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THE NEUTRALITY OF TAXATION OF INVESTMENT PROJECTS IN SERBIA

ABSTRACT: *The paper analyses the neutrality of taxation of investment projects on the example of Serbia. The aim of the research is to confirm/reject the existence of uniformity of the tax burden on investment projects that differ regarding the asset type, industry and the source of finance. The uniformity of tax burden, that is, the absence of discrimination and distortive effects of taxation, may be considered a confirmation of the tax neutrality. To investigate neutrality of taxation the analysis employed King-Fullerton framework of calculating effective marginal tax rates. The research results show that the tax treatment of investment projects in Serbia is nondiscriminatory. Marginal effective tax rates for different types of investment projects do not vary widely; that is, there are no investment projects that have a markedly favourable (unfavourable) tax treatment compared to the other types of investment projects.*

KEY WORDS: *Investment decision making, tax burden, tax neutrality, marginal effective tax rate*

JEL CLASSIFICATION: D22, G11, H21, H32, H71

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1. INTRODUCTION

Taxation is one of many factors that influence the investment decision-making process in corporations. More specifically, taxation may affect the decision to invest in a particular investment project in a certain national tax jurisdiction, as well as the volume of investment. Assuming the influence of other factors is held constant in the observed period, it can be argued that companies will invest more in countries with a relatively low tax burden, while countries with a relatively high tax burden will attract less capital or possibly suffer an investment outflow. Thus, in order to obtain an impartial assessment of the profitability of investment projects, companies have to consider the tax regime.

The traditional approach to the analysis of the tax burden on investment projects is based on the research of Jorgenson (1963), Hall and Jorgenson (1967), and King (1974). Jorgenson (1963) estimates the impact of taxes on the cost of capital; that is, the rate of return that an investment project must generate to be profitable for the investor after paying taxes. Hence, the cost of capital can be defined as the minimum rate of return that a project must generate to position itself at a break-even point, or the point where the depreciation cost is settled and taxes and dividends are paid to government and shareholders respectively (Gale & Orszag, 2005, 410). The model of investment project analysis with the cost of capital as a central variable is further expanded in Hall and Jorgenson (1967), using the basic assumption that a firm seeking to maximize profits invests until the present value of the marginal return of the investment project becomes equal to the marginal cost of purchasing the particular asset.

King and Fullerton (1983) expand the concept of the cost of capital developed by Hall and Jorgenson (1967) by including personal income taxation (dividends and capital gains received by shareholders) and various investment project sources of finance. In addition to different sources of finance, King and Fullerton (1983) assume that investment projects differ with respect to the asset type being financed, the sector of the economy in which the investment is made, and the characteristics of the after-tax return on the investment project. The measuring of marginal effective tax rates is carried out for new (marginal) investment projects that represent different combinations of these characteristics. Thus, the size of the effective tax rate depends on the distinct combination of these characteristics (Gordon, Kalambokidis & Slemrod, 2003, 8).

King and Fullerton (1983) define the marginal effective tax rate using a marginal tax wedge. The marginal tax wedge represents the difference between the before-tax rate of return on the marginal investment and the after-tax rate of return. The before-tax rate of return is the rate of return on one extra unit of capital engaged in an investment project in the absence of taxation, while the after-tax rate of return is the rate of return received by the shareholder after paying corporate and personal income taxes. Thus, the marginal tax wedge measures the difference between the rate of return that the company realises on one extra (marginal) unit of capital and the rate of return realised by the investor (shareholder or creditor of the company) after paying corporate income tax and personal income tax. The marginal effective tax rate is obtained by dividing the difference between the before-tax and the after-tax rates of return by the before-tax rate of return.

The subject of this research is the measurement of the marginal effective tax rate (METR) as an indicator of the tax burden on marginal investment projects. The primary aim of the research is to determine the extent of tax distortion on the investment decision-making process in the Serbian corporate sector based solely on the measurement of marginal effective tax rates, viewed exclusively from the perspective of a uniform tax treatment of investment projects with different characteristics. In this regard the paper evaluates whether the taxation of new investment projects in Serbia is neutral; that is, taxation does not discriminate against any particular type of new investment project.

The analysis aims to show whether there are investment projects in Serbia that have favourable tax treatment, resulting in greater investor interest, or investment projects that have unfavourable tax treatment, which investors avoid. The different tax treatment of investment projects will be quantified following the conceptual framework to measure the marginal effective tax rate, confirming or rejecting the existence of the neutrality of taxation.

The paper is structured as follows. The second section provides an overview of previous research that deals with measuring effective tax rates as an indicator of the tax burden on investment projects. The third section presents the King-Fullerton framework used to calculate marginal effective tax rates. The fourth section analyses the research data and methodology implemented to measure marginal effective tax rates for the example of Serbia. The fifth part discusses the empirical results, with the emphasis on determining those investment projects that have favourable tax treatment and those whose financing is significantly discouraged by the tax system. The final part of the paper draws appropriate conclusions that can serve as a recommendation to national tax policy creators.

2. LITERATURE REVIEW

The literature analysing the tax burden on investment projects is extensive. Most of the research takes the analysis of diminishing marginal expected returns as its starting point. With regard to the effective tax burden, differences in the taxation of investment projects are an important research issue. The impact of taxation on the investment process is usually assessed through the cost-of-capital function, which represents the minimum required before-tax rate of return the project should generate to be considered profitable.

The concept of the cost of capital was developed by Jorgenson (1963) as a variable that not only includes the cost of financing a new investment project but also depends on the nominal tax rate, economic asset depreciation, inflation, and other variables. Hall and Jorgenson (1967) established the relationship between cost of capital and investment volumes as the basis for measuring the impact of taxation. King and Fullerton (1983) developed the concept of marginal effective tax rates, which Fullerton (1983) pointed to as probably the most adequate methodological tool for measuring tax incentives for the realisation of new investment projects. Initially, King and Fullerton (1983) developed a model to measure METR using the cost of capital and calculating METRs for domestic investment by including taxation on both the corporate and personal level, based on a sample of four countries (the United Kingdom, Sweden, Germany, the United States). The approach is based on the construction of a hypothetical marginal investment project. For each hypothetical investment project the impact of taxation on the cost of capital is measured.

Given that King and Fullerton (1983) focused on domestic investment in buildings, machinery, and inventory financed by domestic savings, this model was later expanded several times. Boadway, Bruce, and Mintz (1984) used a similar approach, but developed a model for a small open economy. However, when international capital flows entered an expansionary phase during the 1980s the tax burden on cross-border investments became a significant research issue.

Keen (1991) and Alworth (1998) showed that this methodology can be extended and implemented in research on multinational corporation taxation by introducing the problem of international double taxation and different sources of finance.

In one of the most influential studies that uses the King-Fullerton framework to measure the marginal effective tax rate, the OECD (1991) compared estimates of marginal effective tax rates for domestic and foreign direct investment in all OECD member countries. This study extended the calculation of tax rates from the original four countries in King and Fullerton (1983) to 24 OECD member countries, 12 of which were members of the European Community. The approach used in OECD (1991) was extended in a European Commission (1992) study that measured tax rates for transnational investments by looking at the case of a branch in one country financed by a parent company in another country. The calculations in this study were based on the assumption of uniform interest and inflation rates in all European Community member states, taking into account the fact that barriers to capital movements within the Community were significantly reduced and that the countries were gearing up to monetary union.

A few years later, Devereux and Griffith (1998) significantly modified the King-Fullerton framework by developing a conceptual framework for analysing the impact of taxation on a company choosing between several distinct investment alternatives. They also introduced a new measure of the impact of taxation on investment projects, the average effective tax rate, based on the standard marginal effective tax rate approach. The average effective tax rate can be measured for any rate-of-return level, not only at the level of the cost of capital. More precisely, the marginal effective tax rate represents the value of the average effective tax rate, but for marginal investment projects (Sorensen, 2004, 6). The rate of return on a marginal investment is reduced to the value of the cost of capital, which is a condition for equal marginal and average effective tax rates. The European Commission (2001) implemented the Devereux-Griffith approach in one of the most comprehensive studies, assessing the effective corporate tax rates on domestic and transnational investments in 15 EU member states.

As King and Fullerton (1983) analysed the corporate sector exclusively, further expansions were made to include other sectors. Bowenberg and ter Rele (1998) applied the original framework to self-employed individuals and entrepreneurs, and Jorgenson and Yun (2001) calculated effective tax rates for both the corporate and non-corporate sectors. Valenduc (2004) used the King-Fullerton approach to determine effective tax rates for small enterprises in Belgium operating in the unincorporated sector. Gordon and Tchilinguirian (1998) developed the methodology by expanding the emphasis in the King-Fullerton framework on investment in buildings, machinery, and inventory to calculating effective tax rates for R&D investment. Investment in research and development was classified as investment with either short-run or long-run returns.

In the last decade several researchers have used the King-Fullerton framework. De Almeida (2010) calculates tax wedges and marginal effective tax rates for the Brazilian corporate sector by analysing the existing state of affairs and conducting alternative policy simulations. De Almeida and Paes (2013) analyse capital income taxation in Brazil using two features not introduced in the original King-Fullerton framework: the interest on net equity (INE), which, similarly to dividends, is paid to shareholders, and the differentials in interest rates available to Brazilian companies. The authors show that marginal effective tax rates are very sensitive to which interest rate is available to companies, since debt financing could be the best or the worst option depending on that rate. Barrios et al. (2014) provide estimates of marginal effective tax rates for a sample of 17 OECD countries and 11 economic sectors, considering labour and energy taxation as well as capital taxation. The effective tax rates for capital taxation are derived directly from King and Fullerton (1983) and the ZEW database on corporate taxation is the main data source. The authors conclude that the effective tax rates on capital vary extensively across sector and country. Holečkova and Menzl (2018) examine tax neutrality in the Czech Republic by calculating tax wedges in 2010 and 2018 based on statutory tax parameters and the assumed depreciation rates. The weights for the assets and the sources of finance are the same as in OECD (1991). The authors use the statutory tax rates and the assumed depreciation rates to calculate the total tax wedge, which is much lower than the OECD average, while partial tax wedges are similar in value to those in OECD (1991), and even lower in some cases. Johansson et al. (2020) examine marginal effective tax rates for industrial foundations, legal entities founded by entrepreneurs for achieving favoured tax status conditioned on engagement in philanthropic activities, in the period 1862–2018. The authors analyse the retained earnings and new equity as sources of finance, while debt is disregarded, since the control in industrial foundations is exercised through ownership. The analysis reveals the importance of including the cash flow effect of the requirement to donate part of the net income for charitable purposes, since in this case the recalculated METR on new share issues increases substantially and this source of finance becomes disadvantaged compared to retained earnings.

3. THE KING-FULLERTON CONCEPTUAL FRAMEWORK

As already pointed out, the marginal effective tax rate is an indicator of the tax burden on an investment project. Due to its marginal character, the central point of the calculation is the marginal investment project. Profit maximisation means that the company invests up to the point where the cost of the asset purchase equals the present value of the after-tax return and depreciation through the life cycle of the project. The marginal rate of return on the extra unit of capital that a company achieves at this point represents the cost of capital, which is the central concept for measuring the marginal effective tax rate.

A company that aims to realise an investment project must provide sources of finance. The real interest rate, denoted by r, acts as an intermediary between the investment decisions of the company and the saving decisions of individuals, because it represents the opportunity cost of financing the investment project. Hence, the expression for the real interest rate is as follows:

$$r = \frac{(1+i)}{(1+\pi)} - 1 \tag{1}$$

The relationship between the cost of capital and the real interest rate, expressed as the cost-of-capital function, depends on tax legislation provisions. If s denotes the after-tax rate of return, it can be calculated using the following equation (King & Fullerton, 1983):

$$s = (1-m_i)(r+\pi) - \pi - w_p \, , \tag{2}$$

where m_i denotes the marginal personal tax rate on interest income, π is the inflation rate, and w_p is the marginal personal tax rate on wealth that exists, for example, in the United States.

If p denotes the before-tax return on a marginal investment project, net of depreciation, in the absence of taxation, p = s = r. However, taxes insert a wedge between the before-tax rate of return on investment and the after-tax rate of return on savings. The tax wedge, w, represents the difference between the rate of return generated by the investment project and the rate of return on the savings which finance the project:

$$w = p - s \,, \tag{3}$$

and the marginal effective tax rate, t, is the tax wedge divided by the before-tax rate of return:

$$t = \frac{p-s}{p} \tag{4}$$

The marginal effective tax rate for investment projects with different characteristics can differ significantly. King and Fullerton (1983) examine three investment project characteristics and consider three alternatives for each characteristic. The first characteristic is the asset type in which the company invests, which is divided into three groups: buildings, machinery, and inventory. Machinery includes plants, production machines, equipment, and means of transport. Investment in financial assets, research and development, or intangible assets is not included. The second characteristic is the sector of the economy in which the investment project is positioned, which can be manufacturing, other industry, or commerce. The definition of manufacturing follows the standard industry classification and includes the entire manufacturing sector. The 'other industry' sector includes construction, transport, communications, and water, electricity, and gas production. The commerce sector includes wholesale and retail activities and non-financial services but excludes agriculture, state-owned production, and financial services. The third characteristic is the finance source, which can be retained earnings, new shares issuance, or debt (bond issuance and bank borrowing).

The three alternatives for each of the three characteristics result in 27 distinct hypothetical investment projects. The marginal effective tax rate is calculated for each of 27 investment projects. The underlying assumptions are a fixed nominal tax rate, the absence of uncertainty, and a constant inflation rate.

The analysis focuses on a marginal investment project with an initial cost of one unit of capital. Following the methodology of King and Fullerton (1983), if MRR denotes the gross marginal rate of return generated by the project, assuming that the investment asset is depreciated at a constant exponential rate δ,

$$p = MRR - \delta \tag{5}$$

where p equals the net income.

It should be noted that economic depreciation and tax depreciation usually differ. Economic depreciation is assumed to be exponential, while tax depreciation is, in general, not exponential. If τ denotes the corporate income tax rate and ρ denotes the cash flow discounting rate, the present value of the profits generated by the project, net of taxes, is

$$V = \frac{(1-\tau)\,MRR}{\rho + \delta - \pi} \tag{6}$$

From Equation (6) it can be seen that nominal profit increases at the rate of inflation π, decreases at the rate of depreciation δ, and is discounted at the rate ρ. The discount rate depends on the real interest rate and the rate of inflation. The initial project cost is unity (one extra unit of capital) minus the present value of tax allowances given for asset A. Hence, the initial cost of the project is

$$C = 1 - A\,. \tag{7}$$

By making V from Equation (6) equal to C from the Equation (7) the cost of capital is calculated as

$$p = \frac{(1-A)}{1-\tau)}(\rho + \delta - \pi) - \delta\,. \tag{8}$$

Equation (8) derives the cost of capital for investments in buildings and machinery. To derive the cost of capital for inventory if the FIFO accounting method is used, the effect of inflation must be adjusted for. It is also important to point out that inventory is accounted for by its acquisition value and therefore does not depreciate over time (de Almeida 2010, 20).

In order to derive the expression for the present value of tax relief, King and Fullerton (1983) assume that it takes three forms: standard depreciation allowances, immediate expenses, and tax credits. The value of standard depreciation allowances depends on the method of calculating the depreciation that is allowed for tax purposes (declining balance method or linear method).

Regarding the taxing of inventory, if v denotes the part of inventory recognized at historical cost, i.e., FIFO accounting, then, if relative prices do not change, the marginal investment in one unit of inventory will lead to $tv\pi$ additional tax on an annual basis (Holečkova and Menzl, 2018, 15). If FIFO accounting is used the value of v will be one, and if LIFO accounting is used the value of v will be zero. King and Fullerton (1983) suggest that when a company uses weighted average cost accounting to calculate the value of inventory the value of *v* should be set to 0.5.

The next step in the analysis is to link the discount rate to the market interest rate. When taxation is present the discount rate will differ from the market interest rate and will depend on the source of finance.

In case of debt financing, interest income is taxed but interest payments are tax deductible. The rate at which a firm discounts after-tax cash flows is the after-tax interest rate (de Almeida & Paes, 2013, 189):

$$\rho = i(1-\tau)\,. \tag{9}$$

If new shares issuance is the source of finance, the opportunity rate of return is equal to the return that could be earned by providing a company loan and is expressed as $(1-m_i)i$, where i denotes nominal market interest rate and m_i stands for the personal income tax rate on interest income. The discount rate equates the return of dividends after paying tax at m_d rate with the opportunity return rate. Hence, the discount rate in case of new shares issuance is:

$$\rho = \frac{(1-m_i)i}{(1-m_d)} \tag{10}$$

From Equation (10), it can be concluded that if $m_i = m_d$, ρ equals i.

The retained earnings allow investors to realise capital gains that are taxed by capital gains tax rather than personal income tax. If the project return is denoted by ρ, then the investor requires a rate of return that equates ρ(1-z) and i(1-m), where z denotes the effective capital gains tax rate. According to King and Fullerton (1983), the discount rate in the case of retained earnings finance is

$$\rho = \frac{(1-m_i)i}{(1-z)} \tag{11}$$

The inclusion of tax deferral in this case implies that the statutory tax rate z_s has to be converted to the effective tax rate z that represents the present value of future capital gains taxes levied on one unit of capital gain:

$$z = \frac{\lambda z_s}{\lambda + \rho_i} = \frac{\lambda z_s}{\lambda + i(1-m_i)} \tag{12}$$

where ρ_i denotes the nominal discount rate for the investor, and λ denotes the part of capital gains realised in a particular fiscal year.

4. DATA AND METHODOLOGY

To calculate the METR for Serbia it is necessary to set the value of both a number of tax parameters in compliance with tax legislation provisions and a number of non-tax (economic) parameters. King and Fullerton (1983) define tax parameter values based on the provisions of the relevant tax laws, and non-tax parameters – such as the economic life of fixed assets, the recognition of inventory costs, capital stock structure, and company financial resources – based on various national surveys.

Since, to the authors' best knowledge, no research has been conducted in Serbia that systematically analyses the structure of national capital stock in the manner required for calculating marginal effective tax rates, this paper uses an approach that estimates the necessary parameters based on a sample of companies. The economic depreciation rates for buildings, plants, and equipment and inventory recognition are estimated for a sample of 223 companies that in the 2018 fiscal year achieved the highest operating incomes in Serbia, based on financial reports publicly available at the Business Registers Agency and at the Belgrade Stock Exchange for those companies whose shares are listed on the stock exchange listing or on the open market. Initially, the group consisted of 250 companies, but 27 companies were excluded from the analysis because they did not meet the necessary requirements (assets did not include buildings and business facilities, depreciation rate on buildings was not reported, none of three financing sources was used because companies were in bankruptcy or restructuring, companies incurred losses in previous fiscal years, etc.). In addition, the METR does not consider state companies, so a number of companies are not included for this reason, which is somewhat a disadvantage, given that state companies in Serbia have significant financial strength.

The companies were selected keeping in mind the requirements of the framework to be implemented, which only analyses the domestic non-financial corporate sector. Business income was taken as the initial criterion for sample selection because corporations generate significantly higher business income than unincorporated businesses. The sample in this paper consists of companies that operate entirely in the corporate sector, either as joint stock companies or as limited liability companies.

The sample consists of 223 companies, of which 82 companies (37% of the sample) are joint stock companies and 141 (63%) are limited liability companies. Regarding sectoral classification, 113 (51%) are manufacturing companies, 39 companies (17%) are in other industries, and 71 companies (32%) are in commerce.

The asset classifications considered are 1) buildings, 2) plants and equipment, and 3) inventory. From the fixed assets in the financial statements of companies operating in Serbia we singled out real estate, plants, and equipment (account 02), construction facilities (account 022), and plants and equipment (account 023), and from the current assets we selected class 1 – inventory (materials, products in progress, and finished products).

Economic activity is classified as three sectors given in King and Fullerton (1983): manufacturing, other industry, and commerce. Other industry includes construction, transport, communications, and electricity, gas, and water, and commerce comprises wholesale, retail, and service activities of a non-financial nature. Our analysis uses the classification of economic activities in the Ordinance Concerning the Classification of Activities (The Official Gazette of Serbia, No. 54/2010). Manufacturing includes sector C –processing industry (economic areas 10–33). Other industry includes sectors D –supply of electricity, gas, steam, and air conditioning (35), E – water supply (36–39), F – construction (41–43), H – traffic (49–53), and J – information and communications (58–63). Commerce includes sector G – wholesale and retail trade (45–47), and sector I – accommodation and food services (55–56).

The sources of finance used are debt, new issue of shares, and retained earnings. Debt includes both the issuance of company bonds and bank loans. For the purposes of this analysis, the new issue of shares is expanded to include new issuance of membership units in limited liability companies, as this organisational and legal form plays an important part in the Serbian economy. From the perspective of tax treatment, the position of owners in joint stock companies and limited liability companies is similar because both dividends and shares in profits are taxed by capital income tax within personal income tax.

The three characteristics, each with three alternatives, result in 27 individual combinations, and it is necessary to calculate the marginal effective tax rate for each one. From the data in our sample the structure of capital stock in Serbia can be deduced; in other words, it is possible to determine the matrix of capital weights for each of the 27 alternative investment projects. Given that both the share of all three economic sectors in the total capital stock and the structure of capital in each of the sectors are known, weights can be derived at the level of each sector for nine investment projects that differ regarding asset type and source of finance, as shown in Table 1.

Table 1: Matrix of weights in capital stock for investment projects

	Buildings	**Plants and equipment**	**Inventory**	**Total**
Manufacturing				**0.545**
Retained earnings	0.036	0.077	0.0276	0.1406
New shares issuance	0.0316	0.068	0.0243	0.1239
Debt	0.072	0.1547	0.0553	0.282
Other industry				**0.344**
Retained earnings	0.0514	0.034	0.0098	0.0952
New shares issuance	0.0706	0.0467	0.0129	0.1302
Debt	0.0649	0.043	0.0118	0.1197
Commerce				**0.113**
Retained earnings	0.015	0.0057	0.0168	0.0375
New shares issuance	0.0099	0.0038	0.011	0.0247
Debt	0.0211	0.0081	0.022	0.0512
	0.372	**0.441**	**0.191**	Σ= 1.00

Source: Authors

The combined share of buildings, plants, and equipment in capital stock is 81.3%. According to Karapavlović et al. (2020) the average share of property, plants, and equipment in the total assets of Serbian companies was 44.7% in the period 2014–2016, which means that the observed sample is capital intensive. In addition to calculating capital weights, the sample will be used to calculate the values of economic (non-tax) parameters and tax parameters, which are necessary to calculate effective tax rates. The economic parameters included in the calculation are economic depreciation rate, nominal interest rate, real inflation rate, and real interest rate. Of the economic parameters only the rate of economic depreciation is calculated on a sample basis, both for buildings and for plants and equipment, as shown in Table 2.

Table 2: Non-taxation (economic) parameters for Serbia

Economic parameters			**Entire sample**	**Sector 1**	**Sector 2**	**Sector 3**
Economic depreciation rate	**δ**					
- **buildings**	**δ_b**		2.1%	2.08%	1.8%	2.23%
- **plants and equipment**	**δ_{pe}**	lower	7.44%	6.85%	6.00%	9.26%
		higher	15.82%	15.94%	18.5%	18.07%
Nominal interest rate (2009–2017)	**i**		9.83%			
Inflation rate (2007–2017)	**π**		6.78%			
Real interest rate	**r**		2.85%			

Source: Authors

Given that the rates of economic depreciation that companies apply to different categories of plants and equipment differ significantly, the rate of economic depreciation is calculated as two levels, lower and higher. The average rate of economic depreciation is used to calculate tax rates for plants and equipment. The nominal interest rate is based on the average weighted interest rates on one-year maturity government bonds in the period 2009–2017, and the actual inflation rate is based on National Bank of Serbia data on the consumer price index for the period 2007–2017.

Regarding tax parameters, tax rates are defined by the provisions of the relevant tax laws (Law on Personal Income Tax, Law on Corporate Income Tax, Law on Property Tax). For the purposes of this analysis, only tax treatment of inventory, that is, the value of the parameter v, is derived from the sample. The value of v = 0.5 is assigned to those companies that use the weighted average price method to calculate inventory costs and the value of 1 to those companies that use the FIFO method. As can be seen in Table 3, the prevalent method in Serbian companies is the weighted average price, which is used by 85% of the observed companies and is why the value of v is relatively small.

Table 3: Tax parameters for Serbia

Corporate income tax rate		**τ**		15%
Tax depreciation rate		**φ**		
- buildings				2.5% LM
- plants and equipment				10% and 15% (12.5%) DM
Inventory		**Weighted average price**	**FIFO**	**v**
	Overall	191	32	0.572
	Sector 1	93	20	0.54
	Sector 2	36	3	0.538
	Sector 3	62	9	0.56
Personal income tax rates				
- interest income		$\mathbf{m_i}$		15%
- dividend income		$\mathbf{m_d}$		15%
- realised capital gain		$\mathbf{z^*}$		8.1%
Effective property income tax rate		**e**		0.4%

*LM – linear method * DM – declining balance method

Source: Authors

Regarding tax depreciation of fixed assets, the Law on Corporate Income Tax prescribes a linear depreciation for real estate in the broader sense and a declining balance depreciation for plants and equipment. For tax depreciation purposes, the Rulebook on the Classification of Fixed Assets puts plants and equipment in the second and third fixed-asset groups, with respective depreciation rates of 10% and 15%. In this paper it will be assumed that all plants and equipment are depreciated using the declining balance method at an average depreciation rate of 12.5%.

The effective tax rate on realised capital gains is obtained using Equation (12). The capital gains tax rate z_s is 15% in Serbia, and ρ_i denotes investors' nominal discount rate, expressed for Serbia as

$$\rho_i = \frac{i}{1+m_i} \tag{13}$$

where m_i stands for the personal income tax rate on interest income. This is distinct from the original King-Fullerton framework because interest on income tax is paid at source in Serbia, unlike in the United States, where it is paid after filing a tax return. For m_i =15% and λ = 0.1 (the average holding period for stocks is presumed to be 10 years), the effective capital gains tax rate z is 8.1% (the calculation is given in Appendix A).

Marginal effective tax rates for individual investment projects are calculated according to the following five steps.

First step. Since a constant real interest rate approach is used, it is necessary to calculate its value. Based on the data for the value of the nominal interest rate and the inflation rate, the real interest rate r is obtained using Equation (1). Personal income tax rates in Serbia are proportional, so in the case of Serbia the approach with a constant r can be reduced to a fixed after-tax rate of return approach denoted by s:

$$s = \frac{\frac{i}{1+m_i} - \pi}{1+\pi} \tag{14}$$

Second step: Calculating the discount rate for each of the three sources of finance:

- For retained earnings financing based on the following equation:

$$\rho = \frac{\left(\frac{i}{1+m_i} - z\pi\right)}{1-z} \tag{15}$$

where m_i denotes interest income tax rate, z denotes the effective capital gains tax rate, and π denotes the inflation rate.

- For new shares issuance based on the equation

$$\rho = \frac{\left(\frac{i}{1+m_i} - z\pi \right)}{(1-m_d)} \tag{16}$$

where m_d denotes the dividend income tax rate.

- For debt financing

$$\rho = i(1-\tau), \tag{17}$$

where i denotes the nominal interest rate, and τ stands for the corporate income tax rate.

Third step. Calculating the present value of tax depreciation deductions for buildings, plants, and equipment.

- The present value of tax depreciation for buildings, given that the linear method is used, is calculated using the formula

$$A = \frac{\tau\phi(1+\rho)}{\rho} * \frac{((1+\rho)^n - 1)}{(1+\rho)^n} \tag{18}$$

where τ is the corporate income tax rate, ϕ is the depreciation rate, ρ is the discount rate, and n is the length of time period over which the asset is depreciated.

- For plants and equipment, since the declining balance method is used, the present value of tax depreciation allowance is calculated using the formula

$$A = \frac{\tau\phi(1+\rho)}{(\phi+\rho)} \tag{19}$$

Fourth step. Calculating the real before-tax rate of return p:

- for buildings, plants, and equipment, the before-tax rate of return is calculated using the formula:

$$p=\frac{(1-A)\left(\rho-\pi+\delta(1+\pi)\right)+(1+\rho)e}{(1-\tau)(1+\pi)}-\delta \tag{20}$$

- for inventory the following formula is used:

$$p=\frac{(1-A)\left(\rho-\pi+\delta(1+\pi)\right)+\tau v\pi}{(1-\tau)(1+\pi)}-\delta \tag{21}$$

Fifth step. Based on the before-tax rate of return p and the fixed after-tax rate of return s, calculation of the marginal effective tax rate is straightforward:

$$METR=\frac{p-s}{p}. \tag{22}$$

5. RESEARCH RESULTS

The tax wedges and marginal effective tax rates are calculated by following the explained procedure and implementing the necessary steps. Since a constant real interest rate approach is used, as the starting point the real interest rate is calculated using Equation (1) and is set at 2.85%. The after-tax rate of return is calculated using Equation (14) and is set at 1.65% (the calculations are given in Appendix A).

The after-tax rate of return can be considered constant, bearing in mind that income tax rates in Serbia are proportional; that is, all investors have similar personal income tax rates. After the investment project generates a return equal to the real interest rate the taxation of that return is the same for all investors, so it follows that if r is constant, the after-tax rate of return s for all individual investors has to be constant.

The next step involves calculating discount rates for different sources of finance. For retained earnings, new shares issuance, and debt financing the discount rates are obtained by Equations (15), (16), and (17), respectively. The discount rates for retained earnings, new shares, and debt financing are 8.7%, 9.41%, and 8.36%, respectively (Appendix B).

The next step calculates the present value of the tax depreciation allowance, which is related to the source of finance used (retained earnings, new shares issuance, or debt) and the respective discount rates. For buildings, Equation (18) is used for each of the three sources of finance, while for plants and equipment Equation (19) is used for each of three sources of finance (Appendix C).

The before-tax rates of return for buildings, plants, and equipment are calculated using Equation (20) and the procedure is given in Appendix D. The before-tax rates of return are sorted according to economic sector. For manufacturing, the parameters necessary to calculate the before-tax rate of return for buildings, plants, and equipment are given in Table 4. The difference in the present values of tax allowances for buildings is relatively small due to all sources of finance having the same depreciation rate and the same depreciation period (2.5% and 40 years, respectively). A similar situation exists with plants and equipment, as the same depreciation rate and the same depreciation method are applied to all assets in this category. The rate of economic depreciation of plants and equipment varies in terms of lower and higher rates, so that the pre-tax rate of return on plants and equipment will vary not only due to differences in discount rates but also due to differences in economic depreciation rates.

Table 4: Parameters for the calculation of before-tax rate of return for buildings, plants, and equipment

<table>
<tr><td colspan="8">Buildings</td></tr>
<tr><td></td><td></td><td colspan="2">Retained earnings</td><td colspan="2">New shares</td><td colspan="2">Debt</td></tr>
<tr><td>Present value of tax depreciation allowances</td><td>A</td><td colspan="2">0.0452</td><td colspan="2">0.042</td><td colspan="2">0.0466</td></tr>
<tr><td>Economic depreciation rate</td><td>δ</td><td colspan="2">2.08%</td><td colspan="2">2.08%</td><td colspan="2">2.08%</td></tr>
<tr><td>Discount rate</td><td>ρ</td><td colspan="2">8.71%</td><td colspan="2">9.41%</td><td colspan="2">8.36%</td></tr>
<tr><td>Inflation rate</td><td>π</td><td colspan="2">6.78%</td><td colspan="2">6.78%</td><td colspan="2">6.78%</td></tr>
<tr><td>Property income tax rate</td><td>e</td><td colspan="2">0.4%</td><td colspan="2">0.4%</td><td colspan="2">0.4%</td></tr>
<tr><td colspan="8">Plants and equipment</td></tr>
<tr><td></td><td></td><td colspan="2">Retained earnings</td><td colspan="2">New shares</td><td colspan="2">Debt</td></tr>
<tr><td>Present value of tax allowances</td><td>A</td><td colspan="2">0.0961</td><td colspan="2">0.0936</td><td colspan="2">0.0974</td></tr>
<tr><td>Economic depreciation rate</td><td>δ</td><td>6.85%</td><td>15.94%</td><td>6.85%</td><td>15.94%</td><td>6.85%</td><td>15.94%</td></tr>
<tr><td>Discount rate</td><td>ρ</td><td colspan="2">8.71%</td><td colspan="2">9.41%</td><td colspan="2">8.36%</td></tr>
<tr><td>Inflation rate</td><td>π</td><td colspan="2">6.78%</td><td colspan="2">6.78%</td><td colspan="2">6.78%</td></tr>
<tr><td>Property income tax rate</td><td>e</td><td colspan="2">0.4%</td><td colspan="2">0.4%</td><td colspan="2">0.4%</td></tr>
</table>

Source: Authors

The before-tax rate of return for inventory is calculated using Equation (21) and the parameters needed to calculate the before-tax rate of return in manufacturing are given in Table 5 (calculations are provided in Appendix E). It can be seen that when calculating the pre-tax rate of return for inventory within one sector the only variable that varies in value is the discount rate, so the differences in rates of return before tax are due to different discount rates.

Table 5: Parameters for the calculation of before-tax rates of return for inventory

	Retained earnings	**New shares**	**Debt**
v	0.54	0.54	0.54
ρ	8.71%	9.41%	8.36%
π	6.78%	6.78%	6.78%
δ	0	0	0

Source: Authors

The before-tax rates of return for investment in manufacturing are based on the calculated values of parameters in the relevant equations, as shown in Table 6. It can be seen that the highest rates of return before taxation are generated by projects that are financed by the issue of new shares, which automatically suggests that the tax burden on these projects is higher because the after-tax rate of return is constant. It should be noted that the fact that a project must generate a high rate of return before taxation does not represent a benefit to the investor, as it is the return necessary to make a project financially viable. Projects that are financed from retained earnings and debt have a more favourable tax treatment.

Table 6: Before-tax rates of return in manufacturing (%)

p	**Buildings**	**Plants and equipment**		**Inventory**
		lower δ	**higher δ**	
Retained earnings	2.76	2.75	3.32	2.72
New shares issuance	3.44	3.48	4.08	3.50
Debt	2.31	2.39	2.95	2.34

Source: Authors

Similarly, the values of before-tax rates for investment projects in other industry and commerce are calculated using the values of the variables identified in the previous section (tax and non-tax parameters, discount rates for different sources of finance, present value of tax allowance). Based on the formula for calculating the marginal effective tax rate, Table 7 shows the values of marginal effective tax rates for all 27 hypothetical investment projects. It can be seen that investments in buildings in the manufacturing sector that are debt-financed have the most favourable tax treatment, as the marginal effective tax rate on these investments is 28.38%. In addition, debt-financed investments in buildings in the other industry sector, in inventory in manufacturing, and in inventory in other industry have favourable tax treatment, with effective tax rates of 29.58%, 29.28%, and 29.28%, respectively.

Table 7: METR for investment projects (%)

	Buildings	**Plants and equipment**	**Inventory**
Manufacturing			
Retained earnings	39.90	45.54	39.23
New shares issuance	51.84	56.22	52.74
Debt	28.38	38.12	29.28
Other industry			
Retained earnings	39.24	47.79	39.18
New shares issuance	52.49	57.77	52.70
Debt	29.58	40.92	29.20
Commerce			
Retained earnings	40.39	49.23	39.73
New shares issuance	53.22	58.76	53.03
Debt	31.12	42.70	29.95

Source: Authors

On the other hand, investment in plants and equipment in the commerce sector financed by the issuance of new shares has the least favourable tax treatment because the marginal effective tax rate on this type of investment is 58.76%. Investment in plants and equipment in the manufacturing and other industry sectors financed by the issue of new shares also has unfavourable tax treatment, with effective tax rates of 56.22% and 57.77% respectively.

As shown in Table 8, if individual effective tax rates are presented with respect to the type of asset in which the funds are invested, economic sector, and source of finance, relative uniformity can be observed when comparing marginal effective tax rates by selected positions.

Table 8: METR for type of asset, sector of the economy, and source of finance

	METR (%)
Asset	
Buildings	39.07
Plants and equipment	45.71
Inventory	38.13
Sector of the economy	
Manufacturing	40.86
Other industries	43.85
Commerce	40.11
Source of finance	
Retained earnings	42.48
New shares issuance	54.38
Debt	33.66

Source: Authors

These positions were obtained by weighting the shares in the capital stock (capital weights from Table 1), and not by calculating the simple arithmetic mean of the corresponding effective tax rates for individual investment projects. When looking at the assets being invested in, marginal effective tax rates range between 38.13% and 45.71%. Inventory has the most favourable tax treatment, with an effective tax rate of 38.13%, while buildings are in a slightly less favourable position with a marginal effective tax rate of 39.07%. Investment in plants and equipment has a slightly more unfavourable position with a rate of 45.71%.

When it comes to the sectoral structure the situation is even more uniform, because investments in manufacturing and commerce have similar tax treatment (40.86% and 40.11% respectively), and investments in other industry are in a somewhat less favourable position (43.85%). Regarding the source of finance there are somewhat more pronounced differences, in the sense that debt-financed investments have the most favourable tax treatment, with a marginal effective tax rate of 33.66%; investments financed by retained earnings have slightly less favourable tax treatment (42.48%), and investments financed by the issue of new shares have the most unfavourable tax treatment, with an effective tax rate of 54.38%. These results support the research hypothesis that investment activities in Serbia are neutrally taxed; that is, the tax treatment of investment projects is non-discriminatory.

Comparing these results with previous research confirms the neutrality of taxation of investment projects in Serbia. According to a study conducted by the European Commission (2001), there is pronounced variability in the marginal effective tax rates in EU member states. In all member states except Ireland the marginal effective tax rates for debt-financed projects were negative (ranging between –56.2% and –8.7%), indicating extremely favourable tax treatment for these projects. On the other hand, for projects financed from retained earnings the effective tax rate ranged between 10% in Italy and 48.4% in Germany, while for projects financed by a new share issuance, marginal effective tax rates ranged between 10% in Italy and 44.4% in France. The results of the European Commission (2001) show a substantial difference between the tax treatment of debt-financed investment projects on the one hand, and projects financed from retained earnings and new share issues on the other. Such variation in tax treatment significantly impairs the neutrality of taxation due to the distortive effects that the tax system generates in favour of one group of investment projects at the expense of other types. De Almeida (2010) calculated marginal effective tax rates using the King-Fullerton approach in the case of Brazil. The effective tax rates for debt-financed projects were negative for investments in buildings and equipment, while the effective tax rate for inventory was zero. For projects financed by both retained earnings and the new issue of shares, effective tax rates ranged between 20.4% and 31.7%. This case showed a clear bias in favour of debt-financed investment projects as opposed to projects financed by retained earnings or new issue of shares. De Almeida and Paes (2013) confirmed that the Brazilian income tax system distorts incentives for allocation of capital between assets and sources of finance, since the effective tax rate is negative for debt (–27.07% on average) and positive for retained earnings and new equity (44.15% and 33.62% on average, respectively). Holečkova and Menzl (2018) calculated tax wedges for the Czech Republic for 2010 and 2018 based on statutory tax parameters and weights for finance sources in the OECD (1991). Their results suggest that in 2018 tax wedges were lowest for debt finance (0.5% on average) and higher for retained earnings and new equity (1.33% and 1.80% respectively). Also, the tax wedge for machinery was lower than the tax wedge for buildings and inventory (0.76% on average as opposed to 1.19% and 1.71% respectively). The authors concluded that the Czech tax system favours investment in machinery over buildings and inventory as regards assets, and debt over retained earnings and new equity as regards sources of finance.

The uniformity of marginal effective tax rates in Serbia can be explained by the equality of nominal tax rates, bearing in mind that the nominal tax rates on dividend income, profit shares, interest, capital gains, and corporate income are identical. As in previous studies, debt is the best choice as a source of finance regarding tax treatment because the interest is deductible when calculating corporate income tax. The discount rate for debt finance is accordingly the lowest, so that in this case the present value of depreciation deductions is the highest (both for buildings and plants and equipment), which combined lead to the lowest before-tax rate of return in the case of debt financing. The difference in the case of financing between the discount rate from retained earnings and from the issue of new shares exists solely due to the lower effective realised capital gains tax rate compared to the dividend income tax rate.

Regarding debt-finance tax treatment, investment projects financed by debt do not get preferential tax treatment; that is, the marginal effective tax rates, although lower than other financing sources, are not negative. In most countries, marginal effective tax rates for debt financing are negative, which means that investment projects are financed not only by the private sector but also by the government sector. This phenomenon occurs if companies can deduct the interest cost from the income tax base at a higher rate than the rate at which interest recipients pay tax on the same interest income. Therefore, in a situation where the corporate income tax rate is higher than the interest income tax rate the marginal effective tax rate may be negative, and investment projects financed in this way have a very favourable tax treatment, which is not the case in Serbia.

6. CONCLUSION

The paper provides marginal effective tax rates for hypothetical investment projects using the example of Serbia and the King-Fullerton framework. Marginal effective tax rates, as indicators of the tax burden on investment projects, are used to analyse neutrality in the taxation of investment projects. Although most previous research using the King-Fullerton framework highlights the way taxation distorts the investment decision-making process, the analysis of taxation of investment projects in Serbia shows a relative neutrality of taxation. The Serbian tax system is characterised by a relative uniformity of marginal effective tax rates. Effective tax rates for different types of asset differ by only a small percentage, and the situation is similar in terms of the sectoral structure of effective tax rates. The tax treatment of the source of finance is only slightly more unequal, considering that the tax treatment of debt financing is more favourable than financing from retained earnings and the issue of new shares. This regime can be explained by the fact that debt has a relatively favourable tax treatment compared to the other two sources of finance because the interest cost can be deducted from the tax base when calculating corporate income tax. However, this comparative advantage is much less pronounced than the superiority that debt has in many other countries where effective tax rates are very low, and in many cases are negative. Thus, the empirical results support the neutrality of taxation of investment projects in Serbia.

Regarding the recommendations that could be addressed to the creators of tax policy in Serbia, it seems that, from the perspective of neutrality in taxation, the current model of taxation of investment projects is satisfactory. Without going into the issues of the vertical and horizontal equity of personal income tax in Serbia, corporate income tax revenue, and other topics of economic debate, and focusing on a strict interpretation of the results obtained implementing the King-Fullerton framework, it can be concluded that the Serbian tax system achieves tax neutrality because it neither favours nor discriminates against various types of investment project to a significant extent. From this point of view, it can be concluded that the existing taxation system should not be changed, and if changes are needed to achieve greater tax revenues, they should be done in a way that maintains neutrality in the taxation of investment projects.

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APPENDIX

Appendix A

Parameter	Equation	Value
Real interest rate	$r=\frac{(1+i)}{(1+\pi)}-1=\frac{1+0.0983}{1+0.0678}-1$	2.85%
Effective capital gains tax rate	$z=\frac{\lambda z_s}{\lambda+\rho_i}=\frac{\lambda z_s}{\lambda+\frac{i}{1+m_i}}=\frac{0.1*0.15}{0.1+\frac{0.0983}{1+0.15}}$	8.1%
After-tax rate of return	$s=\frac{\frac{i}{1+m_i}-\pi}{1+\pi}=\frac{\frac{0.0983}{1+0.15}-0.0678}{1+0.0678}$	1.65%

Appendix B

Discount rates		
Source of finance	**Equation**	**Value**
Retained earnings	$\rho^{RE}=\frac{\left(\frac{i}{1+m_i}-z\pi\right)}{1-z}=\frac{\frac{0.0983}{1+0.15}-0.081*0.0678)}{(1-0.081)}$	8.7%
New shares issue	$\rho^{NS}=\frac{\left(\frac{i}{1+m_i}-z\pi\right)}{(1-m_d)}=\frac{\left(\frac{0.0983}{1+0.15}-0.081*0.0678\right)}{(1-0.15)}$	9.41%
Debt	$\rho^{D}=i(1-\tau)=0.0983*(1-0.15)$	8.36%

Appendix C

Tax allowances for buildings, plants, and equipment		
Buildings	**Equation**	**Value**
Retained earnings	$A_B^{RE} = \frac{t\phi_B\left(1+\rho^{RE}\right)}{\rho^{RE}}\left(1-\frac{1}{\left(1+\rho^{RE}\right)^T}=\right)$ $=\frac{0.15*0.025*1.087}{0.087}\left(1-\frac{1}{\left(1+0.087\right)^{40}}\right)$	0.0452
New shares	$A_B^{NS} = \frac{t\phi_B\left(1+\rho^{NS}\right)}{\rho^{NS}}\left(1-\frac{1}{\left(1+\rho^{NS}\right)^T}\right)=$ $=\frac{0.15*0.025*1.0941}{0.0941}\left(1-\frac{1}{\left(1+0.0941\right)^{40}}\right)$	0.042
Debt	$A_B^{D} = \frac{t\phi_D\left(1+\rho^{D}\right)}{\rho^{D}}\left(1-\frac{1}{\left(1+\rho^{D}\right)^T}\right)=$ $=\frac{0.15*0.025*1.0836}{0.0836}\left(1-\frac{1}{\left(1+0.0836\right)^{40}}\right)$	0.0466
Plants and equipment		
Retained earnings	$A_{PE}^{RE} = \frac{t\phi_{PE}\left(1+\rho^{RE}\right)}{\left(\phi_{PE}+\rho^{RE}\right)} = \frac{0.15*0.125*\left(1+0.087\right)}{\left(0.125+0.087\right)}$	0.0961
New shares	$A_{PE}^{NS} = \frac{t\phi_{PE}\left(1+\rho^{NS}\right)}{\left(\phi_{PE}+\rho^{NS}\right)} = \frac{0.15*0.125*\left(1+0.0941\right)}{\left(0.125+0.0941\right)}$	0.0936
Debt	$A_{PE}^{D} = \frac{t\phi_{PE}\left(1+\rho^{D}\right)}{\left(\phi_{PE}+\rho^{D}\right)} = \frac{0.15*0.125*\left(1+0.0836\right)}{\left(0.125+0.0836\right)}$	0.0974

Appendix D

Before-tax rates of return	Buildings, plants, and equipment	Value
	Buildings	
Retained earnings	$p_B^{RE}=\frac{(1-0.0452)\big(0.087-0.0678+0.0208(1+0.0678)\big)+(1+0.087))0.004}{(1-0.15)(1+0.0678)}-0.0208$	2.76%
New shares	$p_B^{NS}=\frac{(1-0.042)\big(0.0941-0.0678+0.0208(1+0.0678)\big)+(1+0.941))0.004}{(1-0.15)(1+0.0678)}-0.0208$	3.44%
Debt	$p_B^{D}=\frac{(1-0.0466)\big(0.0836-0.0678+0.0208(1+0.0678)\big)+(1+0.0836))0.004}{(1-0.15)(1+0.0678)}-0.0208$	2.31%
	Plants and equipment	
Retained earnings	$p_{PE}^{RE}=\frac{(1-0.0961)\big(0.087-0.0678+0.0685(1+0.0678)\big)+(1+0.087))0.004}{(1-0.15)(1+0.0678)}-0.0685$	2.76%
New shares	$p_{PE}^{NS}=\frac{(1-0.0936)\big(0.0941-0.0678+0.0685(1+0.0678)\big)+(1+0.0941))0.004}{(1-0.15)(1+0.0678)}-0.0685$	3.48%
Debt	$p_{PE}^{D}=\frac{(1-0.0974)\big(0.0836-0.0678+0.0685(1+0.0678)\big)+(1+0.0836))0.004}{(1-0.15)(1+0.0678)}-0.0685$	2.39%

Appendix E

Before-tax rates of return	Inventory	Value
Retained earnings	$p_I^{RE} = \frac{(1-0)\left(0.087-0.0678+0*(1+0.0678)\right)+0.15*0.54*0.0678}{(1-0.15)(1+0.0678)}-0$	2.72%
New shares	$p_I^{NS} = \frac{(1-0)\left(0.0941-0.0678+0*(1+0.0678)\right)+0.15*0.54*0.0678}{(1-0.15)(1+0.0678)}-0$	3.50%
Debt	$p_I^{NS} = \frac{(1-0)\left(0.0836-0.0678+0*(1+0.0678)\right)+0.15*0.54*0.0678}{(1-0.15)(1+0.0678)}-0$	2.34%