impulse functions do not predict this kind of

developments. Thus it is highly realistic that the fiscal-monetary mix and exchange rate policy are a must for the BOP adjustment.

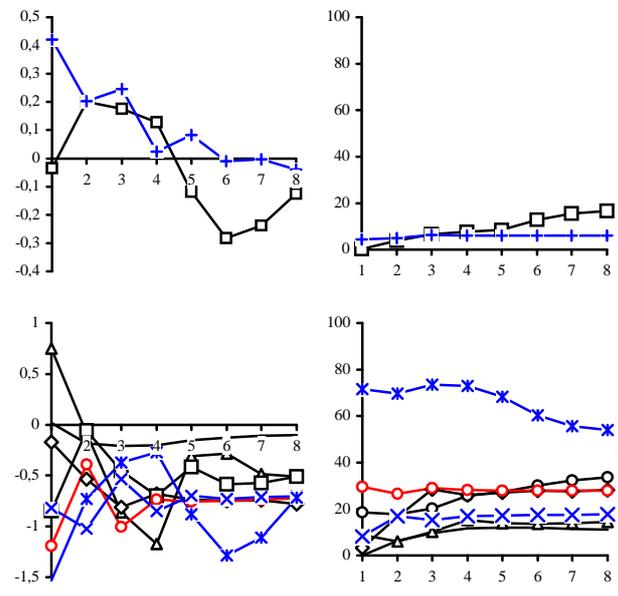
It is no surprising that the impact of trade balance upon GDP growth (Fig. 5a) coincides with the impact of CA balance (Fig. 4a), with the exception of the Czech Republic and Hungary. In the former an improvement in the trade balance has an adverse effect on GDP growth, while in the latter the trade balance becomes neutral in respect to GDP growth. Contrary to the CA estimates, expansionary impact of the trade deficit is stronger, especially in the Czech Republic and Slovakia, where foreign trade determines around 50 percent of GDP growth. This share approaches 30 percent in Hungary and Latvia, 20 percent in Slovenia, 10 percent in Estonia and Croatia. Expansionary impact of the trade surplus is visible in Poland, with its share in decomposition of GDP residuals exceeding 20 percent. The expansionary impact of trade surplus in Lithuania is short-lived. Taking into account mostly negative impact of the trade surplus, favorable effects of the CA surplus upon GDP growth in Hungary and the Czech Republic may be attributed to lower costs of the foreign debt servicing.

It is rather natural that in a debt-ridden economy conditions for intertemporal optimization of private and public consumption are lacking. The pattern of GDP—CA (trade balance) interaction in Hungary reflects the logic of the monetary model, which proposes symmetric short-run links between both macroeconomic indicators (economic growth improves the CA balance, thus creating a positive feedback), with a long-run neutrality. Although the effect of GDP growth upon CA and trade balances is not uniform, a switch from the short-run improvement of the external balance to the long-run neutrality is not ruled out. Similarly the trade surplus initially is marked by a slight acceleration of GDP growth, but then this impact is reversed, with a slow convergence towards neutrality. On the first glance, the expansionary impact of the CA surplus, contradicts assumptions of a monetary model, but this outcome may result from the foreign debt servicing, preventing from accumulation of money assets. The trade surplus promotes GDP growth in

Poland, but the opposite positive link is absent, which is in the spirit of the Mundell—Fleming model. Slovenia, Slovakia, the Czech Republic, Croatia and Estonia demonstrate such GDP—trade balance linkages, which are consistent with the logic of intertemporal approach.



a) the effects of trade balance upon GDP growth;



b) the effects of GDP growth upon the trade balance;

*Fig. 5.* Interaction between GDP growth and the trade balance (VEC)

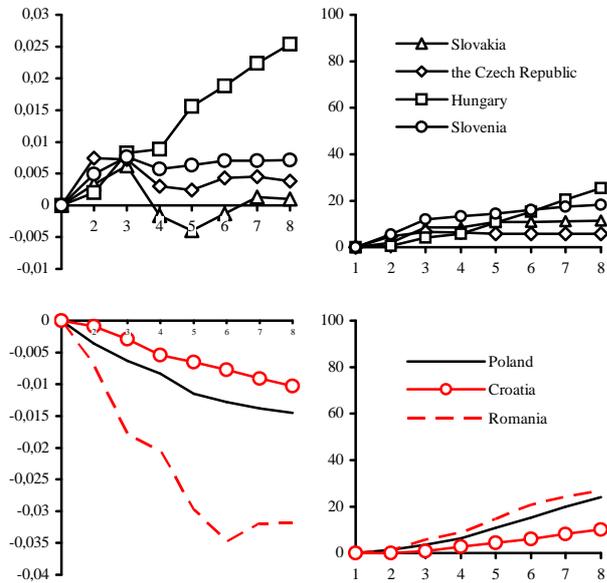
While improvement in the trade balance has more chances to decelerate GDP growth (Fig. 5a), its effects upon industrial output growth are less persistent

(Fig. 6a). Also a positive effect of industrial output growth upon the trade balance is more pronounced (Fig. 6b). In all three countries with a positive income—trade balance relationship — Hungary, Slovenia and the Czech Republic — the weight of industrial output in the decomposition of residuals does not exceed 20 percent. Much stronger impact of industrial output is attributed to the countries with the corresponding worsening of the trade balance, as Poland, Romania, and Croatia, where the interaction between industrial output and trade balance looks unfavorable, as improvement in the latter sets obstacles to the former. More promising interaction is observed in Hungary, Slovenia and the Czech Republic, where the expansionary trade surplus is supplemented with a positive output⇒trade balance causality. Regarding GDP growth and the CA balance, such a favorable interaction holds only for Hungary (Fig. 3).

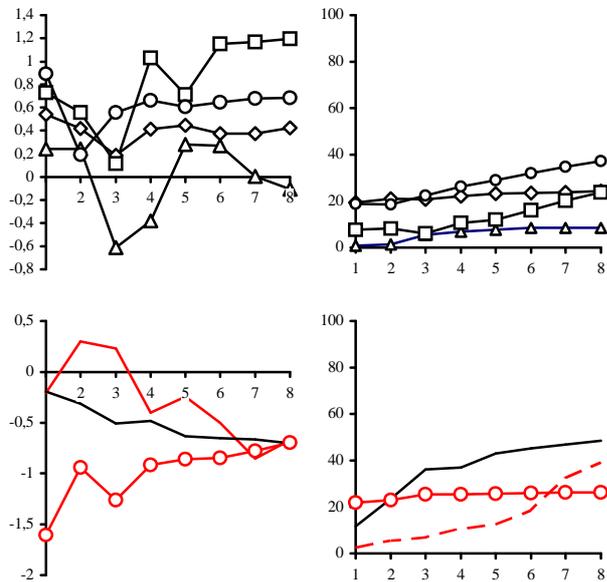
The impact of industrial output growth upon the trade balance looks stronger compare to the reverse trade balance⇒output relationship. On the other hand, it is likely that the trade balance exerts a stronger impact upon GDP than on industrial output. The impact of trade balance upon income is weaker for industrial output (Fig. 6b), compare to GDP (Fig. 5b). It may be explained by higher sensitivity of industrial output in respect to foreign demand, **or by a relatively low propensity for imports in the domestic market-oriented branches**. A stronger direct link between an increase in industrial output and improvement in the trade balance may result from a limited import substitution. Also, output in export-oriented branches may be import-intense.

The impact of independent variables is very robust across all VAR models for German's CPI, suggesting that in all countries its upward changes are favorable for either GDP, or industrial output growth. There is not a single country with a positive impact of German's CPI upon the trade balance. With respect to the CA balance, an improvement of this indicator is observed in Lithuania, with an opposite outcome attributed to Croatia and Latvia. Higher German's growth improves the trade balance in Poland and the Czech Republic, while affecting negatively foreign

trade balances in Hungary and Slovakia; a resulting improvement in the CA balance is observed only in Latvia. German's industrial output promotes economic growth in the Czech Republic, Poland, and Slovenia, but in Slovakia and Lithuania its output effects are negative.



a) the effect of trade balance upon industrial output growth;



b) the effects of industrial output growth upon the trade balance;

*Puc. 6.* Interaction between industrial output growth and the trade balance (VEC)

The exchange rate devaluation does not affect income growth and the external balance in Poland, Slovenia, and the Czech Republic. An unfavorable contem-

poraneous impact upon GDP growth in Croatia is neutralized in a quarter. Weakening of the exchange rate improves the trade balance in Romania, but at the cost of industrial output slowdown. Hungary is the only country, where the devaluation is favorable in both respects, promoting GDP growth and improving the CA balance.

The impact of LIBOR is quite heterogeneous. An inverse relationship between LIBOR and the external balance is found only in the Czech Republic (CA and trade balances) and Poland (the trade balance). Higher values of LIBOR improve the trade balance in Latvia and Slovakia, being neutral in respect to the CA balance in other countries. An increase in LIBOR promotes income growth in Hungary and Poland, but in the Czech Republic it causes a decrease in GDP and industrial output growth rates. An upward trend in LIBOR affects industrial output in Slovakia, but improves the country's GDP growth rate.

Dummy *CRISIS* suggests that the 1997—98 turbulence caused a worsening of CA and trade balances in Estonia, while only the former was affected in Hungary and Latvia and the latter suffered in Croatia and the Czech Republic. A crisis-connected decline in industrial output growth had happened in Romania and the Czech Republic, while in Slovakia only GDP growth left affected. Quite surprisingly the 1997—98 period contributed to GDP growth in Hungary and the Czech Republic. Contradicting results may be explained by the choice of exchange rate policies, as well as by structural features, such as the shares of traded and non-traded goods in the aggregate GDP, or the way the CA balance is determined — by demand or supply of traded goods.

The BOP automatic adjustment looks a viable option for Hungary, where GDP growth at least does not worsen the CA balance, with an improvement of the latter being expansionary. By the same token, GDP growth does not affect the external balance in Latvia, but in this country improvements in either CA, or trade balances are not pro-growth. Similar are conditions for Slovenia, except of the inverse relationship between GDP growth and trade balance.

In other countries mostly inverse relationship between GDP or industrial output growth rates and the CA or trade balance looks “**problematic**” according to the majority of the BOP models, as a desirable improvement in the CA balance requires a slower income growth and implementation of the restrictive policy mix. An important exception is provided by intertemporal approach, which proposes a distinct two-period pattern of the income—external balance relationship dependent on investment decisions. If intertemporal considerations are not effective, equilibrating improvement of CA deficit in Estonia and Croatia will require restrictive fiscal and monetary policies.

*Conclusions.* This paper does not reject an assumption of significant long-run and short-run relationship between GDP and the CA or trade balances along the lines of intertemporal models. Relevant linkages are identified for either panel data estimates (OLS), or individual VAR/VEC estimates. Theoretically consistent interaction between GDP and the CA balance are traced in Estonia and Croatia, between GDP and the trade balance — in Estonia, Croatia, Slovakia, Slovenia, and the Czech Republic. However theoretical predictions of intertemporal approach look much weaker in the case of industrial output (Poland, Romania, Croatia). Regardless of indicators chosen, country-specific interaction between income and external balance is quite heterogeneous. The possibility of diverse effects by industrial output and GDP growth upon the trade balance is found in the Czech Republic, while different effects of the trade balance upon both indicators of income are present in Poland, Slovenia, and the Czech Republic. In Slovenia, GDP growth has asymmetric effects upon the CA and trade balances. Only in Croatia, Hungary, and the Baltic countries income—external balance relationships are uniform in respect to the indicators chosen. Hungary is closest among all countries to the pattern of direct linkage between income and external balance, when increase of GDP or industrial output improves the CA and trade balances.

A few other results are worth mentioning: a) an improvement in the CA balance promotes GDP growth in Lithuania, Hungary, and the Czech Republic, b)

expansionary trade deficits have stronger income effects comparing with CA deficits, c) the income elasticity of trade balance is higher comparing with the effects of trade balance upon income growth. In most of the countries income growth depends positively upon German's CPI, while the contribution of German's industrial output appears to be much weaker. The trade balance of the Eastern European and Baltic countries follows changes in German's output, with the CA balance being more sensitive to German's CPI. The effects of LIBOR upon GDP growth and industrial output, as well as on the trade balance, do not reveal any regularity. The inverse relationship between LIBOR and the CA balance is established only in the Czech Republic. Preconditions for the BOP automatic adjustment have been found in Hungary, Latvia and Slovenia. If intertemporal considerations are not strong enough, the improvement of CA deficit in Estonia and Croatia will require a restrictive fiscal-monetary mix.

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