What drives the long-run effective corporate tax rates? Evidence from agricultural companies in Serbia

Stefan Vržina*, Nemanja Karapavlović*,
Dragomir Dimitrijević*

Abstract

Previous research on the determinants of effective corporate tax rates (ETRs) dominantly studied annual ETRs. On the other hand, in this paper we examined the impact of firm characteristics on long-run ETRs (LRETRs) of agricultural companies in the transition economy of Serbia, where statutory corporate tax rate is set at 15%. Research showed that the LRETR of the average Serbian agricultural company is well below the statutory rate. Regression analysis showed that larger agricultural companies have significantly lower LRETRs, consistent with the political power hypothesis. Capital intensity negatively influences LRETRs, while leverage and profitability do not appear to significantly impact them. Using quantile regression, it is shown that the impact of firm characteristics on LRETR is different on different parts of its distribution. Research results are robust to important changes in the research sample. We have also proposed changes in investment tax incentives rules to ensure fairer corporate tax treatment of larger and smaller agricultural companies. We argue that making investment tax incentives accessible to smaller companies would mitigate the political power hypothesis.

Keywords: Agriculture, Corporate taxation, Tax burden, Tax incentives, Tax planning.

1. Introduction

Tax research has a long tradition in agricultural sector, both in developed and developing countries. Milošević *et al.* (2020) point out that the level of the tax burden is of vital importance for achieving a sustainable agricultural development. On the other hand, agricultural companies in transition countries report growing, but only modest profitability (Vržina and Dimitrijević, 2019), cope with many efficiency problems (Horvat *et al.*, 2020), frequent changes of policy framework (Todorović *et al.*, 2020) and struggle to achieve sustainable growth (Momčilović *et al.*, 2015). In addition, Stanojević (2022) points out at the abundant unused agrarian land and the insufficient application of information technologies in the agricultural sector of Serbia. In such circumstances, the reduction of corporate tax burden may be an attractive strategy to maximize their earnings.

Prior studies imply that agricultural compa-

---

* Faculty of Economics, University of Kragujevac, Kragujevac, Serbia.
Corresponding author: stefan.vrzina@kg.ac.rs

nies should include taxes in their investment and financing decision-making (Gunes and Guldal., 2019). Stekla and Grycova (2016) argue that tax savings from the use of debt instead of the equity may increase the value of agricultural holdings. In addition, important tax savings may be achieved investing in government securities instead of the securities of the private sector (Ang *et al.*, 2010). Besides such tax planning opportunities offered by the national government, agricultural companies may organize internal tax department or finance tax consulting services to find tax loopholes, furtherly avoid corporate tax and lower their corporate tax burden.

Corporate tax burden is usually measured at the annual level. Although not ideal (Schwab *et al.*, 2022a/b), the effective tax rate (ETR) is the most widely used measure of corporate tax burden. However, we rely on long-run ETRs (LRETRs), developed by Dyreng *et al.* (2008), as many tax planning and tax avoidance strategies are implemented in the long-run. Using LRETRs, we aim to study the determinants of long-run corporate tax planning and tax avoidance in agricultural companies in the transition economy of Serbia.

The subject of the paper are LRETRs of agricultural companies in Serbia. Taxation of agricultural sector in Serbia has been the subject of some prior research (Simonović *et al.*, 2013; Vržina and Dimitrijević, 2019; Milošević *et al.*, 2020), but the research on long-run corporate tax burden is scarce. In addition, three main objectives of the paper may be identified. The first objective is to calculate LRETRs and compare them with the statutory tax rate. The second objective is to examine the impact of firm characteristics on LRETR. The third objective is to recommend some improvements in taxation of the income of agricultural companies to make the corporate tax system more efficient and fairer.

We use linear regression as well as quantile regression to analyze the impact of firm characteristics on long-run corporate tax burden. Our research is based on the Chamber of Commerce and Industry of Serbia data, covering 842 agricultural companies in the period between 2014 and 2018. In general, we have found the strong impact of political power hypothesis, as larger companies have lower LRETRs. In addition, capital-intensive agricultural companies have lower LRETRs.

Our study complements the prior studies in several ways. First, vast majority of research studied only determinants of annual ETRs, while the literature on long-run ETRs is highly scarce (Zeng, 2010; Salawu and Ololade, 2018; Fernández-Rodriguez *et al.*, 2019). Second, research on corporate tax planning in transition and post-transition countries is also scarce (Lazar, 2014; Vintilă *et al.*, 2018; Bubanić and Šimović, 2021). Third, studies on the determinants of ETRs only in specific industry are extremely rare (Moreno-Rojas *et al.*, 2017; Bubanić and Šimović, 2021) as previous research dominantly studied companies from all sectors. Fourth, to the best authors' knowledge, this is the first research to study the determinants of corporate tax planning and tax avoidance in agricultural sector.

Except for introduction and conclusion, the paper consists of three parts. In the Section 2, the research hypotheses are stated, based on the literature review. Section 3 presents context analysis, research data and research model, while research results and discussion of the results are given in the fourth section of the paper.

2. Literature review and hypotheses development

2.1. *Annual vs. long-run effective corporate tax rates*

Traditional approach in measuring corporate tax burden employs annual ETRs, dividing corporate tax burden and some accounting income. However, the consensus regarding the indicators employed in numerator and denominator is yet to be reached, as the ETR design particularly depends on the research objective and specific features of national corporate tax systems. In this regard, corporate tax burden is commonly proxied with current corporate tax expense (Delgado *et al.*, 2014; Fernández-Rodriguez and Martinez-Arias, 2014; Lazar, 2014; Hazir, 2019) or total corporate tax expense as a sum of current and deferred corporate tax

expense, reduced for deferred corporate tax income (Vintilă *et al.*, 2018). In addition, it may also be proxied with cash taxes paid (Fernández-Rodriguez *et al.*, 2021) from the statement of cash flows. On the other hand, profit before tax has been most widely used in the denominator of the ETR as it is argued to be the nearest approximation of taxable income, though some authors employ other indicators. Vintilă *et al.* (2018) and Hazir (2019) use earnings before interest and taxes (EBIT), while Lazar (2014) and Parisi (2016) use earnings before interest, taxes, depreciation and amortization (EBITDA) instead of profit before tax. Rarely, the net operating cash flow is used in the ETR denominator (Hanlon and Heitzman, 2010).

Previous literature pointed out the advantages and weaknesses of each option for numerator and denominator (Hanlon and Heitzman, 2010). In particular, the indicators used in the denominator are important as they define the scope of tax planning and tax avoidance strategies that are captured by the ETR. In this regard, ETR with profit before tax in the denominator captures only the effects of non-conforming tax planning and tax avoidance strategies (like investment tax incentives, tax loss carryforward or group taxation) that reduce corporate tax burden, holding the profit before tax constant (Hanlon and Heitzman, 2010). Such ETRs, on the other hand, cannot capture the vast majority of conforming tax planning and tax avoidance strategies (like debt tax shield or tax-motivated related party transactions) that reduce both corporate tax burden and profit before tax. Therefore, some authors use more corporate tax burden proxies in the numerator (Fernández-Rodriguez *et al.*, 2019) or more accounting results in the denominator (Lazar, 2014).

However, researchers expressed the need to measure corporate tax burden in the long run as many tax planning and tax avoidance strategies are implemented in many years. For instance, companies usually carry forward the unused investment tax incentives (as tax planning strategy) for more than one year, sometimes for ten years or even longer. Furtherly, structuring tax-motivated transactions with tax haven related-party entities (as tax avoidance strategy) is almost never organized for only one year.

Research in the last two decades produced several new measures of corporate tax burden and avoidance (Dyreng *et al.*, 2008; Henry and Sansing, 2018; Schwab *et al.*, 2022a/b). In this regard, Dyreng *et al.* (2008) propose LRETR, dividing the sum of annual corporate tax paid and sum of annual profits before tax in many years. LRETRs are usually calculated for five or ten years, though the period in the previous research has ranged from three years (Fernández-Rodriguez *et al.*, 2019) to even twelve years (Salawu and Ololade, 2018). Mathematically, LRETR for the year *t* may be calculated as follows:

$$LRETR_t = \frac{\sum_{i=1}^{t} CTP_i}{\sum_{i=1}^{t} PBT_i} \qquad (1)$$

where CTP is corporate tax paid in the year *i*, while PBT is profit before tax reported in the year *i*. It is rational to assume that LRETR may be calculated with some different indicators in both numerator and denominator. Accounting regulation in some countries does not require a statement of cash flows to be prepared and published or it is required only for public and/or big companies, thus cash taxes paid may be replaced by current or total corporate tax expense. Similarly, profit before tax may be replaced by some other accounting results. For instance, Hsieh (2012) calculates five-year LRETRs dividing current corporate tax expense and EBIT.

Dyreng *et al.* (2008) argue that this measure is less sensitive to the extreme values of annual ETRs than pure arithmetic mean of annual ETRs. Assume that a company reported profit before tax of 200,000 in the first year and in the second year, while in the third year reported only 40,000 (for instance due to heavy asset impairment losses that are not tax deductible). Furtherly, assume that it had corporate tax expense constant at 20,000 per year. Thus, a company had 10% ETR in the first two years and 50% in the third year. Pure arithmetic mean of these ETRs is nearly 23%, while LRETR is nearly 13%. In addition, Dyreng *et al.* (2008) argue that LRETR may mitigate loss observations problem, since observations with pre-tax loss are usually eliminated from the tax research to avoid negative ETRs.

2.2. *Determinants of Effective Corporate Tax Rates*

Agricultural companies may differ in terms of their ETRs, even if the same statutory tax rate applies. Abundant studies find that companies with different firm characteristics have different ETRs. In this regard, company size, capital intensity, leverage and profitability have emerged as traditional ETR drivers (Fernández-Rodriguez and Martinez-Arias, 2014).

Research on the ETR determinants has been dominantly conducted in a single-country context, which is not surprising given the large cross-national differences in corporate tax systems. However, there are some research that captured companies headquartered in more countries at the same continent (Kim and Limpaphayom, 1998; Delgado *et al.*, 2014; Vintilă *et al.*, 2018; Barbera *et al.*, 2020) or across the world (Fernández-Rodriguez and Martinez-Arias, 2014; Fernández-Rodriguez *et al.*, 2021). In this regard, some prior research (Kim and Limpaphayom, 1998; Fernández-Rodriguez and Martinez-Arias, 2014) note that the impact of firm characteristics on the ETR may significantly vary between studied countries.

Firm size is probably the most widely studied ETR determinant as decades of research produced two conflicting standpoints. An older one, the political power hypothesis, prescribes that larger firms have lower ETRs due to their power to influence tax laws and negotiate significant tax incentives. On the contrary, political cost hypothesis presents the view that larger firms have higher ETRs since they are prone to higher scrutiny by the national tax authorities and media. In addition, larger firms have more diversified businesses, so they are less probable to use tax loss carry-forward. Prior literature produced mixed results, supporting either political power (Zeng, 2010; Hsieh, 2012; Fernández-Rodriguez *et al.*, 2019; Barbera *et al.*, 2020; Bubanić and Šimović, 2021) or political cost hypothesis (Delgado *et al.*, 2014; Parisi, 2016; Moreno-Rojas *et al.*, 2017; Vintilă *et al.*, 2018; Hazir, 2019; Fernández-Rodriguez *et al.*, 2021; Braz *et al.*, 2022).

Political power hypothesis may be particularly pronounced in transition, post-transition and developing countries (Kim and Limpaphayom, 1998; Derashid and Zhang, 2003; Bubanić and Šimović, 2021), where national tax authorities do not have enough resources for proper tax administration and subsidiaries of multinational corporations have bargaining power over the national governments. Since Serbia belongs to this group of countries, the first research hypothesis is formulated as follows:

H_1: Size of agricultural companies negatively influences their long-run Effective Corporate Tax Rates.

Majority of the research (Hsieh, 2012; Lazar, 2014; Parisi, 2016; Fernández-Rodriguez *et al.*, 2021; Braz *et al.*, 2022) find that capital-intensive companies have lower ETRs. Such relationships may be explained by the fact that governments offer investment tax incentives for companies that invest certain funds in non-current assets. In addition, some governments enable companies to use accelerated depreciation to lower their tax burden in the several years at the beginning of the useful life of the asset.

On the other hand, different parts of non-current assets may have different corporate tax treatment. In this regard, intangible assets are often considered to have the most preferential corporate tax treatment (Brune *et al.*, 2019), due to the investment tax incentives, but also to the possibilities for profit shifting to the tax havens through royalty payments. On the contrary, investment tax incentives are usually not offered for long-term financial investments, like investments in shares or bonds. Therefore, the second research hypothesis is formulated as follows:

H_2: Capital intensity of agricultural companies negatively influences their long-run Effective Corporate Tax Rates.

Many studies (Lazar, 2014; Parisi, 2016; Hazir, 2019; Bubanić and Šimović, 2021; Fernández-Rodriguez *et al.*, 2021; Braz *et al.*, 2022) find that more indebted companies have lower ETRs. Such finding is explained by the debt tax shield or the more favorable tax treatment of interest than dividends. However, it should be noted that debt tax shield belongs to the conforming tax planning strategies, so it will not reflect any tax savings if tax burden is measured with ETR that contains profit before tax in the denomina-

tor, but only when ETR contains EBIT or EBIT-DA. On the other hand, the negative impact of leverage on ETR may be also explained by the fact that managers of more indebted companies are under higher pressure as they must service interest expenses and they may treat tax planning as an attractive option to enhance free cash flow for shareholders.

Despite important tax savings, using leverage has an important weakness as it leads to the higher financial risk exposure. Therefore, many countries implemented some allowances for corporate equity, allowing the certain deduction of equity financing costs in tax return, as some prior research (for instance Karpavicius and Yu, 2016) show that the debt tax shield would be less attractive if the tax gap between interest and dividends is mitigated. However, as such systems are yet to be implemented in most transition countries, the third research hypothesis is formulated as follows:

H3: Leverage of agricultural companies negatively influences their long-run Effective Corporate Tax Rates.

Profitability is the ETR determinant that produced the least consensus in prior research. Summarizing prior theoretical research, Gupta and Newberry (1997) argue that the relation between profitability and ETR is direct, though such argument holds only when profit before tax is higher than taxable income. In addition, more profitable firms may have higher ETRs as they do not have tax losses that may be carried forward. Many governments also impose progressive corporate tax system, taxing firms with higher amount of income at a higher tax rate. Relying on previous arguments, some studies (Hsieh, 2012; Delgado *et al.*, 2014; Lazar, 2014) find that more profitable firms have higher ETRs.

On the other hand, some other studies (Zeng, 2010; Parisi, 2016; Delgado *et al.*, 2018; Fernández-Rodriguez *et al.*, 2021) find that more profitable firms have lower ETRs as they have more resources to invest in tax consulting. In this regard, more profitable firms may structure internal tax department, specialized for tax planning and tax avoidance and/or contract big accounting firms for the tax minimizing purposes. Since the progressive corporate tax system is not

implemented in Serbia and there are many tax consulting services available, the fourth research hypothesis is formulated as follows:

H4: Profitability of agricultural companies negatively influences their long-run Effective Corporate Tax Rates.

3. Research methodology

3.1. *Context analysis*

Despite it is insufficiently developed, agriculture has been historically important sector of the Serbian economy due to its significant contribution to the employment, export and economic growth. Stojanović (2022) stresses that there are more than a half million farms in Serbia, though the fragmented land parcels are significant obstacle for their development – farms up to five hectares of utilized agricultural land have a share of more than 60% in the total number of farms. On the other hand, many big agricultural companies operate in Serbia, though several companies experienced financial difficulties, primarily due to bad privatization processes. These companies primarily produce cereals and oilseeds (wheat, corn, sunflower, soybeans), while farmers also engage in vegetables (potato, pepper) and fruit (apple, plum, cherry, raspberry, grape) production.

Serbia is an open and small transition economy that is recognized candidate for the European Union membership. Therefore, frequent changes of the tax legislation are not surprising, striving for the regulation adjusted with the European Union tax provisions. Corporate tax system of Serbia experienced important changes since the start of the transition in the early 2000s. At the beginning of the XXI century, the statutory corporate tax rate was set at 20%. After some changes of the rate, reaching the minimum at 10%, the statutory corporate tax rate is constant at 15% from the 1 January 2013. In general, Serbia belongs to the low-tax European countries as it uses corporate tax as an instrument to attract foreign direct investments and foster economic growth.

Vast majority of agricultural companies in Serbia pay the corporate tax at an effective rate that is lower than statutory (Vržina and Dimitrijević, 2019). As companies may use many tax

planning and tax avoidance strategies (like investment tax incentives or tax loss carryforward) in the long-run, they are able to maintain the ETR lower than the statutory tax rate in many subsequent years. In general, corporate taxation of agricultural companies is subject to the same procedure as companies from other sectors, prescribed by Corporate Profit Tax Law.

However, Vržina and Dimitrijević (2019) argue that agriculture is one of the sectors with the lowest corporate tax burden in Serbia. They point out that using tax planning strategies may, *inter alia*, lower ETRs of agricultural companies. Agricultural companies are allowed to use investment tax incentives should they invest in non-current assets of more than one billion Serbian dinars and employ more than a hundred employees. Such tax incentives may be used in the period of ten years.

In addition, agricultural companies may carry forward tax losses in the five-year period. Prior to 2010, companies were allowed to use a ten-year tax loss carryforward period. Agricultural companies may also use group taxation between the resident parent entity and one or many subsidiaries, if the parent entity has more than 75% of the controlling rights in the subsidiary. This possibility is in line with the Common Consolidated Tax Base concept, developed in the European Union.

Serbia also has a rich network of double taxation avoidance agreements, signed with more than sixty countries. Such agreements make the profit shifting to the tax havens easier through the tax-motivated related-party transactions. A specific feature of such network lies in the fact that Serbia signed the agreements with some of the largest traditional and conduit European tax havens, such as Cyprus, Luxembourg, Netherlands, Republic of Ireland or Switzerland.

Agricultural companies have to submit tax-basis balance and tax return within 180 days after the reporting period, even though they operated with loss. Companies determine taxable income in tax-basis balance, while the corporate tax burden is determined in a tax return. As in most European countries, taxable income is determined after the adjustment of profit before tax from the statement of profit or loss, increasing the tax base for fully or partially non-deductible expenses (recognized in the statement of profit or loss, but not allowed in tax-basis balance) and decreasing it for tax-exempt revenues.

3.2. *Data and research model*

Data for the research has been retrieved from the 'PKS Partner' – the application of the Chamber of Commerce and Industry of Serbia (www.pkspartner.rs/en). Financial data is retrieved from statutory financial statements to eliminate the impact of non-resident subsidiaries. We have looked only for agricultural companies registered under 011 (Growing of non-perennial crops), 012 (Growing of perennial crops) and 013 (Plant propagation) International Standard Industrial Classification codes. We defined the sampling period between 2014 and 2018 due to the availability of financial data. In addition, we have searched only for companies founded before 01 January 2014 in order to capture the whole sampling period. As a result, we have found 842 companies that meet these criteria.

In the calculation of LRETR, we have used current corporate tax expense in the numerator rather than cash corporate tax paid as many agricultural companies in Serbia are not required to submit statement of cash flows. Although it may be a material position in statement of profit or loss of agricultural companies, we have not included deferred corporate tax in the calculation of tax burden as it represents non-cash position of statement of profit or loss and is widely prone to subjective valuation. In addition, Hazir (2019) labels current corporate tax expense as the 'real tax expense'. On the other hand, the predictors are defined in line with many previous studies (Delgado *et al.*, 2014; Parisi, 2016; Vintilă *et al.*, 2018; Fernández-Rodriguez *et al.*, 2021). In this regard, in the calculation of capital intensity, we have excluded the long-term financial investments as this component of the non-current assets is not covered by the investment tax incentives. In addition, we have used only long-term liabilities instead of total liabilities as most of the short-term liabilities are interest-free, so they cannot be used as a debt tax shield mechanism. Definitions of employed variables are presented in Table 1.

Table 1 - Definitions of variables.

Variable	Formula
LRETR	Sum of current corporate tax expense : Sum of profits before tax
AvSIZE	Natural logarithm of average total assets
AvCAPIT	Average plant, property, equipment and biological assets : Average total assets
AvLEV	Average long-term liabilities : Average total assets
AvPROF	Average profit before tax : Average total assets

We have used both linear and quantile regression to examine the general impact of firm characteristics on LRETR, but also the impact at five different parts of the LRETR distribution. Vast majority of previous research employed linear regression when studying the determinants of tax avoidance. However, some authors employ quantile regression, arguing that the predictors do not have the same magnitude at each level of the ETR distribution (Hsieh, 2012; Delgado *et al.*, 2014) or may even have a significantly positive impact at one quantile and significantly negative at another (Parisi, 2016; Delgado *et al.*, 2018). As such situation is possible in Serbia, we also employ quantile regression, though this methodology is a relatively newer one and is still developing (Koenker, 2017).

Quantile regression estimation, initially proposed by Koenker and Basset (1978), minimizes the deviations in absolute value with asymmetric weighting instead of minimizing the squares of the errors, as the Ordinary Least Squares (OLS) estimation does. In general, the quantile regression may be described as follows:

$$y_i = x'_i \beta_\theta + u_{\theta i} \qquad (2)$$

$$Quant_\theta(y_i|x_i) = \inf\{y : F_i(y|x) \geq \theta\} = x'_i \beta_\theta \quad (3)$$

$$Quant_\theta(u_{\theta i}|x_i) = 0 \qquad (4)$$

where $Quant_\theta(y_i|x_i)$ denotes the conditional quantile of y_i on the vector x_i. Hence the quantile θ ($0 < \theta < 1$) solves the expression:

$$\min_\beta \frac{1}{n}\left\{\sum_{i:y_i \geq x_i\beta} \theta|y_i - x_i\beta| + \sum_{i:y_i < x_i\beta} (1-\theta)|y_i - x_i\beta|\right\} \quad (5)$$

LRETR is not calculated for companies with the negative sum of profits before tax, as such ETR does not have clear economic meaning. Since there is no tax loss carryback in Serbia, LRETR always takes a non-negative value. We have also removed values of LRETR and AvLEV higher than 100% to mitigate the impact of outliers and over-indebted companies. In addition, AvPROF is winsorized at 1 percent and 99 percent. We are also not able to compute predictors for companies with null average total assets, so they are removed from the sample.

4. Results and discussion

4.1. *Descriptive statistics and univariate analysis*

Table 2 presents descriptive statistics of employed variables. It is worth noting that both arithmetic mean and median of LRETR are significantly lower than the statutory tax rate of 15%. Arithmetic mean is slightly higher than median, indicating some companies with extremely high LRETR. In addition, as much

Table 2 - Descriptive statistics.

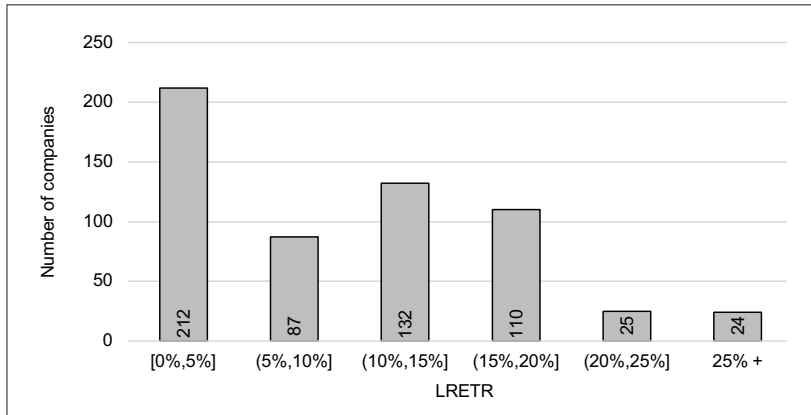|	LRETR	AvSIZE	AvCAPIT	AvLEV	AvPROF
Arithmetic mean	10.074%	10.671	33.346%	8.033%	1.265%
Minimum	0.000%	1.335	0.000%	0.000%	-100.719%
Median	9.749%	10.629	28.631%	0.532%	1.910%
Maximum	79.019%	16.490	99.948%	94.666%	31.430%
Standard deviation	9.727%	2.380	28.110%	14.110%	10.917%
Observations	590	840	840	839	825

Figure 1 - Distribution of companies by LRETR.

as 130 companies have null LRETR, while 92 companies have positive pre-tax result in each sampled year and null LRETR.

It is also interesting to note that the highest LRETR (79.019%) refers to the agricultural company that reported annual ETR of 15% in one year, around 3% in the second year and 0% in the third. However, heavy losses in the remaining two years significantly lowered the sum of profit before tax and increased LRETR to the extremely high extent.

Figure 1 shows the distribution of companies by LRETR, indicating that as much as 431 companies have LRETR lower than statutory tax rate. In fact, most companies have LRETR equal to or lower than 5%. These results confirm previous finding (Vržina and Dimitrijević, 2019) on low corporate tax burden of agricultural sector in Serbia, both in the short and long run.

Correlation matrix with Pearson's correlation coefficients is presented in Table 3. It shows that there is no strong correlation (for instance, with coefficients higher than 0.5 or lower than -0.5) between any predictors, indicating that multicollinearity problems are not expected.
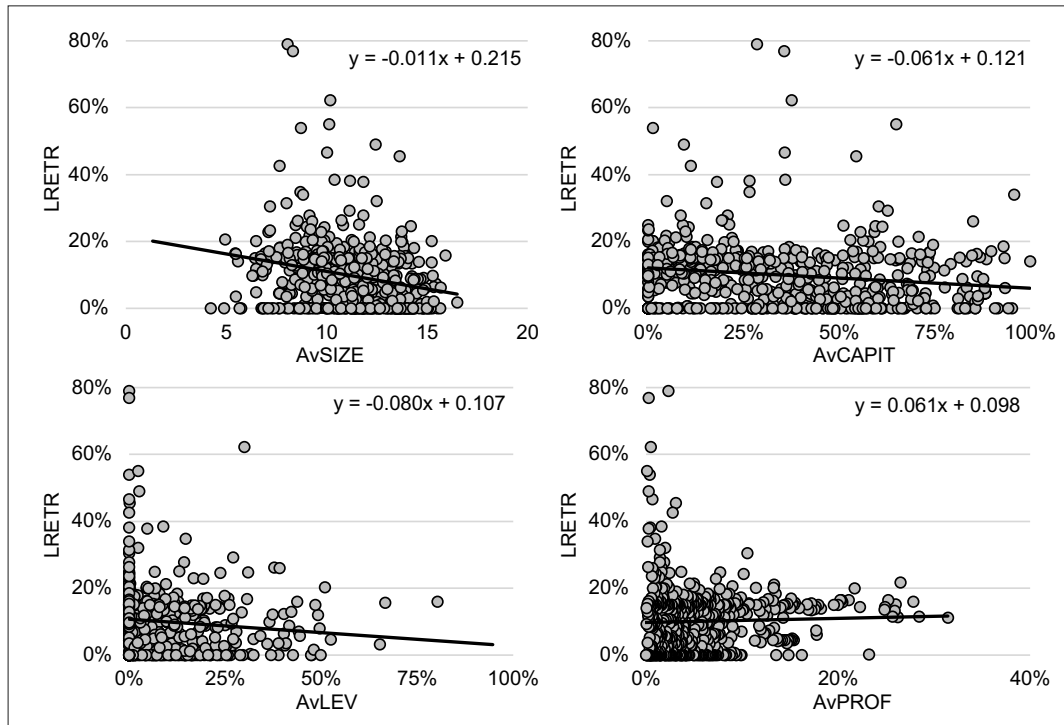
4.2. *Regression analysis*

Figure 2 presents scatter diagrams to investigate the relation between certain predictor and dependent variable, abstracting the impact of other variables. In fact, they are simple OLS estimates. The diagrams indicate that average size, capital intensity and leverage negatively influence, while average profitability positively influences corporate tax burden in the long-run.

Results of the regression analysis are presented in Table 4. Following prior research (Hsieh, 2012; Delgado *et al.*, 2014 and 2018), we combine OLS and quantile regression estimates. In line with Delgado *et al.* (2018), we tabulate quantile regression estimates at five quantiles. Detailed quantile regression estimations are presented in Figure 3.

Regression estimates suggest that larger agricultural companies have lower LRETR, thus supporting the political power hypothesis. Such finding indicates that larger companies find it easier to employ some tax planning and tax avoidance strategies. In this regard, the key dif-

Table 3 - Correlation matrix.

	LRETR	*AvSIZE*	*AvCAPIT*	*AvLEV*	*AvPROF*
LRETR	1.000				
AvSIZE	***-0.245	1.000			
AvCAPIT	***-0.166	***0.328	1.000		
AvLEV	**-0.100	***0.280	***0.153	1.000	
AvPROF	0.034	***0.114	0.021	0.007	1.000

Note: Statistically significant at 1% (***), 5% (**) and 10% (*).

Figure 2 - Scatter diagrams for determinants of the LRETR.

ference between larger and smaller companies may be found in the access to the investment tax incentive, described in previous section of this paper. As the unused investment tax incentives may be carried forward up to ten years, agricultural companies that are using such tax incentives are in position to minimize tax burden in the long run.

Until 2014, companies in Serbia could use investment tax credit, which was important particularly for smaller companies. Such companies were allowed to use tax credit in the amount of 40% of the investment and tax credit for the reporting period could not been higher than 70% of the calculated tax expense. At this time, there were many proposals to increase the amount of

Table 4 - Regression estimates.

Variable	OLS	Quantile				
		0.2	0.4	0.5	0.6	0.8
Constant	***22.998 (10.818)	***5.877 (2.795)	***20.612 (8.584)	***24.285 (10.245)	***23.607 (8.966)	***23.616 (10.936)
AvSIZE	***-1.009 (-5.326)	***-0.455 (-2.800)	***-1.017 (-5.085)	***-1.174 (-5.389)	***-0.877 (-3.559)	***-0.623 (-3.406)
AvCAPIT	***-0.042 (-2.731)	-0.019 (-1.268)	***-0.092 (-5.996)	***-0.091 (-5.284)	***-0.079 (-3.713)	**-0.027 (-2.088)
AvLEV	-0.022 (-0.670)	0.021 (0.754)	-0.005 (-0.186)	-0.019 (-0.715)	-0.043 (-1.287)	-0.028 (-0.998)
AvPROF	-0.040 (-0.547)	***0.271 (3.477)	***0.197 (2.998)	**0.152 (2.381)	0.071 (1.064)	-0.067 (-1.388)

Note: Beta coefficients in front of parentheses, t-statistics in parentheses; statistically significant at 1% (***), 5% (**) and 10% (*).

Figure 3 - Quantile regression estimates with confidence intervals.
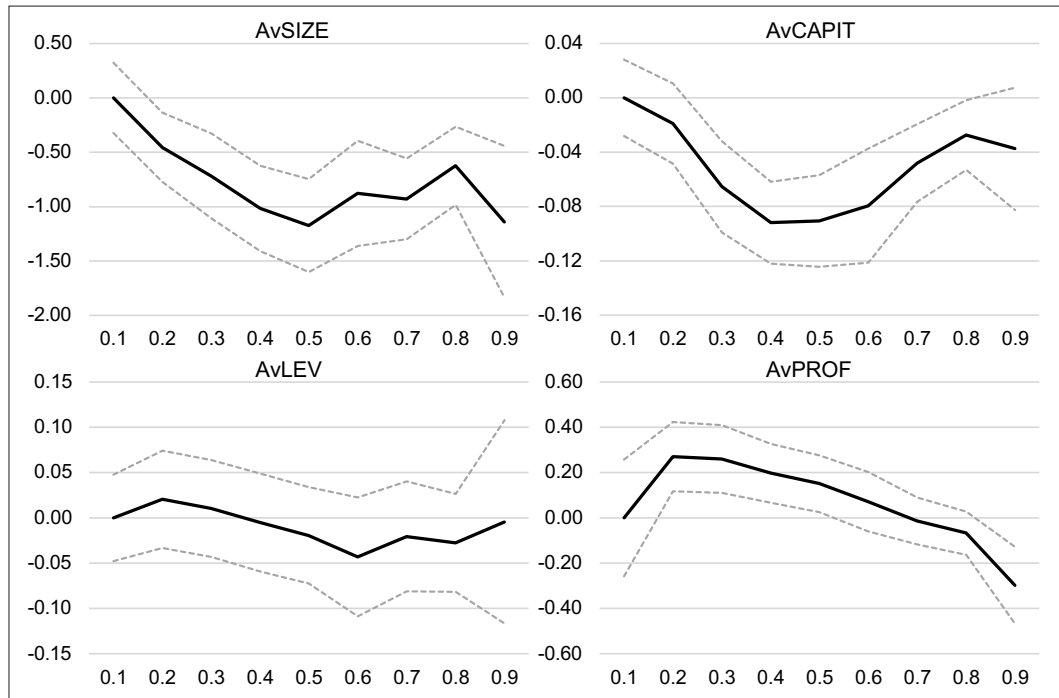
tax credit from 70% to 100%, but national tax authorities, quite surprisingly, opted to abolish investment tax credits and to allow only above-mentioned investment tax incentives.

In addition, many large agricultural companies are owned by the economic group, so they may use group taxation to minimize tax burden. Group taxation for parent entity and subsidiary is available if the parent owns at least 75% of subsidiary, and, if chosen, has to be employed for at least five years. Alternatively, such companies may use tax-motivated related-party transactions, though these may be considered as non-ethical.

Capital-intensive companies also tend to have lower LRETR. Besides mentioned investment tax incentive, capital-intensive companies may benefit from reduced depreciation and amortization costs. Corporate tax law in Serbia required companies to use declining balance depreciation method for most assets when calculating tax depreciation, while most companies use straight-line method for general purpose financial reporting. Such accelerated method results in minimized taxable income and current corpo-

rate tax expense, while profit before tax remains unaffected. As a result, current ETR is lower.

Although both AvSIZE and AvCAPIT favor larger agricultural companies, we argue that AvSIZE makes bigger distortions in the corporate tax system. This may be explained by the fact that labor intensive agricultural companies also have some tax incentives, primarily through tax refund for newly employed workers, in line with Personal Income Tax Law, thus mitigating the difference in tax treatment between larger and smaller agricultural companies. On the other hand, there is no institutional mechanism in Serbia to mitigate differences in tax burden between larger and smaller agricultural companies.

Research results suggest that leverage does not significantly influence LRETR of agricultural companies. In fact, employed LRETR uses profit before tax in denominator, thus capturing only non-conforming tax avoidance strategies, while debt tax shield is a conforming strategy. In addition, agricultural companies in Serbia have relatively low leverage since agricultural loans market is not developed enough. Banks are dominantly oriented towards larger producers and

agricultural companies (Popović *et al.*, 2018), so the potentials for using leverage to minimize tax burden are highly limited.

In general, the impact of profitability on LRETR appears to be statistically insignificant. The direction of such impact is also different to the one presented in scatter diagrams. This finding indicates that there is not significant difference in LRETR between companies with more and those with lower resources that may be invested in tax planning.

Quantile regression estimates showed that the impact of predictors on LRETR is not the same across the LRETR distribution. Size is the only employed variable that affects LRETR at each quantile, while leverage is the only variable that does not affect LRETR at any quantile. In addition, the impact of size and capital intensity is strongest at the medium levels of LRETR distribution. However, the impact of profitability is statistically significant and positive at the lower levels of LRETR distribution, countering the results of OLS estimation.

4.3. *Robustness check*

We have also checked the robustness of the results. In this regard, we have resized sample to 500 largest agricultural companies by operating revenue in 2018. Although each agricultural company is a taxpayer, we aimed to capture only companies with real economic activity. For in-

stance, among eliminated companies, there are many without sales revenue in each sampled year or with the same structure and value of total assets in each year. There were also companies whose total assets fully consist of long-term financial investments or cash and cash equivalents.

Despite significant changes in the research sample, regression results do not differ substantially. One important exception is the impact of AvCAPIT, that appears to be, unlike in the original research model, significant at each quantile. Regression results for modified research sample are presented in Table 5 and Figure 4.

5. Conclusions

We studied the impact of traditional firm characteristics on the long-run corporate effective tax rates (LRETRs) in agricultural companies in the transition country of Serbia. In this regard, we developed a sample of 842 companies, using the period between 2014 and 2018. Research analysis showed that LRETRs of agricultural companies are significantly lower than statutory tax rate. Relying on annual ETRs analysis by Vržina and Dimitrijević (2019), we conclude that corporate tax burden of agricultural companies in Serbia is lower both in short and long run.

Larger agricultural companies appeared to have significantly lower LRETRs, thus supporting political power hypothesis. This finding is in line with many previous studies (Zeng, 2010;

Table 5 - Regression estimates for modified sample.

Variable	OLS	Quantile				
		0.2	*0.4*	*0.5*	*0.6*	*0.8*
Constant	***23.503 (8.483)	***14.753 (4.526)	***22.810 (8.911)	***24.162 (8.985)	***21.330 (7.356)	***25.404 (7.230)
AvSIZE	***-0.906 (-3.671)	***-0.990 (-3.946)	***-1.113 (-4.881)	***-1.054 (-4.190)	**-0.552 (-2.006)	**-0.656 (-2.205)
AvCAPIT	***-0.089 (-4.540)	*-0.039 (-1.897)	***-0.110 (-6.073)	***-0.126 (-6.965)	***-0.143 (-7.957)	***-0.078 (-2.839)
AvLEV	-0.036 (-1.064)	-0.016 (-0.564)	-0.011 (-0.414)	-0.026 (-0.879)	-0.041 (-1.239)	-0.036 (-0.751)
AvPROF	-0.022 (-0.225)	*0.234 (1.772)	***0.245 (3.163)	***0.203 (2.746)	0.100 (1.319)	-0.065 (-0.811)

Note: Beta coefficients in front of parentheses, t-statistics in parentheses; statistically significant at 1% (***), 5% (**) and 10% (*).

Figure 4 - Quantile regression estimates with confidence intervals for modified sample.
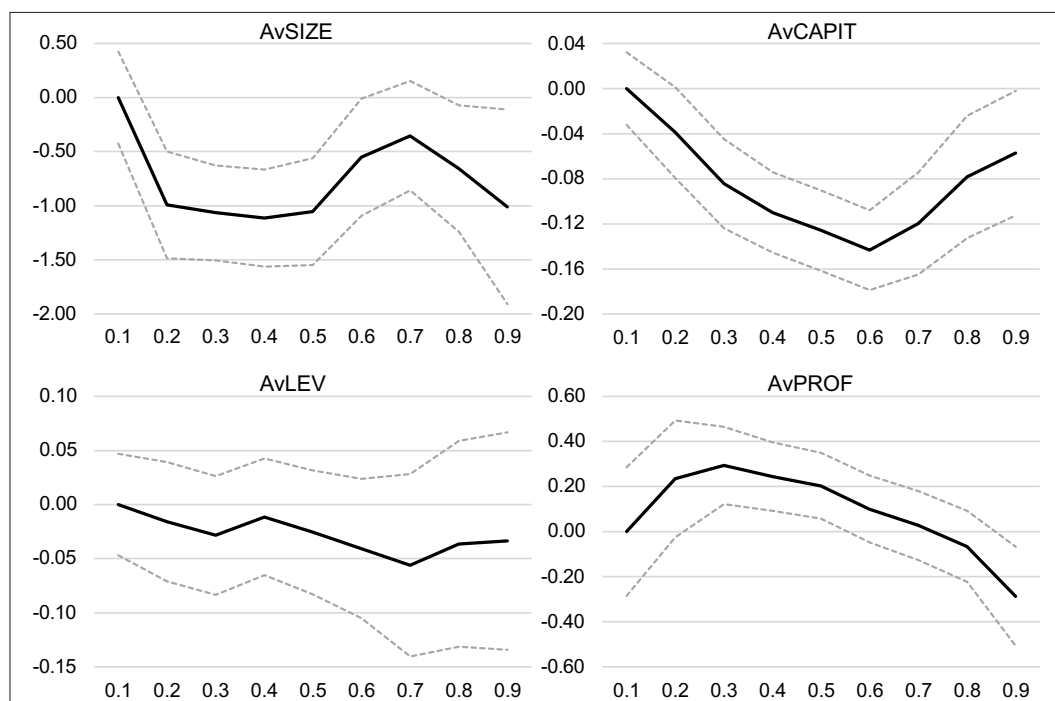
Hsieh, 2012; Fernández-Rodriguez *et al.*, 2019; Barbera *et al.*, 2020; Bubanić and Šimović, 2021). Therefore, the first research hypothesis cannot be rejected. In addition, we found that capital intensity significantly and negatively influences LRETR and such finding is also consistent with many prior studies (Hsieh, 2012; Lazar, 2014; Parisi, 2016; Fernández-Rodriguez *et al*., 2021). Therefore, the second research hypothesis also cannot be rejected. On the other hand, the impact of leverage and profitability on LRETR, in general, appears to be insignificant, so the third and fourth research hypotheses can be rejected. Using quantile regression, we also found that the impact of firm characteristics is different on different parts of the LRETR distribution. Results of the quantile regression, in general, confirm the OLS estimates, except for the impact of profitability on LRETR that seems to be inconclusive.

We believe that our analysis may contribute to ensuring a fair corporate tax treatment of agricultural companies in Serbia. In particular, the corporate tax system should be modified to mitigate the differences in LRETRs between larger and smaller companies. Changes in investment tax incentive rules may contribute to it, as such incentives should be accessible also to the smaller, not only larger, companies. Such proposals have already been made by Foreign Investors Council and National Alliance for Local Economic Development of Serbia, and our study adds to it.

Besides national tax authorities that should use results of the research to modify the corporate tax system, our results may be of interest to management of agricultural companies, as they should account corporate tax effects when sizing and structuring their investments and optimal financial structure. Our results particularly imply that managers of smaller agricultural companies should pay attention to the corporate tax planning as these companies have a higher tax burden.

Presented research results should be used in the light of certain limitations. The analysis captured only one country – bearing in mind cross-national differences in corporate tax systems, the conclusions cannot be applied on companies from other transition countries. In addition, well known limitations of sampling method may be attributed to this paper. It should also be noted that the paper

captures the period after global economic crisis in 2008 and before Covid-19 pandemic period in 2020. It means that the paper does not capture key crisis years that may negatively affect sustainability, stability and investment of agriculture (Lacirignola *et al.*, 2015; Chavas *et al.*, 2022).

It would be also interesting to study determinants of LRETRs in other transition countries, to include other potential LRETR determinants or to apply other types of regression. However, we leave these questions for future research.

References

Ang A., Bhansali V., Xing Y., 2010. Taxes on Tax-Exempt Bonds. *The Journal of Finance*, 65(2): 565-601.

Barbera A., Merello P., Molina R., 2020. Determinants of Corporate Effective Tax Rates: Evidence from the Euro Area. *Academia Revista Latinoamericana de Administracion*, 33(3-4): 427-444.

Braz C., Cabral S., Campos M., 2022. *A Micro-Level Analysis of Corporate Income Taxation in Portugal*, Banco de Portugal Research Paper.

Brune A., Thomsen M., Watrin C., 2019. Tax Avoidance in Different Firm Types and the Role of Nonfamily Involvement in Private Family Firms. *Managerial and Decision Economics*, 40(8): 950-970.

Bubanić M., Šimović H., 2021. Determinants of the Effective Tax Burden of Companies in the Telecommunications Activities in the Republic of Croatia. *Zagreb International Review of Economics & Business*, 24(2): 59-76.

Chavas J., Rivieccio G., Di Falco S., De Luca G., Capitanio F., 2022. Agricultural Diversification, Productivity, and Food Security across Time and Space. *Agricultural Economics*, 53(51): 41-58.

Delgado F., Fernández-Rodriguez E., Martinez-Arias A., 2014. Effective Tax Rates in Corporate Taxation: A Quantile Regression for the EU. *Engineering Economics*, 25(5): 487-496.

Delgado F., Fernández-Rodriguez E., Martinez-Arias A., 2018. Corporation Effective Tax Rates and Company Size: Evidence from Germany. *Economic Research*, 31(1): 2081-2099.

Derashid C., Zhang H., 2003. Effective Tax Rates and the "Industrial Policy" Hypothesis: Evidence from Malaysia. *Journal of International Accounting, Auditing and Taxation*, 12(1): 45-62.

Dyreng S., Hanlon M., Maydew E., 2008. Long-Run Corporate Tax Avoidance. *The Accounting Review*, 83(1): 61-82.

Fernández-Rodriguez E., Garcia-Fernández R., Martinez-Arias A., 2019. Influence of Ownership Structure on the Determinants of Effective Tax Rates of Spanish Companies. *Sustainability*, 11(5): 1441.

Fernández-Rodriguez E., Garcia-Fernández R., Martinez-Arias A., 2021. Business and Institutional Determinants of Effective Tax Rate in Emerging Economies. *Economic Modelling*, 94(1): 692-702.

Fernández-Rodriguez E., Martinez-Arias A., 2014. Determinants of the Effective Tax Rate in the BRIC Countries. *Emerging Markets Finance & Trade*, 50(S3): 214-228.

Gunes E., Guldal H., 2019. Determination of Economic Efficiency of Agricultural Enterprises in Turkey: A DEA Approach. *New Medit*, 18(4): 105-116.

Gupta S., Newberry K., 1997. Determinants of the Variability in Corporate Effective Tax Rates: Evidence from Longitudinal Data. *Journal of Accounting and Public Policy*, 16(1): 1-34.

Hanlon M., Heitzman S., 2010. A Review of Tax Research. *Journal of Accounting and Economics*, 50(2-3): 127-178.

Hazir C., 2019. Determinants of Effective Tax Rates in Turkey. *Journal of Research in Business*, 4(1): 35-45.

Henry E., Sansing R., 2018. Corporate Tax Avoidance: Data Truncation and Loss Firms. *Review of Accounting Studies*, 23(3): 1042-1070.

Horvat A., Matkovski B., Zekić S., Radovanov B., 2020. Technical Efficiency of Agriculture in Western Balkan Countries Undergoing the Process of EU Integration. *Agricultural Economics – Czech*, 66(2): 65-73.

Hsieh Y., 2012. New Evidence on Determinants of Corporate Effective Tax Rates. *African Journal of Business Management*, 6(3): 1177-1180.

Karpavicius S., Yu F., 2016. Should Interest Expenses Be Tax Deductible? *Economic Modelling*, 54(1): 100-116.

Kim K., Limpaphayom P., 1998. Taxes and Firm Size in Pacific-Basin Emerging Economies. *Journal of International Accounting, Auditing and Taxation*, 7(1): 47-68.

Koenker R., 2017. Quantile Regression: 40 Years On. *Annual Review of Economics*, 9(1): 155-176.

Koenker R., Basset G., 1978. Regression Quantiles. *Econometrica*, 46(1): 33-50.

Lacirignola C., Capitanio F., Adinolfi F., 2015. Food Security in the Mediterranean Countries. *New Medit*, 14(4): 2-10.

Lazar S., 2014. Determinants of Variability of Corporate Effective Tax Rates: Evidence from Romanian Listed Companies. Emerging Markets Finance & Trade, 50(S4): 113-131.

Milošević G., Kulić M., Đurić Z., Đurić O., 2020. The Taxation of Agriculture in the Republic of Serbia as a Factor of Development of Organic Agriculture. *Sustainability*, 12(8): 3261.

Momčilović M., Vlaović Begović S., Tomašević S., Ercegovac D., 2015. Sustainable Growth Rate: Evidence from Agricultural and Food Enterprises. *Management*, 20(76): 63-75.

Moreno-Rojas J., González-Rodríguez M., Martin-Samper R., 2017. Determinants of the Effective Tax Rates in the Tourism Sector: A Dynamic Panel Data Model. *Tourism & Management Studies*, 13(3): 31-38.

Parisi V., 2016. The Determinants of Italy's Corporate Tax Rates: An Empirical Investigation. *Public and Municipal Finance*, 5(4): 7-14.

Popović S., Janković I., Stojanović Ž., 2018. The Importance of Bank Credits for Agricultural Financing in Serbia. *Economics of Agriculture*, 65(1): 65-80.

Salawu R., Ololade B., 2018. Corporate Tax Avoidance of Listed Firms in Nigeria. *Journal of Taxation and Economic Development*, 17(2): 1-12.

Schwab C., Stomberg B., Williams B., 2022a. Effective Tax Planning. *The Accounting Review*, 97(1): 413-437.

Schwab C., Stomberg B., Xia J., 2022b. What Determines Effective Tax Rates? The Relative Influence of Tax and Other Factors. *Contemporary Accounting Research*, 39(1): 459-497.

Simonović Z., Jeločnik M., Subić J.. 2013. Tax Policy in Serbian Agriculture. *Economics of Agriculture*, 60(3): 637-651.

Stanojević N., 2022. Assessing Serbia's Cereals Export to the Middle East Markets. *New Medit*, 21(2): 3-16.

Stekla J., Grycova M., 2016. The Relationship between Profitability and Capital Structure of the Agricultural Holdings in the Czech Republic. *Agricultural Economics – Czech*, 62(9): 421-428.

Stojanović Ž., 2022. Agriculture in Serbia. In: Manić E., Nikitović V., Djurović P. (eds.), *The Geography of Serbia*. Cham: Springer, pp. 199-206.

Todorović S., Papić R., Ciaian P., Bogdanov N., 2020. Technical Efficiency of Arable Farms in Serbia: Do Subsidies Matter? *New Medit*, 19(4): 81-97.

Vintilă G., Gherghina Ş., Păunescu R., 2018. Study of Effective Corporate Tax Rate and Its Influential Factors: Empirical Evidence from Emerging European Markets. Emerging Markets Finance & Trade, 54(3): 571-590.

Vržina S., Dimitrijević M., 2019. Determinants of Profitability of the Agricultural Sector of Vojvodina: The Role of Corporate Income Tax. *The European Journal of Applied Economics*, 17(1): 1-19.

Zeng T., 2010. Income Tax Liability for Large Corporations in China: 1998-2007. *Asian Review of Accounting*, 18(3): 180-196.