The Indicators of Macroeconomic Policy in the Baltic Countries

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Annotation

The purpose of this paper is to compare Latvia's production structure in the late - 1990s to that in Lithuania and Estonia. Countries' economics growth rates are broadly similar, but there are disparities in gross domestic product per capita. The composition of total supply and value added is examined across countries. Differences arise as several industries are more important in countries' production structures.

JEL Classification: L16, O57, C22
Key words: country comparisons; economical activity; gross fixed capital formation; error correction model

Introduction

With economic growth it is understood expand of Gross Domestic Product (GDP) volume. For mutual comparison of the countries are used derived GDP volume index - Gross Domestic Product per capita. Nowadays are discussed two groups of factors which form growth dynamics and its tendencies. First, there are priority changes for economic growth. Second, there is reorganization of the growth factors to provide for the technical progress.

A comparative analyse of the Gross Domestic Product composition from expenditure side and the sectors of economic activity contribution to Gross Value Added is used to clarify similarities and dissimilarities in economic growth tendencies for Latvia, Lithuania and Estonia. Besides, there is utilised error correction method to analyse in short – run investments effect on import. The analyses cover a period from 1995 to 2003.

1 Economical Growth

Gross Domestic Product, which is one of the vital national account aggregates, represents in a concise form the activities of economic operators within a given economic territory. It corresponds to the value of all goods and services produced by economic units within a given period, less the value of intermediate goods used in the production process, less taxes minus subsidies on products, less the financial intermediation services indirectly measured. These aggregates are essential indicators for macroeconomic analysis and economic policy.

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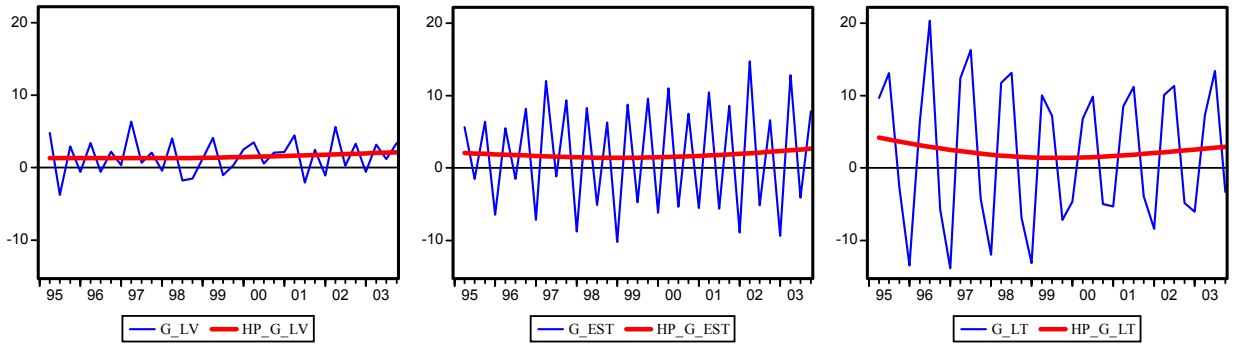

Figure 1: Gross Domestic Product per capita growth, percent of previous period, at constant prices

G – the actual time series of Gross Domestic Product per capita
HP_G – the time series smoothed by the Hodrick – Prescott filter, λ=1600
Here and after: LV- Latvia, LT – Lithuania, EST – Estonia
Data Source: national statistic offices

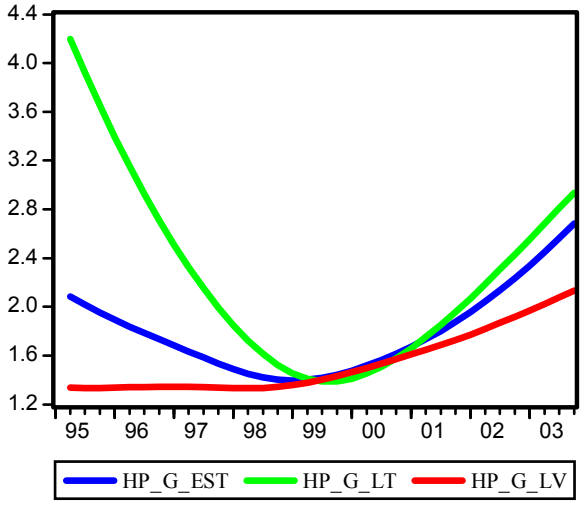

Figure 2: Gross Domestic Product per capita growth, percent of previous period, at constant prices (for smoothed data)

GDP per capita in Latvia, Lithuania and Estonia stable increases over viewed period. Growing rates of GDP per capita in Lithuania was higher than in Estonia and in Estonia it was higher then in Latvia. It was with exemption in period of 1998 – 2000 when economic growth of all three countries had to manage after-effects of Russian financial crisis. (Figure 1, 2)

The differences in GDP per capita growth affect countries converge to EU average level. That has to be shown by the volume index of GDP per capita in Purchasing Power Standards (PPS) expressed in relation to the European Union (EU-15) average which set to equal 100.

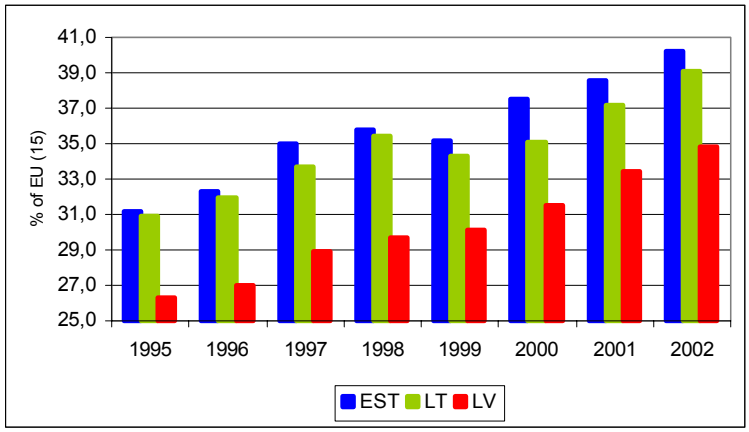

Figure 3 GDP per capita in PPS (EU15=100)

Data Source: Eurostat

It follows from data shown in Figure 3 that GDP per capita in PPS difference between Lithuania and Latvia, and wherewith difference between Estonia and Latvia, remains. Difference in GDP per capita in PPS for Latvia and Estonia vary between 4,9 and 6,1 per cent points; and for Latvia and Lithuania – between 3,6 and 5,7 per cent points. Equally, difference between Estonia and Lithuania vary between 0,3 and 1,4 per cent points, with exemption in year 2000 when difference obtained 2,4 per cent points.

To find out background of these average value of GDP per capita growth first look on GDP expenditure side.

2 Uses of Gross Domestic Product

For the viewed period 1995:1 till 2003:4 the final consumption expenditure of household and non-profit institutions serving households share in GDP varied between 52% - 65% in Estonia, 57% - 71% in Lithuania, and 59% - 72% in Latvia. As it's seen from Figure 4, there is small tendency to decrease for the final consumption expenditure of household share in GDP, but in average this indicator in Latvia and Lithuania is higher than in Estonia by 5% of GDP.

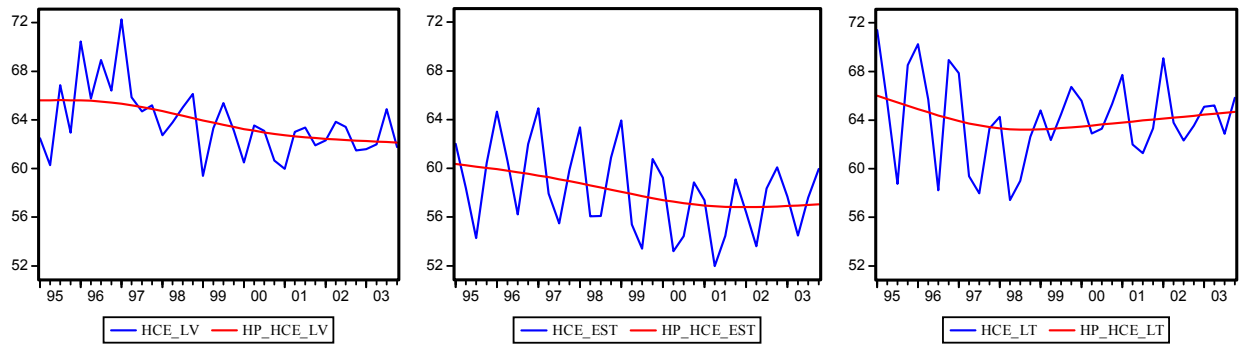

Figure 4: Main GDP aggregates: Final consumption expenditure of household and non-profit institutions serving households, in % of GDP

Data source: the International Financial Statistics (IFS) database

The final consumption expenditure of general government in Estonia and Lithuania as shares of GDP sustained grows down (Figure 5). In Estonia this indicator deceases for 7% points of GDP, from 26% till 19% level; in Lithuania - for 5% points of GDP, from 23% till 18% level. On the contrary, for Latvia this indicator has no tendency to decrease; it does vary between 20 % and 22% of GDP.

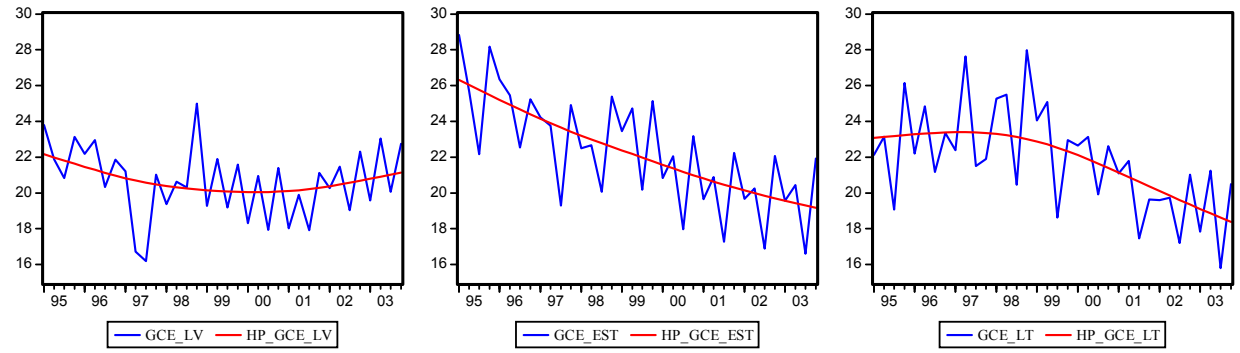

Figure 5: Main GDP aggregates: Final consumption expenditure of general government, in % of GDP

Data source: the International Financial Statistics (IFS) database

Gross fixed capital formation consists of resident producers acquisitions, less disposals of fixed tangible or intangible assets. This covers in particular machinery and equipment, vehicles, dwelling and other buildings. Bigger increase of this indicator took place in Latvia as it's seen in Figure 6 on the left side; the gross fixed capital formation (investments) share in GDP grows up from 14% level to 27%. In Estonia the gross fixed capital formation share in GDP grows up only from 27% level to 30%. On the contrary, in Lithuania the gross fixed capital formation share in GDP grows down from 22% level to 20%.

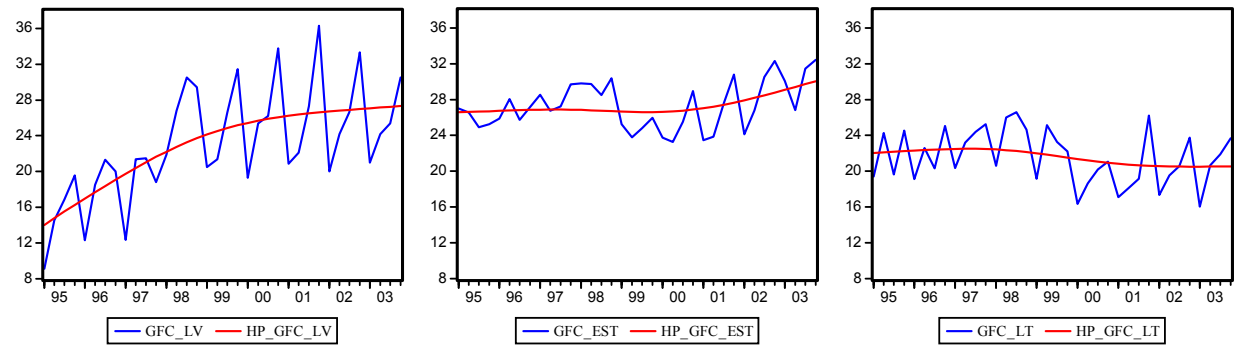

Figure 6: Main GDP aggregates: Gross fixed capital formation (investments), in % of GDP

Data source: the International Financial Statistics (IFS) database

In Latvia exports amount as share of GDP in period 1995:1 till 2003:4 decreases from 50% to 45% level. Till 1998 import amount as share of GDP increased by 5% and obtained 58% level, after it was stay between 57-58% levels. Wherewith, the net import had tendency increase as export level decrease.

In Lithuania from 1995 till 1999 export decreased from 54% till 47% of GDP but from 2000 this indicator increased by 5% and in 2003 obtained 52% level. Import had tendency to decrease until 2000, from 66% till 55% of GDP, after it increased only by 2% of GDP; till 57%. As a result net import had strong tendency to decrease; from 12% in 1995 till 5% in 2003.

In Estonia export amount as share of GDP had sustainable tendency to increase from 1995 till 2001, from 68% till 86% of GDP; after it decreased a little to 85% level. The import amount as share of GDP on contrary to Latvia and Lithuania increases for all viewed period, from 78% till 93% of GDP.

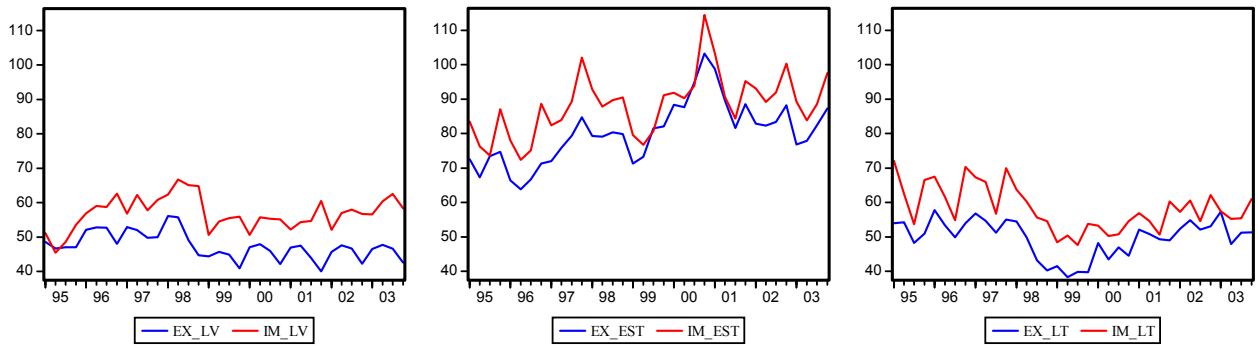

Figure 7: Main GDP aggregates: exports and imports of goods and services, in % of GDP

Data source: the International Financial Statistics (IFS) database

The basic macroeconomic identity states that

$$C + G + I + NX \equiv C + S + (TA - TR) \qquad (1)$$

where consumption denoted by C, investment spending by I, private sector savings by S, government purchases by G, transfer payments by TR, the amount of taxes received by the government TA and net export of goods and services by NX. From the identity (1) follows that

$$S + (TA - TR - G) \equiv I + NX \,. \tag{2}$$

The set of terms in parenthesis on the left – side is the government budget surplus. So the left – hand side of identity is the total country savings: the sum of the private sector savings and the government savings.

The savings shows country possibility to invest into domestic production or to buy foreign assets. Hence if net export decreases then it will reduce country's possibility to invest into domestic production.

In Figure 8 are shown countries savings as share of GDP changes for Latvia, Estonia and Lithuania in examined period; calculated from the right – hand side of identity (2). As it is seen from calculations and Figure 8, for all period of time savings level in Estonia was higher than in Latvia or Lithuania.

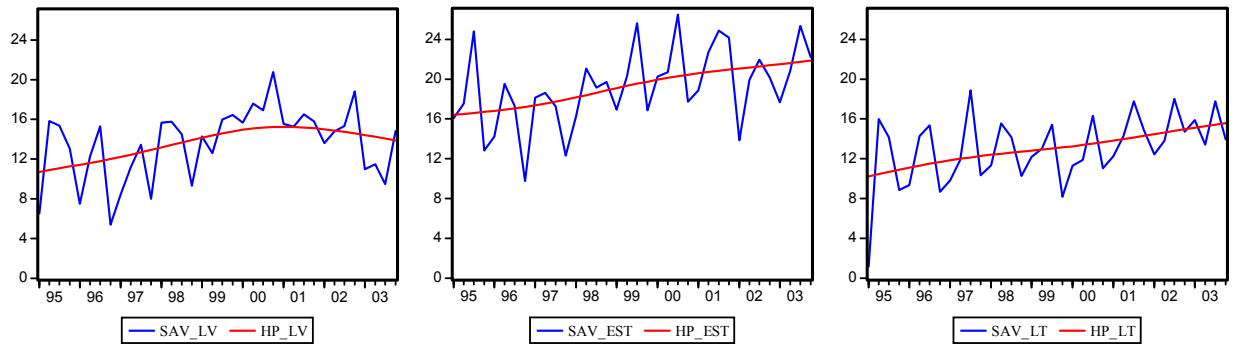

Figure 8: Savings, as % of GDP

(Calculated by authors using data from the International Financial Statistics (IFS) database)

The difference between saving levels in Estonia and Latvia arises from 5% points till 8% points of GDP, but between Estonia and Lithuania it's oscillated around 6% point level. The lowest saving rate in Estonia is in the region of the highest Latvia and Lithuania savings rates what confirms Estonian front-runner status.

Until 2002 the level of savings was higher in Latvia than in Lithuania, but after situation became counter. This may partly explain why Lithuania's economic growth rate overtakes Latvia's growth rate; in last few years Lithuania has bigger possibility than Latvia to invest into domestic production or to buy foreign assets.

3 Contribution to Gross Value Added by Sectors of Economic Activity

For analyses of Estonia, Lithuania and Latvia sectors of economic activity is utilized Gross Value Added (GVA). GVA just like GDP is an indicator for country's economic situation. GVA differs from GDP just with respect to valuation, which is at producers' prices. It does not include the value of taxes on products. The contribution to GVA by sector of economic activity in Estonia, Lithuania and Latvia is summarized in Table 1.

Table 1: Contribution to Gross Value Added by sector of economic activity, in %

	Latvia			Estonia			Lithuania		
	Services	Industry and Construction	Agriculture, Hunting, Forestry and Fishing	Services	Industry and Construction	Agriculture, Hunting, Forestry and Fishing	Services	Industry and Construction	Agriculture, Hunting, Forestry and Fishing
1995	56,6	33,5	9,9	60,3	31,0	8,7	54,0	34,3	11,8
1996	60,5	31,4	8,2	61,5	30,1	8,4	55,2	32,0	12,7
1997	62,1	32,2	5,6	62,8	29,3	7,9	56,4	32,0	11,6
1998	65,4	30,2	4,4	63,5	29,3	7,2	57,8	32,2	10,0
1999	68,6	27,1	4,3	66,2	27,1	6,7	60,5	31,1	8,4
2000	69,8	25,3	4,9	65,3	28,5	6,1	61,6	30,4	8,0
2001	70,3	24,8	4,8	65,6	28,7	5,7	61,3	31,5	7,2
2002	70,6	24,8	4,7	65,3	29,3	5,4	62,2	30,8	7,0

Source: Eurostat

In Lithuania is the biggest agriculture, hunting, forestry and fishing share in GVA comparing with Estonia and Latvia. This sector share in GVA 1995-2002 grows down in all three countries; in Latvia for 5,2 % points, in Lithuania for 4,8% points and in Estonia for 3,3% points. As result difference 3,1% points in 1995 between agriculture, hunting, forestry and fishing shares in GVA in Lithuania and Estonia decreased and in 2002 it was 1,6% points. On contrary between Lithuania and Latvia difference 1,9% points in 1995 increases and in 2002 it was 2,3% points.

The biggest industry (mining and quarrying; manufacturing; electricity, gas and water supply, construction) share in GVA until 1997 was in Latvia, after it in Lithuania. For all countries this sector share in GVA decreased: in Latvia for 8,7% points, in Lithuania for 3,5% points, in Estonia for 1,7% point. A difference between industry shares in GVA in 2002 for Lithuania and Estonia is 1,5% points but between Lithuania and Latvia four times bigger: 6,0 % points of GDP.

In examined period services share in GVA increases; for 5,0% points in Estonia, 8,2% points in Lithuania and 14,0% points in Latvia. In 2002 services share in GVA for Latvia was 70,6%, for 5,3% points and 8,4% points more than in Estonia and Lithuania accordingly.

In Table 2 are showed the number of economically active enterprises by main kind of activity (the same grouping as in table 1). In Latvia and Lithuania breakdown by main kind of economical activity are stable and similar for both countries in examined period. In Estonia agriculture and an industry share of economically active enterprises had tendency to decrease and wherewith services share increases.

Table 2: Economically Active Enterprises and Business Companies by Main Kind of Activity [1]

	Latvia				Estonia				Lithuania			
	Services	Industry and Construction	Agriculture, Hunting, Forestry and Fishing	TOTAL	Services	Industry and Construction	Agriculture, Hunting, Forestry and Fishing	TOTAL	Services	Industry and Construction	Agriculture, Hunting, Forestry and Fishing	TOTAL
1998	28311	6651	1168	36130	19467	6358	1492	27317	37311	9986	1320	48617
	78,4%	18,4%	3,2%	100%	71,2%	23,3%	5,5%	100%	76,7%	20,6%	2,7%	100%
1999	29591	6904	1133	37628	24200	7285	1771	33256	46549	11908	1540	59997
	78,6%	18,4%	3,0%	100%	72,8%	21,9%	5,3%	100%	77,6%	19,8%	2,6%	100%
2000	33192	7657	1143	41992	22711	6662	1379	30752	45272	11949	1583	58804
	79,1%	18,2%	2,7%	100%	73,8%	21,7%	4,5%	100%	77,0%	20,3%	2,7%	100%
2001	31984	7604	1080	40668	24628	6777	1285	32690	49062	12993	1405	63460
	78,6%	18,7%	2,7%	100%	75,3%	20,7%	3,9%	100%	77,3%	20,5%	2,2%	100%
2002	33437	7957	1154	42548	n.a	n.a	n.a	----	n.a	n.a	n.a	----
	78,6%	18,7%	2,7%	100%	n.a	n.a	n.a	----	n.a	n.a	n.a	----

Source: Statistical Yearbook of Latvia 2003/ Central Statistical Bureau of Latvia, Riga, 2003
Statistical Yearbook of Lithuania 2001, 2002/ Department of Statistics, Vilnius, 2001, 2002
Statistical Yearbook of Estonia 2002/ Statistical Office of Estonia, Tallinn, 2002

[1] excluding peasant farms

Next, to compare sectors by it productivity in Latvia, Estonia and Lithuania there is calculated contribution of each per cent of enterprises by kind of activity to GVA. Results for annual data 1998 – 2001 are shown in Figure 9.

It is seen that enterprises productivity in services has tendency to increase in Latvia and Lithuania. In Latvia each per cent of enterprises in services contribute up to 0,9 per cent to country

GVA. This level of productivity is close to Estonia level. In Lithuania this indicator is lower for 0,1 per cent point.

In Lithuania each per cent of enterprises from industry contribute to GVA upwards 1,5 per cents. In Estonia there is tendency to rise productivity up to 0,15 per cent points but still it is lower than in Lithuania for 0,1 per cent points. In Latvia there could be observed strong tendency to reduce productivity in industry, from 1,6% in 1998 to 1,3% in 2001.

Conspicuous in Lithuania enterprises in agriculture has productivity that is two times bigger than in Latvia and Estonia.

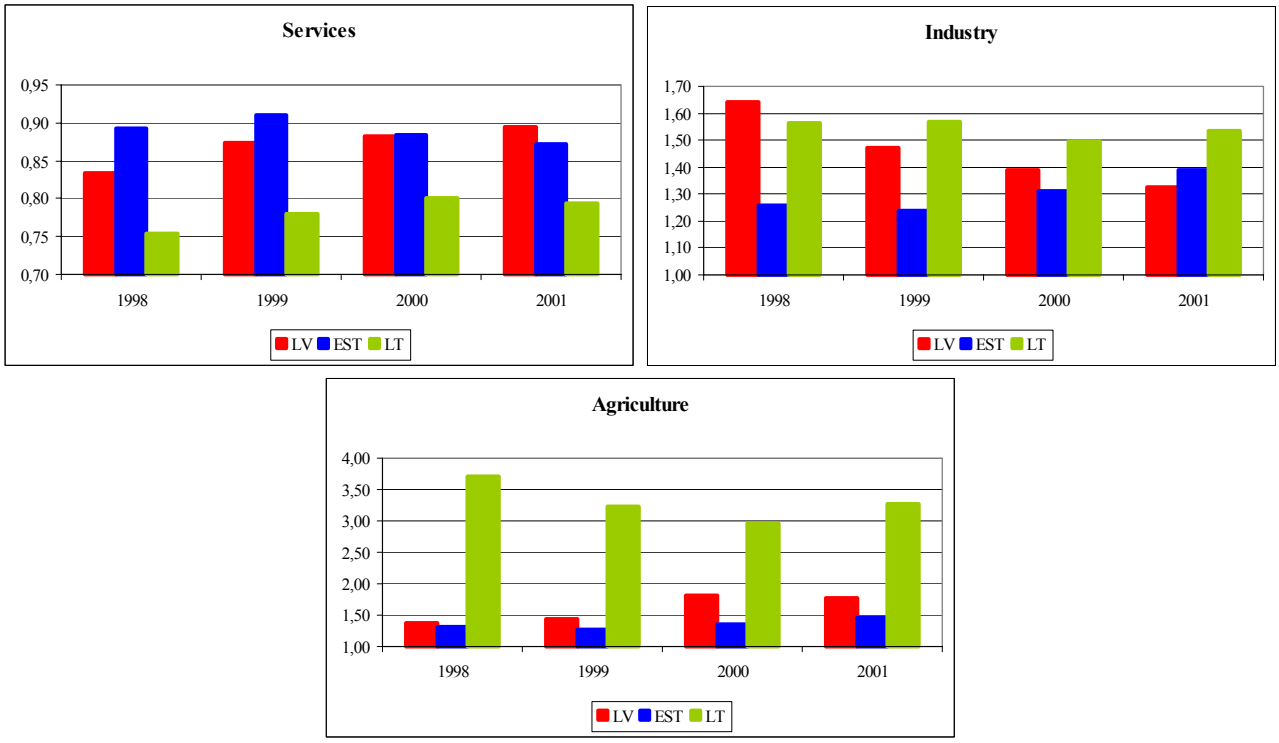

Figure 9: Contribution of each per cent of enterprises by kind of activity to GVA, % of GVA

(Calculated by authors)

So it's seen that contribution of each per cent of enterprises from production sector (agriculture and industry) to GVA has tendency to increase in Estonia and to keep in current level in Lithuania. In Latvia this indicator increases in agriculture and services but substantially decreases for industry. Comparing these results with tendencies of the gross fixed capital formation (investments) in each country there is clear that in Estonia increase of investments involves rise of contribution of each per cent of enterprises from industry and agriculture to GVA. In Latvia increase of investments generally involves rise of contribution of each per cent of enterprises services to GVA. In Lithuania investment level (as share of GDP) is stable and contribution of each per cent of enterprises by kind of activity to GVA is stable too.

4 Fixed Capital Formation and Import

Gross fixed capital formation (investments) has not necessary to be resident producers spending on domestic goods. These spending may be partly for imported goods. As was shown above, in Estonia and Latvia an import as share of GDP increases, but in Lithuania until 2000 import level had tendency to decrease and after it increase a little. As all three countries economies are in transition to free market economy, there is necessary to raise competitiveness of domestic producers and wherewith required addition investments in fixed capital. To estimate fixed capital formation effect on import in short – run there is used error correction method.

Herewith there was estimated the long – run equilibrium relation by regressing import level on gross fixed capital formation and export levels:

$$IM_t = b_0 + b_1 FCF_t + b_2 EX_t + u_t, \tag{3.1}$$

where IM_t – import; FCF_t – gross fixed capital formation; EX_t – export; u_t – error term; b_0, b_1, b_2 – parameters and $b_1>0$, $b_2>0$. All data is quarterly and expressed as share of GDP for period from 1995:1 till 2003:4.

First, the time series *IM*, *EX* and *FCF* was pre tested for stationarity. As could be seen from Appendixes 1a-c, these time series contained unit root.

Second, to test that model's variables are cointegrated there is used the Johansen method. This method is included in software package EViews. A result shows (Appendix 2) that for all countries' the time series are cointegrated under assumption about persistence of linear deterministic trend (restricted). Wherewith there is showed that *IM*, *EX* and *FCF* are cointegrated, that is, there is a long term relationship between them. Of course, in the short – run there may be disequilibrium. To show the short – run behaviour of the import to its long – run value there is used the Engle – Granger error correction mechanism (ECM) below.

The empirical counterparts of (3.1) for the each country are:

Latvia: $$\underset{[t=]}{\hat{IM}_t} = \underset{[-0,877]}{-7,808} + \underset{[6,978]}{0,676}\, FCF_t + \underset{[6,597]}{1,035}\, EX_t \qquad R^2 = 0,642 \qquad d = 1,632 \tag{3.2}$$

Estonia: $$\underset{[t=]}{\hat{IM}_t} = \underset{[-0,544]}{-4,611} + \underset{[3,723]}{0,906}\, FCF_t + \underset{[11,856]}{0,850}\, EX_t \qquad R^2 = 0,831 \qquad d = 1,937 \tag{3.3}$$

Lithuania: $$\underset{[t=]}{\hat{IM}_t} = \underset{[-1,503]}{-11,973} + \underset{[4,474]}{0,922}\, FCF_t + \underset{[8,802]}{1,013}\, EX_t \qquad R^2 = 0,720 \qquad d = 1,711 \tag{3.4}$$

Since used time series are individually nonstationary, there is the probability that these regressions are spurious. Performing a unit root test on the residuals obtained from (3.2), (3.3) and (3.4), it is shown that residuals from each regression are I(0) – they are stationary (Appendix 3).

Now for ECM consider the following model:

$$\Delta IM_t = c_0 + c_1 \Delta FCF_t + c_2 \Delta EX_t + c_3 u_{t-1} + \varepsilon_t \tag{3.5}$$

where Δ denotes the first difference operator, ε_t is a random error term and u_{t-1} is the one – period lagged value of the error from regressions (3.2), (3.3) or (3.4).

The empirical counterparts of (3.5) are below.

Latvia:
$$\underset{[t=]}{\Delta \hat{IM}_t} = \underset{[-0,077]}{-0,035} + \underset{[5,501]}{0,505}\,\Delta FCF_t + \underset{[3,347]}{0,594}\,\Delta EX_t - \underset{[-4,955]}{0,806}\,\hat{u}_{t-1} \qquad (3.6)$$
$$R^2 = 0,662 \quad d = 1,862$$

Estonia:
$$\underset{[t=]}{\Delta \hat{IM}_t} = \underset{[0,008]}{0,005} + \underset{[2,518]}{0,652}\,\Delta FCF_t + \underset{[5,811]}{0,800}\,\Delta EX_t - \underset{[-5,411]}{1,027}\,\hat{u}_{t-1} \qquad (3.7)$$
$$R^2 = 0,812 \quad d = 1,859$$

Lithuania:
$$\underset{[t=]}{\Delta \hat{IM}_t} = \underset{[-0,649]}{-0,315} + \underset{[6,893]}{0,900}\,\Delta FCF_t + \underset{[8,940]}{1,185}\,\Delta EX_t - \underset{[-7,350]}{1,065}\,\hat{u}_{t-1} \qquad (3.8)$$
$$R^2 = 0,817 \quad d = 1,951$$

As it's seen from the long – run equilibrium regressions (3.2), (3.3), (3.3) in Estonia and Lithuania gross fixed capital formation has bigger effect on import than in Latvia. In Estonia and Lithuania rise of fixed capital formation by 1 % of GDP extend import for 0,9 % of GDP but in Latvia for up to 0,7%.

Regressions (3.6), (3.7), (3.8) shows that in Estonia and Lithuania one unit deviation from long – run import level in previous period will be eliminated at present period. In Latvia 80 per cent of deviation from long – run import level in previous period will be eliminated at present period.

Besides, in Lithuania short - run changes in fixed capital formation level are faster reflected in the import level than in Estonia for 1,5 times; but compare to Latvia for 2 times. Equally, in Lithuania short – run changes in export level are faster reflected in the import level than in Estonia for 1,4 times; and compare to Latvia for 1,8 times.

As stated above, in Lithuania sectors of industry and agriculture are more important than in Estonia and Lithuania. To keep competitive capacity of industry and agriculture there is necessary to renew particular machinery and equipment, vehicles, dwelling and other buildings; therefore Lithuania have a higher acquisition of foreign goods in fixed capital formation than Estonia and Latvia. As Lithuania less than Estonia and even less than Latvia are services – guided, then short – run changes of export are quickly reflected in import level.

Summary and Conclusions

In this paper is made comparative analysis of production structure in Latvia, Lithuania and Estonia using analysis of main GDP aggregates and by contribution to GVA by sectors of economical activity.

The error correction method is used to estimate fixed capital formation effect on import in short – run.

The analysis shows that in Estonia country savings level is higher than in Lithuania and Latvia. It shows that Estonia has bigger possibility to invest into domestic production or to buy foreign assets than two other countries. Some differences arise as some economical activity is more important in some countries. For example, the contribution to value added from agriculture and industry is larger in Lithuania relative to Estonia and Latvia; the contribution to value added from services is larger in Latvia relative to Estonia and Lithuania.

The economically active enterprise breakdown by main kind of economical activity is similar for all three countries. The main reason for industry and services comparatively larger contribution to value added in Lithuania, it is a higher fixed capital formation relationship to import in short - run. This shows that import more than in Estonia and Latvia is used to renew particular machinery and equipment, vehicles, dwelling and other buildings and so to keep higher competitive capacity of industry and agriculture.

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Appendix 1a

The Augmented Dickey – Fuller (ADF) Tests for Latvia's time series

Null Hypothesis: D(FCF) has a unit root
Exogenous: None
Lag Length: 2 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.02093	0.0000
Test critical values:	1% level	-2.639210	
	5% level	-1.951687	
	10% level	-1.610579	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FCF,2)
Method: Least Squares
Sample (adjusted): 1996Q1 2003Q4
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FCF(-1))	-3.384911	0.281585	-12.02093	0.0000
D(FCF(-1),2)	1.564809	0.203972	7.671689	0.0000
D(FCF(-2),2)	0.777865	0.115047	6.761253	0.0000

R-squared	0.895291	Mean dependent var	0.076696
Adjusted R-squared	0.888070	S.D. dependent var	11.35754
S.E. of regression	3.799770	Akaike info criterion	5.596818
Sum squared resid	418.7094	Schwarz criterion	5.734231
Log likelihood	-86.54909	Durbin-Watson stat	1.487648

Null Hypothesis: D(EX) has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.049122	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX,2)
Method: Least Squares
Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EX(-1))	-1.067847	0.176529	-6.049122	0.0000

R-squared	0.525726	Mean dependent var	-0.064706
Adjusted R-squared	0.525726	S.D. dependent var	5.042960
S.E. of regression	3.472962	Akaike info criterion	5.356863
Sum squared resid	398.0284	Schwarz criterion	5.401756
Log likelihood	-90.06668	Durbin-Watson stat	2.020466

Null Hypothesis: D(IM) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.486692	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IM,2)
Method: Least Squares
Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IM(-1))	-1.360046	0.160256	-8.486692	0.0000

R-squared	0.685774	Mean dependent var	0.044118
Adjusted R-squared	0.685774	S.D. dependent var	7.286692
S.E. of regression	4.084618	Akaike info criterion	5.681304
Sum squared resid	550.5753	Schwarz criterion	5.726197
Log likelihood	-95.58217	Durbin-Watson stat	1.964186

Appendix 1b

The Augmented Dickey – Fuller (ADF) Tests for Estonia's time series

Null Hypothesis: D(FCF) has a unit root
Exogenous: None
Lag Length: 3 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.683852	0.0090
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FCF,2)
Method: Least Squares
Sample (adjusted): 1996Q2 2003Q4
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FCF(-1))	-1.592153	0.593234	-2.683852	0.0123
D(FCF(-1),2)	0.234555	0.470202	0.498839	0.6219
D(FCF(-2),2)	-0.204408	0.325549	-0.627887	0.5354
D(FCF(-3),2)	-0.410080	0.187096	-2.191813	0.0372

R-squared	0.793234	Mean dependent var	0.011950
Adjusted R-squared	0.770260	S.D. dependent var	4.369930
S.E. of regression	2.094561	Akaike info criterion	4.436479
Sum squared resid	118.4540	Schwarz criterion	4.621509
Log likelihood	-64.76542	Durbin-Watson stat	2.080808

Null Hypothesis: D(IM) has a unit root
Exogenous: None
Lag Length: 4 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.557714	0.0009
Test critical values:	1% level	-2.644302	
	5% level	-1.952473	
	10% level	-1.610211	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IM,2)
Method: Least Squares
Sample (adjusted): 1996Q3 2003Q4
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IM(-1))	-1.470200	0.413243	-3.557714	0.0015
D(IM(-1),2)	0.716201	0.382652	1.871678	0.0730
D(IM(-2),2)	0.368045	0.302916	1.215006	0.2357
D(IM(-3),2)	0.101491	0.222425	0.456291	0.6521
D(IM(-4),2)	0.550627	0.160181	3.437522	0.0021

R-squared	0.826050	Mean dependent var	0.491533
Adjusted R-squared	0.798218	S.D. dependent var	11.85550
S.E. of regression	5.325509	Akaike info criterion	6.333906
Sum squared resid	709.0262	Schwarz criterion	6.567438
Log likelihood	-90.00858	Durbin-Watson stat	2.214573

Null Hypothesis: D(EX) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.664469	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX,2)
Method: Least Squares
Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EX(-1))	-0.983994	0.173713	-5.664469	0.0000

R-squared	0.492192	Mean dependent var	0.297546
Adjusted R-squared	0.492192	S.D. dependent var	7.658177
S.E. of regression	5.457269	Akaike info criterion	6.260745
Sum squared resid	982.7989	Schwarz criterion	6.305638
Log likelihood	-105.4327	Durbin-Watson stat	1.862778

Appendix 1c

The Augmented Dickey – Fuller (ADF) Tests for Lithuania's time series

Null Hypothesis: D(FCF) has a unit root
Exogenous: None
Lag Length: 3 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.040224	0.0036
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FCF,2)
Method: Least Squares
Sample (adjusted): 1996Q2 2003Q4
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FCF(-1))	-2.063073	0.678593	-3.040224	0.0052
D(FCF(-1),2)	0.513612	0.526491	0.975538	0.3380
D(FCF(-2),2)	-0.002154	0.361476	-0.005959	0.9953
D(FCF(-3),2)	-0.410867	0.180347	-2.278202	0.0308

R-squared	0.922532	Mean dependent var	0.231884
Adjusted R-squared	0.913924	S.D. dependent var	7.101223
S.E. of regression	2.083401	Akaike info criterion	4.425795
Sum squared resid	117.1952	Schwarz criterion	4.610826
Log likelihood	-64.59982	Durbin-Watson stat	2.045324

Null Hypothesis: D(EX) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.463233	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EX,2)
Method: Least Squares
Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EX(-1))	-1.255835	0.168270	-7.463233	0.0000

R-squared	0.627958	Mean dependent var	-0.007230
Adjusted R-squared	0.627958	S.D. dependent var	6.635623
S.E. of regression	4.047413	Akaike info criterion	5.663003
Sum squared resid	540.5911	Schwarz criterion	5.707896
Log likelihood	-95.27106	Durbin-Watson stat	2.033484

Null Hypothesis: D(IM) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.366055	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IM,2)
Method: Least Squares
Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IM(-1))	-1.336894	0.159800	-8.366055	0.0000

R-squared	0.678973	Mean dependent var	0.448658
Adjusted R-squared	0.678973	S.D. dependent var	10.43391
S.E. of regression	5.911776	Akaike info criterion	6.420740
Sum squared resid	1153.320	Schwarz criterion	6.465633
Log likelihood	-108.1526	Durbin-Watson stat	2.241504

Appendix 2

Testing for Cointegration - the Johansen Method

Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: EX FCF IM
Lags interval (in first differences): 1 to 1

Latvia

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.595576	55.34334	42.91525	0.0019
At most 1	0.369639	24.56346	25.87211	0.0721
At most 2	0.229714	8.873756	12.51798	0.1883

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.595576	30.77988	25.82321	0.0102
At most 1	0.369639	15.68970	19.38704	0.1590
At most 2	0.229714	8.873756	12.51798	0.1883

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Estonia

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.652491	55.23525	42.91525	0.0019
At most 1	0.380242	19.29844	25.87211	0.2635
At most 2	0.085314	3.031920	12.51798	0.8727

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.652491	35.93682	25.82321	0.0017
At most 1	0.380242	16.26652	19.38704	0.1342
At most 2	0.085314	3.031920	12.51798	0.8727

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Lithuania

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.860244	90.05074	42.91525	0.0000
At most 1	0.434322	23.14353	25.87211	0.1053
At most 2	0.105028	3.772720	12.51798	0.7747

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.860244	66.90721	25.82321	0.0000
At most 1	0.434322	19.37081	19.38704	0.0503
At most 2	0.105028	3.772720	12.51798	0.7747

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Appendix 3

The Unit Root Tests for Residuals of Regressions (1.1), (1.2), (1.3)

(1.1)

Null Hypothesis: D(U) has a unit root
Exogenous: None
Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.702203	0.0000
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(U,2)
Method: Least Squares
Sample (adjusted): 1995Q3 2003Q4
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(U(-1))	-1.430964	0.147489	-9.702203	0.0000

R-squared	0.740333	Mean dependent var	0.116665
Adjusted R-squared	0.740333	S.D. dependent var	6.168677
S.E. of regression	3.143405	Akaike info criterion	5.157461
Sum squared resid	326.0728	Schwarz criterion	5.202354
Log likelihood	-86.67683	Durbin-Watson stat	2.300602

(1.2)

Null Hypothesis: U has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.695181	0.0000
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(U)
Method: Least Squares
Sample (adjusted): 1995Q2 2003Q4
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
U(-1)	-0.974502	0.171110	-5.695181	0.0000

R-squared	0.488037	Mean dependent var	-0.096959
Adjusted R-squared	0.488037	S.D. dependent var	5.178210
S.E. of regression	3.705090	Akaike info criterion	5.485447
Sum squared resid	466.7414	Schwarz criterion	5.529886
Log likelihood	-94.99533	Durbin-Watson stat	1.973647

(1.3)

Null Hypothesis: U has a unit root
Exogenous: None
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.247180	0.0000
Test critical values:	1% level	-2.632688	
	5% level	-1.950687	
	10% level	-1.611059	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(U)
Method: Least Squares
Sample (adjusted): 1995Q2 2003Q4
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
U(-1)	-1.019873	0.140727	-7.247180	0.0000

R-squared	0.604570	Mean dependent var	-0.354819
Adjusted R-squared	0.604570	S.D. dependent var	4.546036
S.E. of regression	2.858693	Akaike info criterion	4.966761
Sum squared resid	277.8523	Schwarz criterion	5.011200
Log likelihood	-85.91832	Durbin-Watson stat	1.767034