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Abstract

This article examines the tendencies of economic growth in Romania after its transition to the market economy by employing a balance of payments approach and an extended growth model that takes into account both internal and external imbalances. The first approach is linked to the well known balance of payments constrained growth hypothesis, while the second is an extension of that model that encompasses not only external imbalances emerging from trade but also internal imbalances related to public deficit and debt, among other factors. Both approaches show that the Romanian economy is balance of payments constrained and that measures must be taken to increase the country's competitiveness. The scenario analysis provided by the second approach reveals that the Romanian economy must improve its external competitiveness in order to achieve higher growth rates.

JEL code: C13, E12, F43, O24

Keywords: balance-of-payments equilibrium growth rate, price and income elasticities of foreign trade, internal and external imbalances, *2SLS* and *3SLS* regressions.

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1. Introduction and outline

Thirlwall's Law (1979) defines the so-called equilibrium growth rate consistent with the balance of payments equilibrium, given by the simple relation[1]

$$\dot{y}_{BP,t} = \frac{\varepsilon(\dot{y}_t^*)}{\pi} \quad \text{(1a)} \qquad \text{or} \qquad \dot{y}_{BP,t} = \frac{\dot{x}_t}{\pi} \quad \text{(1b)}$$

Thirlwall's simple rule states that a country's growth rate compatible with the balance of payments equilibrium, $\dot{y}_{BP,t}$, is given by the ratio of the foreign income elasticity of exports ε to the domestic income elasticity of imports π multiplied by the growth of world income z (equation 1a) or, alternatively, by a simpler rule dividing export growth $\dot{x}_t$ by π(equation 1b). This Law assumes that international relative prices (or terms of trade) are constant in the long term. According to this rule, when a country grows at a higher rate than that allowed by the balance of payments equilibrium growth rate, sooner orlater itwill accumulate trade deficits anddomestic demand will have to be adjusted downwards in order to bring the economy into equilibrium. Thirlwall also states that no country is able to grow faster than its balance of payments equilibrium growth rate unless it can manage to pay the external deficits with capital inflows[2]. Therefore, countries can fall into a balance of payments trap when the income elasticity of the demand for imports exceeds that of exports, that is$\pi>\varepsilon$.

Several empirical studies have emerged, either testing the validity of Thirlwall's Law or criticizing its main assumptions, namely that relative prices are constant in the long -run and that current account is initially balanced. Among others, McCombie (1989), Moreno-Brid (1998-99), McCombie and Thirlwall (1994) and Blecker (2009) have made valuable contributions to the discussionof the underlying implications of the Law. Evidence in the empirical literature suggests that income is the variable that adjusts to equilibrate external imbalances, implying therefore that growth is indeed balance-of-payments constrained. On the other hand, increasing capital inflows canat most be only a temporary way of relaxing the balance-of-payments constraint. In fact, this is not a long-term solution since capital inflows keep a country from growing at the export-led cumulative growth rate and hide a high uncertainty. What matters in the long-term analysis is the growth of real exports, owing to higher multiplier effects on domestic growth.

[1] For more details on the derivation of this Law see Soukiazis *et al.* (2013).
[2] Financing current account by capital inflows is not a sustainable solution in the long-run and does not have the same dynamic effects on growth as the export-led growthpolicy.

Although Thirlwall's model has been modified[3] to include capital flows and foreign debt, previous studies have not considered the role of public imbalances caused by public deficit and debt as additional constraints to growth. The recent experience of some peripheral Euro-Zone countries falling into a public debt trap (Greece, Ireland, Portugal, Spain, Italy and Cyprus) is the motivation for dealing with this issue. As it is known, the implementation of an expansionary fiscal policy, aiming to enhance growth and reduce unemployment, is not always successful (Pelagidis and Desli, 2004). The failure can be explained in the case that budget deficits, financed by public borrowing, would increase public debt and interest rates, crowd-out private investment, and jeopardize medium-term growth. The question of whether budget deficits are always desirable has many dimensions, including whether government borrowing is used to finance government consumption or investment in infrastructure, whether the deficit is sustainable, and how it is financed. On the other hand, the hesitation of many policy makers – especially in Europe – to rely more aggressively on fiscal policy measures in order to keep their public finances balanced may lead to the persistenceof a vicious cycle between low growth and higher deficit formation as a result of the reduction of tax revenues and the increase on social security benefits. The recent austerity programs implemented in some peripheral countries in the Euro-Zone seem to confirm this reality.

Our paper aims at contributing to the debate by using a more complete growth model in the spirit of Thirlwall's Law that takes into account not only external, but also internal imbalances that emerge from budget deficits and public debt. The model also relaxes the controversial assumption of the neutrality of relative prices by assuming thatthey can play a significant role in the pace of economic growth. The model was previously applied to Portugal (Soukiazis *et al.*, 2013-2014),Italy (Soukiazis *et al.*, 2014a), and the Slovak economy (Soukiazis *et al.*, 2014b), revealing that it is very coherent in identifying the most important determinants of growth, mainly associated with external trade competitiveness. It has also been shown that factors related to fiscal policy and public finances (internal imbalances) influence significantly the pace of economic growth in these countries. Our present interest is to test our model in a newEuropean Union member, Romania, and provide some assessment on the expected economic performance of this country. Romania is a special case study, belonging to the group of the transition economies showing reasonable results regarding economic development and integration in the market economy after the collapse of the communistregime.

Taking all these facts into consideration, the paper is organized as follows: in section 2 we briefly explain some historical and economic developments in Romania. In section 3 we implement Thirlwall's Law to check whether the country is balance of payments constrained;

[3] On the history and new developments on Thirlwall´s Law see Soukiazis and Cerqueira (2012).

section 4 is the core part of the paper: it briefly presents the extended theoretical growth model that takes into account internal and external imbalances and assumes that relative prices are not neutral; then it shows the results from the estimation of the structural equations of the model; it also tests the model on the Romanian economy trying to identify the main determinants of growth; and finally, a scenario analysis is provided focusing on the factors that could foster or harm economic growth in Romania. The last section of the paper presents the main conclusions and policy recommendations that could help the country to improve farther its economic performance.

1. Historical and economic developments of the Romanian economy

In December 1989, the Romanian people decided to abolish the communist regime and follow the pathtowards democracy. Many important changes in the political and economic system, but also in the whole society took place thereafter. One of the natural consequences of this development was to move from a state-owned economy to the market economy. The transition process implied several structural changes having as main goal the accession of the country to the European Union. The reforms which had been implemented then speeded up the transition process and helped the country to consolidate the democratic system and establish a market orientated economy. After less than 20 years, the country was prepared for the next important step in its history and joined the European Union in 2007. Nevertheless, as Zaidi and Rejniak (2010) pointed out, even if the EU accession and increased opportunities of trade cooperation andforeign direct investment strengthened the transition to the marketeconomy and, hence, the former communist countries had become the fastestgrowing economies across Europe, this process also made them particularly vulnerable to economic shocks. A short outline of the Romanian economy reveals several structural issues which should be addressed if government aims at achieving a sustainableeconomic growth.

Figure D.1 (in Appendix D) plots the GDP real growth rates of Romania in comparison with the growth rates registered by the EU28 for the period 1996-2013. Romania registered significant higher growth rates than the EU28 over the period 2001-2008. In the late 1990s, the drop in the GDP growth was caused by high inflation rates (see Figure D.2) and by the inconsistency of macroeconomic policy during that period. The recent financial crisis led to a sharp decrease in the Romanian GDP real growth rate which dropped in 2009 by almost 14 percentage points and reached the lowest historical record. For comparison, the fall in GDP growth in the EU28 countries wasonly5 percentage points.

One question which may arise is how a country having an expansionary economy can confront such sharp recession. The answer is that Romania's economy has encountered several structural

deficiencies. The way Romanian government decided to achieve economic growth was by pushing up the demand side.For this purpose, several measures and facilities on the credit side (i.e. easy terms in buying and paying goods, loans in small amounts without a solvency analysis for buying goods and services) were introduced. Thus, the demand largely increased over the 2000s (see Figure D.3).Examining the main components of Romanian GDP (see Figure D.4), we can observe that imports had an important contribution in balancing the supply shortage and in fulfilling the rising demand, but largely exceeded exports (see Figure D.5).Even if the trade openness increased over time lying in-between 80%-90% of GDP, the international trade is strongly concentrated within the European Union which makes the Romanian economy more vulnerable to external shocks.One way of addressing the external imbalances of goods and services was attracting investors from abroad. Comparing the foreign direct investments and the current account deficit(see Figure D.6), we can see that FDI laid far below the deficit, with the exception in 2013 which was the only year when FDI exceeded the external imbalance. The increasing exports during that year had a significant contribution in recovering from the crisis and also in reducing the deficit.

Following the boost of the Romanian economy during the 2000s, the unemployment rate is situatedbelow the EU28 average (see Figure D.7). However, the main issue in the Romanian labor force market was that the economic growth, which extensively relied upon the increase of demand, was not able to stimulate more employment.

Analyzing the sectoral shares (see Figure D.8), we notice that services had a significant and rising contribution over time to the gross value added in the Romanian economy, and for the late 2000s we also assisttoan increase in the share of buildings and constructions. If Romania wishes to raise its comparative advantage on exports, then it should stimulate the agriculture, industry and manufacturing sectors of the economy focusing mainly on the production of tradable goods with high elasticity of demand in international markets.

2. Thirlwall´s Law and its application to the Romanian economy

To verify the validity of Thirlwall's Law[4]it is necessary to compute the trade elasticities $\pi$and ε respectively (see equation 1a), and thereforethe import and export demand functions must be estimated in an efficient way.

To do so, the import demand function is specified as follows:

[4] For recent applications of this Law see Soukiazis and Antunes (2012) referred to Portugal and Soukiazis *et al.* (2013) referred to Slovak Republic.

$$\dot{m}_t = a + \pi\, \dot{y}_t + \psi\, rp\dot{m}_t + \omega_t \qquad (1)$$

In this equation $\dot{m}_t$ stands for the growth of real imports, $\dot{y}_t$ is the growth of real domestic income (average GDP growth at constant prices), and $rp\dot{m}_t$ represents the growth of relative prices of imports[5] (the growth of real exchange rate is used in this study). The parametersπ>0 and ψ<0 are the income and price elasticities of the demand for imports, respectively, the former expected to be positive and the later negative[6]. Theincome elasticity of the demand for imports captures the supply characteristics of the imported goods associated with quality, design, reliability, variety, among others. The price elasticity in the import function captures the price competitiveness of the imported goods relatively to the domestic products. Finally, $\alpha$is autonomous imports and ω the error term.

Analogously, the export demand function is defined as:

$$\dot{x}_t = \beta + \varepsilon \dot{y}_t^* + \eta\, rp\dot{x}_t + \nu_t \qquad (2)$$

In this equation $\dot{x}_t$ is the growth of real exports, $\dot{y}_t^*$ the growth of realforeign income (average GDP growth of the EU28 countries), and $rp\dot{x}_t$ stands for relative prices of exports (the growth of real exchange rate is used as in imports). Additionally, ε>0 is the foreign income elasticity of the demand for exports with an expected positive value (normally exceeding one) capturing the quality characteristics of exports, and η>0 is the price elasticity of the demand for exports capturing the price-competitiveness of the exported goods[7]. Finally, β is autonomous exports and v the stochastic term.

Table A.1in the Appendix reports the regression results of the import and export functions using annual data for the period 1996-2013, where full data is available. The import function is estimated by 2SLS since as it is shown by the Hausman test domestic income (real GDP growth) is endogenous[8] and OLS estimates arebiased and inconsistent. The export equation is estimated by OLS since realforeign income is

[5] Although relative prices are assumed to be constant in Thirlwall´s Law the import and export equations are estimated taking into account changes in prices, to avoid biases due to omission of relevant variables.
[6] A real devaluation turns imports more expensive and reduces its demand.
[7] A real devaluation turns exports cheaper in international markets and increases its demand.
[8] The annual growth rates of exports, consumption, gross investment and relative prices are used as instruments in the 2sls estimation approach, and it is shown to be valid instruments (through the Sargan test) and they are not weak instruments (through the F-test).

exogenously given (Romania is a small country relative to the EU28 in order to influence relative prices).

The estimation results show that relative prices are not statistically significant in the exportequation, and are inelastic in the import function, carrying their expected signs. On the other hand the income elasticities in both equations are statistically significant (at the 1% level) showing that imports and exports are more sensitive to changes in domestic and foreign income, rather than to price changes. The income elasticity of the demand for imports,π=2.112, is lower than that of exports,ε=2.561, thus allowing the country to grow faster than the average of the EU28 countries (2.617% versus 1.661%, respectively). This conclusion becomes evident by rewriting Thirlwall's Law (1a) alternatively as $\dot{y}_{BP} / \dot{y}^* = \varepsilon / \pi$, which implies that if $\varepsilon > \pi$, then $\dot{y}_{BP} > \dot{y}^*$.

After estimating the import and export functions we are now able to test the validity of Thirlwall's Law. **Table 1** reports all the figures needed to compute this Law as it is given by equation (1a).

Table 1. Evidence on "Thirlwall's Law" for the Romanian economy, 1996-2013

$\dot{y}_t$ GDP_{RO}	$\dot{x}_t$	π(2SLS)	ε(OLS)	$\dot{y}_t^*$ GDP_{EU28}	$\dot{y}_{BP} = \varepsilon(\dot{y}_t^*) / \pi$	$(\dot{y}_{BP} - \dot{y}_t)$	*ca*
2.617	*9.344*	*2.112*	*2.561*	*1.661*	*2.013*	*-0.487*	*-6.056*

Notes: $\dot{y}_t$, $GDP_{RO}$is growth of Romanian *GDP*, $\dot{x}_t$ *is* growth of exports, $\dot{y}_t^*$, $GDP_{EU28}$is *GDP* growth of the *EU28*, and *ca* is current account as % of *GDP.* The income elasticity of demand of exports $\varepsilon$is taken from the *OLS* estimation and the income elasticity of demand of imports $\pi$is taken from the *2SLS* estimation approach.

It is shown that Romanian actual growth rate (2.617%) is higher than its balance of payments equilibrium growth rate (2.013%) at a cost of accumulating current account deficits (-6.056% of GDP average rate over the observed period). Therefore, according to the interpretation of Thirlwall's Law, the Romanian economy is balance of payments constrained.The fact that it has been growing over its balance of payments equilibrium growth rate (2.617 versus 2.013%) and also faster than the EU28 (2.617 versus1.661%) lies on capital inflows.Over the period 2007-2013, Romania received structural funds from the European Union thatamounted to 19213 million euros. The countryhad faced

various difficulties in attracting these funds showing an absorption rate of only 40% (October 2014)[9]. Delayed payments, high bureaucracy and corruption caused distress in implementing the projects and increased the reluctance in applying for European funding. Moreover, during the economic recession, foreign direct investments have reduced significantly from 9% of GDP in 2006 to almost 2% of GDP in 2013[10].

If the above tendency continues in the near future, thusworsening even more the external deficit, it is most certain that domestic income will have to be contracted to bring the economybackinto equilibrium. An alternative strategy may consist in increasing the income elasticity of the demand for exports and reducing that of imports, by turning exports more attractive in international markets and dropping the appetite for imports. For instance, a simple simulation using equation 1a, shows that in order for the Romanian economy to reach equilibrium (actual growth rate equal to that consistent with the balance of payments equilibrium) the income elasticity of the demand for exports must increase up to 3 and that for imports must be reduced to 1.9, considering the EU28 growth rate of 1.661%.

3. The extended growth model with internal and external imbalances

3.1. Description of the model

Thirlwall's Law takes into account only external imbalances on current account to establish the balance of payments constraint hypothesis. Therefore, internal imbalances that could emerge from high public deficit and debt rates are not playing any role in predicting a country's effective growth in the original Thirlwall's law. Our view is that internal imbalances are also important for growth, being related tobalance of payments problems. The recent public debt crisis that hit the peripheral countries in the EU is an evidence of this linkage. Taking into account this point of view Soukiazis*et al.* (2013-14) developed an alternative model that considers not only external imbalances as in Thirlwall's Law but also internal imbalances related to public deficit and debt as the critical factors to determine domestic growth rates. Their model (the SCA model henceforth) also considers that relative prices are not neutral in the growth process, relaxing therefore this controversial assumption of Thirlwall's Law.

[9]The data is provided by the Romanian Ministry of European Funds.
[10]The data for the foreign direct investment is provided by the National Bank of Romania.

The extended SCA model encompasses four equations and two identities. The set of the four structural equations is the following:

$$\dot{m} = \pi_c \dot{c} + \pi_g \dot{g} + \pi_x \dot{x} + \pi_k i\dot{n}v + \delta_m (\dot{p}^* + \dot{e} - \dot{p}) \qquad \text{Imports} \qquad \textbf{(1)}$$

$$\dot{x} = \varepsilon_x \dot{y}^* + \delta_x (\dot{p}^* + \dot{e} - \dot{p}) \qquad \text{Exports} \qquad \textbf{(2)}$$

$$\dot{c} = \varepsilon_c \dot{y}_d \qquad \text{Private consumption} \qquad \textbf{(3)}$$

$$i\dot{n}v = \varepsilon_K \dot{y} + \varepsilon_r \dot{r} \qquad \text{Private investment} \qquad \textbf{(4)}$$

In the import equation the growth of real imports $\dot{m}$ depends on the growth of the components of domestic demand (instead of aggregate income as in Thirlwall's model), that is, consumption $\dot{c}$, public expenditures $\dot{g}$, exports $\dot{x}$ and gross investment $i\dot{n}v$, as well as the growth of relative prices given by $(\dot{p}^* + \dot{e} - \dot{p})$ where $\dot{p}$ and $\dot{p}^*$ are the growth rates of domestic and foreign prices respectively, and $\dot{e}$ isthe exchange rate variation[11]. In the same equation, π represents the elasticity of imports with respect to each of the components of demand with an expectedpositive sign, since all components of demand have an imported content. In addition, δ_m <0 is the relative price elasticity of the demand for imports with an expected negative sign, indicating that a currency devaluation is expected to reduce the demand for imports by turning them more expensive in thedomestic market.

Equation (2) defines export growth $\dot{x}$ as a function of the growth of foreign income $\dot{y}^*$ (external demand) and the growth of relative prices as has been defined in the import equation.In the same equation, ε_x>0 is the income elasticity of demand for exports capturing the non-price characteristics of the exportable goods associated with quality, design, reliability, product varieties, etc. In the same equation δ_x>0 stands for the relative price elasticity of the demand for exports with an expected positive sign, indicating that a currency depreciation reduces the price of exports in international markets increasing therefore their demand.

The aggregate consumption is mainly a function of total disposable income (that includes the returns obtained from holding government bonds) given by Equation (3), where $\dot{c}$ is the growth

[11] Exchange rate is defined as the price of foreign currency in terms of domestic currency units. Therefore when *e* increases it representsa currency depreciation of the domestic currency.

of private consumption, $\dot{y}_d$ the growth of realdisposable income and ε_c>0 is the income elasticity of consumption.

Private investment is specified according to theconventional accelerator theory stating that the growth of gross investment $\dot{inv}$ is a function of the growth of domestic income $\dot{y}$ and real interest rate $\dot{r}$ as shown in Equation (4). In this equation, ε_k>0 is the accelerator effect and ε_r<0 reflects the sensitivity of investment in relation to the real cost of financing gross investment.

Our growth model further includes the government sector assuming that the government budget (in nominal terms) is given by the following identity:

$$G_n + iB_H + i^* B_F e = tYP + D \qquad \textbf{(5)}$$

where G_n stands for nominal government expenditures, B_H is public debt[12] owned by home bond holders, B_F is public debt owned by foreign bond holders, Y is domestic income, P is the domestic price level, D the public deficit, i and i^* are nominal interest rates paid to home and foreign public debt holders, respectively, e the nominal exchange rate, and t is the tax rate on nominal income. From Equation (5), we can define the alternative expression $G_n + iB_H + i^* B_F e > tYP$, which shows that public deficit exists when total current expenditures (including interest payments on public debt) exceed the revenues obtained through taxes on domestic money income**.**

The long term relationship of the growth of real government expenditures $\dot{g}$ is given by[13]:

$$\dot{g} = \frac{t\dot{y}}{w_G} + (\dot{d} - \dot{p})\frac{w_D}{w_G} - \left[\Delta i + i(\dot{b}_H - \dot{p})\right]\frac{w_{BH}}{w_G} - \left[\left(e\Delta i^* + i^*\Delta e\right) + i^* e\left(\dot{b}_F - \dot{p}\right)\right]\frac{w_{BF}}{w_G} \qquad \textbf{(6)}$$

where $w_D = \frac{D}{YP}$ is the budget deficit ratio, $w_G = \frac{G}{Y}$ is the government expenditure ratio, $w_{BH} = \frac{B_H}{PY}$ and $w_{BF} = \frac{B_F}{PY}$ are the shares of public debt owned by home and foreign bond holders (as a percentage of nominal income), respectively, $\dot{d}$ is the growth of budget deficit and $\dot{b}_H$ and $\dot{b}_F$ are the growth rates of the public debt owned by home and foreign bond holders, respectively.

[12]Public debt is originated by issuing government bonds to finance public deficit.
[13]More details for this derivation can be found in Soukiazis *et al.* (2013-14)

The last relation to complete our growth model is an external equilibrium condition given by the following identity:

$$XP + D_F e - i^* B_F e = MP^* e \qquad \textbf{(7)}$$

The left-hand side of the identity shows the money resources available to finance imports formedby the export revenues *XP* and the amount of public deficit assets hold by foreigners $D_F e$ less the interest rate payments on foreign bond holders $i^* B_F e$. As it is shown in Soukiazis *et al.* (2013-14) (see the *Appendix*) the balance of payments final relation can be expressed as:

$$\dot{x} + \dot{p} + (1-\xi)\frac{w_D}{w_X}(\dot{p} + \dot{y} - i^*) - (1-\xi)\frac{w_B}{w_X}\Delta i^* = \frac{w_M}{w_X}\frac{P^* e}{P}\left(\dot{m} + \dot{p}^* + \dot{e}\right) \textbf{(8)}$$

where $\dot{x}, \dot{m}, \dot{p}, \dot{p}^*$, $\dot{y}$ and $\dot{e}$ are thegrowth rates of exports, imports, domestic prices, foreign prices, domestic income and nominal exchange rate, respectively. Additionally, w_D, w_B, w_M and w_X are the ratios of budget deficit, public debt, imports and exports on income, respectively. Finally $(1-\xi)$ represents the percentage of public deficit (or debt) owned by foreign bond holders.

In an explicit manner, Soukiazis *et al.* (2013-14) (see the*Appendix*) show that the growth rate of domestic income can be given by the following relation:

$$\dot{y}_{SCA} = \frac{A}{B}$$

where

$$A = \left[\begin{array}{l} \left(\varepsilon_x - \frac{w_M}{w_X}(\frac{P^* e}{P})\pi_x \varepsilon_x\right)\dot{y}^* + \left(\delta_x(1 - \frac{P^* e}{P}\frac{w_M}{w_X}\pi_x) - \delta_m \frac{w_M}{w_X}(\frac{P^* e}{P})\right)(\dot{p}^* + \dot{e} - \dot{p}) + \\ + \left(\dot{p} - \frac{P^* e}{P}\frac{w_M}{w_X}(\dot{p}^* + \dot{e})\right) + (1-\xi)\frac{w_D}{w_X}(\dot{p} - i^*) - (1-\xi)\frac{w_B}{w_X}\Delta i^* - \\ -(\frac{P^* e}{P})\frac{w_M}{w_X}\left\{ \begin{array}{l} \frac{(\Delta i - \Delta \dot{p})\xi w_B}{(1-t) + r\xi w_B}(\pi_c \varepsilon_c) + \pi_k \varepsilon_r(\Delta i - \Delta \dot{p}) + \\ + \pi_g\left[-\Delta i \frac{\xi w_B}{w_G} - \Delta i^* e(1-\xi)\frac{w_B}{w_G}\right] \end{array} \right. \end{array} \right]$$

and **(9)**

$$B = \frac{w_M}{w_X}\left(\frac{P^* e}{P}\right)\left\{\pi_c \varepsilon_c + \pi_k \varepsilon_k + \pi_g\left(\frac{t}{w_G} + \frac{w_D}{w_G} - \frac{i\xi w_B}{w_G} - i^* e(1-\xi)\frac{w_B}{w_G}\right)\right\} -$$

$$-(1-\xi)\frac{w_D}{w_X}$$

Equation **(9)**is a more complete form of a vast number of determinants that can affect economic growth. Among other factors, the growth of domestic income is determined by internal and external imbalances, and also takes into account the effect of relative prices. In particular the numerator A is decomposed into various parts: the first measures the impact of foreign demand on domestic growth, the second captures the effect of relative prices on growth, the third element is the volume effect of trade, and the fourthmeasures the impact of internal imbalances on domestic growth. The denominator captures basically the effect of the disaggregated import elasticities of the components of demand on domestic growth. Equation (9) will be used to explain actual growth in Romania over the period from 1996 to 2013, where complete data is available.

3.2. Estimation of the structural equations

To implement our extended model to the Romanian economy we first need to estimate simultaneously the structural Equations (1) to (4) to obtain the elasticities required to compute the reduced form ofthe domestic income growth as it is given by Equation (9). Annual data (growth rates) are used for the period 1996-2013 to estimate the simultaneous equation system. The definition of the variables and the data source are explained in the Appendix B.

We first estimated the system by 2SLS (see Table C.2 in Appendix C). The intention was to carry out some diagnostic tests to justify the robustness of our results. The first is the Sargan statistic, a test of over-identifying restrictions to check the validity of the instruments used in the regressions and this hypothesis is confirmed in all cases. The second is the Pagan-Hall heteroskedasticity test, showing that the hypothesis of homoskedasticity is never rejected. The third test is the Cumby-Huizinga test for autocorrelation and it is confirmed that errors are not first-order autocorrelated in all cases. Finally the normality hypothesis of residuals is also confirmed in all equations.

After confirming the robustness of our results, we implemented the 3SLS (Three-Stage Least Squares) estimation technique as the most efficient to capture the interrelations between equations and the causal and feedback effects between the core variables of the system. Table C.1 in the Appendix C reports the estimation results where simultaneity is controlled by using a set of instrumental variables. The growth of imports, consumption, investment, exports as

wellthe growth of domestic disposable income, domestic product, real exchange rate and real domestic interest rateare all assumed to be endogenous. The remaining variables in the system are assumed exogenous, including some lagged variables, as it is explained in Table C.1.

In general the estimation results are reasonable[14]. In the import equation, the growth of exports is statistically significanceat the 1% level showing that other things being unchanged, every 1 percentage point increase in exports is associated with 0.658 percentage point increase in imports. This result shows that exports are highly dependent on imports or in other words gives the idea that the import content of exports is high.Due to this fact the value-added of exports is expected to be low and consequently the multiplier effects of exports on economic growth are expected to be weak since the positive effects of exports on growth can be counteracted by the high import content of exports.

Investment growth is also statistically significant in the import function at the 1% level but the import sensitivity of this component of demand is lower than that of exports (0.59). We were not able to find any significant impact of the growth of consumption and government expenditures on import growth. Relative prices is another variabledisplaying a significant negative impact on imports (at the 1% significance level) confirming the standard evidence that imports decline in Romania when they become more expensive. Therefore, the devaluation of the domestic currency in Romania can be a useful instrument (at least in the short term) for preventing a higher penetration of imports in the domestic market.

In the export function our results confirm the standard findings in the literature that exports are income elastic and price inelastic. The income elasticity of the demand for exports is statistically significant at the 1% level revealing that a 1 percentage point increase in foreign income is responsible for a 3.349 percentage point increase in exports. This is an encouraging result for the Romanian economy showing that exports are competitive in international markets in terms of the supply characteristics they possess, associated with quality aspects. The price elasticity of the demand for exports is not statistically significant but itdisplays the expected positive sign.

Consumption growth is income inelastic (0.606) as expected by the standard consumption theory and investment growth is income elastic (2.581) confirming the well known accelerator theory. This shows that consumption grows at a lower rate than disposable income whereas investment grows 2.6 percentage points for every 1 percentage point increase in real domestic income.Therefore, the accelerator impact is dominant in the investment equation, showing that

[14] It was not possible to use a longer period due to the lack of data. Therefore, the robustness of the estimation results must be interpreted with caution.

investment projects are undertaken only when the perspectives on economic growth are fulfilled. Another important finding is that real interest ratehas a negative (although inelastic) impact on investment, as expected,and it is significant at the 5% level. This evidence suggests that high financial costs do not benefit the development of investment projects. It is found that every 1 percentage point increase in real interest rate provokes a 0.144 percentage point fall in real gross investment.

3.3. Application of the SCA model to the Romanian economy

Table 2 reports all the figures necessary to compute the growth rate of the Romanian economy as it is given byEquation (9). All elasticities are taken from the 3SLS estimation presented in Table C.1 in the *Appendix C*; the rest are average annual growth rates of the respective variables over the period 1996-2013. If we replace all these figures in Equation (9) we are able to determine the average growth rate of the Romanian economy taking into account internal and external imbalances. In this case, our model predicts a very modest growth rate of about 0.113%. The average growth rate found following the original Thirlwall's Law (without internal imbalances and assuming constant relative prices, as explained in Section 2), is about 2.013% (see Table 1). Comparing these growth rates with the effective annual growth of 2.617% we can infer that the Romanian economy grew at a higher rate than that predicted both by Thirlwall's model and by our extended model,resulting in the accumulation of external deficits. Although our model also takes into account internal balances (among other factors) the conclusionwe get is in line with the evidence found by computing the simple Thirlwall's Law.

Moreover,Thirlwall's Law over-predicts the growth rate of Romania in comparison with our extended SCA model. Therefore, if internal imbalances and relative price movements are ignored asin Thirlwall's Law, the predicted growth rate for the Romanian economy is overestimated.

Table 2. Computation of the growth rates of domestic income. Romania, 1996-2013.

ε_x 3.349	π_x 0.658	ε_c 0.606	π_c -0.109	ε_k 2.581	π_k 0.590	π_g 0.044	ε_r -0.144	δm -0.433
δx 0.111	t *0.325*	r 0.008	$\dot{p}$ 0.275	$\dot{y}^*$ 0.017	w_D 0.037	w_G 0.344	w_B 0.221	ξ_D 0.141
ξ_B 0.141	w_M 0.403	w_X 0.329	i 0.282	i^* 0.039	Δi -0.022	Δi^* -0.003	e 0.739	$\dot{e}$ 0.183
$\frac{p^* e}{p}$ 1.164	$\dot{p}^* + \dot{e} - \dot{p}$ -0.024	$\Delta i - \Delta \dot{p}$ -0.004	$\dot{p}^*$ 0.017	$(\dot{p} - i^*)$ 0.235	$\dot{y}_{SCA}$ 0.113	$\dot{y}_{BP}$ 2.013	$\dot{y}_{Rom}$ 2.617	

Source: own calculations

3.4. A scenario analysis to detect growth inducing factors

A scenario analysis can helpto identify factors able to enhance higher growth in Romania. Some interesting hypotheses areanalyzed below:

(i) Budget policy as designed by the Stability and Growth Pact – w_D=3% and w_B=60%.

The annual average deficit ratioin Romanianfor the period 1996-2013 is w_D=3.7%, not far from the limit defined regarding the conditions for adopting the European common currency. Still, if we consider the 3% threshold, growth falls from 0.113% to -0.09%.As for debt, the average ratio for the same period is about 21%, which is much lower relatively to other European Union countries. Interestingly, by increasing the debt to 60% of GDP, growth increases to 0.239%. Combining both thresholds, growth would drop from 0.113% to 0.026%. Therefore, trying to get closer to EU established goals is not an effective way to enhance higher growth in Romania.

ii) Reducing the import dependence of exports.

The elasticity of imports with respect to exports, $\pi_X = 0.658$, shows that exports are highly dependent on imports thus revealing a structural problem of the Romanian economy: that value-added of exports is not very substantial; therefore the multiplier effect of exports on domestic income is not expected to be high since its positive effects might be cancelled out by a significantincrease in imports. Analyzing the composition of Romanian exports (see Figure D.9) we observe a shift in the structure of exported goods in the mid-2000s where machinery, apparatus, equipment and transport means exceeded the textiles, wearing apparel and footwearof the traditional sectors. The structure of the Romanian exports improved significantly for the last decade towards higher-tech products, despite the fact that they still incorporate imported technology.

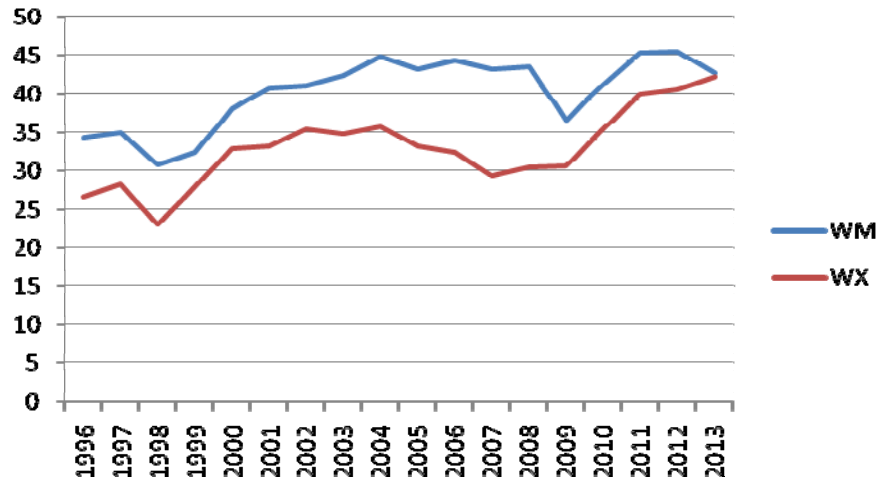
By reducing the value of this elasticity we obtain higher growth in income. For instance, if the Romanian economy manages to reduce the dependence of exports on imports, from $\pi_X = 0.658$ to $\pi_X = 0.50$, income growth increases from 0.113% to 0.70%; a farther decrease of the export elasticity with respect to imports to $\pi_X = 0.4$ yields an even higher income growthof 1.07%; Therefore policies must be developed to reduce the import content of exports in order for exports to have higher impact on growth.

(iii) External equilibrium

During the period 1996-2013, as Chart 1 shows, both the import and export sharesshow an increasing tendency, with both series getting closer over time. However the import share is always above the export share meeting each other only at the end of the observed period. In the

last year the ratio of the share of imports over exports is $w_M / w_X = 1$ which is an encouraging result from the balance of payments perspective.

Chart 1. The evolution of the imports and exports share, Romania 1996-2013.



Data source: European Commission, Statistical Annex of European Economy, spring 2014

However, if we make the average share of exports (0.329%) equal to that of imports 0.403%, the Romanian economy grows from 0.113% to 3.74%. An alternative could be to bring the import share down to the level of the average export share, that is, $w_X=w_M=0.329$. If we replace these values in Equation(9) our model predicts a higher income growth of about 3.94%. Therefore, trade balance equilibrium is apparently the most efficient policy to foster growth in this country.

(iv)Constant relative prices.

If we assume that relative prices are constant in the long run that is, $\dot{p}^* + \dot{e} - \dot{p} = 0$ implying also that $(P^* e / P) = 1$ and replace these values in Equation (9) our model predicts that growth raises to 3.71%. Therefore, relative prices make a substantial difference in the growth process, and when they are neglected the model over-predicts the growth rate. On the other hand, our model shows that the Romanian economy can grow faster in a system with price and exchange rate stability.

4. Concluding remarks

In this study we have employed two complementary approaches to explain the growth performance of the Romanian economy from 1996 to 2013. The first approach is the conventional balance of payments constraint hypothesis known as the Thirlwall´s Law predicting a country´s growth rate consistent with the balance of payments equilibrium. Since this approach ignores internal imbalances related to public deficit and debt, we extend this model to include both, internal and external imbalances as well as relative prices movements. The extended multi equation-model is estimated by 3sls to obtain robust results and take into account the reciprocal relations among the core variables of the model.

Both models agree that the Romanian economy grew at a higher rate than that allowed by the balance of payments equilibrium growth rate at the cost of accumulating current account deficits. Therefore, the Romanian economy is balance of payments constrained financing its extra growth by capital inflows. However, the conventional approach linked to Thirlwall Law over-predictsthe Romanian growth rate when it ignores internal imbalances and does not recognize that relative prices can play an important role in the path of economic growth. In this sense our extended model is more complete to analyze the determinants of economic growth in Romania.

Estimating our extended model we detect a structural problem on exports being highly dependent on imports. The high import content of exports does not allow the benefits from exports to be fully transmitted on growth aggravating on the other hand the current account imbalances. Some positive results are observed for the Romanian economy manifested by the tendency of eliminating the gap between exports and imports in the last years of the analysis.

The scenario analysis shows that the only way for the country to grow faster without deteriorating the balance of payments position is by increasing the competitiveness of the economy that is, by turning imports less attractive in the domestic market and exports more attractive in external markets. It is shown that equilibrating the shares of exports and imports can lead to higher growth, more than 3% per year. Increasing the share of international trade in the economy is also beneficial to growth.The scenario analysis also shows that relative price and exchange rate stability enhance higher growth. Movement towards the EMU criteria of public deficit and debt are not growth enhancing since the Romanian economy up to now reports lower values.

In general the results from our extended growth model are coherent with the spirit of Thirlwall´s Law and the balance of payments constraint hypothesis.

5.

Appendix A

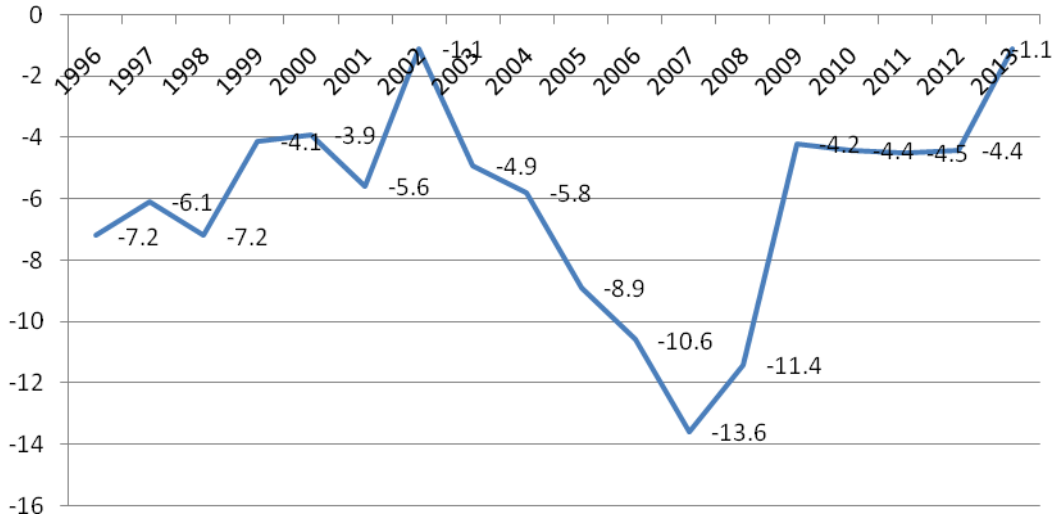
Table A.1. Estimation of the Import and Export functions forthe Romania economy, 1996-2013

Variables	Imports (2SLS)[a]	Exports (OLS)
Constant t-ratio p-value	4.417 2.29 0.037**	5.441 2.98 0.009***
$\dot{y}_t$ t-ratio p-value	2.112 5.37 0.000***	
$(\dot{p}_t^* + \dot{e}_t - \dot{p}_t)$ t-ratio p-value	-0.594 -3.72 0.002***	0.148 0.97 0.348
$\dot{y}^*$ t-ratio p-value		2.561 3.17 0.006***
R^2_{adj} DW	0.667 1.61	0.327 1.97
Hausman $x^2_{(1)}$ Sargan LM Weak instruments F(3,13)	16.44 [0.000] 4.81 [0.09] 54.86	

([a]) Relative prices, exports, consumption and gross investment are used as instruments
*, **, *** Coefficient significant at the 10%, 5% and 1% level, respectively

Data source: European Commission, Statistical Annex of European Economy, spring 2014

Chart A.1. Romanian's current account as a percentage of GDP, 1996-2013.



Data Source: European Commission, Statistical Annex of European Economy, spring 2014

***Appendix* B:** *Variable definition and data sources*

- $\dot{m}_t$ – annual growth rate of real imports - Imports of goods and services at 2005 prices (national currency; annual percentage change).
- $\dot{c}_t$ – annual growth rate of final private consumption - Private final consumption expenditure at 2005 prices (national currency; annual percentage change).
- $\dot{x}_t$ – annual growth rate of real exports - Exports of goods and services at 2005 prices (national currency; annual percentage change).
- $\dot{inv}_t$ – annual growth rate of investment - Gross fixed capital formation at 2005 prices (national currency; annual percentage change).
- $\dot{y}_t$ – annual growth rate of real GDP - GDP at 2005 market prices (national currency; annual percentage change).
- $\dot{y}^*$ - annual growth rate of real foreign income - EU28 (national currency; annual percentage change).
- $\dot{p}_t$ – annual growth rate of price deflator GDP at market prices (national currency; annual percentage change).
- $\dot{p}_t^*$ - annual growth rate of price deflator GDP at market prices, for the EU-12 (national currency; annual percentage change).
- w_G – share of government's expenditure on GDP - Total expenditure; general government minus interest including flows on swaps and FRAs (% of GDP at market prices; excessive deficit procedure).
- w_D– share of government's deficit on GDP - Net lending (-) or net borrowing (+); general government (% of GDP at market prices; excessive deficit procedure).
- w_B – share of government's debt on GDP - General government consolidated gross debt (% of GDP at market prices; excessive deficit procedure).
- w_M - imports of goods and services at current prices (national accounts) - % of GDP at market prices
- w_X-. exports of goods and services at current prices (national accounts) - % of GDP at market prices.
- t – share of government's revenues on GDP - Total current revenue; general government (% of GDP at market prices; excessive deficit procedure).
- i – nominal short-term interest rates (%)

- i^* - nominal long-term interest rates (%) for Germany (Public sector bonds outstanding (over 3 years); from 1993, central government benchmark bond of 10 years.)

Data on $\dot{m}_t$, $\dot{c}_t$, $\dot{x}_t$, $\dot{inv}_t$, $\dot{y}_t$, $\dot{y}^*_t$ $\dot{p}_t$, $\dot{p}^*_t$, w_G, w_D, w_B,,w_M, w_X, t, and i^* were taken from European Commission (2014).

- $\dot{g}_t$ – annual growth rate of government's expenditure. Computed by the authors from data on "General government expenditure (Millions of euro from 1.1.1999/ECU up to 31.12.1998)" from Eurostat (extracted on 13th June 2014) and information on $\dot{p}_t$.

- $\dot{y}_d$ - annual growth rate of real gross disposable income (deflator private consumption) – index 2005=100. Downloaded on 16th June 2014, from the AMECO database (http://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm).

- e – nominal effective exchange rate - price of domestic currency in terms of foreign currency - index (2010=100) broad indices (61 countries). Computed by the authors using monthly data, from the Bank for International Settlements (BIS)- http://www.bis.org/statistics/eer/index.htm .

- *(P*e/P)*- real effective exchange rate index (2010=100), broad indices (61 countries). Computed by the authors using monthly data, from the Bank for International Settlements(BIS)- http://www.bis.org/statistics/eer/index.htm

ξ - the percentage of public deficit (or debt) owned by national bond holders.

Appendix C

Table C.1. The 3SLS estimation of the structural model, Romania 1996-2013.

	Coefficient	Std Error	t-stat	p-value	R^2	F-stat	p-value
Imports growth							
constant	0.279	1.853	0.15	0.881			
$\dot{C}_t$	-0.109	0.366	-0.30	0.768			
$\dot{g}_t$	0.044	0.054	0.80	0.426	0.8832	30.67	0.000
$\dot{x}_t$	0.658	0.154	4.26	0.000***			
$\dot{inv}_t$	0.590	0.180	3.28	0.002***			
$(\dot{p}_t^* + \dot{e}_t - \dot{p}_t)$	-0.433	0.126	-3.43	0.001***			
Consumption growth							
constant	2.511	1.211	2.07	0.043**	0.5134	20.78	0.000
$\dot{y}_{d,t}$	0.606	0.133	4.56	0.000***			
Investment growth							
constant	-0.965	1.842	-0.52	0.603			
$\dot{y}_t$	2.581	0.345	7.48	0.000***	0.6962	31.27	0.000
$\dot{r}_t$	-0.144	0.056	-2.56	0.013**			
Exports growth							
constant	4.644	1.551	2.99	0.004***			
$\dot{y}_t^*$	3.349	0.637	5.26	0.000***	0.3777	16.05	0.000
$(\dot{p}_t^* + \dot{e}_t - \dot{p}_t)$	0.111	0.130	0.85	0.397			

Notes to the tables: Endogenous variables: $\dot{m}_t, \dot{c}_t, \dot{inv}_t, \dot{x}_t, \dot{y}_t, \dot{y}_{d,t}, (\dot{p}_t^* + \dot{e}_t - \dot{p}_t), \dot{r}_t$

Exogenous variables: $\dot{g}_t, \dot{y}_t^*, \dot{y}_{t-1}^*, t_t, i_t, i_t^*, \dot{p}_t^*, \dot{p}_{t-1}^*, w_{B,t}, w_{B,t-1}, w_{D,t}, w_{G,t}, \dot{x}_{t-1}$

*, **, *** Coefficient significant at the 10%, 5% and 1% level, respectively

Table C.2. The 2SLS estimation of each equation of the structural model, Romania 1996-2013.

	Coefficient	Std Error	t-stat	p-value	Sargan test	Heteroscedasticity test	AR(1) test	Normality test
Imports growth								
constant	-1.181	2.544	-0.46	0.652	χ^2_8=11.728	χ^2_{13}= 10.235	χ^2_1= 1.312	χ^2_2=1.57
$\dot{c}_t$	-0.002	0.473	0.00	0.997	p-value=0.164	p-value=0.675	p-value=0.252	p-value= 0.456
$\dot{g}_t$	0.042	0.069	0.60	0.557				
$\dot{x}_t$	0.597	0.200	2.99	0.012***				
$\dot{inv}_t$	0.551	0.233	2.37	0.037**				
$(\dot{p}_t^* + \dot{e}_t - \dot{p}_t)$	-0.427	0.160	-2.67	0.022*				
Consumption growth								
constant	2.523	1.311	1.92	0.074*	χ^2_{11}=14.279	χ^2_{12}= 11.369	χ^2_1=0.012	χ^2_2=1.85
$\dot{y}_{d,t}$	0.602	0.153	3.94	0.001***	p-value=0.218	p-value=0.498	p-value= 0.912	p-value= 0.396
Investment growth								
constant	-0.902	2.121	-0.43	0.667	χ^2_{10}= 11.796	χ^2_{12}=11.168	χ^2_1=0.078	χ^2_2= 0.76
$\dot{y}_t$	2.576	0.437	5.90	0.000***	p-value=0.300	p-value=0.515	p-value=0.780	p-value= 0.685
$\dot{r}_t$	-0.051	0.083	-0.62	0.546				
Exports growth								
constant	5.686	1.820	3.12	0.007***	χ^2_{10}=16.173	χ^2_{12}=13.187	χ^2_1=0.426	χ^2_2= 0.24
$\dot{y}_t^*$	2.777	0.832	3.34	0.005***	p-value=0.0948	p-value=0.356	p-value= 0.514	p-value= 0.885
$(\dot{p}_t^* + \dot{e}_t - \dot{p}_t)$	0.228	0.175	1.30	0.214				

Notes to the tables: Endogenous variables: $\dot{m}_t, \dot{c}_t, \dot{inv}_t, \dot{x}_t, \dot{y}_t, \dot{y}_{d,t}, (\dot{p}_t^* + \dot{e}_t - \dot{p}_t), \dot{r}_t$

Exogenous variables: $\dot{g}_t, \dot{y}_t^*, \dot{y}_{t-1}^*, t_t, i_t, i_t^*, \dot{p}_t^*, \dot{p}_{t-1}^*, w_{B,t}, w_{B,t-1}, w_{D,t}, w_{G,t}, \dot{x}_{t-1}$

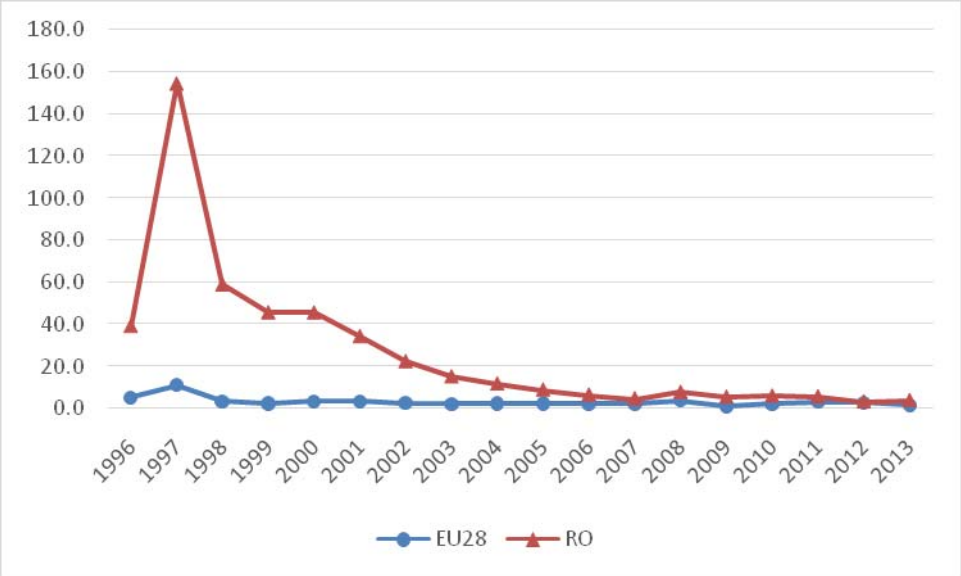
*, **, *** Coefficient significant at the 10%, 5% and 1% level, respectively

Appendix D

Figure D.1. Real GDP growth rates, 1996-2013

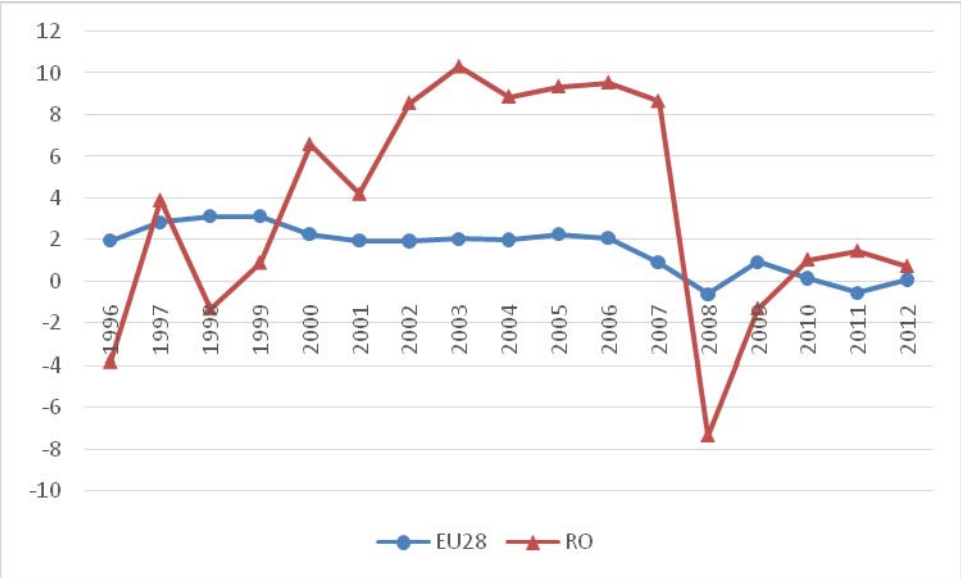
Data Source: European Commission, Statistical Annex of European Economy, spring 2014

Figure D.2. Inflation rate, 1996-2013



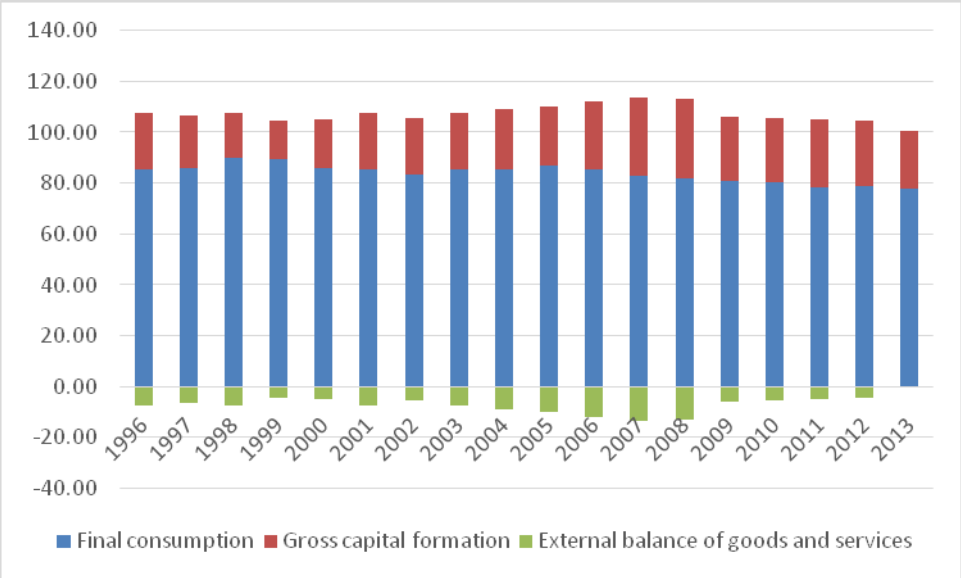
Data Source: European Commission, Statistical Annex of European Economy, spring 2014

Figure D.3. The demand nominal growth rates, 1996-2013



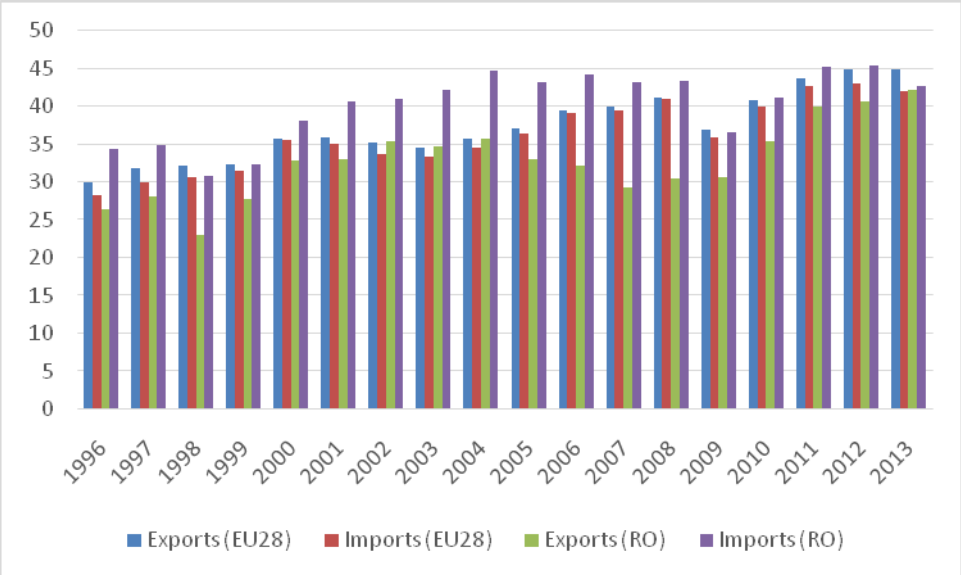
Data Source: European Commission, Statistical Annex of European Economy, spring 2014

Figure D.4. GDP and main components, 1996-2013



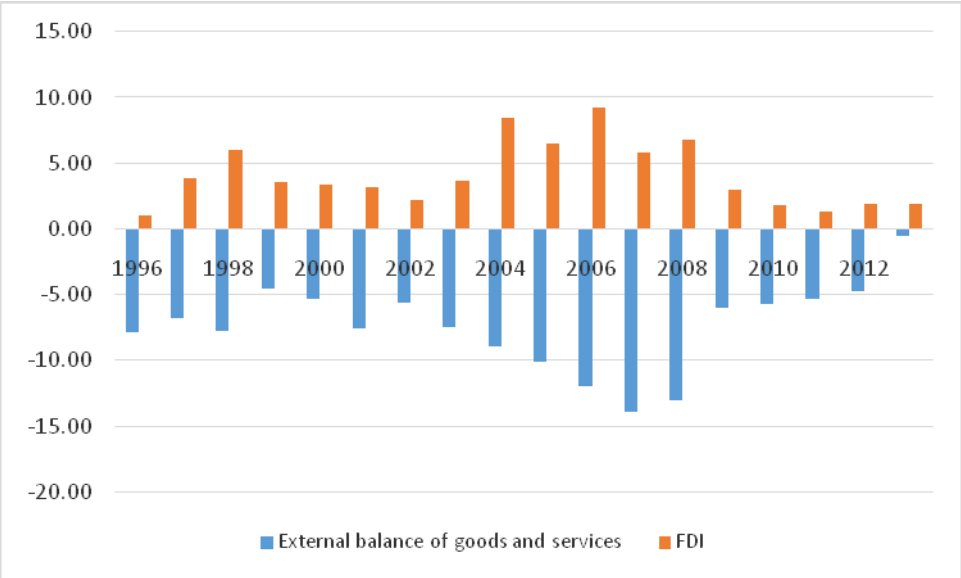
Data Source: Eurostat

Figure D.5. Exports and imports (% GDP), 1996-2013



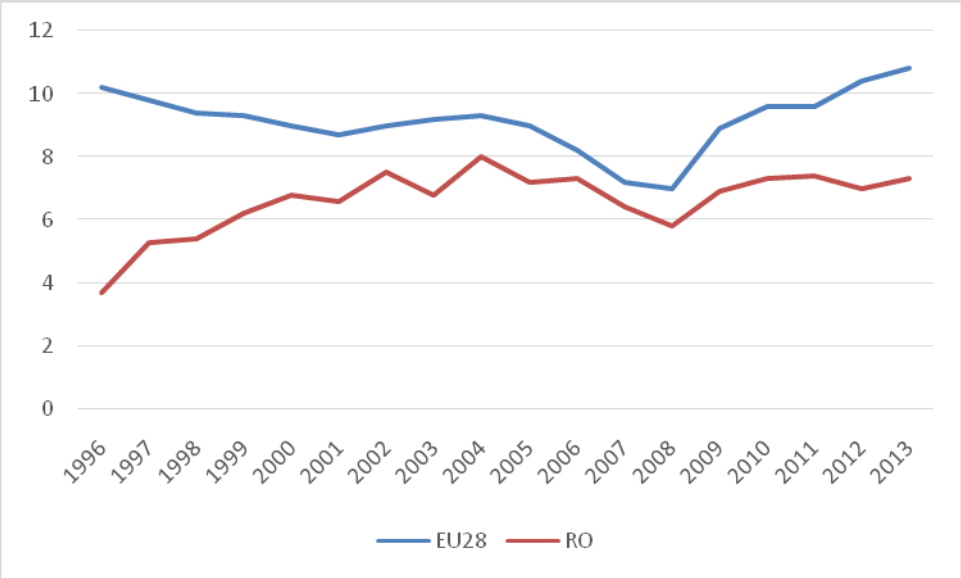
Data Source: European Commission, Statistical Annex of European Economy, spring 2014

Figure D.6. FDI and external balance of goods and services (% GDP), 1996-2013



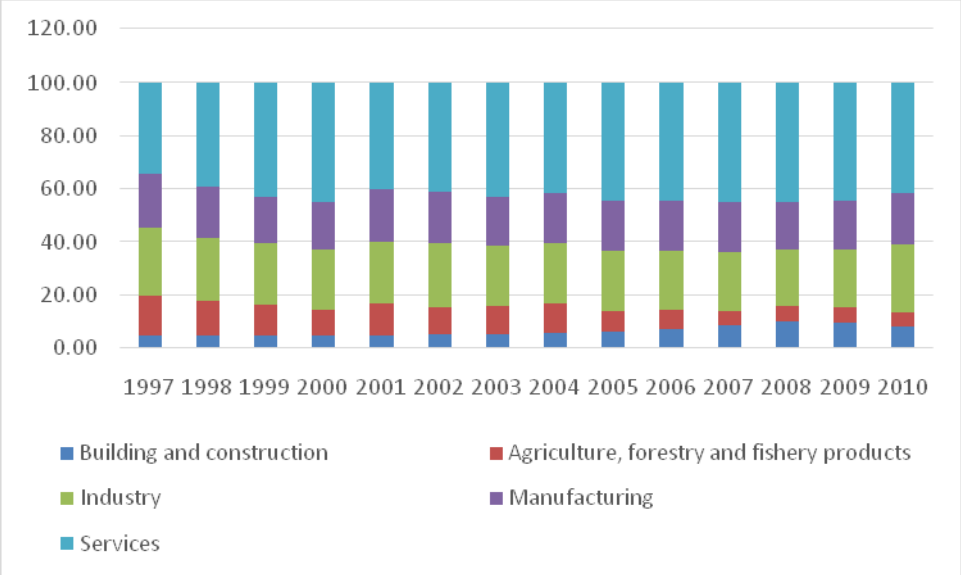
Data Source:the data for FDI provided by National Bank of Romania; the data for GDP and external balance of goods and services provided by Eurostat and National Bank of Romania

Figure D.7. Unemployment rate, 1996-2013



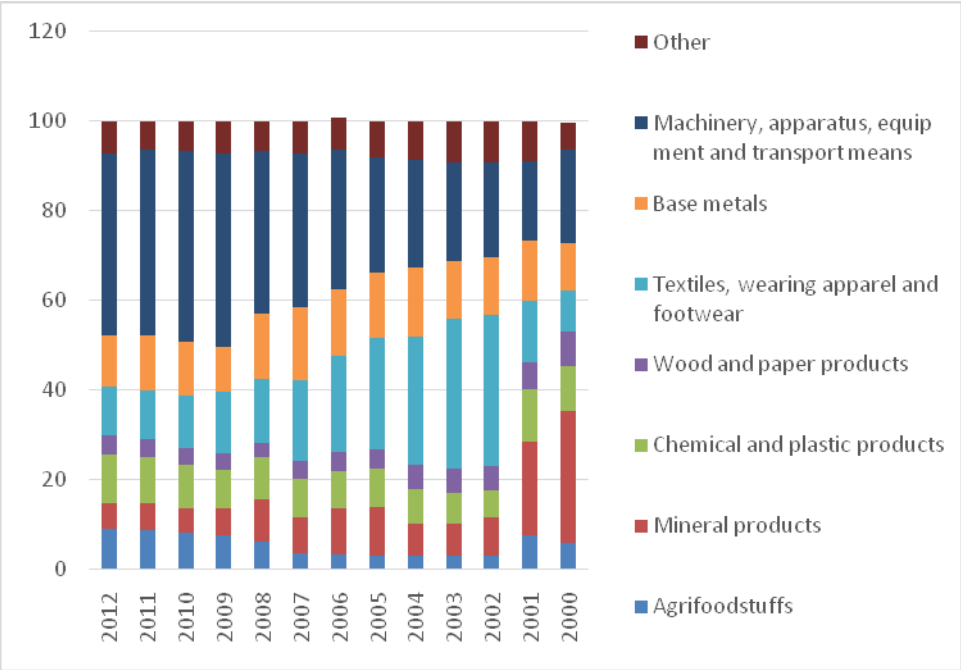
Data Source: European Commission, Statistical Annex of European Economy, spring 2014

Figure D.8. Sectoral shares (%), 1997-2010



Data Source: European Commission, Statistical Annex of European Economy, spring 2014

Figure D.9. The composition of Romanian exports (%)



Data Source: National Bank of Romania, Annual Reports on Balance of Payments

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