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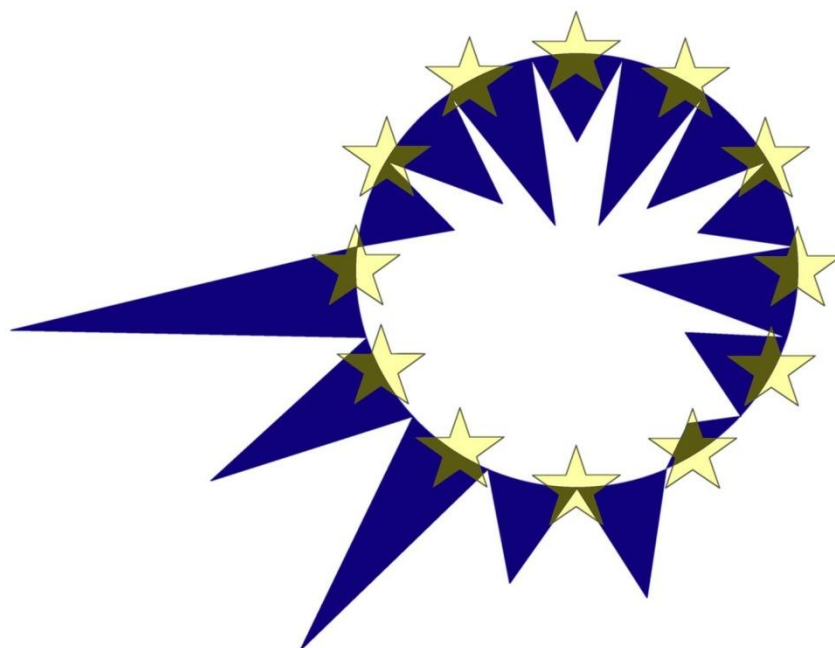
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Effects of Income Tax on Personal Savings: Econometric Evidence from Serbia

Sasa Randjelovic

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EFFECTS OF INCOME TAX ON PERSONAL SAVINGS: ECONOMETRIC EVIDENCE FROM SERBIA¹

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Abstract

Due to limited access to foreign savings after the 2008 crisis, transition economies are forced to rely more on domestic savings in financing their growth. In that respect, it is often argued that the government should use tax policy to encourage domestic savings. Since the personal income tax reform is a burning issue in Serbia, the aim of this paper is to provide empirical evidence on the expected effects of each of the three income tax reform scenarios (flat, dual and comprehensive income tax scheme) on personal savings in Serbia, by taking into account both capital income tax effects and labour income tax effects. Taylor's theoretical model suggests that the personal saving is a function of personal income and the rate of return to savings. This is one of the seminal papers, in which the savings effects of tax policy reform are empirically estimated for a transition economy by taking into account both transmission channels. By combining Engle-Granger cointegration methods based on monthly macro data from 2004 to 2009, with the tax-benefit microsimulation model based on cross section micro data for 2007, it has been estimated that changes of capital income tax rate effects prevail

¹ This paper uses SRMOD , a tax-benefit simulation model for Serbia. SRMOD has been constructed using EUROMOD 2.8 as a platform. EUROMOD is continually being improved and updated and the results presented here represent the best available at the time of writing. Any remaining errors, results produced, interpretations or views presented are the authors' responsibility.

over the effects of labour income tax changes, in terms of savings response. The results suggest that introduction of dual income tax in Serbia would boost personal savings in the long run, by 0.20%, while the flat tax and comprehensive income tax would lead to its decline by 2.15% and 3.64% respectively.

JEL Classification: H22, H24, H31

Key words: income tax reform, personal savings, Taylor's model

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1. Introduction

Capital is one of the key production factors and one of the key drivers of economic growth. In the last decade growth in Serbia was mostly financed by means of FDI and cross-border loans, since the formal (institutional) savings in Serbia at the beginning of transition was negligible. However, starting from 2008 the supply of capital on the international financial markets deteriorated considerably, which led to a decline in the flow of FDI and cross-border loans. Therefore, it is expected that domestic accumulation would have to play a greater role in financing growth in Serbia in the following period. In that respect, it is often argued that the changes in tax policy, particularly in terms of capital income taxation, could make substantial contribution to boosting national savings.

The diversity of capital income tax rules in developed and developing countries is, *inter alia*, the consequence of the fact that the theory of taxation does not provide a unified view on this issue. While one approach suggests that the zero capital income tax is close to optimality, the other claims the opposite. Proponents of zero capital income tax rate claim that capital is an intermediary good, which as such should not be taxed away. Besides, assuming high elasticity of savings to required rate of return, imposition of capital income tax could trigger a decline in accumulation of capital, leading to deterioration of economic growth (Mankiw, et. al. (2009)). In addition, when high capital mobility is present, high taxes on capital income could trigger outflows of capital, which would also be harmful from the growth perspective. On the other hand, proponents of taxation of capital income claim that the underlying assumptions for zero capital income tax are unrealistic (Diamond, et. al. (2011)). Moreover, they suggest that it is hard to distinguish capital and labour income in practice (e.g. in case of self-employment) and that imposition of capital income tax enables cut in labour taxes, which reduces inequality (since poor people more rely on labour income, while capital income is mostly earned by middle and high income classes). It is also pointed out that since there is positive correlation between earning ability and propensity to save, taxing capital income contributes to balancing between equity and efficiency in taxation, because capital income distribution properly describes the ability distribution. In addition to this, it is argued that when there is uncertainty related to future earnings, taxing capital income discourages savings, which should boost labour supply in the future. Although the arguments in favour of zero capital income tax have been discussed for a long time, in practice only three OECD

countries follow this approach (Mexico, Greece and Slovakia). However, in the period from 1980 until 2005 average tax rate on dividend and interest income in OECD countries has been reduced from 55% to 20%.

The existing personal income tax scheme in Serbia differentiates eight sources of income, which are taxed at different - flat tax rates. Such an income tax model does not provide horizontal nor vertical equity in taxation and leads to distortion of economic decisions (Randjelovic, et. al. (2011)). These are some of the most prominent arguments for thorough reform of the personal income tax in Serbia. In that respect, based on the practice in other European countries, three potential reform scenarios are considered: Western-style comprehensive income tax, Nordic-style dual income tax and flat tax (with uniform tax rate), commonly applied in European transition countries. One of the substantial differences between these tax schemes refers to taxation of capital income. While under comprehensive income tax, capital income (dividend, interest, etc.) is taxed as part of total aggregated income at progressive tax rates, dual and flat tax schemes imply taxation of capital income at flat tax rate. However, since savings is also dependent on the disposable income, design of labour income tax also may have impact on the personal savings, which is not commonly considered in empirical studies related to taxation and savings.

The aim of this paper is to provide empirical evidence on expected effects of each of these income tax reform scenarios in Serbia on domestic savings and to contribute to the literature on the effectiveness of tax policy in boosting savings and capital accumulation. The contribution of this paper also refers to the fact that it takes into account labour market-capital market interaction, by employing both transmission channels (rate of return and income, i.e. the effects of capital income tax and labour income tax) in estimating savings effects. The results suggest that the direct effects of introduction of flat tax and comprehensive income tax on personal savings, through change in after-tax interest rates, would be negative, while in case of introduction of dual income tax being neutral. The indirect effects of tax reform on savings, through labour income effects, would be positive under all reform scenarios. The total (net) effects of introduction of dual income tax on personal savings in Serbia would be positive (increase in savings by 0.20% in the long run). At the same time, total (net) effects of flat and comprehensive income tax would be negative (decline in bank deposits by 2.15% and 4.43% in the long run, respectively).

The paper is structured as follows. In the second chapter theoretical framework and literature review are presented. The third chapter describes current institutional setting for personal

income taxation in Serbia and introduces three, hypothetical, income tax reform scenarios. In the fourth chapter the data, methodology and the model are disclosed. The empirical results are presented in chapter five, while the chapter six concludes.

2. Theoretical framework and literature review

Unlike classical economic theory which has regarded capital as one of the two growth drivers, neoclassical growth models (such as Solow model) treat growth as an exogenous process, conditional on the increase on population and technological progress, which implies that the capital accumulation is important only in transition to steady state. However, results of numerous empirical researches suggest that there is strong positive relationship between the capital accumulation and economic growth (Baumol (1989)). Therefore, the fundamental question is which policy measures could be efficient in accelerating growth, by boosting capital accumulation.

The positive impact of saving on economic growth is transmitted via increase in investments. Assuming that the impact of savings on investment and growth is positive, which is empirically confirmed (Chakrabarti, A. (2006)), the fundamental question is if (and how) tax policy could trigger an increase in savings. The view of economic theory on this issue has evolved considerably over time. Keynesian approach relies on „absolute income hypothesis“, according to which consumption is a function of real income and marginal propensity to save. This implies that tax policy instruments could be efficient in promoting savings. This relationship between taxation and savings is further elaborated in the IS-LM model. Further to this model, increase in the tax rate moves IS curve downwards, which implies reduction in the savings rate at certain level of income. Contrary to the classical theoretical considerations, neoclassical economic theory has based its view on „permanent income hypothesis“ (Friedman (1957)). Starting from this hypothesis, it proves that the permanent income-permanent consumption relationship is strong (elasticity equal 0.9), which suggests relatively low propensity to save. Under such arrangement potential effects of economic policy (including tax policy) in boosting savings are limited (Peter, et. al. (2006)).

The basic framework for the analysis of impact of tax policy on savings is based on Taylor's model, according to which aggregate savings (S) is a functions of desired amount of wealth (W^*), and existing wealth (W_{-1}):

$$S = \varphi(W^* - W_{-1}) \quad (1)$$

Desired wealth is dependent on the income (Y) and the rate of return (r):²

$$W^* = b_1 * Y + b_2 r \quad (2)$$

Equations (1) and (2) suggest that aggregate savings is a function of income and the rate of return, which is the basic theoretical framework for the most of contemporary empirical studies of impact of public policies on savings.

The introduction or increase in tax on return to savings (interest, dividend, capital gains, etc.) leads to decline in net (after-tax) return, the reduction in the rate of return being dependent on the elasticity of savings to net return. The impact of reduction in the after-tax rate of return on savings is the result of an income and a substitution effect. The introduction of capital income tax changes the relative price of current to future consumption. The increase in the after-tax rate of return is equivalent to uncompensated fall in price of future consumption, which leads to rise in savings, and *vice versa*. This is the substitution effect which postpones consumption, i.e. boosts savings. On the other hand, income effect leads to increase both in current and future consumption, thus reducing savings. Which of these two effects would prevail is the issue of empirical analysis.

The impact of personal income tax on savings can be estimated indirectly, by estimating savings-interest elasticity and introducing assumptions on the incidence of capital income tax. Regardless of the methodological approach, empirical literature suggests that the impact of interest rate on savings is positive and moderate (Bernheim (1999)). Modest levels of elasticity are explained by the declining international mobility of bank deposits to income tax rates. Recent empirical studies indicate that elasticity of savings to income tax rate is low, ranging from -0.035 to 0.035 (Huizinga, H. (2004)). This is the consequence of modest elasticity of savings to the rate of return and relatively low capital income tax rates. The average tax rate on interest income in the Bank for International Settlements member states declined from 50% (in 1983) to 30% (in 2000) and the same trend has continued. At the same time, cross-border movements of bank deposits have slowed-down. In addition, in developed countries interest rates on bank deposits are relatively low, which is why the variation in tax burden is less important.

² Taylor, L. D. (1971) i Peter, V., et. al. (2006)

Although the elasticity of savings to capital income tax is modest, cumulative effects of changes in personal income taxation on savings may be considerable in the long run, particularly when taking into account the effects on other markets (e.g. labour market effects). Namely, the change in income tax scheme includes not only change in capital income taxation, but first of all the change in labour income taxation. Labour market effects of change in labour income taxation tend to change the taxpayers' disposable labour income in the long run, which in the second round triggers change in the amount of savings.

3. Personal income tax in Serbia – institutional settings and reform options

Currently in Serbia some sort of combined income tax, defined as mix of scheduler and comprehensive income tax, is applied. Within the scheduler component, incomes from various sources are taxed at the moment of receipt. In that respect, all incomes are divided into eight categories, each being taxed using different rules.

Table 1: Personal Income Tax Rates in Serbia

<i>Source of income</i>	<i>Statutory rate (%)</i>	<i>Deductible costs/ non-taxable amounts</i>	<i>Effective tax rates (%)</i>
Income from self-employment	10	-	10
Salary/wage	12	non-taxable limit - RSD 6,554	10.4 ¹
Income from agriculture and forestry	14	-	14
Income from authorship rights, related rights and intellectual property rights	20	34%, 43%, 50%	10, 11.4, 13.2
Income from capital	10	-	10
Income from immovable property	20	20%	16
Capital gains	20	-	0, 20
Other income	20	20%	16

1) Effective tax rate on average monthly salary in Serbia paid in April 2007
2) Interest on dinar deposits are tax exempted.

Starting from 2001, the Personal Income Tax Law was amended several times. The most important changes relate to reduction in the wage tax rate from 14% to 12%, introduction of non-taxable threshold for wage tax (in 2007), and changes in the capital income tax rates.

From 2001 capital income (interest and dividend) was taxed at nominal rate of 20%. However, the tax base in case of dividend was equal to 80% of gross dividend (in 2009 – 50%), which is why the effective tax rate equals 16% (10% in 2009). At the same time interest income was subject to taxation at the effective tax rate of 20%, except in 2009, when this tax was temporarily abolished, in order to stimulate an increase in bank deposits. Amendments to the Personal Income Tax Law introduced a uniform capital income tax rate of 10% and reduced the capital gains tax rate from 20% to 10%, starting from 2010, while capital income tax rate is increased again to 15% in 2012.

In addition to the tax paid at the moment of receipt of income, individuals resident in Serbia, whose total annual income exceeds stipulated threshold, are obliged to pay annual income tax on the amount of income exceeding the threshold, at progressive rates of 10% and 15%. However, capital income is not subject to annual income tax, in order to mitigate double or triple taxation of this income.

The existing income tax scheme in Serbia is not neutral from an allocation perspective (different types of incomes are treated differently), while at the same time being complex due to a variety of tax rules. The horizontal and vertical equity in taxation are modest, in comparison to other countries (Randjelovic, et. al (2011)). These are some of the frequently quoted justifications of the need for thorough reform of the personal income tax in Serbia. In that respect, taking into account the practice in other European countries, there are several potential strategic options related to income tax reform – introduction of comprehensive income tax, dual income tax or *flat* tax. The most substantial difference between these tax schemes concerns taxation of capital income. Under comprehensive income tax capital income is included in aggregated gross income and taxed at the progressive tax rates. However, due to capital mobility and the consequent distortive effects, stemming from heavy taxation of capital income, some countries (Nordic countries at first) have differentiated the rules of taxation of labour income and capital income. Thus, under pure, theoretical dual income tax scheme, labour income is still taxed at the progressive tax rates, while the capital income is taxed at flat tax rate, equal to the lowest marginal tax rate at which labour income is taxed-away. During the last decade many of Western European countries (e.g. Germany, the Netherlands, etc.) have dualised their income tax schemes, by imposing final withholding tax on capital income, at the uniform tax rate. On the other hand, most Central and Eastern European countries have switched to simple flat tax scheme, meaning that incomes from all sources are taxed at the uniform tax rate. The introduction of flat tax in these countries was

aimed at stimulating capital inflow, tackling tax evasion, reducing compliance costs and adjusting the tax system to its administrative capacity.

Starting from the existing theoretical considerations and the contemporary practice in other European countries, these three reform scenarios are considered in Serbia. For the purpose of this paper, three hypothetical income tax reform scenarios have been construed – comprehensive, dual and flat tax model. The design of hypothetical reform scenarios was limited by two parameters. Firstly, each of the reform scenarios corresponds to a pure theoretical model (comprehensive, dual and flat) of income tax, although in practice these models are often slightly amended when actually introduced. Secondly, the reform scenarios are revenue neutral. Namely, the intensity of economic effects of tax policy is determined by the structure of tax instruments, as well as by the level of burden. Therefore, the performances of reform scenarios would be fully comparable only if they were revenue neutral. The revenue neutrality requirement in ex-ante analyses is elaborated and followed in numerous theoretical and empirical studies related to the analysis of the personal income tax reform (Davis, J., et. al. (2002), Gonzales-Torrabadella, M., et. al. (2006), Decoster, A. (2008)). The reform scenarios which will be analysed in this paper are presented in the Table 2.

These three scenarios represent only some, of numerous possible parameterizations of income tax reform. The results, in terms of estimated economic effects, are highly dependent on the design of tax reform.

Table 2. Income tax reform scenarios

<i>Elements</i>	<i>Flat tax</i>	<i>Comprehensive income tax</i>	<i>Dual income tax</i>	
			<i>Labour income</i>	<i>Capital income</i>
Taxable income	Sum of incomes from all sources	Sum of incomes from all sources	Wages, 80% of self-employment income, and income from agriculture and forestry	Interest, dividend, capital gains, income from immovable property, 20% of self-employment income
Tax base	Gross taxable income decreased by allowances	Gross taxable income decreased by allowances	Gross taxable income decreased by allowances	Gross taxable income
Allowances ¹ (in RSD)	Personal allowance	9,000	9,000	0
	Dependent children allowance	4,000	4,000	0
	Health care expenditures allowance	0	full amount of expenditures	0
	Education expenditures allowance	0	4,000	4,000
Tax rates	15%	10% (up to RSD 20,000) 20% (from RSD 20,000 to 45,000) 25% (above RSD 45,000)	10% (up to RSD 10,000) 15% (from RSD 10,000 to 25,000) 20% (above RSD 25,000)	10%

1) Monthly amount of allowances are presented. It is assumed that allowances are firstly used by the member of the household with the highest income.

4. Data, methodology and basic model specification

From a macroeconomic perspective, domestic savings consists of public and private saving, the later one being equal to the sum of savings of individuals/households and corporate savings. Since in the last decades Serbia has been almost permanently generating fiscal deficits, the contribution of the government sector to domestic saving is negligible. At the same time, data of the National Bank of Serbia and the Business Register Agency indicate that the net result of Serbian corporate sector, in the last two decades was mostly negative. Therefore, the potentials for increasing domestic savings from this source are limited. This suggests that the largest source of domestic saving in Serbia refers to savings of household sector.

Households' can save through bank deposits, by purchasing life insurance or private (fully-funded) pension insurance, by investing in the securities at the financial market or by investing in housing sector. Total premiums collected by the life insurance sector in Serbia in the previous years amounted to approximately 0.3% of GDP, while the premium collected by voluntary pension insurance funds is ten times lower, since this pillar of pension insurance was established in 2006/2007 (NBS (2010)).³ Given that financial market in Serbia is shallow, the participation of individuals in the purchase of securities is also negligible. Due to the underdevelopment of other savings instruments, the bank deposits represent the largest portion of the total savings of the household sector in Serbia (in December 2010 bank deposits of the household sector in Serbia amounted to app. 26% of GDP). Therefore, for the purpose of this study bank deposits of the household sector will be used as a proxy for household sector savings.

The estimation of econometric model which would describe the relationship between savings and its determinants (net return to savings and income) is the starting point for the analysis of the effects of different income tax models on personal savings in Serbia. The specification of the econometric model for estimating interest elasticity of bank deposits in Serbia is pre-determined by the relevant economic theory considerations (equations (1) and (2)) and by the availability of data. The econometric estimation will be performed by using the monthly time series data for the

³ Although theoretically households can save by investing in housing, this form of saving is also not developed in Serbia, due to low personal income (average monthly wage in Serbia was ranging between EUR 300 and EUR 400 in the previous years).

period January 2005-December 2009 (60 observations), due to constraints related to availability of consistent and comparable data.

As previously explained, the dependent variable in the econometric model will be the data series on the level of Euro-denominated deposits in the entire Serbian banking sector (*DEP*), from the database of the National Bank of Serbia, since most of bank deposits in Serbia (app. 95%) are denominated in Euros.

Explanatory variables will be the net-of tax interest rate offered by the banks to households (*IR*) as indicator of the rate of return to savings, the average wage bill (*WB*) and the amount of remittances (*REM*) as proxies for households income:

$$\log DEP_t = \beta_0 + \beta_1 \log IR_t + \beta_2 WB_t + \beta_3 \log REM_t + \beta_4 d + \varepsilon_i \quad (3)$$

Since money supply (savings) predominantly depends on the return to saving, the first explanatory variable to be included in the model is the series of net-of-tax interest rates, offered by the banks to the private (household) sector. Given that the National Bank of Serbia does not provide a sufficiently long data series on passive interest rates on bank deposits, for the purpose of this analysis the sample of the banks has been created. The total amount of savings in the banks included in the sample amounts to over 30% of the total bank deposits in Serbia. In addition, the banks included in the sample differ by size, ownership structure, market share and the type of business strategy, in order to make it as representative as possible. Sample banks have been requested to provide the series of monthly data on the interest rates offered to household sector, for Euro-nominated deposits. Since the interest rates are slightly differentiated by the term and amount of deposits, the data on the interest rates on one-year Euro deposits have been used, because most personal saving in Serbia is deposited on a 12-months term. The variable *IR* included in the model is weighted average of the net-of-tax interest rates offered by the sample banks for one-year deposits. Weights assigned to interest rates, offered by particular sample banks, equal their respective share in the total bank deposits in Serbia. Since the data received from the sample banks refer to interest rates before tax, while the savings behaviour depends on the rate of return net of tax, this series has been transformed to the respective after-tax interest rates, by using respective capital income tax rates (20% by 2008 and 0% in 2009).

In addition to the interest rates, the saving is dependent on the amount of personal income. Since the Statistical office of Serbia does not provide monthly data on households/personal disposable income, the data on wage bill and the monthly data on remittances have been used, as the proxy for disposable income. The statistical data indicate that over 90% of households' income in Serbia comprises of wages and pensions. Due to low level of pensions (compared to the living costs), they cannot be regarded as the significant source of savings. Wage bill series equals the number of employees multiplied by the average net salary, as per the records of the Statistical office of Serbia. In addition to this, Serbia has large capital inflow based on remittances from Serbians living abroad to their relatives, ranging between 13% and 16% of GDP per year. Therefore, the data on remittances, collected from the data base of the National bank of Serbia, have also been included in the model.

The bank deposits in Serbia fell dramatically in the last quarter of 2008, due to psychological effects related to the global financial crisis, but after the initial fall they have quickly returned to pre-crisis level. Therefore, the dummy variable (d) depicting this structural break (in October, November and December 2008) is also included in the model.

In order to stabilize the series and to compute coefficients of elasticity, Box-Cox transformation of almost all variables has been performed. The empirical distribution of the wage bill is normal, and transforming it to logarithm makes it skewed, which influences the performances of estimated parameters. Therefore, the level of WB variable is included in the model.

5. Empirical results

According to the basic theoretical model, saving is dependent on return to savings and personal (disposable) income. Therefore, the effects of income tax reform on both transmitting channels will be assessed, in order to make an estimation of the overall effects of each reform scenario on the personal savings. First, the savings model will be estimated. Afterwards, the changes to the net-of tax interest rate (under assumption of equal tax incidence) will be assessed, in order to estimate the direct impact of capital income tax reform on savings (through alteration of the rate of return). In the next step, the effects of income tax reform on net employment income (as proxy

for total income) will be estimated, in order to capture the effects of changes to labour income taxation on savings.

5.1 Estimating basic model of personal savings

Selecting a method of estimation of the savings model depends on the stationarity of respective data series. Therefore, prior to the selection of an estimation method, it is necessary to perform unit root tests for all variables to be included in the model.

Schwert's rule suggests that the optimal number of lags to be included in unit root tests equals ten. Augmented Dickey-Fuller (ADF) test indicates that *logDEP* series has two unit roots, while Philips-Perron (PP) test imply existence of only one unit root. Since there is a structural break in the series (in Q4 2008), one unit root could be related to that break. Therefore, Zivot-Andrews and Climao1 unit root tests of series with structural break has been applied.⁴ The results of this test confirm the presence of unit root in *logDEP* series, while the first difference of this series is stationary, which means that this series has exactly one unit root. The similar conclusion is related to *logIR* series. Namely, the ADF test suggests that there are two unit roots in this series, while PP test suggests the presence of one unit root. Since there is a structural break in this series as well, Zivot-Andrews and Climao1 tests have been used, in order to perform the unit root test when there is a structural break in the series. These tests imply that the *logIR* series has only one unit root.⁵ With regards to the stationarity of the *WB* series, ADF test suggests existence of two unit roots, while PP test imply that there is only one unit root in this series. Since the seasonal component is strong in the wage bill series (the average wage rises significantly in December, falls in January and again rises in the middle of the year when the holiday allowance is paid-out), the second unit root could actually be seasonal. In that respect, HEGY12 seasonal unit root test has been applied. This test has suggested that the first difference of *WB* series is stationary, which means that this series has only one unit root.⁶ It has been concluded that the *WB* series has one regular and one seasonal unit root. For the *logREM* series, both ADF and PP test indicate that there is one unit root.

⁴ See: Zivot, E., et. al. (1992)

⁵ See: Clemente, J. et. al. (1998)

⁶ For the details on seasonal unit root tests see: Depalo, D. (2008)

Since all variables under consideration are of the same level of integration ($d=1$), the elasticity can be estimated by applying the Engle-Granger cointegration method or by using VAR/VECM model. Economic theory, as well as results of empirical studies in numerous countries are unambiguous and suggest that the interest rate affects the level of savings (not the opposite), which means that there is no dilemma on the direction of causality between interest rates and bank deposits. In addition to this, we have performed the causality test on our data. Firstly, a VAR model has been estimated. The information criteria suggested that inclusion of three lags is appropriate. Starting from VAR(3) specification, the Granger causality test has been applied. The results indicate that the average weighted deposits interest rates in Serbia (IR) Granger cause the changes in the level of bank deposits (DEP), since the null hypothesis that the coefficient with the interest rate equals zero is rejected ($p=0.0000$). At the same time, the test implies that the changes in deposits do not Granger cause changes in the interest rates, since the null hypothesis that the coefficient with the deposits equals zero could not be rejected ($p=0.149$). This clearly confirms that there is no dilemma in respect of the direction of causal relationship between interest rates and bank deposits, which means that there is no need to follow VAR/VECM approach and that a two-stage Engle-Granger cointegration procedure should provide appropriate estimates of the respective elasticities.

Starting from the initial model specification (equation (3)), the $\log DEP$ variable has been regressed on the respective explanatory variables, and the following results have been obtained:⁷

$$\log \hat{DEP}_t = 8.51 + 0.88 \log \hat{IR}_t + 0.002 \hat{WB}_t + 0.18 \log \hat{REM}_t - 0.41d$$

In due course, the residuals series has been created and its stationarity has been tested. Both ADF and PP, as well the graphical representation of residuals suggest that the residual series is stationary, which confirms that the variables included in the model are cointegrated, i.e. that the linear combination of these (non-stationary) variables is stationary. Therefore, the estimated coefficients can be interpreted as indicators of long-run relationship between these variables.

⁷ All estimated coefficients are statistically significant (at $\alpha=0.01$) and at the same time they are jointly statistically significant $F(4,55)=163.27$. Adjusted R^2 equals 0.91, while Jarque-Berra test suggests that the residuals are normally distributed. However, due to standard manner of representation in case of Engle-Granger cointegration models, statistical properties of the model are not disclosed with the model parameters.

In addition to these variables, we have attempted to include additional variables in the model, which were considered as potentially important in modelling bank deposits: weighted average interest rate on one year time deposits in Eurozone, interest rate differential (defined as the difference between the average interest rate on deposits in Serbia and the EU), inflation rate in Eurozone, dummy variable for the „week/month of savings“⁸, dummy variable which would take into account abolishing the interest income tax in 2009,⁹ and trend. Inclusion of these variables did not improve the quality of the model, which is why none of these variables is included in the final specification of the econometric model.

Estimated elasticity of bank deposits to offered interest rate in Serbia is positive and equals 0.88, while the elasticity of savings to wage bill and remittances is lower, amounting to 0.2 and 0.18 respectively. The robustness of the results has been checked by estimating the VECM on the same variables, after the Johanssen procedure has confirmed the existence of a cointegrating vector. The estimated elasticities obtained in VECM are close to those obtained through Engle-Granger cointegration method, which suggests that the results are robust.

The estimated bank deposits elasticity to interest rate in Serbia of 0.88 is within the range of estimated elasticities in other 15 countries, ranging from 0.2 to 4.5, but somewhat lower than the average in elasticity (1.44) in these countries (Peter (2006)). Lower elasticity in Serbia compared to the developed countries is explained by the lower confidence of individuals in banking sector, since in 1990s banking system collapsed in Serbia and the bank deposits of the private sector were frozen and converted to public debt, which is now being paid out in instalments, until 2016.

5.2 Estimating savings response to personal income tax reforms in Serbia

The change in the capital income tax rate after each tax reform scenario would trigger changes in the bank deposits, the level of changes being dependent on the estimated elasticity. But at the same time, the change in personal income tax also triggers certain labour market effects, since it leads to a change in the tax wedge (on labour income). Since unemployment in Serbia is very

⁸ „Week/month of saving“ refers to a program aimed at attracting bank deposits in November each year, supported by the National Bank of Serbia, which reduces the obligatory reserves on bank deposited in that month. Therefore, interest rates offered by the banks in that month might be slightly higher than in the other months.

⁹ In 2009 the tax on interest income was reduced to 0% in order to boost personal savings in the banks. Starting from 2010, this tax was re-introduced, now at the rate of 10%.

high (app. 25%), due to a shortage of vacancies, it is believed that the income tax reform could trigger effects on the level of (un)employment in Serbia, through changes in labour demand, caused by the change in tax wedge. In order to capture the overall effect of income tax reform on personal savings, it is necessary to capture the effects realized through both channels of transmission.

a) Estimating the effects of change in capital income tax rate on bank deposits

By using the tax-benefit microsimulation model for Serbia (SRMOD), run on the 2007 Living Standard Measurement Survey of 5,553 households, it has been shown that the total income of the most of taxpayers in Serbia is within the RSD 20 thousand and RSD 45 thousand, which falls to 20% tax bracket (under the comprehensive income tax scheme). Therefore, for the purpose of assessing savings response to income tax reform, the average capital income tax rate of 20% has been applied, which means that the tax rate on interest income rises by 10 p.p. comparing to the baseline scenario. Under hypothetical dual income tax scheme, capital income would be taxed at 10% tax rate, which is the same as under the existing tax scheme, while under flat tax model, the general tax rate of 15% is by 5 p.p. higher than the existing capital income tax rate. The tax rates have been derived so as to achieve revenue neutrality with the baseline scenario, which is prerequisite for comparability of different tax models. In addition, theoretical features of these three income tax schemes also had impact on the level of capital income tax burden (e.g. capital income tax rate under dual income tax scheme should equal the bottom marginal tax rate applied to labour income). Therefore, final layout of tax schedules was derived through calibration of the model on micro data, under revenue neutrality limitation and the need to make the reform scenarios realistic (in terms of political economy) and at the same time comparable with the tax models applied in other European countries.

According to the data from our sample, the average before-tax interest rate offered for one year Euro nominated, time deposits amounts to 4.58%. Since the savings decision is based on the net-of-tax rate of return, it is necessary to compute after-tax effective interest rate for each tax model. That computation would be dependent on the incidence of interest income tax, i.e. who bears the tax burden – bank or deponent. By comparing the after-tax interest rate for each income tax scenario to the after-tax interest rate under the baseline scenario, the percentage change in the

after-tax interest rate is computed. Starting from the estimated elasticity of bank deposits to interest rates and the percentage changes to the after-tax interest rate, the long-run changes in bank deposits due to capital income tax reform can be estimated.

Since the incidence of interest income tax in Serbia is not being empirically estimated, for the purpose of this analysis it has been assumed that the tax burden is equally shared between the banks and deponents.

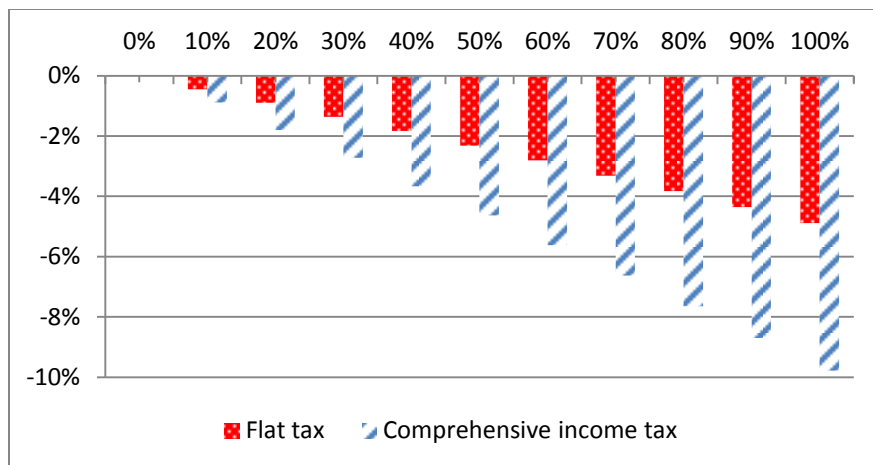
Table 3. Long run changes to the level of bank deposits, under different income tax reform scenarios, compared to baseline scenario

	<i>Flat tax</i>	<i>Comprehensive income tax</i>	<i>Dual income tax</i>
Average before-tax interest rate	4.58%	4.58%	4.58%
Interest income tax rate	15%	20%	10%
Average after-tax interest rate	4.24%	4.12%	4.35%
Change to the interest rate	-2.63%	-5.26%	-
Elasticity of bank deposits to interest rate	0.88	0.88	0.88
Long-run change in the level of bank deposits	-2.3%	-4.6%	0

The results presented in the Table 3 suggest that, *ceteris paribus*, a switch to 15% capital income tax (flat tax scheme) would trigger decline in the bank deposits by 2.3% in the long run, while in the case of the comprehensive income tax it would fall by 4.6%, assuming even distribution of the tax burden. In the case of dual income tax no direct effects on personal savings would arise, since the capital income tax rate does not change, relative to the baseline scenario.

As noted, the effects of income tax reform on the bank deposits are highly dependent on the incidence of capital income tax. Since the empirical estimation of tax incidence in Serbia is beyond the scope of this paper, it would be useful to perform some sensitivity analyses of changes to the level of bank deposits, for various distributions of the income tax burden between the banks and deponents, in order to identify the potential range of changes in savings from different tax reform scenarios.

Figure 1. Estimated changes to the level of bank deposits in Serbia, depending on the percentage of tax burden born by deponents



The results of the sensitivity analysis suggest that the introduction of the respective flat tax scheme in Serbia could, *ceteris paribus*, trigger a long-run decline in bank deposits by 0% (if capital income tax burden is fully born by banks) to 4.9% (if the whole tax burden is born by deponents). At the same time, the potential decline in case of introduction of the comprehensive income tax model would range from 0% to 9.8%.

b) Estimating the effects of labour income tax reform on bank deposits

As previously discussed, employment income represents more than 4/5 of total disposable income in Serbia. Therefore, changes in employment income could be regarded as a proxy for individuals' disposable income. The wage bill (total amount of employment income paid out in one month) is predominantly determined by the level of employment and the average wage. At the same time, it is justified to assume that the correlation between labour demand and the level of employment in Serbia in the long run is high, due to extremely high levels of unemployment (app. 25%). Therefore, in order to determine the effects of an income tax reform on the wage bill it is necessary to estimate the changes in the labour income tax wedge for each reform scenario, and to estimate the tax wedge-labour demand elasticity in Serbia.

The change in the average tax wedge under each reform scenario is estimated by means of tax-benefit microsimulation model for Serbia (SRMOD). Parameters of each reform scenario are modelled and then the total tax wedge for each individual and average tax wedge for the total active population is computed. According to the results of microsimulation analysis, the introduction of a flat tax would trigger decline in the average employment income tax wedge by 2.01% (compared to the baseline scenario), while in case of dual and comprehensive income tax

thw wedge would fall by 2.27% and 2.48% respectively. Although the employment income tax wedge is changed, each reform scenario is in total revenue neutral, due to changes in taxation of other forms of labour income (self-employment, agriculture, etc.) and changes to taxation of capital and other incomes (rental income, income from royalty, income from free-lance contracts, etc.).

Income tax reform alters the tax wedge on labour income, which then triggers labour supply and labour demand effects, depending on the tax incidence and respective elasticities. Since the unemployment rate in Serbia is extremely high, it is assumed that the labour demand effects would play a greater role in terms of changes in (un)employment, than labour supply. In order to estimate the labour demand – tax wedge relationship, monthly data from January 2004 to December 2008 (60 observations) have been used. The data of the National Employment Bureau (NEB) on the number of vacancies (VAC) has been used as a proxy for labour demand. Until the end of 2008 employers in Serbia were obliged to report all vacancies to the NEB, regardless of the manner of recruitment (via NEB or via internal selection processes). Starting from 2009, they are obliged to report only those vacancies which will be filled with the assistance of NEB. According to economic theory and empirical literature, the main determinants of labour demand are labour costs (wages) and the output (Carne (2007), Lewis (2002)). In that respect, the data on GDP have been used as the proxy for output, while in terms of labour costs there were several options available. According to economic theory, labour demand could be driven by the minimum wage, labour costs or other indicator highly correlated with them. Since the aim of this analysis is to estimate a tax wedge-labour demand elasticity, while the tax-wedge is highly correlated with the labour costs (correlation close to one), the monthly data series on the average wage tax wedge, have been used. Wages in Serbia are subject to income (wage) tax and social security contributions. The rules for computation have been changed several times in the sample period – the payroll tax has been abolished in July 2004, the social contributions rate was increased in September 2004, a non-taxable threshold was introduced in August 2006, while the wage tax rate was lowered from 14% to 12% starting from January 2007. In addition to this, the non-taxable threshold has been indexed by CPI at the beginning of each following year. Since the tax wedge series (TW) is highly correlated with labour costs and the minimum wage, the later two are dropped from the model in order to avoid the multicollinearity. Standard unit root tests (ADF and PP test) suggest that the vacancies and GDP series have one unit root, while in

case of tax wedge, the ADF test suggests the existence of two unit roots, while the PP test discovers one unit root. Since the tax wedge is perfectly correlated with wages, which have strong seasonal component, the seasonal unit root test (HEGY 12) has been applied. This test suggested that the second unit root in TW series is seasonal unit root, which implies that this series also has one regular unit root. Since all series are of the same order of integration (d=1), the Engle-Granger cointegration method can be used for estimation of tax wedge-labour demand elasticity. The cointegration model has the following form:

$$\log VAC_t = \beta_0 + \beta_1 \log TW_t + \beta_2 \log GDP_t + \varepsilon_t \quad (4)$$

Based on the sample of monthly data from January 2004 until December 2008, the following model has been estimated:¹⁰

$$\log \hat{VAC}_t = 4.17 - 0.38 \log \hat{TW}_t + 0.86 \log \hat{GDP}_t$$

ADF and PP test show that residuals for this cointegration model are stationary, which is confirmed by the graphical inspection. This confirms existence of cointegrating relationship between the parameters included in the model.

The cointegration model indicates that the estimated labour demand-tax wedge long run elasticity equals -0.38, while the labour demand-output elasticity equals 0.86.

It is also possible to estimate the short run relationship, by applying an error correction model:

<i>Dependent variable</i>	<i>Explanatory variables</i>		
$\Delta \log VAC_t$	resid _{t-1}	$\Delta \log TW_t$	$\Delta \log GDP_t$
Estimate	-0.99	-0.35	1.18
t-statistics	-7.14	-2.35	-3.65
p-value	0.000	0.022	0.001
Other statistical properties	$R^2=0,50$; $F_{(3, 56)}=18.51$ (p=0.000); DW=1.90; JB=1.55		

Estimated parameters of ECM are individually and jointly statistically significant (at $\alpha=0.01$), the Durbin-Watson and Breusch-Godfrey tests indicate that there is no autocorrelation problem,

¹⁰ All estimated coefficients are statistically significant (at $\alpha=0.01$) and at the same time they are jointly statistically significant $F(4, 55)=163.27$. Adjusted R^2 equals 0.50, while Jarque-Berra test suggests that the residuals are normally distributed. Durbin-Watson and Breusch-Godfrey tests indicate that there is no autocorrelation. However, due to standard manner of representation in case of Engle-Granger cointegration models, statistical properties of the model are not disclosed with the model parameters.

while the Jarque-Berra test suggests that the residuals are normally distributed. ECM suggests that the short run elasticity between labour demand and tax wedge equals 0.35.

Since the aim of the study is to estimate long run effects of the income tax reform, the estimated coefficient of labour demand-tax wedge elasticity, from basic cointegration model will be used.

Table 4. Effects of the income tax reform on labour demand

	<i>Flat tax</i>	<i>Comprehensive income tax</i>	<i>Dual income tax</i>
Average change in tax wedge	-2.01%	-2.27%	-2.48%
Labour demand-tax wedge elasticity	-0.38	-0.38	-0.38
Average change in labour demand	0.76%	0.86%	0.94%
Elasticity of bank deposits to wage bill	0.2	0.2	0.2
Average change in bank deposits	0.15%	0.17%	0.20%

The results of econometric and microsimulation analysis suggest that the each of these reform scenarios would trigger a rise in the labour demand, the increase being the lowest in case of flat tax (0.76%), somewhat higher in case of dual income tax (0.86%) and the highest in case of comprehensive income tax (0.94%). If the elasticity between labour demand and employment equals one, the change in labour demand would cause a corresponding change in employment. If the wage bill rises as the employment is rising, the introduction of flat tax, comprehensive or dual income tax, *ceteris paribus*, would trigger an increase in bank deposits in the long run, by 0.15%, 0.17% and 0.20% respectively.

c) Estimating the total effects of income tax reform on savings

Starting from the estimated cointegration model of personal savings in Serbia and the estimated changes in the after-tax interest rate and the wage bill the total impact of each reform scenario on bank deposits, can be estimated. Since remittances are non-taxable in Serbia and it is implicitly assumed that they will remain non-taxable after the reform, it is envisaged that the amount of remittances after tax reform will not change.

Table 5. Total effects of income tax reform on bank deposits in Serbia

Estimated change in bank deposits...	<i>Flat tax</i>	<i>Comprehensive income tax</i>	<i>Dual income tax</i>
...due to change in after-tax interest rate	-2.3%	-4.6%	0
...due to change in wage bill	0.15%	0.17%	0.20%
Total	-2.15%	-4.43%	0.20%

The results imply that the direct impact of tax reform on bank deposits (through change in after-tax interest rate) would be mostly negative, while the indirect effects, through increase in employment/wage bill, would be positive. Overall, the introduction of dual income tax would trigger positive long-run impact on personal savings in Serbia, through spill-over effects from labour market to capital market (bank deposits). At the same time, the introduction of flat tax and comprehensive income tax would have adverse impact on personal savings, the negative effects being larger in case of comprehensive income tax.

6. Concluding remarks

The question of effectiveness of public policies in boosting capital accumulation and its inflow is particularly important when the countries are facing limitations in respect to access to capital, a situation Serbia found itself in after 2008. In that respect, it has been argued that reform of personal income tax, which is motivated by other (non-capital related) weaknesses of the existing tax system, could also contribute to a rise in domestic savings. According to economic theory, domestic saving is determined by two groups of factors: the rate of return and personal (disposable) income. Therefore, in order to assess the effectiveness of government policy in boosting personal saving, it is necessary to capture the effects in both transmitting channels. This is particularly the case with personal income tax reform, which triggers changes in taxation of both capital income and labour income. Capital income taxation affects the after-tax rate of return to savings, while labour income taxes have influence on the wage bill, through altering the level of employment.

Since the existing income tax system in Serbia performs poorly, both in terms of equity and efficiency, compared to other countries, the reform of personal taxation and its implication is a burning topic in academic and policy making circles. In that respect, three potential ways to reform income tax scheme have been discussed – flat tax, dual income tax or comprehensive

income tax. In this paper the implications of different income tax reform options on personal saving in Serbia have been examined. There is a substantial difference between the three reform scenarios with respect to taxation of capital income. The results suggest that, *ceteris paribus*, only the dual income tax would trigger an increase in personal savings in the long run (by 0.20%), while in case of a flat tax or comprehensive income tax personal savings would decline by 2.15% and 4.43% respectively. However, these results should be interpreted with caution due to several reasons. Firstly, if the capital income tax incidence is different from the one assumed in this study (50:50), the total effects could be different. Secondly, the results are highly dependent on the parameterization of the reform scenarios (e.g. if dual income tax is designed so as to lead to an increase in capital income tax rate compared to the baseline scenario, the conclusion would change). Thirdly, these results are valid only under the other-things-being-equal assumption.

Despite the caveats and limitations discussed above, this study is among one of the first to empirically examine the relationship between personal savings and tax policy reform, by taking into account labour-capital interactions, particularly in transition economies. In addition, it provides a broad analytical framework for the analysis of other income tax reform options and the inputs for further analysis aimed at assessing the growth effects of income tax reform in Serbia.

In addition to this, the results of the empirical analysis lead to the conclusion that the (personal income) tax policy is not an efficient instrument for boosting personal saving in Serbia. This implies that other, non-tax related measures have to be analysed in order to design an effective policy aimed at increasing the level of domestic saving, necessary to finance economic growth.

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