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Fiscal policy and growth in new member states of the EU: a panel data analysis

MARTINA DALIĆ, PhD*

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Abstract

Fiscal policy can have positive effects on economic growth through changes in the structure of total expenditure, i.e. reductions in unproductive or current expenditure, lower taxes, and higher government investment – provided that it is offset by a decrease in unproductive expenditure. Such changes reduce the size of government, which positively affects output growth. Lower volatility of government investment expenditure is also growth-enhancing. However, the strongest growth effects are found for improvements in the fiscal balance, in particular if achieved by a reduction in the size of government expenditure. This suggests that a cautious fiscal policy stance may be the best way to improve growth.

Keywords: growth, productive expenditure, distortionary taxation, volatility, fiscal balance

1 INTRODUCTION

The purpose of this paper is to shed some light on the growth effects of fiscal policy in new member states (NMS) of the EU. These countries have been only occasionally included in the previous research due to the lack or low quality of data. However, over time more data have become available. As these countries have functioned within the same institutional and legal framework as advanced EU economies for several years now, there is a need to understand the effects of fiscal policy on their growth path. This paper endeavours to fill this gap by analysing the relationship between fiscal policy and growth on a balanced panel of NMS and Croatia over the period 1999-2010.

Our empirical approach is based on a consistent treatment of the government budget constraint in the context of static and dynamic panel data analyses. A comprehensive analysis of the growth effects of fiscal policy requires that both sides of the budget be considered. However, to prevent perfect co-linearity among fiscal variables, growth-neutral fiscal variables have to be omitted (Kneller et al., 1999). This strategy allows us to investigate how a particular change in fiscal policy affects growth, and thus to suggest specific changes in fiscal instruments that could enhance growth.

The paper also studies the growth effects of volatility in government investment. Dalić (2013) showed that government expenditure in NMS is generally pro-cyclical, with a particularly strong pro-cyclical behaviour found for capital expenditure. This raises the question whether the high volatility of government investment could produce its own growth effects over and above those resulting from a given level of investment expenditure. An empirical investigation of the growth effects of volatility in government investment is particularly interesting for NMS, where the average level of such investment is relatively high.

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The rest of the paper is organised as follows. Section two outlines key contributions to the literature on fiscal policy and growth. Section three discusses the data and estimation strategy. Section four presents baseline results of econometric analysis. Robustness analysis is presented in section five. Section six concludes.

2 LITERATURE REVIEW

In the recent literature, the relationship between fiscal policy and growth has been articulated, among other contributions, in endogenous growth models of Lucas (1988), Romer (1990) and Aghion and Howitt (1992). The implications of endogenous growth models for fiscal policy were also examined by Barro (1990), who discussed how fiscal policy could affect both the level of output and its steady state growth rate.

In particular, Barro (1990) postulated that the impact of fiscal policy on growth is derived from the flow of government services, and introduced a distinction between distortionary and non-distortionary taxation and productive and unproductive expenditure. He categorised as distortionary those taxes that affect the investment/saving decisions of private agents with respect to accumulation of physical and human capital. Non-distortionary taxes in his classification were those that do not affect these decisions.

Government expenditure is differentiated according to its contribution to private production and productivity of total private capital (Zagler and Dürnecker, 2003). Expenditure categories that affect the productivity of private capital and/or the stock of total capital, such as expenditure on education (Lucas, 1988), health (Bloom, Canning and Sevilla, 2001), public infrastructure (Barro, 1990; Aschauer, 1988), research and development (Romer, 1990) and enforcement of property rights (La Porta et al., 1996) are considered productive. Expenditure categories that do not affect the productivity of private capital or add to/subtract from the stock of total capital are considered unproductive. The classification of certain expenditure components as unproductive does not mean that they are unnecessary or wasteful, but rather that their potential welfare effects are too difficult to assess to be a focus of the growth analysis. At the same time, they need to be considered because the taxation required to finance them has growth implications.

More generally, public expenditure, whether productive or unproductive, uses resources and diverts them from potentially more efficient private uses. Productivity of public expenditure therefore also depends on the degree of its substitutability/complementarity with private expenditure (Irmen and Kuehnel, 2009). The overall impact of fiscal policy on growth is thus the net result of various positive and negative effects of fiscal policy instruments on productivity of overall capital and returns to human and physical capital (Zagler and Dürnecker, 2003).

The effect of individual public expenditure categories on growth cannot be assessed without consideration of the overall macroeconomic effects of fiscal policy and its implications for the sustainability of public finance. In the presence of Ricardian equivalence, fiscal expansion could leave overall output unchanged (Barro, 1979). At high levels of government debt, a permanent increase in government expenditure could even produce negative growth effects (Blanchard, 1990; Alesina et al., 2002; Alesina and Ardagna, 2009). Even in the absence of Ricardian equivalence, persistent fiscal deficits and high public debt could harm growth because deficits require the government to absorb additional resources from the private sector, which could have been used for the accumulation of private capital (Zagler and Dürnecker, 2003). Harmful effects of fiscal deficits and debt on growth could be further reinforced if government borrowing is used in order to finance less productive types of expenditure.

These hypotheses have been empirically tested and extended in several directions, using for instance different classifications of government revenue and expenditure, and different treatments of government budget constraints, i.e. different ways of accounting for the linear dependency among revenue, expenditure and the fiscal balance. Devarajan, Swaroop and Zou (1996) concluded that the productivity of different expenditure components may depend on their share in total expenditure, i.e. the productivity of the same expenditure component may differ depending on its relative size. Public investment is generally recognised as a productive determinant of growth (Aschauer, 1986; Easterly and Rebelo, 1993; Canning and Pedroni, 2004). However, there is also evidence of insignificant growth effects of public investment (Afonso and Furceri, 2008).

Kneller, Bleaney and Gemmell (1999) emphasized the need to include all fiscal policy variables in the analysis of growth effects of fiscal policy, so as to avoid the omitted variables bias. However, in order to avoid perfect co-linearity in such a case, variables with negligible growth effect should be excluded from regressions and treated as an implicit source of financing. Using this approach, Kneller, Bleaney and Gemmell (1999) showed that increases in productive expenditure have a positive effect on growth if achieved by non-distortionary taxes and cuts in unproductive expenditure. However, higher public investment has a negative effect on growth if the increase is financed with distortionary taxes. Bleaney, Gemmell and Kneller (2001) confirmed these results, and also found that government surpluses achieved through an increase in non-distortionary taxes and a reduction in unproductive expenditure have a positive impact on growth. Gemmell, Kneller and Sanz (2011) examined the robustness of previous results on the growth effects of fiscal policy on a sample of OECD countries, and again confirmed the negative growth effects of distortionary taxation and positive growth effects of productive expenditure.

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Some newer research highlighted the relationship between macroeconomic volatility as an important additional channel of fiscal policy influence on growth. Fatas and Mihov (2003) argued that the volatility of government expenditure was the main determinant of business cycle volatility, which in turn negatively affects growth (see Hnatovska and Loayza, 2004 and Aghion and Banerjee, 2005). Fatas and Mihov (2009) also provided evidence that the volatility of public expenditure had its own direct effects on growth, which are independent of the effects of output volatility on growth. Afonso and Furceri (2008) confirmed the harmful growth effects of volatility of total expenditure and investment expenditure for EU-15 countries.

In sum, the literature underlying the analysis carried out in this paper focuses on the effects of fiscal policy on private sector behaviour and the formation of human and physical capital. Fiscal policy affects economic growth through both the level and volatility of taxes and government expenditure. Moreover, the impact of fiscal policy on growth will depend on which taxes and expenditures are adjusted.

3 METHODOLOGY AND DATA

The relationship between fiscal policy instruments and growth is estimated by regressing the annual rate of real GDP growth on a set of conditioning non-fiscal variables and a set of fiscal explanatory variables. Therefore, the following growth equation is estimated (subscripts denote country *i* and year *t*).

$$g_{i,t} = \propto + \sum_{k=1}^{k} \beta_k Y_{ik,t} \sum_{j=1}^{m} \gamma_j X_{ij,t} + u_{i,t} \qquad (1)$$

Where:

- $g_{i,t}$ denotes the growth rate of real GDP for country *i* (i = 1..13) in year *t* (t = 1..12)
- $Y_{ik,t}$ is a matrix of *k* non-fiscal variables (k = 1..5) expressed in logarithms
- $X_{ij,t}$ is a matrix of *m* (m = 1..13) fiscal variables expressed in logarithms that also includes a variable measuring the volatility of government investment expenditure.

The choice of non-fiscal explanatory variables follows the standard approach in the literature: as proposed by Levine and Renelt (1992), we include initial GDP per capita (i.e. lagged GDP per capita), inflation, average growth rate of labour force, the share of investment in GDP, and openness (for definitions of variables see the appendix).

The expected sign of the coefficient on GDP per capita is negative: poorer economies normally grow faster than richer ones. Lagged inflation is also expected to have a negative coefficient: high inflation is bad for growth because it discourages investment in long-term projects (Barro, 2003). The growth rate of labour force and the share of investment in GDP directly affect the production function through

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supply of labour and physical capital; their coefficients should therefore be positive. Openness has an ambiguous effect on growth: a more open economy could grow faster than a less open economy if there is sufficient external demand. However, a more open economy is also more exposed to external shocks. The sign of the coefficient on openness therefore has to be determined empirically for the sample at hand.

The set of fiscal variables includes:

– a measure of volatility of government investment expenditure, defined by equation (2) and included with a lag of one year;
– variables describing the overall government activity, i.e. total revenue, total expenditure and fiscal balance;
– disaggregated components of revenue and expenditure.

All fiscal variables are measured as a share of GDP and expressed in logarithms; their scope is related to general government. For details, see the appendix.

Volatility of government investment expenditure is measured by squared deviations of the annual level of country's investment from the sample average:

$$VOL\_INV_{i,t} = (GOV\_INV_{i,t} - (\frac{1}{T} \sum_{t=1}^{T} GOV\_INV_{i,t}))^2 \qquad (2)$$

where $GOV\_INV_{i,t}$ represents the share of government investment expenditure in GDP in country i in year t. This measure of volatility does not discriminate between increases and decreases in the level of government investment; i.e. it only signals the intensity of a change regardless of its direction. We expect the coefficient on this variable to have a negative sign because changes in the level of government investment may increase uncertainty about the inputs the government provides for private production. Volatile public capital formation may also lead to wrong strategic positioning of private production and to suboptimal private production capacity that cannot be easily altered. Therefore we include this variable with a one-year lag.

As discussed above, to study the impact of fiscal policy on growth we need to distinguish between distortionary and non-distortionary taxes, and productive and unproductive expenditure. Table 1 provides the classification used in this paper. While all major taxes are distortionary in some respect, the distortions that are relevant for growth are taken to be those related to decisions on saving and investment. Therefore, taxes on income, profit and social contributions are classified as distortionary – they introduce tax wedge that can change the incentives to accumulate physical and human capital, which can in turn harm economic growth (Zagler and Dürnecker, 2003). Taxes on goods and services are considered non-distortionary – or rather, less distortionary for growth – because they do not

distort consumption-saving decisions at different dates (Bleaney, Gemmell and Kneller, 2001).

Table 1
Fiscal variables

	Fiscal variable included in regression equation	Revenue/expenditure category included in fiscal variable
Revenues	Distortionary taxes	Taxes on income, profit and property
		Social contributions
	Non-distortionary taxes	Taxes on domestic goods and services
		Taxes on international trade
	Other taxes	Non tax revenue and other taxes
Functional classification	Productive expenditure_health	Health expenditure
	Productive expenditure_education	Education expenditure
	Other productive expenditure	Expenditure on public order and safety
		Defence expenditure
		Expenditure on economic affairs
		Expenditure on environment protection
	Unproductive expenditure	Social security and welfare expenditure
		Expenditure on recreation
		Expenditure on housing
		Expenditure on general public services
Economic classification	Current expenditure	Compensation of employees
		Social benefits
		Subsidies
		Interest payments
		Other current and capital transfers
	Investment expenditure	Gross fixed capital formation

Distinguishing between productive and unproductive expenditure in the available statistics is more problematic than distinguishing between distortionary and non-distortionary taxes. The reason is that the underlying statistical principles of economic and functional classifications of expenditure are not guided by growth considerations. For instance, few would disagree that health and education expenditures are productive, i.e. have positive growth effects. But expenditure on economic affairs is composed of both productive expenditure items, e.g. spending on public transport and communication, and unproductive spending such as subsidies to loss-making public enterprises. These issues are recognised in the literature using the functional classification (see Kneller, Bleaney and Gemmell, 1999; Gemmell, Kneller and Sanz, 2011; Adam and Bevan, 2005), and have led some

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authors to use the economic classification of expenditure instead (Gupta et al., 2002; de Avila and Strauch, 2003; Afonso and Furceri, 2008).

The approach taken in this paper tries to circumvent, to the extent possible, some of these issues by using both classifications. Therefore, the regression equation (1) is first estimated for disaggregated expenditure variables based on the functional classification, and then for expenditure variables based on the economic classification. The results of these two approaches are complementary rather than mutually exclusive. For example, positive growth effects of government investment (derived from the economic classification) are not in contradiction with positive growth effects of spending on education (derived from the functional classification).

Expenditure on economic services is on balance considered productive because one of its largest components is expenditure on transport and communication, which normally has positive effect on growth (Easterly and Rebelo, 1993). Expenditure on defence and public order and safety is considered productive because it serves to maintain the rule of law and thus contributes to investor security and the stability of property rights, which are growth-enhancing (Barro, 1990).

Expenditure classified as unproductive includes social security and welfare, housing, recreation and public administration. Spending on these items does not directly affect private production and capital formation. One should note, however, that the quality and efficiency of public administration are reflected in the quality of institutions that are recognised as important determinants of growth in institutional economics (Acemoglu, 2012). Therefore, it is also possible to argue that expenditure on general public services should be considered productive. In order to address this issue, in the robustness analysis in section five we use an alternative classification that includes expenditure on general public services as productive.

When economic classification is used, total expenditure is grouped into current and investment expenditure. Investment expenditure is considered productive and current expenditure on balance unproductive because of the large weight of social security benefits, subsidies and interest payments. Regarding compensation of employees, the same caveat holds as with functional expenditure on general public services; however, we did not test for this case separately in the robustness analysis.

The estimation strategy follows Kneller, Bleaney and Gemmell (1999) and Bleaney, Gemmell and Kneller (2001). They pointed out that the results of regressions examining the relationship between fiscal policy and growth depend on how one treats the budget constraint. If the set of fiscal variables includes all the elements of the budget, i.e. government revenue, expenditure and the fiscal balance, then

they sum up to zero and perfect co-linearity is present. To avoid the problem of perfect co-linearity, at least one fiscal variable entering the budget constraint should be omitted. This variable then represents the implicit source of financing of a unit change in the relevant fiscal variables that are included in the regression. Kneller, Bleaney and Gemmell (1999) showed that the size of coefficients on fiscal variables included in the regression changes depending on the omitted fiscal variable. In other words, the effect of a particular fiscal policy instrument on growth may change depending on the way it is financed.

Kneller, Bleaney and Gemmell (1999) suggested that the omitted variables should be those that theory suggests do not affect the production function. Good candidates for omitted variables are thus unproductive expenditure, non-distortionary taxes, and the two taken together. Furthermore, if these variables are really growth-neutral, their coefficients should be insignificant when included in regressions. Adam and Bevan (2005) cautioned that country heterogeneity made it difficult to identify any revenue or expenditure category as growth-neutral across all countries. Therefore, coefficient estimates in this type of regression should be interpreted as measuring the effect of a particular fiscal variable net of the effect of omitted fiscal variables. Gemmell (2001) further noted that even where all government expenditure was productive, any increase in taxes from an already high ratio of taxes or expenditure to GDP could generate negative growth effects.

In this paper, we compiled data for a balanced panel of ten new EU member states and Croatia over the period 1999-2010. These countries were only occasionally considered in previous research due to either the non-existence or the low quality of data, especially in view of the structural breaks and rapid changes these countries went through in the 1990s. We chose 1999 as the initial year in the sample because most countries began their EU accession talks at the time, which gradually led to an improvement in the quality of data. Croatia is included in the sample because it completed the alignment with EU standards through 2010. The sources of data are the Eurostat data base, the WDI data base (for some control variables) and national sources for Croatia.

4 EMPIRICAL RESULTS

4.1 DESCRIPTIVE STATISTICS AND BIVARIATE ANALYSIS

The descriptive statistics for regression variables are presented in table 2. They confirm the large variability of data across the sample. The sample average growth rate amounted to 3.4%, and the average share of total expenditure in GDP to 41.6%. The sample average government balance was a deficit of 3.4% of GDP. All countries in the sample had on average higher unproductive than productive expenditure, and higher distortionary than non-distortionary taxes.

TABLE 2
Descriptive statistics

	Average	Standard deviation	Maximum/ country		Minimum/ country	
Growth rate of output	3.4	4.5	11.5	Latvia (2006)	-17.7	Latvia (2009)
GDP per capita, cons. EUR	6,812.2	3,866.1	16,740.8	Cyprus (2008)	1,612.9	Bulgaria (1999)
Investment ratio, % of GDP	23.5	4.3	34.9	Estonia (2006)	14.2	Malta (2000)
Openness, % of GDP	117.2	32.0	194.8	Malta (2000)	53.2	Romania (2010)
Inflation, ch	5.1	6.2	45.8	Romania (1999)	-1.1	Lithuania (2003)
Labour force growth, in %	-0.06	1.48	4.3	Slovenia (2004)	-8.8	Romania (2002)
Total revenue, % of GDP	38.2	3.7	46.9	Hungary (2010)	31.7	Lithuania (2004)
Total expenditure, % of GDP	41.6	4.8	52.2	Hungary (2006)	33.0	Lithuania (2003)
Fiscal balance, % of GDP	-3.4	2.8	3.4	Cyprus (2007)	-12.3	Slovakia (2000)
Distortionary taxes, % of GDP	20.3	2.7	25.8	Cyprus (2007)	13.2	Bulgaria (2010)
Non-distortionary taxes, % of GDP	13.6	2.2	18.6	Croatia (2000)	10.1	Slovakia (2010)
Other revenue, % of GDP	5.1	1.2	10.4	Bulgaria (1999)	3.2	Romania (2000)
Productive exp._ education, % of GDP	5.2	1.1	7.5	Cyprus (2010)	3.3	Croatia (2006)
Productive expenditure_ health, % of GDP	5.0	1.3	7.8	Czech R. (2010)	2.5	Bulgaria (2001)
Other productive expenditure, % of GDP	9.7	1.8	17.4	Slovakia (2000)	6.4	Poland (2000)
Unproductive expenditure, % of GDP	21.6	3.9	31.6	Hungary (2009)	14.6	Estonia (2006)
Government investment, % of GDP	3.6	1.1	6.8	Czech R. (2003)	1.1	Latvia (2001)
Current expenditure, % of GDP	36.5	4.4	47.0	Hungary (2009)	27.8	Estonia (2007)
Variability of government investment	0.87	1.30	0.0	Hungary (2004)	7.1	Romania (1999)

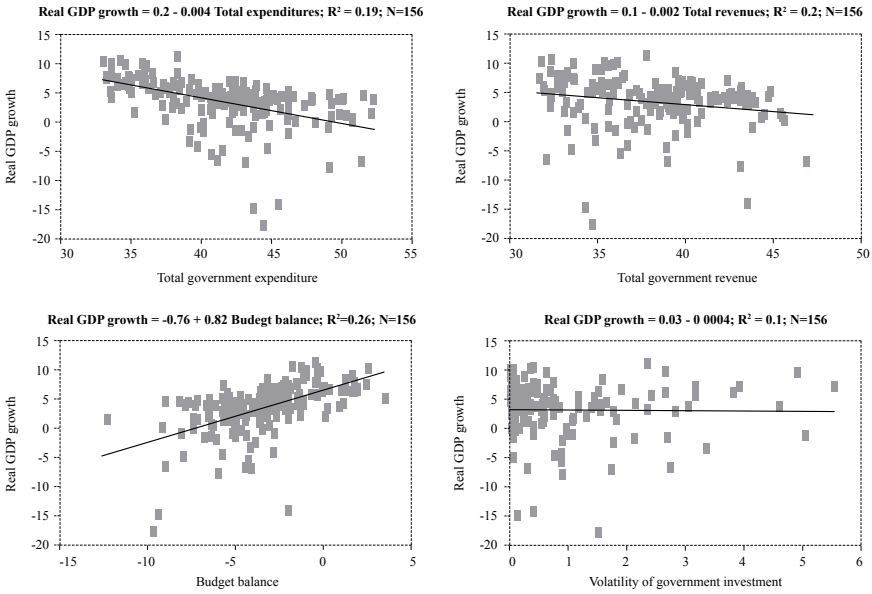
Table 3 presents bivariate correlations between regression variables. Improvements in fiscal balance (i.e. higher surpluses or lower deficits) are strongly and positively correlated with real GDP growth, while total government revenue and expenditure, as well as some of their disaggregated components, are negatively correlated with growth. As expected, different revenue and expenditure components are highly correlated with each other, highlighting the importance of the estimation strategy that avoids perfect multi co-linearity among fiscal variables.

The preliminary findings from bivariate simple regressions are reported in graph 1. The top left-hand panel shows a negative relationship between government size and growth. The bottom left-hand panel shows a positive relationship between improvements in fiscal balance and growth. The right-hand panels indicate nega-

tive correlation between the level of total revenue and growth (top) and the volatility of government investment and growth (bottom).

GRAPH 1

Overall government activity and growth



Source: Author's calculation.

4.2 BASELINE REGRESSIONS

Equation (1) was estimated using two-way fixed effects OLS estimator with the correction for first-order serial correlation in the error term. The Hausman test of significance of fixed versus random effects confirmed that it was appropriate to use the fixed effects estimator. The likelihood ratio test for the significance of fixed effects indicated the importance of both cross-section and time effects, which led us to use the two-way fixed effects estimator.

Column (2) in table 4 reports the baseline results for non-fiscal variables and the volatility of government investment. Columns (3) to (5) show the estimates with different aggregate fiscal variables.

TABLE 3

Bivariate correlations

Variables expressed as percent of GDP, unless stated otherwise

	Real GDP growth	GDP per capita, EUR	Invest-ments	Open-ness	Inflation rate	Labor force growth	Fiscal balance	Total expendi-tures	Total revenues	Expendi-ture on educa-tion	Expendi-ture on health	Other prod. expendi-ture	Unpro-ductive expendi-ture	Distor-tionary taxes	Non-distortio-nary taxes	Govern-ment invest-ment	Cur-rent expen-diture	Variabi-lity of gov. invest-ment
Real GDP growth, in %	1.00																	
GDP per capita, EUR	-0.08	1.00																
Investments	0.29***	-0.17**	1.00															
Openness	0.10	0.23***	0.15*	1.00														
Inflation rate	0.07	-0.05	-0.02	-0.35***	1.00													
Labour force growth, in %	0.06	0.19**	0.21***	0.18**	0.03	1.00												
Fiscal balance	0.52***	-0.05	0.34***	0.05	0.09	0.05	1.00											
Total expenditures	-0.44***	0.31***	-0.26***	0.08	-0.06	0.07	-0.63***	1.00										
Total revenues	-0.17**	0.36***	-0.08	0.14	-0.01	0.13	-0.05	0.80***	1.00									
Exp. on education	-0.13	0.51***	-0.10	0.14	0.10	0.11	0.02	0.14*	0.20**	1.00								
Exp. on health	-0.19**	0.14*	0.11	0.36***	-0.23***	0.01	-0.28***	0.46***	0.38***	-0.10	1.00							
Other prod. expend.	-0.20**	-0.19**	0.21***	0.08	-0.34***	0.05	-0.37***	0.33***	0.14*	-0.46***	0.27**	1.00						
Unproductive exp.	-0.34***	0.28***	-0.44***	-0.09	0.14*	0.03	-0.52***	0.88***	0.74***	0.14*	0.15*	0.00	1.00					
Distortionary taxes	-0.13	0.34***	0.03	0.34***	-0.02	0.02	-0.24*	0.64***	0.65***	0.23***	0.55***	0.16**	0.48***	1.00				
Non-distort. taxes	-0.03	0.24***	-0.13*	-0.09	-0.03	0.15	0.13	0.43***	0.66***	-0.01	0.00	-0.04	0.54***	-0.05	1.00			
Government invest.	-0.09	0.00	0.34***	0.00	-0.03	0.17*	-0.05	0.09	0.08	0.10	0.03	0.34***	-0.09	0.00	-0.02	1.00		
Current expenditure	-0.42***	0.31***	-0.34***	0.08	-0.05	0.03	-0.62***	0.98***	0.78***	0.12	0.46***	0.26***	0.90***	0.64***	0.44***	-0.13	1.00	
Variability of gov. inv.	-0.02	-0.23***	0.18**	-0.29***	0.05	0.11	-0.11	-0.10	-0.22**	-0.13	-0.12	0.21***	-0.15*	-0.16**	-0.19**	0.18	-0.14	1.00

** significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.*

Source: Author's calculation.

TABLE 4

Growth effects of overall government activity
Estimation method: OLS two-way fixed effects
Dependent variable: real output growth rate

		Omitted fiscal variable		
	Baseline	**Fiscal balance**	**Total revenue**	**Total expenditure**
1	**2**	**3**	**4**	**5**
GDP per capita, lagged	-0.166***	-0.149***	-0.154***	-0.155***
	(0.039)	(0.037)	(0.036)	(0.037)
Investments	0.105***	0.082***	0.082***	0.085***
	(0.035)	(0.024)	(0.024)	(0.024)
Labour force growth	0.149	0.190**	0.193**	0.197**
	(0.167)	(0.090)	(0.092)	(0.092)
Openness	0.118***	0.063**	0.063	0.064**
	(0.033)	(0.029)	(0.029)	(0.028)
Inflation, lagged	-0.073***	-0.123***	-0.121***	-0.121***
	(0.053)	(0.037)	(0.037)	(0.037)
Total expenditure		-0.217***	-0.210***	
		(0.073)	(0.059)	
Total revenue		-0.011		-0.189***
		(0.101)		(0.054)
Fiscal balance[1]			-0.003	0.465***
			(0.241)	(0.164)
Volatility of investment expenditure, lagged	-0.0029***	-0.0027***	-0.0027**	-0.0027***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
$R^{2\sim}$	0.745	0.825	0.825	0.822
Number of observations	156	156	156	156

*Note: ***, ** and * indicate that the variable is significant at 1%, 5% and 10% respectively. Robust standard errors in parentheses.*
[1]Fiscal balance is defined as (1 + fiscal balance/100); an increase denotes an improvements in fiscal balance, i.e. a reduction of the deficit or an increase of the surplus.
Likelihood ratio test for joint significance of cross section and period fixed effect: p-value $\chi^2(229.7;23) = 0.000$.
Hausman test for the significance of random vs. fixed effect: p-value χ^2 (193.5;8)= 0.000.

All of the non-fiscal variables have the expected sign and most are highly significant. Inflation and labour force growth gain in statistical significance with the inclusion of fiscal variables. The coefficient on lagged volatility of government investment expenditure, although small in size, is negative and statistically significant in all regressions presented. A 1% increase in the volatility of government investment expenditure reduces the GDP growth rate in the sample on average by 0.003 percentage points. This result is in line with Afonso and Furceri (2008), who found negative growth effects of government investment volatility in advanced EU economies.

If fiscal balance is omitted and assumed to adjust freely to changes in government revenue and expenditure (column 3) the coefficient on total expenditure is negative and significant, while the coefficient on overall taxes is statistically insignifi-

cant. Negative growth effects of government spending are further confirmed if revenue is omitted from the regression (column 4): a 1% increase in total expenditure reduces the growth rate of real GDP by 0.21 percentage points. Column (5) shows that a 1% increase in total revenue reduces the real growth rate by a similar amount (0.19 percentage points). The coefficient on fiscal balance became positive and significant in this regression, indicating that an improvement in fiscal balance might be growth-enhancing if achieved through a reduction in government expenditure.

The negative relationship between growth and total expenditure (which measures the size of the government) indicates that any positive contribution of productive spending may be on balance offset by the negative contribution of the overall government size.

Table 5 presents the results for disaggregated revenue and expenditure components. Coefficients for non-fiscal variables are not reported because they maintain their sign and significance. Regression results for fiscal variables based on functional classification are reported in columns (2) to (4), while columns (5) to (7) report the results for economic classification of expenditure. When functional classification is used, the estimation strategy requires us to omit expenditure items suggested by theory to have negligible growth effects. Therefore non-distortionary taxes, unproductive expenditure, and both of these items combined are omitted and assumed to be the variables that adjust in response to changes in fiscal variables included in regressions. When economic classification is used, non-distortionary taxes, current expenditures, and the two combined are omitted.

The coefficient on volatility of government investment maintains its size and significance in regressions in table 5. The disaggregated approach confirms that the volatility of investment expenditure has its own negative growth effects, over and above those implied by the level and structure of spending.

We find no evidence of growth-enhancing effects of productive expenditure (columns 2 to 4). This result contradicts theoretical predictions, in particular with respect to education and health spending. However, this does not mean that these expenditure components are irrelevant for growth in these countries: the sample is composed of upper middle-income economies, for which the structure and efficiency rather than the level of such spending might be important for growth. Aghion and Durlauf (2009), for example, pointed out the importance of higher education for counties approaching the technology frontier. In order words, the growth-enhancing effects could be hidden in the composition of these expenditure components or in their efficiency. Uncovering these effects would require further investigation, which is for the time being constrained by data availability.

TABLE 5

Growth effects of expenditure and taxation components
Estimation method: OLS two-way fixed effects
Dependent variable: real output growth rate

Omitted fiscal variable	Functional classification of expenditure			Economic classification of expenditure		
	Non-distortionary taxes	Unproductive expenditure	Non-dist. tax. and unprod. exp.	Non-distortionary taxes	Current expenditure	Non-dist. tax. and current exp.
1	2	3	4	5	6	7
Distortionary taxes	0.052	-0.089**	-0.071	-0.042	-0.115***	-0.109**
	(0.053)	(0.038)	(0.052)	(0.057)	(0.040)	(0.049)
Non-distortionary taxes	–	-0.100**	–	–	-0.104***	–
		(0.044)			(0.034)	
Other revenue	0.024	-0.006	0.006	0.016	0.017	0.019
	(0.012)	(0.011)	(0.013)	(0.011)	(0.012)	(0.015)
Productive expenditure_health	-0.021	0.009	-0.008			
	(0.018)	(0.019)	(0.019)			
Productive expenditure_ education	0.002	0.032	0.013			
	(0.037)	(0.045)	(0.051)			
Other productive expenditure	-0.086***	-0.012	-0.036**			
	(0.019)	(0.018)	(0.015)			
Unproductive expenditure	-0.170***	–	–			
	(0.052)					
Fiscal balance[1]	-0.193	0.519***	0.360**	-0.168	0.601***	0.522***
	(0.262)	(0.167)	(0.171)	(0.270)	(0.159)	(0.177)
Current expenditure				-0.322***	–	–
				(0.075)		
Investment expenditure				-0.002	0.019**	0.013
				(0.011)	(0.009)	(0.008)
Volatility of investment exp., lagged	-0.0027*	-0.0026***	-0.0029***	-0.0022***	-0.0022***	-0.0026***
	(0.0006)	(0.0007)	(0.0006)	(0.0008)	(0.0007)	(0.0005)
$R^{2\sim}$	0.832	0.818	0.798	0.840	0.823	0.800
Number of observations	156	156	156	156	156	156

*Note: ***, ** and * indicate that the variable is significant at 1%, 5% and 10% respectively. Robust standard errors in parentheses.*
[1] Fiscal balance is defined as: (1+fiscal deficit (surplus)/100) because of which increase in fiscal balance means improvements in fiscal balance, i.e. reduction in deficit.
Likelihood ratio test for joint significance of cross section and period fixed effect: p-value $\chi^2(229.7;23) = 0.000$.
Hausman test for the significance of fixed effect: p-value $\chi^2(167.6;12) = 0.000$.

Moreover, the coefficient for other productive expenditures is negative if non-distortionary taxation is used as a source of financing (columns 2 and 4). This suggests that higher taxes are bad for growth even if they are used to finance productive expenditure. One should note, however, that "other productive" expenditure includes unproductive items such as subsidies together with productive spen-

ding on communication and transportation infrastructure. These statistical weaknesses of functional classification can affect the results; therefore, we also need to consider the economic classification of expenditure.

The coefficient on fiscal balance is highly significant and positive if implicit financing is not exclusively based on taxation (columns 3 and 4). When the balance improves by 1 percentage point as a result of lower unproductive expenditure, real GDP growth improves by as much as 0.52% percentage points. When the fiscal balance improves as a result of changes in both non-distortionary taxes and unproductive expenditure; the growth rate increases by 0.36 percentage points. However, if only non-distortionary taxes are used to reduce the deficit, the coefficient on fiscal balance is insignificant. These results suggest that to reduce fiscal deficits is the most effective way to boost economic growth. Positive growth effects of improvements in the fiscal balance are also found by Kneller, Bleaney and Gemmell (1999), Gupta et al. (2002), and Gemmell, Kneller and Sanz (2011).

Columns (5) to (7) present the results for expenditure variables based on the economic classification. The coefficient on government investment is positive and statistically significant if current expenditure is omitted from the regression. This suggests that an increase in government investment offset by a decrease in unproductive expenditure, which is the largest component of current expenditure, raises the growth rate of output. On the other hand, if the increase in investment is financed with non-distortionary taxes, then higher government investment has a negligible impact on growth. Even when positive, the coefficient on investment expenditure is small and often lower than that on fiscal balance. In other words, improvement of the fiscal balance is much more beneficial for growth than an increase in government investment.

Finally, an increase in current expenditure has negative growth effects, complementing to some extent the results presented in column (2). A 1% increase in current expenditure financed by higher non-distortionary taxes reduces the growth rate of real GDP by 0.32 percentage points (column 5).

These results point to a more general conclusion that fiscal policy can have positive effects on economic growth through changes in the structure of total expenditure, i.e. reductions in unproductive or current expenditure can trigger positive growth effects of higher government investment of lower taxes. Such changes reduce the size of government, which positively affects output growth. Lower volatility of government investment expenditure is also growth-enhancing. However, the strongest growth effects are found for improvements in the fiscal balance, in particular if achieved by a reduction of the size of government expenditure. This suggests that a cautious fiscal policy stance may be the best way to improve growth.

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5 ROBUSTNESS ANALYSIS

5.1 ENDOGENEITY OF FISCAL VARIABLES

A common theme in the literature on fiscal policy and growth is reverse causality between fiscal variables and economic growth. A certain degree of reverse causality can also exist between growth and investment. If economic growth affects the right-hand side variables in a regression, then parameter estimates are biased and inconsistent. Although endogeneity of fiscal variables may be a smaller problem in regressions using disaggregated fiscal variables, it is nevertheless an issue that needs to be investigated. To address this issue, we used the dynamic specification and estimator proposed by Arellano and Bond (1991), i.e. the first-differenced GMM estimator.

In particular, we re-estimated the models discussed above as dynamic models using the Arellano-Bond estimator that relies on first-differencing in order to eliminate country unobserved effects, and on lagged levels of endogenous variables as instruments. The estimates also included time dummies. The validity of instruments was checked with the Sargan test of overidentifying restrictions.[1]

The GMM estimates of the dynamic model with aggregate fiscal variables are presented in table 6.

The results confirm the findings of the fixed effects models presented in table 4. The control variables remain significant, although the lagged growth rate is not significant.

The significance of coefficients on fiscal variables remains unchanged, confirming the negative growth effect of government size, and the positive growth effects of stronger fiscal balance. The negative growth effect of the volatility of government investment is also confirmed.

Table 7 presents the results of dynamic models for disaggregated fiscal variables. The results broadly confirm the findings of fixed effects models for expenditure variables and fiscal balance. Stronger fiscal balances achieved through expenditure cuts are again found to have a positive and significant impact on growth. As with the fixed effect models in table 5, we do not find positive growth effects of increases in productive expenditure. The growth effects of higher productive expenditure are again negative if the increase is associated with higher taxes, and insignificant if the increase is associated with lower unproductive spending.

[1] We also ran several panel unit root tests. The Levin, Lee and Chun test and the Hadri test, which assume a common unit root process across the all cross-section units, reject the presence of unit root for all of the tested series with the level of significance of at least 5%. The Im, Persan and Shin test and the Fisher tests, which assume individual unit root processes across the cross-section units, indicate the potential presence of unit roots in data for unproductive expenditure and expenditure on health and government investment. However, these tests are less reliable because of the short time dimension of the panel.

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TABLE 6

Growth effects of overall fiscal activity, controlling for reverse causality

Estimation method: first-differenced GMM

Dependent variable: real output growth rate

		Omitted fiscal variable		
	Baseline	**Fiscal balance**	**Total revenue**	**Total expenditure**
1	**2**	**3**	**4**	**5**
Growth rate, lagged	0.254	-0.226	-0.257	-0.196
	(0.189)	(0.162)	(0.164)	(0.164)
Investments	0.094**	0.117***	0.124***	0.122***
	(0.037)	(0.041)	(0.041)	(0.041)
Labour force growth	0.213	0.287**	0.284**	0.294**
	(0.140)	(0.131)	(0.125)	(0.090)
Openness	0.212**	0.148***	0.148***	0.152***
	(0.075)	(0.025)	(0.025)	(0.025)
Inflation, lagged	-0.375	-0.433*	-0.429*	-0.445*
	(0.269)	(0.225)	(0.219)	(0.231)
Total expenditure		-0.33***	-0.401***	
		(0.106)	(0.116)	
Total revenue		-0.037		-0.348***
		(0.140)		(0.106)
Fiscal balance[1]			-0.155	0.719***
			(0.348)	(0.244)
Volatility of capital exp, lagged	-0.0088***	-0.0033**	-0.0032**	-0.0034**
	(0.0021)	(0.0015)	(0.0015)	(0.0014)
Number of observations	143	129	129	129
Sargan test, χ^2 p-value	0.33	0.21	0.31	0.22
Instrument set	Investment, lag 2-3	Investment, fiscal variables lag 2-4	Investment, fiscal variables lag 2-4	Investment, fiscal variables lag 2-4

*Note: ***, ** and * indicate that the variable is significant at 1%, 5% and 10% respectively. Robust standard errors in parentheses.*

[1] Fiscal balance is defined as (1 + fiscal balance/100) because of which increase in the variable of fiscal balance means improvements in fiscal balance, i.e. reduction in deficit.

On the other hand, a small positive growth effect of an increase in government investment achieved by a reduction in current expenditure, which was found in the fixed effects model, disappears in the dynamic model (column 6). Furthermore, the dynamic model does not confirm the positive growth effect of a decrease in distortionary taxes accompanied by a reduction in unproductive expenditure. The negative growth effect of volatility in government investment is confirmed.

TABLE 7

Growth effects of disaggregated components, controlling for reverse causality

Estimation method: first-differenced GMM

Dependent variable: real output growth rate

Omitted fiscal variable	Functional classification of expenditure			Economic classification of expenditure		
	Non-distortionary taxes	Unproductive expenditure	Non-dist. tax. and unprod. expen.	Non-distortionary taxes	Current expenditure	Non-dist. tax. and current exp.
1	2	3	4	5	6	7
Growth rate, lagged	-0.189	-0.131	-0.094	-0.176	-0.058	0.007
	(0.175)	(0.141)	(0.166)	(0.160)	(0.139)	(0.140)
Investments	0.135**	0.133**	0.127**	0.085*	0.107**	0.098**
	(0.061)	(0.057)	(0.064)	(0.043)	(0.042)	(0.039)
Labour force growth	0.278***	0.314**	0.240**	0.366***	0.258**	0.211
	(0.117)	(0.081)	(0.104)	(0.107)	(0.105)	(0.137)
Openness	0.143***	0.096***	0.135***	0.140***	0.158***	0.171***
	(0.036)	(0.038)	(0.041)	(0.033)	(0.025)	(0.032)
Inflation, lagged	-0.399***	-0.289***	-0.305**	-0.448**	-0.288*	-0.306
	(0.134)	(0.105)	(0.145)	(0.222)	(0.167)	(0.211)
Distortionary taxes	0.199	-0.006	0.064	0.121	-0.037	-0.131
	(0.126)	(0.077)	(0.107)	(0.152)	(0.102)	(0.050)
Non-distortionary taxes	–	-0.109	–	–	-0.070	–
		(0.070)			(0.056)	
Other revenues	0.025	-0.024	-0.055	0.049	-0.030	-0.039
	(0.024)	(0.017)	(0.027)	(0.046)	(0.025)	(0.018)
Expenditure on health	-0.082***	-0.006	-0.009			
	(0.029)	0.044	0.043			
Expenditure on education	-0.077	0.030	0.008			
	(0.060)	(0.076)	(0.076)			
Other productive expenditure	-0.196***	-0.064	-0.074*			
	(0.073)	(0.047)	(0.041)			
Unproductive expenditure	-0.193**	–	–			
	(0.084)					
Fiscal balance[1]	-0.535	0.697*	0.441*	-0.606	0.679**	0.636**
	(0.388)	(0.375)	(0.246)	(0.494)	(0.284)	(0.274)
Current expenditure				-0.546***	–	–
				(0.192)		
Government investment				-0.056	-0.143	-0.005
				(0.037)	(0.019)	(0.016)
Volatility of capital exp., lagged	-0.0029**	-0.0034***	-0.0030***	-0.0030**	-0.0029***	-0.0033***
	(0.0012)	(0.0009)	(0.0010)	(0.0013)	(0.0008)	(0.0007)
Number of observations	129	112	112	129	129	129
Sargan test, χ^2 p-value	0.30	0.14	0.48	0.27	0.13	0.16
Instrument set	Investment, fiscal variables lag 2-4	Investment, fiscal variables lag 2-5	Investment, fiscal variables lag 2-5	Investment, fiscal variables lag 2-4	Investment, fiscal variables lag 2-4	Investment, fiscal variables lag 2-4

*Note: ***, ** and * indicate that the variable is significant at 1%, 5% and 10% respectively. Robust standard errors in parentheses.*

[1] Fiscal balance is defined as (1 + fiscal balance/100) because of which increase in the variable of fiscal balance means improvements in fiscal balance, i.e. reduction in deficit.

5.2 ALTERNATIVE CLASSIFICATION OF PRODUCTIVE EXPENDITURE

As noted above, the functional classification of productive and unproductive expenditure has some weaknesses. To check whether our classification affects the results, we reclassified general public services as productive expenditure. The results of fixed effects as well as dynamic GMM estimations with this new classification are presented in table 8.

TABLE 8

Reclassifying expenditure on general public services
Dependent variable: growth rate of real output

Estimation method	OLS, two-way fixed effect			GMM, first differenced		
	Functional classification of expenditure			Functional classification of expenditure		
Omitted fiscal variable	Non-distortionary taxes	Unproductive expenditure	Non-dist. taxes and unprod. exp.	Non-distortionary taxes	Unproductive expenditure	Non-dist. tax. and current exp.
1	2	3	4	5	6	7
Distortionary taxes	0.048	-0.079**	-0.040	0.211	0.009	0.072
	(0.053)	(0.041)	(0.056)	(0.150)	(0.083)	(0.121)
Non-distortionary taxes	–	-0.093**	–	–	-0.095	–
		(0.044)			(0.067)	
Other revenues	0.024	-0.004	0.002	0.023	-0.003	0.040
	(0.012)	(0.011)	(0.012)	(0.035)	(0.020)	(0.031)
Productive exp._health	-0.028	0.004	-0.013	-0.121*	-0.028	-0.021
	(0.018)	(0.019)	(0.019)	(0.041)	(0.029)	(0.039)
Productive exp._education	0.007	0.027	0.070	-0.038	0.039	0.015
	(0.035)	(0.041)	(0.041)	(0.069)	(0.074)	(0.064)
Other productive expenditure	-0.132***	-0.035	-0.071**	-0.256**	-0.050	-0.133*
	(0.027)	(0.030)	(0.023)	(0.098)	(0.065)	(0.067)
Unproductive expenditure	-0.131***	–	–	-0.109	–	–
	(0.040)			(0.084)		
Fiscal balance[1]	-0.202	0.448**	0.370**	-0.0367	0.786*	0.484*
	(0.241)	(0.194)	(0.188)	(0.372)	(0.407)	(0.284)
Volatility of capital exp, lagged	-0.0024***	-0.0027***	-0.0029***	-0.0029***	-0.0032***	-0.0032***
	(0.0006)	(0.0006)	(0.0006)	(0.0014)	(0.0009)	(0.0013)
R2˜	0.835	0.819	0.803			
Number of observations	156	156	156	129	112	112
Sargan test, χ2 p-value				0.51	0.19	0.39
Instrument set				Investment fiscal var. lag 2-4	Investment, fiscal var. lag 2-5	Investment, fiscal var. lag 2-5

*Note: ***, ** and * indicate that the variable is significant at 1%, 5% and 10% respectively. Robust standard errors in parentheses.*
[1] Fiscal balance is defined as (1 + fiscal balance/100) because of which increase in the variable of fiscal balance means improvements in fiscal balance, i.e. reduction in deficit.

The coefficients on macroeconomic control variables are not reported as their signs and levels of significance remained unchanged.

The reclassification of expenditure on general public services from unproductive to productive did not change the results much. The coefficient on expanded productive expenditure remains negative and statistically significant. However, the negative coefficient on the now narrower unproductive expenditure is not statistically significant in the new specification.

6 CONCLUSION

The empirical results presented in this paper provide only weak support for the potential impact of government expenditure on growth in the new member states of the EU. We do not find evidence of a positive impact of expenditure on health and education on growth. The effects of government investment expenditure on growth are weak and are not present in the dynamic specification. When the effect of government investment on growth is observed, it is due to changes in the structure of total expenditure, i.e. it is present only if total expenditure is reduced, so that that the negative effects of government size on growth are lower. These results are surprising and require further investigation and possibly a more detailed breakdown of data on health, education and investment expenditure. On the other hand, we find evidence that the high volatility of government investment has its own direct negative effects on growth, which are independent of the growth effects of the level of investment expenditure.

We find no support for the conjecture in the literature that shifts toward non-distortionary taxes such as indirect taxes on goods and services have a positive effect on growth. Relying on non-distortionary taxes to increase public investment or reduce fiscal deficits has more or less the same negative effect on growth as relying on distortionary taxes.

On the other hand, when improvements in fiscal balance are achieved by either cutting unproductive expenditure or a combination of a reduction in unproductive expenditure and an increase in non-distortionary taxes, then one can observe a strong positive effect of fiscal policy on growth in this group of countries.

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APPENDIX

DATA SOURCES AND DESCRIPTION OF VARIABLES

The countries included in the analysis are Slovenia, Hungary, Poland, Slovakia, Czech Republic, Bulgaria, Romania, Estonia, Lithuania, Latvia, Malta and Cyprus, i.e. the new member states plus Croatia. Data sources include Eurostat data base, WDI data base and national sources for Croatia.

If not otherwise stated, the source of data for non-fiscal variables is the Eurostat data base available at http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.

Growth rate of real output is calculated as the difference in the logarithm of real GDP in constant local currency units (with 2005 as the base year). Data for Malta in 1999 and 2000 are not available from the Eurostat database so the WDI database was used.

GDP per capita is the real GDP per capita in constant euro.

Investments are measured by the share of gross fixed investment in GDP.

Growth of labour force is the difference in the logarithm of the activity ratio, defined as the share of active working age population (15-65 years old) in total population of that age group.

Openness is defined as the GDP share of exports plus imports of goods and services (source: WDI, http://databank.worldbank.org/data/home.aspx).

Inflation is defined as (1 + the annual percentage change in consumer prices/100). We use lagged inflation because changes in indirect taxes affect current inflation rate when one works with annual data (source: WDI).

All fiscal variables, except those for Croatia, are from the Eurostat database (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database). National sources and author's calculations are used for Croatia. All fiscal variables are related to general government and correspond to the ESA95 statistical standard. All are expressed as logarithms of the ratio to GDP.

Total revenue is the share of total general government revenue in GDP.

Total expenditure is the share of total general government expenditure in GDP.

Fiscal balance is defined as (1+fiscal balance/GDP).

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Distortionary taxes, non-distortionary taxes and other revenues are expressed as percentage of GDP and represent reclassified components of total revenue as described in table 1.

Productive expenditure_health, productive expenditure_education, other productive expenditure and unproductive expenditure are reclassified components of total expenditure according to functional classification as described in table 1. All variables are expressed as a share of GDP.

Current expenditure and investment expenditure are reclassified components of total expenditure based on economic classification as described in table 1. Both are expressed as a share of GDP.

METHODOLOGICAL NOTE ON THE CROATIAN DATA

Croatian fiscal statistics is based on the GFS2001 standard and data are available after the year 2002. The Ministry of Finance's estimates of fiscal aggregates (total expenditure, total revenue and fiscal balance) in line with the ESA95 standard are available in EU related documents since 2003. As the GFS2001 standard is close enough to the ESA95 standard to allow an appropriate comparison of disaggregated components of revenue and expenditure, it is used for disaggregated variables, while the ESA95 data are used for the overall government activity.

Missing GFS2001 observations for the period 1999-2001 were calculated by the author through an adjustment of data based on the GFS1986 standard. The adjustment was mainly related to the treatment of employers' contributions and the GFS1986 item *Net lending and repayments*. In comparison to the ESA95 total expenditure, this adjustment underestimates the level of total expenditure in 1999-2003, because called government guarantees are not included due to the lack of reliable data.

A functional classification of general government expenditure in Croatia is not publicly available, either. The author's calculations are based on central government data and intergovernmental flows. Central government expenditure accounts for 93% of total general government expenditure, so this adjustment seems appropriate.

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Long term economic convergence among ten new EU member states in the light of the economic crisis

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Abstract

This paper provides an analysis of absolute economic convergence among the group of ten new member states (NMS-10) that entered European Union in the year 2004. Convergence dynamics is estimated for the period from 1997 to 2012 as well as for two sub-periods: 1997-2007 and 2007-2012. The analysis covers aspects of sigma- (σ-) and beta- (β-) convergence. Convergence is first estimated by testing for panel unit root in GDP per capita series and then by using standard cross-section equations for absolute convergence. Different time intervals were used so that the analysis could capture the impact of the global economic crisis on long-term convergence performance among the NMS-10 countries. Our results show that this group of countries formed one homogenous convergence club during the entire observed period and achieved high convergence rates in the period before the crisis, while the level of homogeneity in the NMS-10 convergence club was significantly diminished in the period after beginning of the crisis.

Keywords: economic convergence, new member states, economic crisis, economic growth

1 INTRODUCTION

This paper analyzes absolute convergence among the ten countries that entered the European Union (NMS-10) in the year 2004. The analysis covers aspects of sigma- (σ) and beta- (β) convergence. The time frame in the analysis includes the period from 1997 to 2012, which is broken down into two sub-periods: 1997-2007 and 2007-2012. This selection of time intervals allows us to compare the convergence dynamics after the period of the initial transition phase with those of the period that began with the onset of the economic crisis. The initial transition phase is associated with the NSM-10 group moving from a socialist towards a market economy and a consequential significant loss in output. This period could be regarded as a time of intensive institutional changes and overall adverse economic conditions. The NMS-10 group did not achieve any mutual convergence during the period 1992-1997, which has therefore been characterized as a period of divergence in the European convergence process (Vojinovic and Prochniak, 2009). Kocenda (2001) analyzes real and nominal convergence for the period 1991-1998 and points to substantial output loss in the first part, but significant output resurgence in the second part of that time interval. Thus, this research first tested for a panel unit root in the time period 1997-2012 so as to check whether convergence among the NMS-10 countries occurred during that time. Since the convergence hypothesis was confirmed by various panel unit root tests, the analysis proceeded with the estimation of β-convergence rates for different time intervals by fitting a cross-section equation to the data. The results indicate a high convergence rate before the crisis and a convergence rate slowdown in the period after the crisis. There is evidence that the NMS-10 group of countries formed one homogenous convergence club throughout the whole time period that was analyzed. Estima-

tions also show that the economic crisis resulted in a reduction of homogeneity in the period 2007-2012. Moreover, all results are corroborated by σ-convergence.

After the divergence period, the NMS-10 group began to undergo dynamic economic growth, linked to their distinctly rapid mutual convergence. Deeper and more intense integration with European Union countries resulted in high economic growth rates for the NMS-10 group, rates that are comparable only with quickly growing Asian countries, which, generally speaking, are of respectable size in global terms (Cihak and Fonteyne, 2009:8). In addition to intensive mutual convergence, the NMS-10 group has also been reducing its income gap with the old European Union member states (Kocenda, Kutan and Yigit, 2006:325). Mutual convergence rates among NMS-10 group members were generally high after the initial transition period and exhibited an ascending trend in each successive subperiod until the beginning of the economic crisis.

The last time interval covered in the analysis is marked by the strong and unfavorable impact of the global economic crisis on NMS-10 countries. Our results show a slowdown in convergence dynamics in the period 2007-2012 as well as change in the structure of the NMS-10 convergence club. The dissimilar impact of the economic crisis on countries from the group and the country-specific crisis policy responses made the NMS-10 convergence club less homogenous. Prospects for renewed convergence dynamization after the onset of the crisis are not reassuring. Although the double-dip recession is over, there is still no recovery in sight (WIIW, 2013). The absence of economic growth acceleration could result in further deterioration of long-term convergence performance and jeopardize continuation of the decade-long positive trend.

Data for the analysis are taken from the IMF (2012) and relate to yearly values of GDP per capita measured at PPP for the period 1997-2012. GDP per capita at PPP value for the year 2012 is from the IMF forecast. The analysis includes the following countries: Cyprus, Czech Republic, Estonia, Hungary, Malta, Latvia, Lithuania, Poland and Slovenia. Romania and Bulgaria are excluded from the sample, although these two countries could be appended to the analyzed group since they have also been new European Union members since the year 2007. The reason for their exclusion can be found in their making the NMS-10 convergence club much more heterogeneous and in the convergence equation showing considerably worse statistical properties if done conversely. The convergence regression line for the extended group shows a much lower residual sum of squares ratio. Fit deterioration could be ascribed to Romania and Bulgaria not belonging to the same convergence club as the entrants from the year 2004 due to some structural differences. The decision to include Cyprus and Malta was made since they do not detract from the convergence club homogeneity level. However, it may be that these two countries do not fit into the analyzed group perfectly, especially due to their size and various other structural differences.

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Some theoretical concepts related to the theory of economic convergence are presented in the second part of this article, after an overview of economic convergence literature regarding European transition countries, especially research that covers countries from the NMS-10 group. The third part explains the analysis of σ-convergence for the period 1997-2012. The analysis of β-convergence for the whole period as well as the two sub-periods is presented in the fourth part. The final section contains a conclusion of the article.

2 CONVERGENCE THEORY

The economic convergence debate has been one of the central issues in economic literature. Although extensively covered, the topic of economic convergence is still far from resolved. Generally, it is possible to distinguish between two major approaches in the analysis of economic convergence: the neoclassical approach and the endogenous growth approach (Temple, 1999; Durlauf and Quah, 1999; Islam, 2003). These two approaches imply different conclusions regarding the convergence process. Nevertheless, both the neoclassical and the endogenous model tend to explain reasons why income levels in different countries or regions become closer or drift away from each other. It is possible to identify four basic methodological approaches in the analysis of economic convergence: cross-section data, panel data, time series and the distributional approach (Islam, 2003: 312). In samples consisting of a homogenous group of countries or regions, the cross-section or panel data approaches are most commonly used.

Convergence analysis is mostly based on the neoclassical concept of economic growth. This type of approach assumes the convergence of all countries towards the same level of economic development, uniform agent preferences and free access to technology. Technology is the same for all countries. Technological progress is exogenous, and initial technological differences are displaced to error term (Mankiw, Romer and Weil, 1992). An additional assumption in the neoclassical analytic framework, important in the context of NMS-10 economic growth, relates to instantaneous knowledge diffusion. According to this idea, a country that opens up internationally should benefit in terms of faster economic growth and convergence. The main economic growth driver in the neoclassical model is assigned to capital accumulation, while economic convergence occurs as a consequence of diminishing capital returns. Countries with low capital reserves will benefit from higher marginal productivity of capital and higher returns on capital. This implies swift capital accumulation and faster economic growth in poorer countries. Neoclassical models therefore predict that countries will converge in the long run.

On the other hand, endogenous models do not necessarily predict income convergence between poor and rich countries or regions. This analytical approach considers different growth paths between countries (Grossman and Helpman, 1991; Barro and Sala-i-Martin, 1992; Temple, 1999). The assumption of diminishing

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marginal returns on capital may not hold (Romer, 1986). Assuming that human capital plays a major role in economic growth (Lucas, 1988), lack of competence, knowledge and skills can cause income to diverge between countries. Endogenous models therefore center on R&D and regard it as the main factor to explain technological and income differences in the world. The aim of this theory is accordingly to explain how the process of knowledge and technology accumulation works. The substantive difference between the endogenous and neoclassical growth models can be found in the role of economic policy. Given that poorer countries grow faster than rich ones, policies have no influence on long-term economic growth in the neoclassical framework. Conversely, active support of technological innovations in endogenous models will lead to higher growth. In this way, it is possible to have convergence between countries in endogenous growth models.

Beta-convergence denotes the concept of income catch-up between poor and rich countries because poor countries tend to grow faster than rich ones (Sala-i-Martin, 1994; 1996). The existence of β-convergence is confirmed when beta-coefficient in a convergence equation has a negative value. The countries from the analyzed sample with lower initial incomes and lower development levels tend to grow faster in that case. This type of relation implies a negative relationship between the initial income level and average economic growth. Convergence dynamics is determined by the β coefficient from the convergence equation and describes the rate at which the country approaches a stationary state.

It is possible to distinguish between two concepts of β-convergence: absolute and conditional. Absolute convergence assumes that the countries from the analyzed group have the same characteristics and the same stationary state. In the case of a heterogeneous sample, an additional cluster of proxy variables is used to control for stationary state, and the convergence equation gets more terms. Conditional convergence is analyzed then. In the evaluation of conditional convergence, parameters such as investment rate, human capital, and political and institutional variables are added to the convergence equation. These parameters condition provide the conditions for a stationary state in each country and possibly vary from country to country. Therefore, the concept of conditional convergence relates to convergence towards different stationary states, while absolute convergence assumes that all countries converge towards a common stationary state. Moreover, conditional convergence implies that different countries achieve different income levels in the stationary state. This idea refers to the concept of convergence clubs (Baumol, 1986). Countries that form one convergence club have to be very similar in terms of historical, political and economic traits or have to be implementing institutional harmonization according to equal criteria.

The concepts σ- and β-convergence are in many respects very close. The assumption behind the σ-convergence concept is that income dispersion among the analyzed group of countries or regions falls through time. Beta-convergence is in

this way conditioned by the existence of σ-convergence. The reverse case need not be confirmed, or said differently; it is not possible to have β-convergence and σ-divergence at the same time. There is a very strong objection to the concept of β-convergence in that regard, because it is at the same time equally compatible with diminishing and growing income inequalities (Quah, 1993; 1996). It could be said that σ-convergence is a qualitative indicator of economic growth.

2.1 CONVERGENCE IN EUROPEAN TRANSITION COUNTRIES

Empirical research into economic convergence that relates to European transitional countries could be distinguished with respect to the group covered in the analysis, the time frame and the goals of the analysis. Ingianni and Zdarek (2009) recognize three main approaches in the analysis of economic convergence for this set of countries. The first approach includes the analysis of long-term growth rates through the aspects of σ- and β-convergence, the second avenue centers on a wider spectrum of macroeconomic indicators in relation to the convergence process, and the last one analyzes the post-transition convergence period in differently defined groups of countries and the relation of convergence dynamics between these and the old European member states. Extension of this classification to other areas of research would relate to optimal currency area convergence (Horvath, 2003), fiscal convergence (Kocenda, Kutan and Yigit, 2008) and various other aspects of nominal and real convergence (EEAG, 2004; ECB, 2007). Comprehensive and systematic coverage of the topics related to real convergence in Central, Eastern and South-Eastern Europe can also be found in Martin and Winkler (2009).

Kocenda (2001) confirms the existence of convergence in various structural macroeconomic indicators for the CEE group of transition countries. Faster convergence was observed in countries with similar institutional characteristics, and the most homogenous group of countries turned out to be Baltic group. The strongest convergence was found in output growth rates, while levels of production and consumption prices converged more slowly. Kocenda (2006) thoroughly analyzes real and nominal convergence in different macroeconomic parameters towards European levels for the ten new member states. His results show slow and steady convergence in per capita income but very dynamic nominal convergence, especially in interest rates and inflation level indicators.

Vojinovic and Oplotnik (2008) analyze real convergence for the group of countries that became members of European Union in year 2004. Their analysis covers the period 1992-2006 as well as various sub-periods. The authors use both cross-section and panel data in their study of β-convergence to get more stable results. After the period 1992-1997, for which convergence could not be confirmed, evidence of β-convergence speed-up was found in each successive future sub-period: 1996-2006 – 3.23%, 2002-2006 – 6.51% and 2004-2006 –7.46%. The study also confirms the existence of σ-convergence for the entire analyzed period.

An extensive analysis of the convergence process in 27 European transition countries and the respective constituent regional groups (CEE-8, CEE-10, CIS-12, CSEE-15) is given in Rapacki and Prochniak (2009). Absolute σ- and β-convergence is confirmed for the whole transitional group, but statistically significant results include the period 2000-2005, when convergence rate amounted to 1.39%. The authors are unable to confirm convergence for the CIS-12 group. Although the analysis for the period 1990-2005 shows statistically significant β-convergence, the results do not confirm the parallel existence of σ-convergence after the year 1998. There is also evidence of a meaningful slowdown in β-convergence dynamics for the group after the year 2000. On the other hand, the analysis of real convergence for the Balkan states in relation to European Union countries for the period 1989-2005 reveals a diminution of the development gap after the period 1991-1993 (Kapetanovic and Ouardighi, 2008). The most homogenous group among the 27 transition countries is CEE-10 or the more restrictively defined CEE-8 group. Beta-convergence is confirmed for both groups, and regression coefficients show faster convergence in CEE-8.

Vojinovic, Acharya and Prochniak (2009) investigate real convergence for the ten new member states of European Union. They confirm convergence on cross-section data for the whole analyzed period and other sub-periods except 1992-1997. Beta-convergence for the period 1992-2006 is 4.2%, in the sub-period 1995-2006 the β-rate advances to 7.0%, while in 2002-2006 β-convergence reaches the very high level of 9.6%. The authors use panel data for conditional convergence estimation. The panel data results show the existence of conditional convergence but not absolute convergence. The hypothesis of equal β-convergence rate for different time periods has also been tested. An F-test could not confirm statistically significant β-convergence rate differences among various time intervals. Finally, the conclusion is that there is no systematic acceleration of β-convergence in each successive period. The authors remark that, although the test shows no sign of the β-rate picking up in successive periods, the convergence rates for 1995-2006 and 2002-2006 are higher than in the entire period covered in the analysis.

A study by Prochniak (2011) of economic growth determinants for the ten new member states in the period 1993-2009 shows that investment, human capital evaluated according to educational level of the labor force, financial sector development, good fiscal position, low inflation rate and low interest rates, demographic structure, the level of IT and communication technology development, the share of the private sector in GDP and institutional conditions have the most important impact on growth performance. The income convergence hypothesis is confirmed for the whole analyzed interval, even if the economic crisis period is included in the analysis. Including the economic crisis period, Bucur (2012) analyzes convergence dynamics for new and old European Union countries as well as their mutual convergence. Her results show convergence slowdown in

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each successive period (1999-2010, 2004-2010 and 2007-2010) between the two groups and within each group.

3 SIGMA-CONVERGENCE IN THE PERIOD 1997-2012

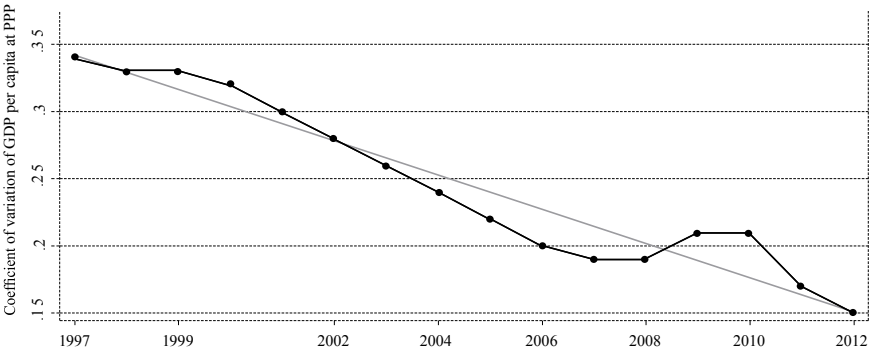
Sigma-convergence refers to the tendency of income dispersion to decrease over time and between countries. It is measured by estimating either the standard deviation of income (SD) or the variation of the income coefficient. The methods yield similar results. The concept of σ-convergence analyzed as a variation of income coefficient is accepted here:

$$CV = \frac{SD}{Mean} \tag{1}$$

Income is represented by GDP per capita measured at PPP. An overview of σ-convergence is given in figure 1. The results show the coefficient of income variation trend for the NMS-10 group. Here the existence of σ-convergence for the whole analyzed period can be seen. Income differences in this group of countries have been narrowing during the period 1997-2012.

Figure 1

σ-convergence for GDP per capita at PPP in NMS-10 countries, 1997-2012



Source: Data were compiled from the IMF (2012).

A more detailed view of these results reveals more rapid σ-convergence dynamics in the period 1999-2007. There has been a significant and rapid reduction in income differences between NMS-10 countries during that time span. The implementation of intensive market-oriented measures in the initial transition period, beneficial economic conditions in the surrounding countries and preparations for European membership all stand in the background of these developments. Out of the factors listed, the accession process and related membership preparations should be underlined. The positive effects of European membership for the NMS-10 countries could be associated with higher intensity of capital and services exchange, increased trade and generally, various institutional adjustments. Institu-

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tional convergence is mainly related to the legal, regulatory and policy framework and originates from acceptance of the Maastricht criteria, the Lisbon Agenda, the Stabilization and Association Agreement, different policies for financial integration and various other prudential measures (Cihak and Fonteyne, 2009:13).

The period of unfavorable σ-convergence tendencies refers to the time after the year 2007. Income dispersion in the NMS-10 countries tends to widen in that period. Particularly strong negative movements can be seen in the period 2008-2010, when the economic crisis had the strongest impact on NMS-10 economies. The economic crisis returned the coefficient of income variation to levels from around the year 2002. This could be seen as a consequence of a very deep and long-term crisis manifestation in this group of countries as well as the absence of new economic growth.

3 BETA-CONVERGENCE

Because the NMS-10 group consists of countries with similar structural characteristics, this analysis continues with the estimation of absolute β-convergence. Since the analyzed time frame in large part covers the accession period of NMS-10 to the European Union and legal, institutional and economic harmonization based on equal principles, the assumption of a homogenous sample makes sense. Enlargement transmission effects also extend to the after-the-accession period and are mainly reflected in a speed-up of structural reforms, various institutional improvements, facilitation of the flow of goods and services, as well as the activation of European policies for the reduction of income disparities (Vojinovic and Oplotnik, 2008:24). Critiques related to heterogeneities in countries that became members earlier (Greece, Ireland, Spain) and their mutually divergent growth paths are not applicable to the NMS-10 group. That is, the NMS-10 countries implemented institutional and economic standards in the pre-accession period that prepared them much more adequately for membership, and the *acquis communautaire* was by then substantially more demanding than in previous decades (Varblane and Vahter, 2005:42).

The methodological approach used for convergence analysis here consists of panel as well as cross-section data. Beta-convergence for the NMS-10 countries was first analyzed by testing for a panel unit root in log of GDP per capita series and then by fitting a cross-section convergence equation (average yearly GDP growth rates are regressed on GDP levels at the beginning of the period) to the data. Different panel unit root tests are applied to estimate whether these countries displayed mutual convergence in the entire analyzed period (1997-2012). The convergence rate is estimated based on cross-section data for the whole period as well as for the two sub-periods. The examination of different time periods enables the comparison of the convergence rate during the whole analyzed period with the intervals from before and after the economic crisis. Two methods of computation are used for the sake of mutual verification of results.

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Panel unit root is tested by applying the following Augmented Dickey Fuller type equation:

$$\Delta y_{i,t} = \alpha_i + (\rho_i - 1)\, y_{i,t-1} + \sum_{j=1}^{p} \varphi_{i,j}\, \Delta y_{i,t-j} + \varepsilon_{i,t} \tag{2}$$

or written differently,

$$\Delta y_{i,t} = \alpha_i + \beta_i\, y_{i,t-1} + \sum_{j=1}^{p} \varphi_{i,j}\, \Delta y_{i,t-j} + \varepsilon_{i,t} \tag{3}$$

for $i = 1, 2, \ldots, N$ and $t = 1, 2, \ldots, T$. The panel unit root hypothesis, meaning $\rho_i = 1$ in (2), implies that $\beta_i = 0$ in (3), for all i. If the T dimension is large enough, this can be tested by using the t-ratio for β_i and the non-standard critical values. Levin, Lin and Chu (2002) (LLC), propose a model where the coefficients are homogeneous for all panel units, namely $\beta = \beta_i \forall_i$. The model takes the following form:

$$\Delta y_{i,t} = \alpha_i + \beta\ \ y_{i,t-1} + \sum_{j=1}^{p} \varphi_{i,j}\, \Delta y_{i,t-j} + \varepsilon_{i,t} \tag{4}$$

LLC suggest a test for the null hypothesis, $H_0 : \beta = 0$, against the alternative where $\beta < 0$ for all $i = 1, \ldots, N$. The test is proposed under the condition that N and T go to infinity with $\sqrt{N}/T$ going to zero. Im, Pesaran and Shin (2003) (IPS), devise a test where autoregressive coefficients are allowed to vary across panels. Coefficients can differ across panels due to various cultural, institutional, and other factors that are country-specific. IPS use (3) to estimate the average ADF statistic (t-ratio for β_i) and give simulated test statistics. This allows for the testing of the hypothesis $H_0 : \beta_i = 0$ for all i against the alternative $\beta_i < 0$ for some i. The alternative hypothesis is that only one part of the panels that are stationary is nonzero. Maddala and Wu (1999) point out that imposing homogeneity on all panel coefficients is an overly restrictive approach and agree that heterogeneous coefficients serve as a better option. However, their suggestion is to use a Fischer-type test. This combines the p-values from independent tests to obtain an overall test statistic:

$$P = -2\sum_{i=1}^{N} (\ln p_i)\,.$$

Under the null hypothesis of $p_i = 0$ for all i, P is distributed $\chi^2(2N)$. The Breitung test (Breitung, 2000) adjusts the data before fitting the regression and in that way avoids the necessary bias adjustments that are common to LLC tests. This test has high power even in small samples but tends to deteriorate when T is fixed and N is increasing. It assumes an error structure that is uncorrelated across panels and time.

To test convergence, the baseline methodology proposed by Ben-David (1996) is followed here. The convergence equation assumes the following form:

$$\Delta\left(y_{i,t}-\bar{y}_t\right)=\alpha_i+\beta_i\left(y_{i,t-1}-\bar{y}_{t-1}\right)+\sum_{j=1}^{p}\phi_{i,j}\,\Delta\left(y_{i,t-j}-\bar{y}_{t-j}\right)+\delta_i x_{i,t}^{'}+\varepsilon_{i,t} \qquad (5)$$

$y_{i,t}$, $i = 1, \ldots, N$ and $t = 1, \ldots, T$, represents the log of real GDP per capita measured at PPP in country i at time t, and $\bar{y}_t$ is the group average of the log of real per capita GDP measured at PPP at time t. Vector x allows for the inclusion of panel-specific means and linear-time trends. Testing convergence relates to estimating whether the series $(y_{i,t}-\bar{y}_t)$ for N countries contains a unit root or not. If the null hypothesis $\beta_i = 0$ cannot be rejected, there is a unit root in the time series $(y_{i,t}-\bar{y}_t)$. This is the indication that per capita incomes do not converge over time. On the other hand, if β_i is significantly less than zero, the time series is said to be stationary and per capita income convergence can be confirmed.

Table 1

Panel unit root test for absolute convergence among NMS-10, 1997-2012

Method	Statistic			p-value
LLC	Adjusted t*		-3.5339	0.0002
Fisher test	Inverse chi-squared (20)	P	50.3146	0.0002
	Inverse normal	Z	-3.5974	0.0001
	Inverse logit t (54)	L*	-3.8729	0.0001
	Modified inv. chi-squared	Pm	4.7932	0.0000
IPS	W-t-bar		0.0777	0.5310
Breitung test	Lambda		-2.5612	0.0052

Source: Calculations based on data from the IMF (2012).

LLC and Breitung tests make the assumption of a common autoregressive parameter across all panels, while IPS allow for an autoregressive term to be determined for each panel specifically. Various tests also make different assumptions about the rate at which the number of panels, N, or number of time periods, T, tend towards infinity or whether N or T is fixed. This analysis uses a data set where the T dimension increases faster than N and N is also fixed. Therefore, panel unit root tests that accommodate those criteria as closely as possible are chosen. Generally, the data sample in the analysis is of a somewhat smaller size than each of the above-listed tests would suggest. Our results could suffer from some loss of statistical power because of this. The optimal lag selection in this estimation procedure was chosen by AIC criteria. The time trend has been included in the testing procedure. Cross-section averages have been subtracted in order to mitigate the impact of cross-sectional dependence.

LLC's test shows the adjusted test statistic $t^* = -3.5339$, which is significantly less than zero ($p < 0.0002$) so the null hypothesis of the unit root in log GDP per capita series is rejected in favor of the alternative that all series are stationary. This conclusion supports the convergence hypothesis for the NMS-10 group of countries.

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The Fisher test combines the p-values obtained from the panel-specific unit root tests into one overall statistic. The null hypothesis in the Fisher test is that all panels contain a unit root. An alternative hypothesis for a finite number of panels is that at least one panel is stationary. All test statistics strongly reject the null hypothesis that all panels contain unit roots.

The IPS test assumes independently and normally distributed errors across panels and through time but allows the error term to have heterogeneous variances across panels. The biggest difference from other tests is that IPS allows for a panel-specific autoregressive parameter. In table 1 the test produces the IPS W-t-bar statistic. This statistic has an asymptotically standard normal distribution when $T \rightarrow \infty$ followed by $N \rightarrow \infty$. This means that the test requires a large cross-section and time dimension so that our sample might not fit the asymptotic properties of the test well and could have low statistical power in that respect. Since the W-t-bar statistic = 0.0777 is not significant at the 10% level (p-value = 0.5310), the null hypothesis that all panels have unit root cannot be rejected. The alternative hypothesis for the IPS test is that fraction of panels are stationary.

The Breitung test has high power even in small samples and prefers situations when the T dimension is not fixed. Therefore, it fits our sample well. It assumes uncorrelated errors across panels and through time. The test shows the lambda statistic = -2.5612 and the associated p-value = 0.0052. This result is taken as support for the convergence hypothesis among the NMS-10 group.

The different panel unit root tests have different asymptotic properties and cannot be directly compared. Another issue is whether our sample size matches various test requirements. It could be that the displayed results are somewhat weakened by the small sample size. However, three out of four tests show significant support for income convergence among NMS-10 countries in the period 1997-2012. Only the IPS panel unit root test rejects stationarity. In consequence of all test results, the conclusion is drawn that the convergence hypothesis holds.

The rate of β-convergence for different time periods is estimated on cross-section data in the following part. The equation for cross-section data takes the following form:

$$\frac{1}{T}\log\frac{y_{i,T}}{y_{i,0}} = \alpha_0 + \alpha_1 \log y_{i,0} + \varepsilon_i \qquad (6)$$

in which $\log y_0$ and y_T stand for the natural logarithms of GDP per capita measured at PPP in country i for the first and last year in given time period while T represents the length of the time interval.

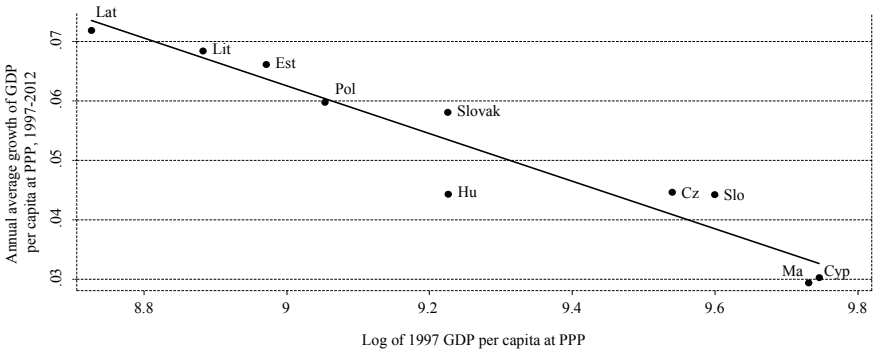
Since

$\alpha_i = -\left(\frac{1-e^{-\beta T}}{T}\right)$, the rate of β-convergence is calculated as

$\beta = -\frac{1}{T}\log(1+\alpha_1 T)$. Convergence is verified if coefficient $\alpha_1 < 0$ in equation (6).

FIGURE 2

Absolute β-convergence based on cross-sectional data, 1997-2012



Source: Data were compiled from the IMF (2012).

Results are shown in figures 2, 3 and 4 as well as in tables 2, 3 and 4. Figures 2, 3 and 4 depict the ratio of average GDP per capita at PPP growth rate and initial-period GDP per capita at PPP for the NMS-10 countries. These results are calculated on cross-section data. Tables 2, 3 and 4 show the estimates of β-convergence. The dependent variable is the average yearly GDP per capita at PPP growth rate, while the initial-period GDP per capita at PPP is the independent variable. A negative regression line slope is shown on every figure. This is an indication of the existence of β-convergence among the NMS-10 countries in every period covered in the analysis. It implies a tendency of long-term income leveling in the group.

TABLE 2

Linear regression model of β-coefficients for the EU-10 countries, 1997-2012

	Estimate	Std. error	t-value	p-value
Intercept	0.4235	0.0403	10.49	0.000
GDP in initial period	-0.0401	0.0043	-9.21	0.000

R-squared: 0.913 *Adjusted R-squared: 0.903*
F-statistic: 84.86 on 1 and 8 *p-value: 0.000*
Implied convergence rate: 6.1%

Source: Calculations based on data from the IMF (2012).

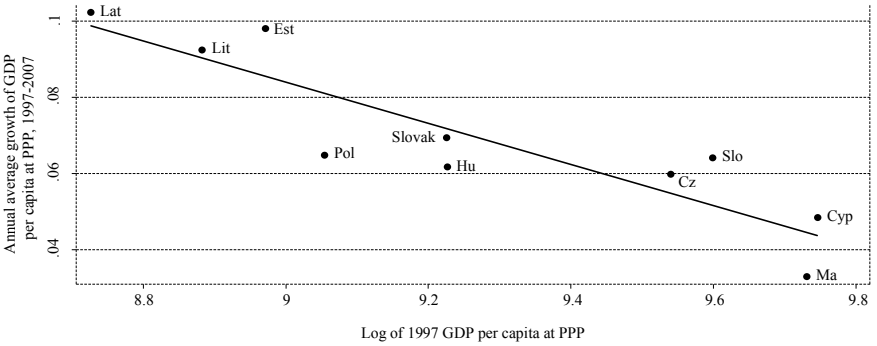
It can be seen that regression line y = -0.040x + 0.423 (R-sq = 0.9139) from figure 2 fits the data very well. The equation shows the existence of β-convergence. The

R-sq coefficient has a high value, so a lot of residual deviations seem to be captured by the regression line. This could be understood as a sign of the NMS-10 group having been a considerably homogenous convergence club throughout the whole time period 1997-2012.

The results presented in table 2 show a rapid β-convergence rate equal to 6.1% for the period 1997-2012. The regression coefficients are highly significant (p-value = 0.000), and the residual deviations coefficient also shows high value. It can be concluded that convergence among the NMS-10 countries in the period 1997-2012 existed, that it was rapid, and that the countries from the sample formed one homogenous convergence club.

FIGURE 3

Absolute β-convergence based on cross-sectional data, 1997-2007



Source: Data were compiled from the IMF (2012).

Figure 3 depicts the regression equation y = -0.054x + 0.570 (R-sq = 0.7999) for the period 1997-2007. This is a period of intensive economic growth and rapid convergence dynamics among the NMS-10 countries. The convergence rate is higher in this period than for the time interval 1997-2012. A high R-sq coefficient in the period 1997-2007 can be seen, but it is somewhat lower than for the entire analyzed period. Obviously, the period of economic expansion is marked by some countries growing faster than others.

Table 3 gives cross-section regression results for the period 1997-2007. Here a 7.7% β-convergence rate has been observed. The period from after-the-transition until the beginning of the economic crisis is characterized by positive convergence performance in the NMS-10 group. Convergence regression has good statistical properties, p-values for respective coefficients show a high significance of regression parameters and the R-sq ratio is also high.

TABLE 3

Linear regression model of β-coefficients for EU-10 countries, 1997-2007

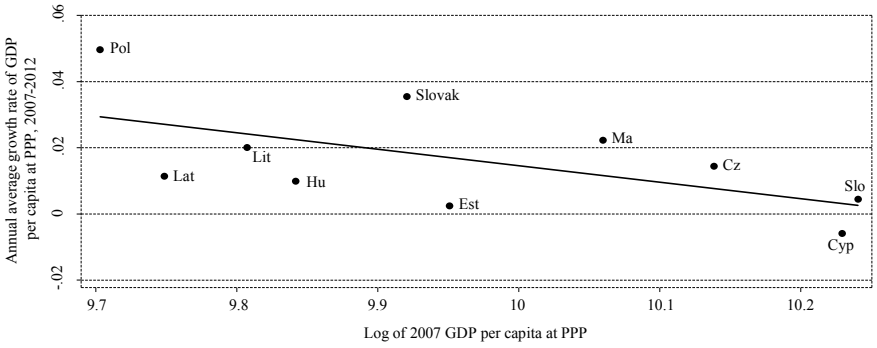
	Estimate	Std. error	t-value	p-value
Intercept	0.5707	0.0887	-6.43	0.000
GDP in initial period	-0.0540	0.0095	-5.66	0.000

R-squared: 0.799 *Adjusted R-squared: 0.775*
F-statistic: 31.99 on 1 and 8 *p-value: 0.0005*
Implied convergence rate: 7.7%

Source: Calculations based on data from the IMF (2012).

FIGURE 4

Absolute β-convergence based on cross-sectional data, 2007-2012



Source: Data were compiled from the IMF (2012).

The results for the period after the onset of the crisis are shown in figure 4. Parameters from regression line y = -0.0497x + 0.512 (R-sq = 0.3509) are not significant at the 5% level, and this is also accompanied by a low R-sq ratio. It is possible to see a slowing down of β-convergence in the period after the crisis began, compared to both 1997-2012 and 1997-2007 periods. The low R-sq ratio can be interpreted as an indication of NMS-10 convergence club homogeneity dissipation due to unequal economic crisis impact on countries from the group. The NMS-10 countries have responded to the crisis with unequal economic policies. This also in part explains the weakening of the convergence indicators. NMS-10 convergence club homogeneity reduction could also indicate a decline in the institutional impact of the European Union on this group respective to the crisis. That would be particularly upsetting since institutional harmonization played a pronounced role in stimulating economic convergence in the past.

TABLE 4
Linear regression model of β-coefficients for EU-10 countries, 2007-2012

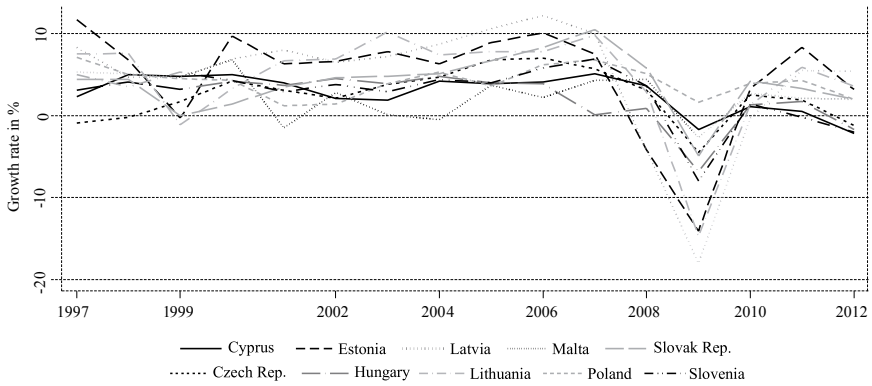
	Estimate	Std. error	t-value	p-value
Intercept	0.5123	0.2385	2.15	0.071
GDP in initial period	-0.0497	0.0239	-2.08	0.064

R-squared: 0.351 *Adjusted R-squared: 0.2697*
F-statistic: 4.32 on 1 and 8 *p-value: 0.0712*
Implied convergence rate: 5.7%

Source: Calculations based on data from the IMF (2012).

The convergence rate levels off in the period 2007-2012, especially in comparison to the previous sub-period. The results depicted in table 4 are weaker than in previous periods. Regression coefficients show worse significance indicators; results could be confirmed on 10% significance levels only (p-values for the first and second sub-period equal 0.710 and 0.064, respectively). Convergence deceleration is observed because the β-coefficient for the whole time period 1997-2012 is 6.1%, while in the sub-period 1997-2007 it reaches 7.7%. It is therefore obvious that a convergence slowdown appears in the last period. Low regression coefficient significance is also flanked by a low R-sq ratio.

FIGURE 5
GDP growth rates in NMS-10 countries, 1997-2012



Source: Data were compiled from the WIIW (2013).

The given results match the fact that the convergence among the NMS-10 countries in the period 1997-2012 outperformed that in the old member states, so their mutual income differences became lower (European Commission, 2006). The effects of transition reforms in the NMS-10 countries and European policies with respect to these countries produced good economic results, especially in the rapid convergence period that started around the year 1997 and ended with the begin-

ning of the economic crisis a decade later. The economic crisis had an adverse reflection on the NMS-10 countries. Output losses were big, and in the post-crisis period they have failed to show the kinds of growth rates that were observed in the past. Nevertheless, the results for the entire period covered in this analysis allow us to make positive conclusions about the long-term convergence process.

Figure 5 depicts GDP growth rates for the analyzed countries in the period 1997-2012. One can see that the economic crisis had a diverse and negative impact on growth rates among the NMS-10 countries. As shown previously, this has been reflected in the NMS-10 countries becoming a less homogenous convergence club. Since this convergence club was formed more than decade-and-a-half ago, the economic crisis threatens to become the turning point in this long-term positive macroeconomic trend. Results imply this as regression coefficients show low significance levels and the R-sq ratio falls considerably in the period after the onset of the crisis. Decline in NMS-10 convergence club homogeneity can be an issue of particular concern for future European member states. Absolute convergence slowdown in the NMS-10 group therefore implies greater incentive for growth-inclined economic policies in its constituent and future members. This could be a way to compensate for slowdown in respective convergence dynamics. In the event of proper policy response failures, the economic crisis could further develop into a long-term negative inflection point causing growth rates to slow down and the positive convergence trend to vanish. Such a perspective would also conflict with efforts to equalize income differences in the European Union.

4 CONCLUSION

This paper analyses aspects of σ- and β-convergence among the NMS-10 countries. The analysis covers the 1997-2012 period as well as two sub-periods: 1997-2007 and 2007-2012. Setting up the time framework in this way allows for the exclusion of an adverse initial transition period so that long-term convergence could be put in the context of the recent economic crisis. The results confirm both σ- and β-convergence among the NMS-10 countries in period 1997-2012. During this period, β-convergence reaches 6.1%. Rapid convergence occurs in the 1997-2007 period and amounts to 7.7%. These results are also confirmed by various panel unit root tests, which indicate that the GDP per capita series exhibited mutual convergence in the period 1997-2012. Similar results are found in other economic convergence studies for this or similarly-defined groups of countries. The time of rapid convergence could be related to positive growth in the initial transition period and the beneficial impact of preparation and European membership afterwards. Since convergence was faster in each successive year until the beginning of the crisis, the European integration process could be described as having had positive economic results.

The economic crisis has had a very deep, prolonged negative impact on the NMS-10 group that could be described as a double dip with slow recovery. Additionally,

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the crisis had varying impacts on the countries from the analyzed sample. Some countries experienced very big output losses, while others fared much better. This has been reflected in the convergence performance results for the period 2007-2012. Regression equations for that period show a deterioration of some statistical indicators, the parameters have low significance levels and the R-sq coefficients indicate a bad fit. Therefore, the economic crisis has resulted in a reduction of NMS-10 convergence club homogeneity. Nevertheless, the crisis did not stop convergence dynamics, it only slowed them down. This can be seen from the relation between the β-convergence rate in the entire analyzed period and the sub-period 1997-2007.

The results of this analysis should also be considered in the context of further European enlargement. The economic convergence slowdown in the NMS-10 convergence club implies the necessity of economic growth stimulation policies in order for these negative trends to be compensated for. The economic growth rate deceleration and the related convergence slowdown imply that the reduction of income differences between old and new European member states could come to a standstill. This stands in opposition to the European Union's efforts towards regional and income equalization and calls for measures to avert this trend.

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Involving citizens in public decision making: the case of participatory budgeting in Lithuania

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Abstract

In times of increasing public distrust in government and its institutions, engaging the public in decision making may strengthen democracy as well as result in a more effective allocation of scarce public resources. Participatory budgeting has started in Brazil and spread around the world but is a new concept in some countries. The objective of this paper is to reveal the current situation of attempts to involve the public in making decisions on budget allocations in Lithuanian municipalities, disclose barriers to a more active participation, and propose possible strategies for greater public empowerment. For that purpose a survey was designed that was filled out by members of municipal councils. The results indicate that members of municipal councils are aware of the advantages of participatory budgeting. However, there are numerous barriers for meaningful citizen participation, including lack of financial resources, occasional incompetence of municipal administration, citizens' indifference, and bureaucratic inertia.

Keywords: participatory budgeting, participatory democracy, citizen empowerment, public, Lithuania

1 INTRODUCTION

Public trust in government is decreasing throughout the democratic world (Edelman Trust Barometer, 2012). There are many reasons for public distrust. Political scandals, corruption, cuts in public expenditure, individualism, and unreasonable expectations are part of the increasing public apathy and low turnout at elections. In contrast, we also witness public rallies, often violent, organized by disappointed and angry citizens. Lithuania is not an exception in this respect. In the period from 1989 to 1991 the public trust in government institutions was exceptionally high. However, as the political dividends earned during the "singing revolution" and the first years of transition started to dwindle, public trust deteriorated. A survey conducted in January 2013 indicated that only 20.5% of citizens over 18 years of age trusted the government (Vilmorus, 2013). Trust in parliament and political parties was even lower, at 9.6% and 5.4% respectively. Citizens trusted municipalities somewhat higher: 29.4% of respondents trusted local government. These low percentages clearly indicate that the "social contract" between the government and the governed is breaking down.

One of the possible ways to fix the situation is to improve relationships between government officials and ordinary citizens. Trust could be restored by making common decisions and accepting joint responsibility for actions taken. Participatory budgeting is one of the recently discovered methods to encourage citizens to take part in public decision making. Participatory budgeting was first used in Brazil and has successfully spread across the world. The main idea behind participatory budgeting is to provide an opportunity to use part of the budget allocated to the local government to fund projects prioritized by the residents of the locality. Participatory budgeting is a mechanism that allows the citizens of a specific juri-

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sdiction to participate in decisions on the allocation and management of all or a part of the local government's available public financial resources (World Bank, 2013:21). Though currently public budgets are being tightened, investment in participatory budgeting may have a positive impact on social, political, and economic environment.

The objective of the research is to reveal the current situation with respect to participatory budgeting in Lithuanian municipalities and recommend ways to encourage citizen participation in decision making. To achieve the aims of the paper the method of experts' evaluation has been used. The results indicate that there are deficiencies in engaging citizens in decision making on budget allocation in Lithuanian municipalities. This research serves as a tool to evaluate the current situation in participatory democracy and to disclose possibilities for a wider and more active usage of participatory budgeting in Lithuania and in politically and economically similar countries.

The paper is organized in the following way. In section two a review of the literature concerning participatory and deliberative democracy and participatory budgeting is presented. It reveals the concept of participatory budgeting, the strengths and weaknesses of the participatory budgeting process, and reviews the background of participatory budgeting in Lithuania. The third section is devoted to a description of the research method used in the paper. The results of the experts' survey are presented and discussed in section four. Finally, the last section concludes and provides recommendations.

2 LITERATURE REVIEW

2.1 PARTICIPATORY AND DELIBERATIVE DEMOCRACY

Since the early 1960s, theorists in the fields of philosophy, sociology and politics have produced a substantial body of scholarship on the effectiveness of participatory and deliberative democracy as a way to empower community leaders and citizens to influence public decisions (Woods, 2012). Participatory democracy is based on an active and enduring participation of ordinary citizens in public decision making. An authentically democratic order entails promoting the political involvement of people in such areas as the workplace, civil associations as well as public institutions (Cini, 2011). Deliberative democracy stresses the discursive quality of the democratic rule. Democracy is seen as a domain of public discussion, dominated by "the unforced force of the better argument" (Habermas, 1984) and leading to the common good. The adherents of the deliberative democracy option are in favor of democracy in which people address collective problems by deliberating together about how best to solve them: democracy is thus associated with the image of deliberation. Though those two paradigms of democracy differ in some aspects, some theorists maintain that they are complementary rather than competing theories of democracy (Chambers, 2003; Cini, 2011). The matrix be-

low reflects various kinds of public events that use or don't use the methods of participatory and deliberative democracy (see table 1).

Table 1

Matrix of participatory and deliberative democracy

		Deliberative	
		Yes	No
Participatory	Yes	1) Municipality meetings	2) Voting in elections
	No	3) "Official" meetings	4) Implementation

Source: Woods (2012).

1) *Municipality meetings.* Municipality meetings use methods of both types of democracy. Citizens gather in the same location at the same time. The education function is used. Residents learn more about the current needs and discuss the possible solutions to common problems.
2) *Voting in elections.* By voting in elections citizens have the opportunity to participate, so participatory democracy gets expressed. However deliberative democracy is not involved. Citizens cannot propose new ideas at this stage of the democratic process.
3) *"Official" meetings.* In this instance deliberative democracy is used but participatory democracy is not used. Elected or appointed officials have an opportunity to discuss issues for a limited time and make decisions. Ordinary citizens don't have the opportunity to participate.
4) *Implementation.* During the execution phase neither participatory nor deliberative processes are generally used. At this stage the policies, programs and decisions adopted are implemented. Experts are usually consulted on technical matters. At this stage citizens' contributions are not beneficial.

Participatory democracy emphasizes the educational function (Woods, 2012). Democratic participation can be both empowering to the participants and effective in influencing the representative bodies that have the final power to make public decisions. Deliberative democracy focuses on creating legitimate conditions for decision makers to communicate with each other in order to make rational democratic decisions based on shared norms, values and objectives (Habermas, 1984). The key to success in fostering public involvement is to provide opportunities for and ease of participating to those who can make a decision or propose a policy, as well as to those who are affected by that decision or policy, and to have their positions and issues taken seriously. Both those theories of democracy contribute to the theoretical background of participatory budgeting. As indicated in the table above, municipality meetings, important in allowing participatory budgeting, use methods of both participatory and deliberative democracy.

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2.2 PARTICIPATORY BUDGETING

The process of participatory budgeting is a recent phenomenon. Participatory budgeting started as an experiment to strengthen democracy through citizen participation in public decision making in 1989 in Porto Alegre, Brazil (Wampler, 2000). A powerful and effective method of citizen involvement in public resources management, it quickly attracted the attention of scholars and international organizations (Baiocchi, 2001; Baquero and Schneider, 2006; Heimans, 2002; Marquetti, Schonerwald da Silva and Campbell, 2011; World Bank, 2003; Zamboni, 2007).

Besides Brazil, countries in which some localities practice participatory budgeting include Albania, Bolivia, Belgium, the Czech Republic, Canada, Ireland, India, Italy, Spain, Uganda, the United Kingdom, Romania, and South Africa (Mikesell, 2013; Sintomer, Herzberg and Rocke, 2008).

Participatory budgeting can be defined as the process of decision making in which citizens discuss and negotiate the allocation of public resources (Wampler, 2000). Participatory budgeting unit, a project funded by the UK government with to the purpose of encouraging participatory budgeting in that country, defines it as "engaging local citizens in making decisions on spending priorities for a defined public budget" (Department for Communities and Local Government, 2011). According to Sintomer, Herzberg and Rocke (2006) participatory budgeting, in order to be distinguished from other forms of democratic participation, should meet the following criteria:

- Financial or/and budgetary dimension must be discussed. Participatory budgeting deals with the problem of scarce resources.
- The process should happen at the city level or a decentralized district with an elected body and some power over administration (the neighborhood level is not enough).
- It has to be a repeated process (one meeting or one referendum on financial issues are not examples of participatory budgeting).
- The process must include some form of public deliberation within the framework of specific meetings. Citizen participation in administrative meetings or classical formal representation instances available to ordinary citizens is not participatory budgeting.
- Some accountability on the output is required (Sintomer, Herzberg and Rocke, 2006).

There are certain basic conditions for success in participatory budgeting. The first condition is the existence of strong progressive municipal governments that enjoy strong support from social movements, unions, and non-governmental organizations. A favorable broader political environment is also needed so that adversaries of the participatory budgeting will not obstruct the process. The second important condition is a well-organized civil society. Participatory budget programs depend upon the active participation of citizens. Higher rates of participation help to legi-

timize government policies as well as select new policies. A crucial condition is the availability of discretionary funding for programs. The more financial flexibility the government enjoys, the greater the influence citizens can exercise on the selection of new public projects and programs. Governments must have the resources to initiate public programs selected by the participants. Otherwise, citizens might view the participation as a waste of time and effort. However, in financially strapped municipalities citizens and the government must work together to develop creative solutions to the lack of available resources, including increase of tax collections, and other ways to boost public revenue sources (Wampler, 2000).

The World Bank is one of the international organizations interested in spreading participatory budgeting world-wide with to the aim of increasing transparency, accountability, and social inclusion in local governance. It has produced a sort of "toolkit" for successful implementation of participatory budgeting practices (World Bank, 2006). Participatory budgeting includes the usual phases of the budget cycle. However, the process requires citizen engagement throughout the cycle and is briefly described below:

- Citizens identify capital investments and projects to address the most urgent local needs;
- Feasibility studies are conducted in order to evaluate such investments and projects;
- Budget proposal is drafted for submission, possibly through the local mayor, to the local council;
- Monitoring over the budget approval process (review, discussion, and voting) is carried out;
- Monitoring of budget execution including tendering, bidding, and contracting for public projects;
- Control and evaluation of the execution of public projects or programs (World Bank, 2006).

The participatory budgeting cycle starts from meetings of citizens that are organized according to territorial units. In the first phase of meetings, local government representatives provide relevant information to citizens about the procedures of participatory budgeting, the execution of the current budget, reveal government priorities, and its revenue forecast. During the second phase citizens discuss and set community priorities and elect representatives to represent the community at the participatory budgeting council (World Bank, 2006). The participatory budgeting council consists of community representatives and the members of the local government. During the council meetings the priorities and proposed projects are analyzed. Information is gathered about each problem and project. Each priority is debated and at length the final draft of the participatory budget is adopted and proposed to the municipality council. The municipality council votes for the approval of the budget. At this stage the community representatives play an active role, too. They need to ensure that the approved budget corresponds to the propo-

sed draft budget. Monitoring is the last stage. After the budget is approved the budget monitoring committee is established in order to secure transparent procurement procedures and budget execution.

There are several advantages to participatory budgeting. First, it strengthens democracy. By creating a channel for citizens to give voice to their priorities, public budgeting thereby enhances the government's credibility and the citizens' trust. Second, it increases transparency in fiscal policy and public expenditure management by reducing scope for clientelistic practices, elite capture, and corruption. It also promotes social learning. By participating in the budget process the participants acquire knowledge about budgetary politics, and the status of the community. Third, it produces a more effective allocation of resources. It can also improve service delivery by linking needs identification, investment planning, tax systems and project management. Public budgeting is instrumental in making the allocation of public resources more inclusive and equitable and thus promotes social justice. Fourth, it helps to build stronger communities. Through regular and enduring meetings citizens learn more about each other and develop stronger ties and lasting relationships. It can also improve social accountability. By deciding what projects to fund participants take a certain part of responsibility for the choices (Cabannes, 2004; Lerner, 2011; World Bank, 2013).

However it is important to note that participatory budgeting is not a remedy for all democratic ills or unfair distribution of resources. This process has its own problems and challenges, among them:

- *Heightened citizen expectations.* If the government does not provide enough information about the scarcity of financial resources, citizens may demand goods that government is not able to provide.
- *Exceeded government capabilities.* The support of participatory budgeting is costly. The cost is both in time and money. These costs may be too high for the municipality to cover.
- *Sustainability.* Citizens tend to cease participation once their pet project has been implemented.
- *The quality of participation.* It is hard to include into the process representatives from all social and economic groups of society (World Bank, 2006).

To summarize, the participatory budgeting is an innovative mechanism which aims to involve citizens in the decision making process of public budgeting. The main features of participatory budget include a geographical structure that breaks down existing administrative boundaries facilitating citizen inclusion. Regular meetings and debates in geographical units should be organized to engage citizens in discussions to decide strategic priorities for capital investments and services. Monitoring of budget adoption process and budget execution needs to be carried out on a constant basis (World Bank, 2006). The main conditions for successful participatory budgeting are a strong support from the local government, well or-

ganized civil society, favorable political environment willing to protect participatory budgeting from adversaries, and enough discretionary resources to fund the chosen projects. The main advantages are democracy, transparency, social learning, and effective allocation of resources, social justice, and community building.

2.3 BACKGROUND FOR PARTICIPATORY BUDGETING IN LITHUANIA

In October 2011 under the auspices of the Council of Europe a survey of the role of central and regional government in participatory budgeting at local level was carried out (Vodusek and Biefnot, 2011). The purpose of the survey was to gather information for an overview of and insight into the policies of governments of member states aimed at strengthening participation in public life at local level. Lithuania was one of the respondents of that survey. The survey report revealed that Lithuania had no national and regional legislation or regulation on participatory budgeting, and that participatory budgeting had a low priority among government's policies. Respondents also indicated that participatory budgeting is not within the competence of the central government.

A conclusion can be drawn that participatory budgeting is not seen as a valuable instrument in encouraging citizen participation in public decision making in Lithuania. However as emphasized in the Report, the existing legal framework is neither a guarantee for successful participatory budgeting nor a strict prerequisite. "Effective implementation of participatory budgeting means to do more than what is prescribed by the law. The failure to apply participatory budgeting is the failure of local leaders, city administration and citizen activism. Participatory budgeting leads to mobilization of additional community resources to build public good" (Vodusek and Biefnot, 2011:11).

As an attempt to involve citizens in decision making the common project by the Ministry of Finance of Lithuania and news portal Delfi called "Make your own budget" can be mentioned. The project was announced on the website of the Ministry of Finance for the fiscal year 2010 and continued in the years 2011 and 2012 (Ministry of Finance of Lithuania, 2013). Participants are given budget estimates for each major government program for the coming budgetary year. Their task is to make changes in allocations in order to balance the budget. The drawback of this initiative is that the participation is very impersonal. Participants do not carry any accountability. The revenue estimates do not include the EU funds. Besides, the purpose of the project is educational; it is not a long-term project requiring citizens' input on spending priorities.

There is no specific legislation on participatory budgeting but the municipalities can involve citizens in decision making on the basis of existing legislative framework, e.g. the European Charter on Local Self-government, the Law of the Republic of Lithuania on Local Self-government, the Law of the Republic of Li-

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thuania on Petitioning. According to the existing law, bodies of local self-government should create conditions for citizen participation in public decision making, organize surveys, encourage and protect citizen initiatives on various civic matters (Law on Petitioning, 1999; Law on Self-government, 2000). The Law on Self-government specifically provides for public discussion of the draft budget (*ibid.*). It can be concluded that the foundations for the introduction and development of participatory budgeting in Lithuania do exist. This research is an attempt to find opportunities for and obstacles to full-fledged participatory budgeting in Lithuania.

3 METHODOLOGY

The aim of the research is to examine the current situation of citizen involvement in public budgeting in Lithuanian municipalities, to disclose experts' opinion on participatory budgeting, and to evaluate the possibilities for the implementation of participatory budgeting in this country.

The method of experts' evaluation has been chosen for this research. This method belongs to the class of qualitative research methods. The choice of this method has been prompted by the fact that most of the citizens are not familiar with the concept of participatory budgeting or its practical implementation. Expert opinion is invoked to evaluate the current situation of citizens' involvement in decision making on public budgeting on municipality level as well as the advantages and disadvantages of participatory budgeting in Lithuania.

The method of experts' evaluation is understood as a generalized experts' opinion. It uses a specialist's (expert's) knowledge, experience, and intuition. The experts' evaluation is a procedure that allows us to consolidate the opinions of separate experts and draw a common conclusion (Rudzkiene, 2005). In the case of experts' evaluation it is impossible to draw a representative sample. Instead a sample is drawn based on the non-probabilistic selection method. "The reliability of the expert's evaluation method depends upon the selection of experts. Selected experts must be competent persons, have specialized expertise in the area directly related to the research object" (Tidikis, 2003:517). The size of the group (number of experts) also depends upon the competency of experts (Rudzkiene and Augustinaitis, 2009). In order to ensure the validity and reliability of experts' evaluation the size of the group should not be less than five experts. However, sometimes the number of experts may reach 30 or 40. The optimal recommended size of the group is from 8 to 10 experts (*ibid.*, 2009). For this research the members of budget committees of Lithuanian municipalities were chosen as experts' pool.[1] In order to select competent respondents the following requirements were applied: the

[1] Each municipality has a budget committee variously called "economics and finance, and budget committee", or "finance and budget committee". The main function of the committee is to consider the draft annual municipality budget before submitting it for the adoption by the municipality council. Depending upon the size of the municipality the committee may undertake other tasks related to the financial management of municipal property and financial assets, make proposals on revenue sources (Association of Local Authorities in Lithuania).

expert's educational attainment could be no less than a college degree or higher and the expert must have no less than 5 years of job experience in municipality council and membership in the budget committee.

In this research the experts' evaluation was conducted with the use of a survey. A questionnaire was designed and sent out for the experts to fill out. This method allows data to be gathered in a time-saving manner. The questionnaire uses close-ended (multiple choice and ranking) questions as well as some open-ended (comment box) questions. Ranking questions employ a Likert scale with five possible answers using a 1-to-5 rating scale where "1" means "strongly agree" to the notion and "5" means "strongly disagree" of the notion. The questionnaire[2] contains 13 questions. Each question is designed to achieve certain goals as reflected in table 2.

TABLE 2

Research goals and corresponding questions in the questionnaire

Goals	Questions
1) Examine the current situation of citizen involvement in public budgeting in Lithuanian municipalities	1, 2, 3, 4, 5
2) Disclose experts' opinion on participatory budgeting in Lithuanian municipalities	6, 7, 8
3) Evaluate the possibilities for implementation of participatory budgeting in this country and for further citizen involvement	9, 10
4) Evaluate the competence of experts	11, 12, 13

Having in mind the high competency requirements and possible low response rate due to the chosen questionnaire distribution method (questionnaires were sent out by e-mail) the questionnaire was sent to all members of the budget committees in all municipalities. There are 60 municipalities in Lithuania. In total 247 emails were sent out with questionnaires. Twenty three questionnaires failed to reach the addressee due to technical reasons, like invalid e-mail address. Thirty responses were received during the first week. The questionnaire was sent repeatedly to experts who did not answer during the first week. At the end of the research period 41 filled questionnaires were received. After the elimination of questionnaires containing mistakes and missing data, 17 questionnaires met competency requirements and were used for analysis.

This method requires formal testing of the compatibility of experts' evaluations. The compatibility of the expert evaluations was tested using Kendall's W (Kendall's coefficient of concordance). Kendall's coefficient of concordance for ranks (W) calculates agreements between experts as they rank a number of items according to particular characteristics. If the test statistic W is 1, then all the survey respondents have been unanimous, and each respondent has assigned the same order

[2] The full questionnaire is available from the author upon request.

to the list of items. If W is 0, then there is no overall trend of agreement among the respondents, and their responses may be regarded as essentially random. The following hypotheses are formed:

H_0: The expert evaluations are conflicting (Kendall's W is equal to zero);
H_A: The expert evaluations are similar (Kendall's W is not equal to zero).

Kendall's coefficient of concordance is calculated according to the following formula:

$$W = \frac{12S^2}{m^2(k^3 - k) - m\sum_{l=1}^{r} T_l} \quad (1)$$

Where
W is the coefficient of concordance
S^2 is the sum of squared deviations
m is the number of experts
k is the number of alternatives
r is the number of rows that contain coinciding ranking
T_l is the number of coinciding rankings in the first row of ranks.

For the data set based on the survey Kendall's W has been calculated using statistical package SPSS (version 13). Results are presented in table 3.

Table 3
Test statistics for expert compatibility

Kendall's coefficient of concordance	0.714
Chi-square	48.564
Degrees of freedom	4
Number of experts	17
Asymp	0.000

Source: Calculated by the author using SPSS.

The responses to ranking question 7 that are summarized in figure 3 below were used to test the compatibility of experts' evaluations. The calculated Kendall's coefficient of concordance of 0.714 indicates a high level of agreement among experts in evaluating proposed items. We can reject the null hypothesis that the experts' evaluations are conflicting at the 0.00 level of statistical significance. The test statistics indicate that results obtained through the chosen methodology are robust.

4 RESEARCH RESULTS AND ANALYSIS

The first question asked if citizens took part in drafting the municipality budget. 71% of respondents answered "yes", while 29% of respondents answered "no".

According to experts' answers, citizens do participate in forming municipality budgets. However, the level of involvement is not clear. The second two questions were created to cast more light on the degree of participation. The respondents who answered the first question affirmatively are asked to list how citizens participate in budget formation. Eleven experts (92%) indicated that citizens make proposals on investment (infrastructure) projects. Six experts (50%) indicated that the municipality council received proposals that emerge from the community meetings and were communicated through the formal leaders of the smallest administrative unit. Three experts (25%) mentioned that citizens have an opportunity to participate and express their opinion at municipality council meetings. Two respondents (17%) mentioned that municipality residents are consulted in making certain budgetary decisions. These results allow drawing the conclusion that citizens mainly participate in the budget formation process by making proposals on infrastructure projects.

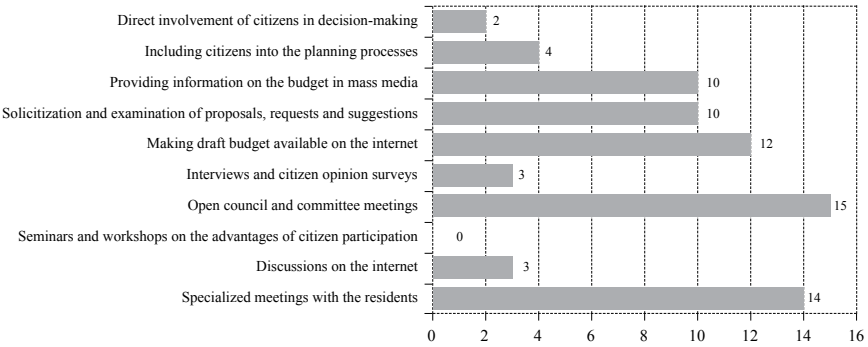
The five respondents who answered the first question negatively were asked to list the major reasons for citizens' non-participation in budget formation process. The experts' arguments can be summarized in the following way:

- Though there is a legal basis and practical arrangements for citizens' participation in budget decision making the problem lies with the project implementation. Implementation as a rule happens with delays because of the incompetence, arrogance and irresponsibility of persons and organizations responsible for project implementation.
- Lack of discretionary funds. Municipality budget often runs a deficit and there are not enough resources to pay for the usual goods and services provided by the municipality. Therefore even if citizens propose certain projects there's no possibility to fund such projects.
- Citizens have an opportunity to participate in decision making but do not take advantage of that opportunity in an organized way and on regular basis. Some individuals sometimes approach the committee members (those they know personally and trust) with proposals like fixing a road. In that case, the council members propose to include that project into the budget during budget deliberations.
- The autocracy of municipality managers, mayoral dictatorship, absence of civil society.
- Mentality lingering from the Soviet (communist rule) times. Residents don't want to participate in decision making because they do not want to be held accountable for decisions made. Citizens are active only during elections and the formation of the municipality administration.

The fourth question asked if citizens were encouraged to participate in decision making on budgetary matters in their municipalities. Sixteen respondents (94%) answered "yes", and only one responded negatively. The aim of the fifth question was to clarify what methods were used to encourage citizen participation.

FIGURE 1

What methods are used to encourage citizen participation in budget formation?

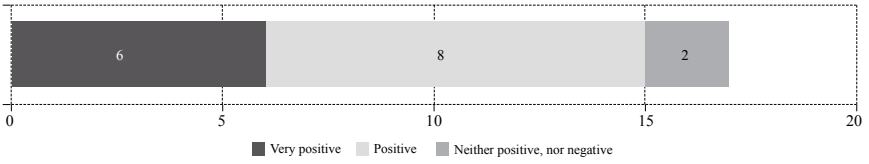


Fifteen experts indicated that citizen participation was encouraged by making municipal council and committee meetings open to the public. The next most popular method "specialized meetings with the residents" was indicated by 14 experts. Twelve experts mentioned the "availability of draft budget on the internet" as means to involve citizens. An equal number of experts (10) indicated the usage of such methods as "providing information about the budget in the mass media" and "solicitation and examination of citizen proposals, requests, and suggestions". Four respondents indicated that they included residents into the planning processes. Only three experts mentioned discussions via internet. Two respondents indicated that citizens were directly involved in decision making. However, it is not possible to tell how exactly this was achieved. None of the experts mentioned the method "organization of seminars and workshops on the advantages of citizen participation". This means that the education function is neglected which in turn may explain citizen passivity.

The aim of the sixth question was to clarify experts' opinions on the effects of citizen participation in budget formation.

FIGURE 2

In your opinion, what is the impact of citizen participation in budgetary decision making?



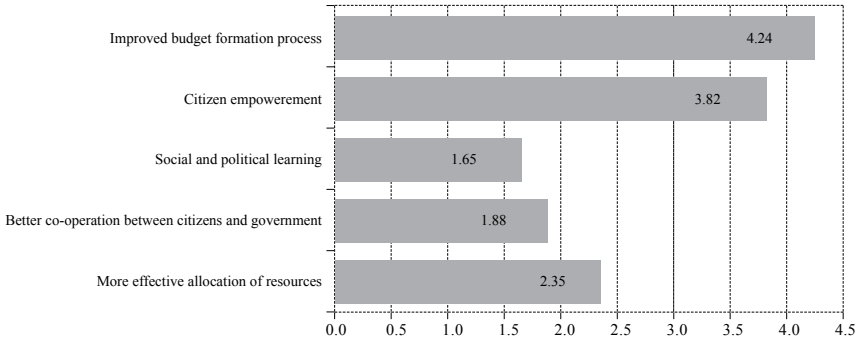
Fourteen respondents indicated that citizen participation have a very positive or a positive impact on budget formation. Two respondents indicated that citizen par-

ticipation had no impact on budget formation.[3] Average score on the Likert scale is 4.2.

The next question was formed to glean a more specific impact of citizen participation in budget formation. Experts who answered that citizen participation had a positive or very positive impact on budget formation were asked to evaluate different aspects of the positive impact of citizen involvement in budgetary decision making (see figure 3).

FIGURE 3

Experts' opinion on the advantages of citizen involvement in budget formation



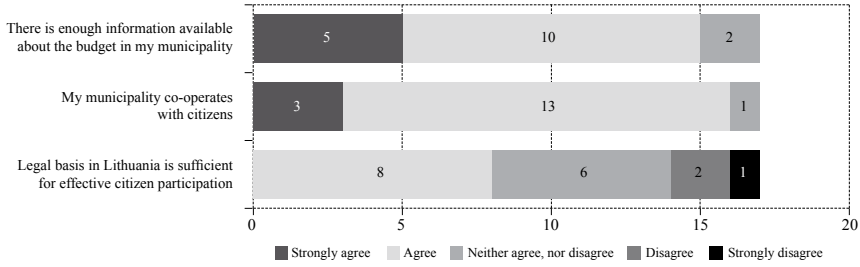
On the scale from 1 to 5, 1 meaning "most important" and 5 meaning "least important" experts were asked to evaluate various advantages of citizen participation. The most important advantage according to experts was "social and political learning" of citizens, the next highly rated advantage was the "better co-operation between citizens and the government", followed by "a more effective allocation of resources" and "citizen empowerment". In the experts' opinion "the improvement of budget formation process" was the least important advantage of citizen participation.

Since none of the experts indicated a "negative" or "very negative" impact of citizen participation on budget formation, the eighth question designed to evaluate negative impact of citizen participation was omitted. The ninth question was designed to evaluate the status of the broader context of citizen involvement in public decision making.

[3] Only one expert indicated that citizen participation had a negative impact on budget formation but in order to meet the criterion of the compatibility of experts' opinion this respondent was not included into the final sample.

FIGURE 4

Please evaluate the following statements from 1 meaning "strongly agree" to 5 meaning "strongly disagree"



The statement "There is enough information about the budget of my municipality" was rated "1" meaning "strongly agree" by five experts. Ten experts agreed with the statement, and two experts neither agreed nor disagreed with the statement. The average rating on the Likert scale is 4.2. The next statement "My municipality co-operates with citizens" received an average rating of 4.1 on the Likert scale. Experts' opinion was more divided in an evaluation of the statement: "The legal basis is sufficient in Lithuania for effective citizen participation". The average score was 3.2. Accordingly, experts are quite united in the opinion that citizens are informed but are less certain about the existence of legal framework for active citizen involvement in public decision making.

The tenth question aimed at finding experts' opinion on the ways to improve citizen involvement in the budgeting process. The proposals can be summarized as follows:

- Make draft budget available in a simplified, easily understandable form. Start discussions on funding priorities on the municipality web-site.
- Ensure greater openness especially on the budget execution. Citizens will be more motivated to participate in budget formation if they feel that their involvement "makes a difference", that they are not wasting time.
- Provide more information on the budget formation process.
- Citizens should be more active in making specific proposals through the formal leaders of the smallest administrative territorial units (closest to the people) and through the members of municipality council.
- More meetings with the residents should be organized.
- Organize special meetings only with the supporters (and voters) of one party. Citizens' appeals and proposals should be taken seriously (not only formally).

Experts emphasized the need for a "two-way street" exchange of information. Municipality should provide information about the budget formation principles, process, and execution. Citizens should voice their needs and preferences.

5 CONCLUSIONS AND RECOMMENDATIONS

The results of the research provide evidence that citizen involvement in budgetary decision making in Lithuania is a slow process, and far from complete. The current methods and efforts to involve citizens in public decision making are neither sufficient nor effective. Though municipality councils view citizen participation in the municipality budget formation as a favorable development the actual participation is largely limited to providing information on decisions already made, or making municipality meetings open to the public. Citizens are rarely if ever included into the planning processes. Discussions with citizens, interviews or opinion surveys are rarely organized and implemented. Citizen education on the advantages of civic participation is also a neglected, and thus an opportunity to raise citizens' interest in public life is missed. Citizen participation proceeds on an ad hoc basis and has no enduring impact. Occasionally clientelistic practices take place.

There are many barriers to active citizen involvement in budget formation in Lithuanian municipalities. Some barriers are objective and hard to change. The most important obstacle is the lack of discretionary funds. As mentioned earlier one of the basic preconditions for successful implementation of participatory budgeting is availability of discretionary funds. Meaningful participation requires that projects and programs proposed by citizens are actually implemented. Other barriers include the incompetence and arrogance of officials responsible for budget execution and for project implementation, and citizen apathy. Citizen involvement is a crucial component of participatory budgeting. Without active citizen engagement participatory budgeting cannot be successful. Lack of citizen participation in civic life could be explained by the communist legacy when citizen initiative was not desirable and even punishable. However, it can also be the result of current bureaucratic inertia. Citizen involvement is officially encouraged; however, the input has no impact on actual decisions. Citizen participation is mainly passive and remains formal. Citizens do not feel empowered.

The research indicates that members of municipality councils see positive impact of citizen participation in budgeting processes including citizen empowerment, a better co-operation between citizens and the government, and a more effective allocation of budget resources. Based on those findings the implementation of participatory budgeting in Lithuania could proceed in the following way:

- Teach the executive branch of the municipality (and central) government about the advantages of participatory budgeting.
- Encourage citizen participation in public decision making in an organized and enduring way.
- Study the process of participatory budgeting that has been successfully implemented in Brazil and some experiments in European countries: Spain (Cordoba, Albacete and Sevilla), Italy (Pieve Emmanuele, Grottammare), Belgium (Mons), and others (Sintomer et al., 2008).

– Select a local government unit for an experimental participatory budget and carry out a pilot project. (Ideally it would be the case of a self-selection.) Learn from the strengths and weaknesses of the process for the possible spread of participatory budgeting practices to other municipalities.

Successful implementation of participatory budgeting depends on willing and empowered citizens but it needs to be facilitated by an innovative, strong local government, and supported by broader political and societal forces.

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A multi-criteria analysis of the banking system in the Republic of Croatia

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Abstract

This paper analysis business strategies of banks by solving a goal programming model using a multi-criteria decision making approach. Multi-criteria business performance is represented as the weighted sum of selected indicators, and the weights or importance of the indicators are a solution of the corresponding problem of goal programming. The ten biggest commercial banks (according to size of balance sheet assets) in the Republic of Croatia were chosen. For an analysis of the operations of the ten banks, three groups of indicators were chosen – profitability, security/risk and liquidity – which were calculated from the banks' financial reports for the year 2010.

Keywords: commercial banks, multi-criteria modelling, goal programming, business performance

1 INTRODUCTION

The purpose of the paper is to show the usefulness of multi-criteria decision-making in an analysis of the strategies of economic agents that are all in the same economic activity. The analysis will use a mathematical model of multi-criteria decision making, which will contain a number of the different individual criteria that are usually used in the framework of this branch of the economy. The analysis and ranking of the banking system according to the criteria selected in the model are applied in accordance with the preferences of the decision makers. The mathematical model for multi-criteria decision making presented will contain nine individual criteria classified into three basic groups – profitability, security (or risk) and liquidity – which are the interlinked components of financial management. The paper will formulate the problem of goal programming in which the goal of the bank is determined by the level of a single indicator from a group of cognate indicators, and the closest operational performance to the goal established is sought.

The usual procedure in multi-criteria analysis is to calculate the score of each bank, i.e. the weighted sum of relative indicator values. The score can also be called the multi-criteria business performance of the elements of the research. At various choices of weights, that is, the importance that is assigned to the indicators, the score of the bank changes and accordingly the position of the bank on the ranking list is also changed. An extreme case is when great importance is assigned to one indicator, and little importance to all the other criteria. This is a single-criterion problem, in which it is easy to see which bank is best. As the indicators listed are in conflict (for example, great profitability is achieved with rather great risk and little liquidity), it is clear that some banks will be the best in the appropriate single-criterion problem. Because of this the main problem is to define the weighting of the indicators in such a way as to avoid decision-maker subjectivity.

The selection of the procedure for calculating the distance of two formulated vectors can be carried out using one of the norms, and so the selection of the norm will also have an impact on the value of the weights obtained, and accordingly on the score of the bank. This paper uses the augmented Chebyshev norm, in which great weights are given to indicators that are in conflict. This paper differs from previous papers in the selection of indicators and in the assumed goals of the banks, that is, the set of banks, goals and indicators considered (Garcia, Guijarro and Moya, 2010).

The paper selects for analysis the banking system of the Republic of Croatia, which comprises thirty commercial banks. Although the ten Croatian banks chosen are the biggest in terms of equity and total balance sheet assets, they are not named, for the emphasis of the work is on the promotion of the mathematical model used, without any consideration of the financial position or operations of the individual banks. For this reason too, just one business year (2010) is analysed in the paper, which means that the model is not restricted in its application, rather, a wider use is enabled in future research (with the use of a time series of data).

The remainder of the paper is presented as follows. Chapter two relates to the definition of the objects of commercial banks' operations. Chapter three shows all the nine individual criteria, and the fourth chapter gives the necessary concepts and multi-criteria decision making and presents a model of goal programming. Conclusions are given in the final chapter of the paper.

2 THE BUSINESS OBJECTIVES OF COMMERCIAL BANKS

This chapter discusses the theoretical fundamentals of the main objectives in the operations of commercial banks, which are subsequently empirically analysed in the mathematical model. In a market economy, banks have diverse objectives, some of which are strategic or long-term goals and others are operational or short-term objectives. For the purposes of this paper, three groups of objectives are picked out, that is, three components that are independent and yet simultaneously in conflicting relationships – profitability, security/risk and liquidity.

Profitability can be considered the basic long-term objective of the operations of commercial banks, and indeed, not of the banking sector alone, but in all the business entities in an economy (Nguyen, 2011). But an insistence on the optimum profitability of operations in a commercial bank will ultimately be bound to bring about changes in the remaining objectives of the bank.

On the other hand, liquidity of operations in commercial banks belongs to the group of short-term objectives. Liquidity is the basis for the proper functioning of the deposit mechanism, in that a bank's liabilities to all its depositors can be met promptly (Van Horne and Wachowich, 2002).

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Security in banking operations derives from the management of the risks that appear in banking operations, such as currency risk deriving from changes of the exchange rate affecting open foreign currency positions, interest risk from changes in interest rates and credit risk for loans extended to clients (Toby, 2011).

The basic task of a bank's management is to ensure the realisation of its strategic objectives through the definition of operational objectives (Brealey, Myers and Marcus, 2007). While maintaining liquidity on a daily basis and managing operating risks, ultimately a satisfactory profitability has to be provided for the bank. Such activity will bring the management of the bank in some business situations into conflicting situations in which it is in practice impossible to achieve all three objectives at the same time. Accordingly, it is necessary to define operational priorities, or to find an optimum combination of priorities. Here it needs mentioning that the legislative background has a considerable influence on banking operations (in the Croatian case, primarily the Credit Institutions Act and the sub-laws of the Croatian National Bank).

These objectives of banking operations will accordingly be expressed as individual criteria in the mathematical model, enabling the presence of the basic components of financial management in the characteristics of the individual criteria. Nine individual criteria will thus be selected, each of the components of financial management being represented by three criteria. Thus the final order of the components of financial moment will, according to their relative importance, be subject to changes because of the definition of the priorities in the operations of the commercial banks.

3 SELECTION OF CRITERIA FOR THE MATHEMATICAL MODEL

The ranking of commercial banks is a classic multi-criteria decision making problem. Firstly, it is necessary to select the criteria according to which the ranking of the banks in a decreasing order will be made (from best to worst bank performance). Nine individual criteria have been chosen here, i.e. indicators that are provisionally allocated to the three basic groups (profitability, security/risk and liquidity). Most of the indicators selected are much employed in financial analysis and in commercial bank supervision; in this paper they are a specific choice of the authors, in conjunction with certain modifications in their calculation. This does not mean that in the application of the model some other indicators cannot be used, or some other ways of allocating the indicators to the given groups or sets.

1) **Net interest margin** is one of the best known profitability indicators, and is used exclusively in the banking system, for it refers to the interest margin obtained in the operations of the bank as compared to the total assets of the bank used (Berrios, 2013). The value of this indicator is calculated according to the following ratio:

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X_1 = net interest margin = net earnings from interest / total bank assets (1)

Net interest earnings can be seen from the profit and loss accounts for 2010, while the total bank assets can be derived from the final balance sheet for 2010. Interest earnings are the main profit generator for every commercial bank. The values obtained are expressed in percentages, and it is desirable that they should be as great as possible for each bank (max).

2) **Return on average equity** or ROAE is also one of the best known profitability indicators, just like interest margin (Kosak and Čok, 2008). But this is used not only in the banking but also in the real sector (where sometimes as well as average equity end of year equity is also used for the calculation). Unlike interest margin, this indicator shows the realized return on investment in the average equity of the bank. The value of this indicator is calculated as follows:

X_2 = return on average equity = after-tax profit / average equity of the bank (2)

After-tax profit is the last item in the profit account, while the average equity of the bank is calculated as the arithmetical mean of the balance sheet positions of equity for two successive business years, in this case, for 2009 and 2010. The fiscal policy of the country in which a commercial bank has its principal place of business will have an effect on the amount of this indicator for after-tax profit is a residual magnitude after deduction of profit tax (in the case of Croatia, corporate income is taxed at a rate of 20%). The values obtained are also expressed as percentages, and it is desirable that for each bank they should be as big as possible (max).

3) **The weighted interest income to weight interest expense ratio** is the third in order, and like net interest margin is a specific profitability indicator that is used only in the banking sector (Bulletin about banks, 2011). The value of this indicator is calculated as follows:

X_3 = the ratio of weighted interest income to weighted interest expense
= (interest earnings / average interest assets) / (interest expenses / average interest liabilities) (3)

Interest earnings and interest expenses are the starting position in the profit and loss account of every commercial bank, for they define the operating result that derives from the basic activity of banking – receiving deposits and granting loans. Interest assets comprise the sum of all positions of the assets of the balance sheet that represent the basis for the calculation of asset interest in banking earnings. On the other hand, interest liabilities comprise the sum of all positions of the liabilities of the balance sheet, which are the basis for the calculation of liabilities' interest that contribute to the expenses of the bank. Interest earnings are weighted by

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the average interest assets, and the interest expenses are weighted by the average interest liabilities. The results obtained are expressed in absolute values, and it is desirable that the results of this ratio are as great as possible, since this confirms the profitability of the bank's operations (max).

4) **Ratio of defaulted loans to total loans** is an indicator that is commonly used in the banking sector for an appraisal of the security or risk of bank investments in all kinds of own loans (Kundid, Skrabić and Ercegovac, 2011). The value of this indicator is calculated as follows:

X_4 = ratio of defaulted loans to total loans = (total value adjustments + reservations) / (total loans + contingent liabilities) (4)

The nominator of the indicator contains the sum of value adjustments and reservations, in which value adjustments constitute the sum of all acknowledged losses for dubious or disputed loans for which no returns are expected, that is, collections, while the term reservations refers to the balance sheet position in the liabilities that the bank has acknowledged as costs for future observed and estimated liabilities (an example is reservations for lawsuits against the bank already filed). In the denominator of the indicator there are the total loans that make up the sum of all positions of bank assets that represent bank loans, which are the basis upon which it makes its earnings, while the second part of the indicator refers to contingent liabilities that are as a rule recorded off-balance-sheet, and relate to guarantees made and letters of credit that constitute typical banking business. This indicator calculates the expected costs of the bank as against its total loans, in which the current cost represents an anticipation of operational loan losses. The values obtained are expressed in percentages, and it is desirable that the results of this ratio obtained are as great as possible, which implies that the bank management is aware of possible risks or uncertainty in its operations and the need to anticipate them through an increase in timely value adjustments and reservations (max).

5) **Security of deposits** is an indicator that like the previous indicator comes within an appraisal of security or risk in bank operations, since it evaluates the percentage coverage of deposits received from all the clients of the bank by available average equity of the bank (Cernohorska and Cernohorsky, 2007). Accordingly, it is used only in the banking sector. The value of this indicator is calculated as follows:

X_5 = security of deposits = average bank equity / deposits received (5)

This equation juxtaposes two positions from the balance sheet liabilities of the bank. Average bank equity, as with ROAE, is calculated as the arithmetical mean of the balance sheet positions of equity in two consecutive business years, in this case, 2009 and 2010. Deposits received constitute all the liabilities from the

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balance sheet that a bank has to other banks and its other clients (as a rule the sight and time deposits of the retail and corporate sectors made with the bank). This indicator in fact is a ratio of the bank's own means (the bank's equity) and other people's funds (deposits received from clients). Depositor security depends above all on the quality of the bank's loans, but it has to be said that a high degree of capitalisation has a positive effect on bank stability and security of deposits confided to it. The values of this indicator are shown in percentages and it is desirable that they should be as great as possible for in this way the bank can to as great a percentage as possible secure the loans of its clients with its own equity (max).

6) **Leverage** is a well known indicator that can also be included in the category of indicators of the security or riskiness of banking operations. Since this indicator is a ratio of the total equity (original and earned) of the bank and its total assets, it can be concluded that it is desirable that the value of this indicator should be as great as possible (Chortareas, Girardone and Ventouri, 2009). Since the liabilities of a bank consist of equity and liabilities, the rule holds: the greater the proportion of equity, the smaller the proportion of bank liabilities in total liabilities. The liabilities of the bank to its clients should be reduced (the third component of the balance sheet equation that is missing in this relationship), which will guarantee a certain security in its operations. This indicator in this form is often used in the real as well as in the banking sector. The value of the indicator is calculated as follows:

$$X_6 = \text{leverage} = \text{total equity of bank} / \text{total assets of bank} \quad (6)$$

The values in this equation are obtained from the final bank balance sheet for 2010. The results of this indicator are expressed in percentages, and it is desirable that they be as great as possible (max).

7) **Cash ratio** is a classic example of a liquidity indicator that is used not only in the banking but also in the real sector, with certain modifications. This indicator is the ratio of all the currently available cash of the bank to the liabilities of the bank to its clients (Siddiqui, 2008). This is a criterion that as against all other liquidity indicators has by far the smallest result (which is intelligible because of the present paucity of highly liquid resources in operations) but the results can be quite telling with respect to some banks. It answers the question how ready the bank is to meet unexpected and unplanned demands for money from its depositors, which will have a cash outflow as its consequence. The value of the indicator is calculated as follows:

$$X_7 = \text{cash ratio} = (\text{cash on account} + \text{cash on current accounts at the banks} + \text{cash kept with the central bank}) / \text{liabilities to clients} \quad (7)$$

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The nominator in this relation is obtained from the short-term position of monetary assets in the bank in the balance sheet assets, while the denominator is obtained from the position of all liabilities to clients (short- and long-term) in the balance sheet liabilities. The results obtained are standardly expressed in absolute values, and as with all previous indicators it is desirable that it should be as great as possible (max).

8) **Loan to deposit ratio** is a specific example of a liquidity indicator that is used only in the banking sector (Kundid, Skrabic and Ercegovac, 2011). This indicator is a ratio of loans made and deposits received by the banks, including all its clients in the calculation (both debtors and creditors). A commercial bank makes loans from the resources of deposits received, i.e. from the basis of resources in the bank's liabilities it makes loans in its assets. This is a criterion that unlike all the other indicators interpreted in the paper should have as small as possible a result, in order to ensure the greatest possibility liquidity in the operations of the bank. Banks that do not go too far in making loans as against availability of deposits can be sure not to have liquidity problems in their operations (if this exceptionally crucial relation is observed only in the context of making sure of operational liquidity). The value of this indicator is calculated according to the following relation:

$$X_8 = \text{loan to deposit ratio} = \text{loans made} / \text{deposits received} \quad (8)$$

The nominator in this equation is obtained from the position of loans made to all debtors in the balance sheet assets, while the denominator is obtained from the position of deposits received from all creditors in the balance sheet liabilities. The results are also expressed in absolute values, and unlike those of other indicators, it is desirable that they be as small as possible (min).

9) **Interest bearing assets to interest bearing liabilities ratio** can be observed in this paper in the context of liquidity, but it can also be considered in the context of the loan activities of the bank since a growth in loans will affect the security of banking operations. This indicator is similar to X_3, but it is different in that it directly establishes a ratio of all the assets of the bank that create earnings from interest and all the liabilities of the bank that create interest expenses (Bulletin on Banks, 2011). It is desirable that the result of this indicator be as great as possible, i.e. at least larger than one, for it can thus be assumed that in the given period the bank has handled its assets properly (this assumption is based only on the amount of the principal on which interest is charged, and not on the amount of the rates that are charged). This would mean that the bank has made more loans producing positive interest, which constitute a monetary inflow, than those that create negative bank interest, which constitute a monetary outflow. The value of this indicator is calculated according to the following:

$$X_9 = \text{interest bearing assets to interest bearing liabilities ratio} = \text{interest on assets} / \text{interest on liabilities} \quad (9)$$

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As mentioned earlier, the numerator in this equation is obtained from the total position of the bank's assets, which only create interest earnings, while the denominator is obtained from the total position of the bank's liabilities, which only create interest expenses. The results are also shown in absolute values, and unlike indicator number 8, it is desirable that they should be as large as possible (max).

Pursuant to the previous formulae, the values of all the nine individual benefit criteria (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 and X_9) are calculated for the ten selected banks (BANK 1, BANK 2, BANK 3, BANK 4, BANK 5, BANK 6, BANK 7, BANK 8, BANK 9 and BANK 10), and then all the results obtained are shown in the decision making table (table 1), as follows:

TABLE 1

Values of the nine individual benefit criteria within the three basic sets (profitability, security/risk and liquidity) for the ten banks selected

Bank	I) Profitability			II) Security (risk)			III) Liquidity		
	X_1 (%)	X_2 (%)	X_3	X_4 (%)	X_5 (%)	X_6 (%)	X_7	$1/X_8$	X_9
BANK 1	3.1796	10.5500	2.2679	4.3702	13.2299	11.9127	0.2131	1.1372	0.9831
BANK 2	2.6476	5.5350	2.1353	5.4420	7.3459	8.0478	0.1683	1.2261	0.9305
BANK 3	2.7016	3.5649	1.7827	5.7059	21.6997	16.4943	0.2713	1.0058	1.1275
BANK 4	2.9890	10.0295	2.4288	5.8505	14.7364	12.6907	0.1883	1.2931	0.9680
BANK 5	2.9585	4.8826	2.1145	3.6519	13.8575	11.6291	0.1488	1.1982	0.9727
BANK 6	2.9131	8.5368	2.3136	3.1443	17.9160	15.3611	0.2170	1.0748	0.9997
BANK 7	3.1247	3.5183	2.2133	5.5790	15.3765	13.3672	0.1954	1.3215	0.9478
BANK 8	3.1171	6.7656	2.1882	2.8526	16.8241	14.0295	0.1621	1.1366	1.0444
BANK 9	3.0889	2.0075	2.0401	3.8299	28.9380	21.5735	0.2653	0.9086	1.1302
BANK 10	2.8620	9.0294	2.1152	3.4044	17.8698	14.8134	0.1949	1.0992	1.0228
Average value	2.9582	6.4420	2.1599	4.3831	16.7794	13.9919	0.2025	1.1401	1.0127

Source: Authors' calculation from the banks' financial reports for 2010.

All the results of the individual indicators were positively directed (max – the greater the value the better) except for criterion X_8 which shows the loan to deposit ratio, which is negatively directed (min – the smaller the value the better). To be able to get all the benefit criteria in the decision making matrix, it was necessary to treat the expense criterion X_8 as a benefit criterion by putting into the decision making table or matrix the transformation of the value of X_8, by registering its reciprocal value $1/X_8$.

In this way a decision making matrix for all nine benefit criteria that are not expressed in identical units of measurement (some in percentages and some in absolute values) is created. For this reason the next step is the transformation of the values of positively directed criteria. Here a percentage transformation is used.

This transformation is carried out because it produces proportional changes in the results. The results obtained are shown in the following table (table 2).

TABLE 2

Transformed values of the nine individual benefit criteria in the three basic sets (profitability, security/risk and liquidity) for the ten banks selected

Bank	I) Profitability			II) Security (risk)			III) Liquidity		
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	$1/X_8$	X_9
BANK 1	0.1075	0.1638	0.1050	0.0997	0.0788	0.0851	0.1052	0.0997	0.0971
BANK 2	0.0895	0.0859	0.0989	0.1242	0.0438	0.0575	0.0831	0.1075	0.0919
BANK 3	0.0913	0.0553	0.0825	0.1302	0.1293	0.1179	0.1340	0.0882	0.1113
BANK 4	0.1010	0.1557	0.1124	0.1335	0.0878	0.0907	0.0930	0.1134	0.0956
BANK 5	0.1000	0.0758	0.0979	0.0833	0.0826	0.0831	0.0735	0.1051	0.0961
BANK 6	0.0985	0.1325	0.1071	0.0717	0.1068	0.1098	0.1072	0.0943	0.0987
BANK 7	0.1056	0.0546	0.1025	0.1273	0.0916	0.0955	0.0965	0.1159	0.0936
BANK 8	0.1054	0.1050	0.1013	0.0651	0.1003	0.1003	0.0801	0.0997	0.1031
BANK 9	0.1044	0.0312	0.0945	0.0874	0.1725	0.1542	0.1310	0.0797	0.1116
BANK 10	0.0967	0.1402	0.0979	0.0777	0.1065	0.1059	0.0963	0.0964	0.1010
Total value	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Source: Authors' calculation.

4 MULTI-CRITERIA DECISION MAKING AND GOAL PROGRAMMING MODEL

A multi-criteria decision-making problem (MP) consists of $p > 1$ objective functions by which one wishes to achieve their maximum in the set of alternatives, feasible solutions or decisions, and it is written in the following way:

$$\max\left\{\left(f_1(a),...,f_p(a)\right): a \in A\right\}$$

The notations represent:

– $f_1,...f_p$ – objective functions
– A – set of alternatives
– a – alternative.

The set of alternatives can be represented in various ways, as a set of solutions to a system of equations and/or inequalities or, as in our case, the alternatives may be explicitly stated. In this paper the alternatives are the banks listed, and the objective functions are the indicators selected. In table 2, which we call the decision making table or matrix, there are ten alternatives in the rows and nine indicators in the columns of the matrix. If we first look at a single criterion problem in which the only criterion is return on average equity, in table 2 we shall look for the biggest number in column X_2 and thus we know that the highest value of this indicator was achieved by Bank 1, and according to this criterion, it is the best. On the other hand, deposit security (column X_5 in table 2) is the largest in Bank 9. At the

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end, cash ratio (column X_7 in table 2) is the greatest in Bank 3. We have listed three partial, single criterion problems, and we can also list the remaining six. Accordingly, the conclusion is that there is not a single bank that is best in all the nine indicators at the same time. For this purpose the concept of a solution in a multi-criteria problem (MP) is introduced, called an efficient or Pareto-optimal solution (alternative, decision). Alternative $b \in A$ is efficient or Pareto-optimal or non-dominated if there is no alternative $a \in A$ such that $f_i(a) \geq f_i(b)$ for all $i = 1,..., p$ and $f_i(a) > f_i(b)$ for at least one $i = 1,..., p$.

One of the most common approaches to determine one of the efficient solutions is an approach in which a multi-criteria problem is reduced to a single-criterion problem using a function that we call the score of the alternative.

The score of the alternative a is the weighted sum of individual objective functions or the indicators:

$$S(a) = \sum_{j=1}^{p} w_j f_j(a)$$

The weights w_j, $j = 1, ..., p$ are positive or non-negative numbers and assign importance to individual indicators and most often for calculating reasons it is taken that their sum is equal to one. The alternative that has the greatest score along with positive values of weights is efficient or Pareto-optimal. If some weights have the value of zero, or if the weights are non-negative numbers and only one alternative has the greatest score, then it is efficient. The score is used as multi-criteria operational performance and there can be no alternative in the first place on the ranking list if there is a better. By a choice of differing values of weights, various efficient solutions are obtained, which are called supported efficient solutions. Because of the structure of the problem that we are analysing there are efficient solutions that cannot be obtained with the help of the score, unsupported efficient solutions and in this case some other approaches are used.

In this paper the values of the indicators are aggregated into a score that has accordingly reduced all the relevant information about bank operations to a number and thus by comparison of the score of the banks obtained we can compare and rank them.

The score is called multi-criteria operational/business performance. The score of S_i bank i, $i = 1, ...,10$ depends on the indicators selected and because of the multi-dimensional nature of the data in the decision making table the procedure of reducing the data to relative values is carried out. Through this procedure the problem becomes one-dimensional and the calculation of the score has a point. The score also depends on the weights that are conjoined to each indicator. The weight reflects the importance ascribed to each indicator, and can be any non-negative number at all and for reasons of calculation we say that the sum of weights is equal

to one. It is obvious that the score of a given bank will change with the various selections of weights. Thus the selection of weights becomes a problem in which it is necessary to discount decision-maker subjectivity.

The banks themselves are oriented to the capital market and the performances of competitive banks. Each bank has its own business strategy in which it evaluates how it is going to bring to fruition the operating goals it has placed before it for a given period. Pursuant to the results of the criteria achieved (table 2), this model takes as its point of departure the assumption that all banks did not have the same operating goals in 2010.

From this point of view, the problem of goal programming will be formulated. The notations in the model are as follows:

1) i – bank, $i = 1, ...,10$
2) j – indicator, $j = 1, ..., 9$
3) w_j – weight of indicator $j, j = 1, ..., 9$
4) x_{ij} – relative value of indicator j of bank i, $i = 1, ...,10$, $j = 1, ..., 9$
5) S_i – score of bank i, $i = 1, ...,10$
6) g_i – goal of bank i, $i = 1, ...,10$
7) d_i^- – under-achievement of goal i, $i = 1, ...,10$
8) d_i^+ – over-achievement of goal i, $i = 1, ...,10$.

S_i, score of bank i, is defined as follows:

$$S_i = \sum_{j=1}^{9} w_j x_{ij}$$

We give labels to the ten banks as shown in the following table (table 3).

TABLE 3
Numbering the ten selected banks

BANK 1	BANK 2	BANK 3	BANK 4	BANK 5	BANK 6	BANK 7	BANK 8	BANK 9	BANK 10
1	2	3	4	5	6	7	8	9	10

The general problem of goal programming is the well known technique of multi-criteria decision making and it consists of finding a solution that is closest to the goal established (Ignizio and Romero, 2003). In this case that means it is necessary to find such weights of indicators in which deviation of the score, i.e. of the performance from the goal established, is the least. The distance of two vectors is defined in general with the help of some metric.

The first vector is the score vector, the components of which are the score of the corresponding bank. The second vector is the goal vector $g = (g_1, ..., g_{10})$, and its components are the goals of the corresponding bank. Depending on the metric chosen, various solutions and various indicator weights are obtained. Two metrics

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are highlighted as the two extreme cases of measuring the distance of the vectors according to the interpretation of the weights obtained. The first is defined as the sum of absolute values of deviation obtained from norm 1 and the solution obtained from it gives lower weights to conflicting criteria. The second is defined as the maximum absolute deviation, obtained from the norm ∞ also known as the Chebyshev norm and the solution obtained from it gives greater weights to conflicting criteria. The augmented Chebyshev norm is close to the Chebyshev norms depending on the selection of parameter α and is recommended because it allows an unsupported efficient solution to be obtained while weak efficient solutions can be avoided. The augmented Chebyshev norm is also known as the Dinkelbach-Isermann norm.

We form the problem of goal programming (P_α) with the help of the augmented Chebyshev metric in the following way:

$$\min\left(\max\left\{\left|g_i - S_i\right| : i = 1,...,10\right\}\right) + \alpha\sum_{i=1}^{10}(\mathrm{d}_i^- + \mathrm{d}_i^+) \tag{10}$$

$$S_i + d_i^- - d_i^+ = g_i, \qquad i = 1,...,10 \tag{11}$$

$$\mathrm{S}_i - \sum_{j=1}^{9} w_j x_{ij} = 0, \qquad i = 1,...,10 \tag{12}$$

$$\sum_{j=1}^{9} w_j = 1,\ d_i^-, d_i^+ \geq 0,\ i = 1,...,10 \tag{13}$$

$$w_j \geq 0, \qquad j = 1,...,9$$

The parameter α is a small positive number. With the non-negativity of the variables in the mathematical model we have the following constraints. The value of the score can deviate from the established goal, which is defined in the set of constraints (11). The set of constraints (12) defines the score. Constraint (13) relates to normed weights. Because of the objective function (10) in the given mathematical model, in the optimal solution at least one of the variables d_i^- or d_i^+ has the value of zero or in other words its value is:

$$d_i^- d_i^+ = 0, \qquad i = 1,...,10 \tag{14}$$

This statement (14) can be verified in the book of Sawaragi, Nakayama and Tanino (1985).

Then we introduce the notation:

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$$y = \max\left\{\left|g_i - S_i\right| : i = 1,...,10\right\} \tag{15}$$

and because of relations (14) and (15) the following holds:

$$y \geq d_i^- + d_i^+, \qquad i = 1,...,10 \tag{16}$$

Now we transform the problem (P_α) into the equivalent problem ($P_{y\alpha}$) with the aid of transformation (15) and (16). Problem ($P_{y\alpha}$) is as follows

$$\min y + \alpha \sum_{i=1}^{10} \left(d_i^- + d_i^+\right)$$

$$S_i + d_i^- - d_i^+ = g_i, \qquad i = 1,...,10$$

$$S_i - \sum_{j=1}^{9} w_j x_{ij} = 0, \qquad i = 1,...,10$$

$$\sum_{i=1}^{9} w_j = 1$$

$$y \geq d_i^- + d_i^+, \qquad i = 1,...,10$$

$$d_i^-,\ d_i^+ \geq 0, \qquad i = 1,...,10$$

$$w_j \geq 0, \qquad j = 1,...,9$$

$$y \geq 0$$

($P_{y\alpha}$) is a linear programming problem that is easily and rapidly solved with programme support.

5 IMPLEMENTATION AND INTERPRETATION OF THE MODEL

In the model of goal programming ($P_{y\alpha}$) that needs to be solved and its optimal solutions found, all the parameters in table 2 are given, apart from the parameter $g = (g_1,...,g_{10})$ which represents the goals of the banks that have been set up. We shall solve three problems of goal programming that differ according to the goals chosen.

First of all we will make it the goal of every bank to achieve a certain level of profitability. Since we have three profitability indicators, each bank chooses as its goal the greatest value that is achieved by one of the profitability indicators. Accordingly we have:

$$g_i = \max\left\{x_{ij} : j = 1,2,3\right\}, \qquad i = 1,...,10 \tag{17}$$

Problem ($P_{y\alpha}$) is solved for the value of the parameter and the optimal solution is obtained:

$$w_2 = 0.5015, w_5 = 0.4985 \tag{18}$$

As a result we have a score for every bank:

$$S_i = 0.5012x_{i2} + 0.4985x_{i5}, \qquad i = 1,...,10 \tag{19}$$

while the other weights are equal to zero.

Table 4

The scores of banks and their positions on the ranking list in achievement of the goal of profitability

BANK 1	BANK 2	BANK 3	BANK 4	BANK 5	BANK 6	BANK 7	BANK 8	BANK 9	BANK 10
0.1214	0.0649	0.0922	0.1219	0.0792	0.1200	0.073	0.1027	0.1016	0.1234
3	10	7	2	8	4	9	5	6	1

According to values of weights obtained (18) if the goal is obtaining an appropriate value of one of the profitability indicators (17), the indicator of return on average capital (X_2) and the deposits security indicator (X_5) have the greatest weights. The first indicator corresponds to the objective set, which is the maximisation of the profitability of the bank's operations in the sense of the greatest possible return on equity in the operational process. On the other hand, for the achievement of this goal it is essential that the bank should collect as much in deposits as it can from its clients in order to transform them into loans made. Accordingly, a bank that has a greater capital will give its depositors greater security, but this will directly result in a fall in profitability in its business operations. Pursuant to the calculated scores of all banks, the best position on the ranking list was obtained by Bank 10, followed by Bank 4, Bank 1 and then all the remaining banks. Last in the list is Bank 2, which meets this set business goals the least effectively.

The second problem that we solve is the problem of goal programming ($P_{y\alpha}$) in which we observe a model, in which the goal of every bank is to achieve a certain level of liquidity, or:

$$g_i = \max\left\{x_{ij} : j = 7,8,9\right\}, \qquad i = 1,...,10 \tag{20}$$

The problem is solved for the value of the parameter and all the weights of the indicator are obtained:

$$w_4 = 0.2874, w_5 = 0.1838, w_9 = 0.5288 \tag{21}$$

while the other weights are equal to zero.

From this we obtain the score of each bank:

$$S_i = 0.2874x_{i4} + 0.1838x_{i5} + 0.5288x_{i9}, \qquad i = 1,...,10 \tag{22}$$

TABLE 5

Scores of banks and positions on the ranking list for meeting the liquidity goal

BANK 1	BANK 2	BANK 3	BANK 4	BANK 5	BANK 6	BANK 7	BANK 8	BANK 9	BANK 10
0.0945	0.0923	0.0922	0.12	0.0899	0.0924	0.1029	0.0917	0.1158	0.0953
6	8	1	3	10	7	4	9	2	5

According to the values of weights obtained (21) in the second problem, if the goal attaining an appropriate value for one of the indicators of liquidity (20), two security indicators (X_4 – ratio of NPL to total loans and X_5 – security of deposits) and one liquidity indicator (X_9 – ratio of interest assets and interest liabilities) have a share in the total weight. Indicator X_9, which gives the ratio of interest assets and interest liabilities, corresponds to the given goal. In the case of an increased value of indicator X_9 through an increase in loans (assets interest), there will be a reduction in the value of indicator X_4 and vice versa. On the other hand, by an increase in deposits (interest on liabilities) the indicator X_9 will be reduced, and accordingly there will be a reduction of indicator X_4. Pursuant to the calculated scores of all the banks, in this case the best position on the ranking list was taken by Bank 3, after that by Bank 9 and Bank 4, and then all the remaining banks. On the bottom of the list is Bank 5.

Finally, we shall consider the problem in which some banks have established as their goal the level of profitability, and some have established the level of liquidity as their goal, and so we have:

$$g_i = \max\left\{x_{ij} : j = 1,2,3,7,8,9\right\}, \qquad i = 1,...,10 \tag{23}$$

The problem is solved for the value of parameter and the weights of the indicator are obtained as follows:

$$w_2 = 0.4093, w_4 = 0.0082, w_5 = 0.0964, w_7 = 0.4861 \tag{24}$$

while the other weights are equal to zero.

Accordingly we shall obtain a score for each bank:

$$S_i = 0.4093x_{i2} + 0.0082x_{i4} + 0.0964x_{i5} + 0.4861x_{i7}, \quad i = 1,...,10 \tag{25}$$

TABLE 6

Scores of banks and positions on the ranking list in the case of achieving the goal of profitability or liquidity

BANK 1	BANK 2	BANK 3	BANK 4	BANK 5	BANK 6	BANK 7	BANK 8	BANK 9	BANK 10
0.1266	0.0808	0.1013	0.1185	0.0754	0.1172	0.0787	0.0921	0.0938	0.1151
1	8	5	2	10	3	9	7	6	4

According to the values of weights obtained (24) in the third problem, if the goal of a given bank is achieving a corresponding value of one of the indicators profitability or liquidity (23), one profitability indicator (X_2 – return on average equity) and two security indicators (X_4 – ratio of NPL and total loans and X_5 – deposit security) have a share in the total weight, as does one liquidity indicator (X_7 – cash ratio). In this case the interpretation of the results of the profitability and liquidity indicators can be indirectly connected via the value of the security of deposit indicator (X_5). If the value of equity is increased, then there is a reduction in return on equity (X_2) and at the same time an increase in deposit security. On the other hand, increased deposit security also augments the cash ratio (X_7). The influence of the second security indicator (X_4 – ratio of loan losses to total loans) on the interpretation of the results is practically negligible because of the share in the total weight displayed.

On the basis of the calculated scores of all banks, Bank 1 is in first place, after which comes Bank 4, and after it Bank 6, and then all the remaining banks. Bank 5 brings up the rear, as in the previous problem.

6 CONCLUSION

Multi-criteria analysis of commercial banks can be successfully carried out through the application of goal programming. The first step is to define the criteria pursuant to which the multi-criteria analysis will be carried out, and in accordance with this to seek the best operational performance of the selected banks. The second step is the formulation of the mathematical model of goal programming in which the decision maker is given the opportunities to use various goals.

The analysis was carried out for a single business year, 2010, and it indicates the operational goals of the banks that their managements carried out for this reporting period. From the results obtained it can be seen, considering the different goals established for the banks in each of the three analysed business situations, that we have different banks in the number 1 positions. It can be concluded that there is not a single bank in a dominating position in the banking sector of the Republic of Croatia, because it is in such a position in which by achieving the set objectives it will be necessary to ignore some other objectives. The conclusion is then that the obtained results in the framework of the multi-criteria decision making model can be identified with the definition of Pareto efficiency, because of which the management of a bank has to be ready for conflicting situations in its

operations because it will be constrained in its ability to attain all the objectives concurrently. Accordingly, the banks have to define their priorities in their operations, or find an optimum combination for the achievement of their objectives.

Future testing of a model of goal programming established in this way assumes inclusion into the analysis of new indicators or new indicator groups used in given industrial sectors. It is also possible to use some other metrics (norms) and longer data time series.

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The new, fifth, edition of the Public Finances, a fundamental textbook for all students at schools, where public finance courses are a fundamental part of the curriculum, was issued at the end of 2012 by the Faculty of Economics – University of Ljubljana. Tine Stanovnik has thoroughly upgraded this edition by introducing several alterations in the chapters about personal income tax, value added tax (VAT), expenditure tax, as well as in the segments covering government revenues and expenditure, public deficit, and public debt. The upgrading includes changes at EU level (e.g. VAT), as well as an outline of the importance of statistical information on public debt and deficit (particularly relevant in the current times of financial crisis), based on ESA 95 methodology. Motivated by experience gathered from the lecturing process, several tables were refreshed with the newest data available; for the sake of greater transparency, some complex derivations were transferred from the text to appendixes. The author has added no new chapters, and thus the textbook includes neither environmental taxes nor issues on fiscal decentralisation.

All chapters are structured according to the same logic; they start with the theoretical background of the main topic, followed by its practical applications where applicable. In cases where particular taxes are presented, their relative importance is also outlined. At the end of each chapter, the author offers additional recommended literature. The fil rouge of the textbook is its EU touch and linkage of theoretical concepts to practical use. The many foreign instances shift the context from country-specific (Slovenian) to internationally-significant, making the textbook interesting for any reader familiar enough with the Slovenian language to follow the highly professional and precise language of the author throughout its 229 pages.

The basic structure of the textbook is nevertheless classical, starting with chapter 1 on the public sector scope and its functions. The second chapter covers the allocation of public goods, where beside the taxonomy of public goods, Samuelson's and Lindahl's solutions of public goods provisions are presented. This topic is followed by issues of public choice, where fundamental elements of voting rules are outlined. The chapter concludes with the topic of bureaucracy and the procedure on establishing a government budget. Chapter 3 – introduction to taxation – serves as an entrance point to the core of the textbook, where major taxes are presented. Here the desired characteristics of tax systems are described and basic tax terminology is introduced. In chapter 4, tax shifting and optimal taxes are explained, including for example the Laffer curve and Ramsey's rule. Chapter 5 is dedicated to personal income tax. It starts with Haig-Simons' definition of income and continues with the standard formula of taxable income, as used in practice. The chapter finishes with current global issues on taxation of personal income. Chapter 6 – Taxes on consumption – starts with the VAT, where its base and methods of accounting are presented. An explanation of the EU context for this area of taxation follows, which includes "EU terms", such as taxable person, persons

identified for VAT, place of taxable transactions, etc. Further on, particular tax regimes for specific groups of taxable persons (e.g. farmers) are given and VAT characteristics, such are accrual principle and comparison with retail sale tax, are debated. The VAT part of the chapter ends with a presentation of a European Court of Justice case. Finally, the whole chapter concludes with a short part, dedicated to excise duties. Chapter 7 – indirect taxes and international trade – deals with taxation of international trade, i.e. with the practical application of destination and origin principle. Emphasis is placed on trade within the EU with an explanation of the fundamental (VAT) reverse charge mechanism, as well as of particular regimes that are applicable for example to distance selling and everyday purchase of citizens in other EU countries. Further on, the chapter includes explanation of basic VAT frauds inside the EU (carousel fraud), and an historical overview of the VAT system inside the EU, including the latest proposals for the final VAT regime for trade in the single European market. Chapter 8 is the most theoretical part of the book, observing the expenditure tax, a theoretical concept that has nevertheless influenced contemporary tax systems, including the personal income tax in Croatia during the 1990's. Corporate income tax is the topic of chapter 9. Definition of its base is followed by discussion on arguments for the existence of this tax and the presentation of different corporate income tax systems. The theoretical part of the chapter also includes explanation of tax incidence and a short overview of Harberger model of general equilibrium. The chapter continues with practical issues of the tax, e.g. with its influence on corporations' financial decisions and its tax incentives. Chapter 10 deals with taxation of international capital flows. It starts with the explanation of residence and source principles, followed by explanation of capital import and capital export neutrality (CIN and CEN). Further on, the use of principles is presented with reference to some practical examples. The chapter concludes with the harmonization of indirect taxes inside the EU. The following chapter 11 is dedicated to social security, which represents the major share of public expenditure in most European countries. The chapter starts with the explanation of social security terminology and, after that, the rationale of the public financing of those systems is given. The author explains in detail several types of welfare state and the difference between private and public social insurance. The rest of the chapter introduces basic issues of pension and health systems. The presentation of pension systems starts with an explanation of World Bank pillars and concepts such as pay-as-you-go (PAYG) and notional defined contributions (NDC), followed by a subchapter concerning the rationale behind the crisis of contemporary pension systems. The part dedicated to health systems includes an overview of health financing and concludes with arguments supporting the public financing of health care. Chapter 12 – wealth taxes – gives the reader an insight into different types of wealth taxes and continues with a discussion of their efficiency, fairness, administrative costs, and a short international overview. In chapter 13 – income distribution – the author describes the concept of income redistribution, as well as the basic inequality measures (Gini coefficient and Atkinson index), and debates on the social welfare functions. Chapters 14 and

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15 introduce the ESA 95, European System of Accounts, and present topics related to budget deficit and public debt. In these chapters, the fundamentals of ESA 95 are explained, as illustrated by Slovenian data. The part about deficit and debt offers definitions of concepts, as well as a few practical examples. The very last part offers a short overview of public debt in EU countries.

The textbook thus presents a comprehensive reading and an excellent addition to the series of public finance textbooks, used at the Faculty of Economics – University of Ljubljana, written by Tine Stanovnik and previously by his mentor Lado Rupnik.

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