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Abstract

We investigate the effect of corporate taxation, in particular investment tax allowances, on corporate investments in Slovenian firms. Since, as argued by Črnigoj and Verbič (2013), Slovenian firms tend to be recently to a large extent financially constraint, we modeled the tax effects in our investment model via two different channels; one being crucial for financially unconstrained firms and the other for financially constrained firms. In financially unconstrained firms, investments should be affected by taxes through the user cost of capital, while for financially unconstrained firms the effect that materializes through the cash flow effect is expected to prevail. We found only weak evidence of the tax effect that materialize through the cash flow effect, but we did not find any significant effect of the cost of capital on corporate investments.

Keywords: investment decisions, tax investment allowances, cost of capital, error-correction model

JEL classification: G31, G01

1. Introduction

Slovenia was hit by a severe economic crisis in 2009 that continues throughout the period 2010-12. GDP p.c. dropped by 8,1 % in 2009, picked up slightly in 2010 but deteriorated further in 2011 and 2012. Negative trends are expected to continue in the next two years. Investments that were stimulating the growth of the economy before the crisis dropped by 21,6 % in 2009 (IMAD, 2010) and have been decreasing by 10 % yearly in the period 2010-12 (IMAD, 2011 and 2012). One of the immediate measures to stop the negative trend of corporate investments was an increase of the investment tax allowances. In 2009 the tax allowance for the investments in equipment and intangible assets increased from 20 % of the investment value to 30 %, a further 10-percentage point increase was introduced in 2012. Even higher increase of the tax allowance was introduced for the investments in R&D. In 2010 the tax allowances for the investments in R&D increased from 20 % of the investment value to 40 %, a huge increase to 100 % of the investment value was introduced in 2012. In this paper we investigate the responsiveness of corporate investments to changes in corporate taxes, in particular, the investment tax allowances, to give a policy recommendation about the effectiveness of the measure aimed at stimulating corporate investments and thus the economic recovery.

The answer to the question whether Slovenian corporate investments can be stimulated by more favorable corporate taxation cannot be inferred from the findings of the existing empirical research. As argued by Črnigoj and Verbič (2013) Slovenian firms tend to be recently to a large extent financially constraint, while the empirical research mostly considered firms operating in economies with sound financial systems. Bank financing in Slovenia plunged in 2009. Bank of Slovenia (2012) reports that the increase of credit obtained by banks dropped from 3,5 billion EUR in 2008 to only 216 million EUR in 2009 and only 139 million EUR in 2010. What is more, there was a negative flow of bank credit to the corporate sector in 2011. Besides, Slovenian firms are overlevered. Bank of Slovenia (2012) reports that the D/E ratio of the Slovenian corporate sector amount to 1,5 in 2008, while only slightly decreased in the period 2009-11. Leverage of the Slovenian firms has increased enormously in the period of after 2006, since in 2006 Črnigoj and Mramor (2009) still report relatively low leverage of the Slovenian corporate sector.

Frequent changes of the investment tax allowances, as well other aspect of the corporate income taxation, suggest that policy makers believe that corporate investments could be stimulated by the changes in the corporate taxation. As argued by Bond and Van Reenen (2007), empirical studies conducted on aggregate time series data have not provided strong support, while some promising results emerge from the microeconometric studies. Microeconometric studies focus mainly on measuring the effect of taxes on the user cost of capital and quantifying the effect of user cost of capital on corporate investments. In particular, the investment tax allowances reduce the user cost of capital and thus the hurdle rate used to evaluate the profitability of the investments. It follows, the lower the required rate of return, the more profitable investments and more investments in the economy. Auerbach and Hassett (1992), Cummins et al. (1994) and Chirinko et al. (1999), investigated the effects of the tax-related components of the user cost of capital on corporate investment in the US firms and all provide strong support that corporate investments can be stimulated by more favorable corporate income taxation. Cummins et al. (1994) found significant effects from the cross-section variation that occurs in the measure of the user cost in the periods of major tax reforms, with the implied long-run elasticity of the capital stock with respect to the user cost between −0.5 and −1.0. Chirinko et al. (1999) report statistically significant but smaller estimates, around −0.25. Similar estimates were obtained by Auerbach and Hassett (1992).

Despite the models in the existing empirical studies control for the effect of financial constraints, the models do not explicitly take into account the tax effect that materialize through the cash flow effect in financially constrained firms. Under the assumption of a perfect capital market the corporate income taxation affect investments through the user cost of capital, while assuming that the capital market is not perfect and that firms are financially constraint, the effect that materialize through the cash flow effect is expected to prevail. Simmler (2012) who investigated responsiveness of corporate investments to taxes in German firms found that only in financially unconstrained firms the user cost of capital matters, whereas for financially constrained firms the cash flow effect is crucial.

In order to determine the effect of the investment tax allowances on corporate investments in Slovenian firms that are as argued by Črnigoj and Verbič (2012) to a large extent financially constraint, we modeled the tax effects in our investment model via two different channels, one being crucial for financial unconstrained firms and the other for financially constrained firms. In financially unconstrained firms, investments should be affected by taxes through the user cost of capital, while for financially unconstrained firms the effect that materializes through the cash flow effect is expected to prevail. We modeled these tax effects in an error-correction model. Error-correction model is a reduced form model, in which in contrast to the structural models, such as the Q model or the Euler-equation specification, long-run formulation for the level of the capital stock is specified to be consistent with a simple model of the firm's demand for capital, but in which the short-run investment dynamics are found from as empirical specification search, rather than being imposed a priori. As found by Črnigoj and Verbič (2013) the error-correction model proved to be able to better explain corporate investment dynamics in Slovenian firms during the period of crisis than the structural models, in particular the Euler-equation specification. We have not found any effect of the user cost of capital on corporate investments and only a weak evidence of the effect that materialize through the cash flow effect. Based on the results, we cannot argue that Slovenian corporate investments are affected by taxes and that can be stimulated by more favorable corporate taxation.

The paper is structured as follows. In section 2 we present theoretical framework and the empirical models. In section 3 we analyze the data. In section 3 we present the result and in section 4 we make concluding remarks.

2. Theoretical framework and the empirical models

Empirical tests of corporate investment decisions, as well as the effects of financial constraints on corporate investments, build on the dynamic factor demand models; structural and reduced form models. Structural models that include the Q model, the Abel and Blanchard model and the Euler-equation specification, have not been very successful in characterizing the adjustment process. Since firm's capital cannot be adjusted costlessly and immediately and thus we cannot resort to static models, econometricians proposed to rely on dynamic specification that is not explicitly derived as optimal adjustment behavior for some particular structure of adjustment costs. As argued by Bond and Van Reenen (2007), a favorable interpretation of the reduced form models, such as the accelerator model and the error-correction model, is that they represent an empirical approximation to some complex underlying process that generate the data. However, they compound the parameters of the adjustment process with the parameters of the expectations-formation process and can be subject to Lucas (1976) critique. Our empirical tests rely on the error-correction model that includes the effects of financial constraints.

Taking into account the financial constraints, we modeled the tax effects in our investment model via two different channels, one being crucial for financial unconstrained firms and the other for financially constrained firms. In financially unconstrained firms, investments should be affected by taxes through the user cost of capital, while for financially unconstrained firms the effect that materializes through the cash flow effect is expected to prevail.

2.1. Error-correction model

The error-correction model was introduced to the investment literature by Bean (1981), while it was first used in the context of firm-level data by Bond et al. (2003). The idea of the model is to nest a long-run specification for the firm's demand for capital within the regression model that allows a flexible specification for short-run investment dynamics to be estimated from the data.

Being aware that firms have some desired capital stock, we can expect a firm to invest in order decrease the gap between its actual and desired capital stock. The desired capital stock of the firm (k_{it}) can be written as a log linear function of its output (y_{it}) and its cost of capital (ucc_{it}):

$$k_{it} = \alpha_i + y_{it} - \gamma ucc_{it} \qquad (1)$$

Under the assumption of no adjustment costs, the firm would adjust the actual capital stock to the desired capital stock immediately. In the presence of the adjustment costs the firm does not adjust immediately to its target. Allowing the adjustment process to be determined by the data, we nest equation (1) within the autoregressive-distributed lag (ADL) specification. Implicitly we assume that the firm's desired capital stock in the presence of the adjustment costs is proportional to its desired capital stock in the absence of the adjustment costs and that the short-term dynamics are stable enough to be well approximated by distributed lags in the regression model.

Assuming ADL specification with first and second order dynamics, the model can be written as:

$$k_{it} = \alpha_1 k_{i,t-1} + \alpha_2 k_{i,t-2} + \beta_0 y_{it} + \beta_1 y_{i,t-1} + \beta_2 y_{i,t-2} + \gamma_0 ucc_{it} + \gamma_1 ucc_{i,t-1} + \\ + \gamma_2 ucc_{i,t-2} + d_t + \mu_i + \vartheta_{it} \tag{2}$$

where d_t is a time dummy and μ_i is an unobserved firm-specific effect and ϑ_i is an error term.

Imposing the long-run elasticity restriction that requires $(\beta_0 + \beta_1 + \beta_2) / (1 - \alpha_1 - \alpha_1) = 1$ and reparameterizing the ADL model in error-correction form, we get:

$$\Delta k_{it} = (\alpha_1 - 1)\Delta k_{i,t-1} + \alpha_2 + \beta_0 \Delta y_{it} + (\beta_0 + \beta_1)\Delta y_{i,t-1} - (1 - \alpha_1 - \alpha_2)\left(k_{i,t-2} - y_{i,t-2}\right) \\ -\gamma_0 \Delta ucc_{it} - \gamma_1 \Delta ucc_{i,t-1} + d_t + \mu_i + \vartheta_{it} \tag{3}$$

To obtain the empirical specification for the investment rate, we approximated $\Delta k_{it} \approx I_{it}/K_{i,t-1} - \delta_i$, in which I_{it} denotes gross investment, K_{it} denotes the capital stock and δ_i denotes firm-specific depreciation rate. The empirical model has the form:

$$\frac{I_{it}}{K_{i,t-1}} = \varphi \frac{I_{i,t-1}}{K_{i,t-2}} + \sigma_0 \Delta y_{it} + \sigma_1 \Delta y_{i,t-1} + \rho\left(k_{i,t-2} - y_{i,t-2}\right) + \pi_0 \Delta ucc_{it} + \pi_1 \Delta ucc_{i,t-1} + \\ + d_t + \mu_i + \vartheta_{it} \tag{4}$$

The model requires $\rho < 0$ in order the model is consistent with error-correcting behavior, implying that capital stock below its desired level is associated with positive future investments, and vice versa.

2.2. Financial constraints

In the model above we assume a perfect capital market, in which a firm can raise as much finance as it desires and that internal and external funds are perfect substitutes, meaning that the firm's investment decisions are not related to its financial decisions (Modigliani and Miller, 1958). However, as argued by Fazzari et al. (1988), the separability between the investment and the financial decisions no longer holds if the capital market is not perfect. Investment decisions in this case depend on the financial factors such as availability of the internal finance and access to new finance. For example, having in mind pecking order hypothesis (Myers, 1984), a firm with internal funds available may have a cost advantage and would decide to invest at lower expected rate of return. On the other hand, a firm without internal funds available would have to use costlier external finance and would decide to invest only at relatively higher expected rate of return. If the cost disadvantage of external finance is large or in the extreme case in which external finance are not available, firm's investments fluctuate with the availability of the internal finance.

To control for the effects of financial constraints on corporate investments, we included current and lagged value of firm's cash flow (normalized by $K_{i,t-1}$) in the empirical model:

$$\frac{I_{it}}{K_{i,t-1}} = \varphi \frac{I_{i,t-1}}{K_{i,t-2}} + \sigma_0 \Delta y_{it} + \sigma_1 \Delta y_{i,t-1} + \rho\left(k_{i,t-2} - y_{i,t-2}\right) + \pi_0 \Delta ucc_{it} + \pi_1 \Delta ucc_{i,t-1}$$
$$+\theta_0 \frac{CF_{it}}{K_{i,t-1}} + \theta_1 \frac{CF_{i,t-1}}{K_{i,t-2}} + d_t + \mu_i + \vartheta_{it} \quad (5)$$

2.3. The effect of taxes in the presence of financial constraints

Corporate investments are affected by taxes through the user cost of capital. In particular, the investment tax allowances reduce the user cost of capital and thus the hurdle rate used to evaluate the profitability of the investments. It follows, lower required rate of return, more profitable investments and more investments, and vice versa.

However, if the capital market is not perfect and firms cannot raise as much finance as it desires and internal and external funds are not perfect substitutes, there is another tax effect that materialize through the cash flow effect. In particular, the investment tax allowances increase the cash flow and thus internal funds available. It follows, the higher the investment tax allowances, the higher the cash flow and thus the internal funds available, and the higher the investments.

Modeling the tax effect that materialize through the cash flow effect thus require to disentangle the cash flow effect into the effect of the cash flow that is generated by the firm's operations and decreased by interest paid – cash flow before taxes (*CFBT*) and the cash flow used to pay taxes – effective average taxes (EAT):

$$\frac{I_{it}}{K_{i,t-1}} = \varphi \frac{I_{i,t-1}}{K_{i,t-2}} + \sigma_0 \Delta y_{it} + \sigma_1 \Delta y_{i,t-1} + \rho\left(k_{i,t-2} - y_{i,t-2}\right) + \pi_0 \Delta ucc_{it} + \pi_1 \Delta ucc_{i,t-1}$$
$$+\theta_0 \frac{CFBT_{it}}{K_{i,t-1}} + \theta_1 \frac{CFBT_{i,t-1}}{K_{i,t-2}} + \omega_0 \frac{EAT_{it}}{K_{i,t-1}} + \omega_1 \frac{EAT_{i,t-1}}{K_{i,t-2}} + d_t + \mu_i + \vartheta_{it} \quad (6)$$

The model requires $\omega < 0$ in order the model is consistent with the expected tax effect that materialize through the cash flow effect.

In the empirical specification that we used to determine the effect of the investment tax allowances on corporate investments in Slovenian firms, we suppressed the current effective average tax rate (EAT_t/K_{t-1}) because firms pay corporate income tax based on the income earned in the previous year. We also did not consider lagged value of used cost of capital ($\Delta j_{i,t-1}$) because we lose additional year, what in a 3-year panel result in a substantial loss of the explanatory power of the empirical model.

3. Data

We constructed a panel data set that covers Slovenian firms in the period 2006-10. The panel combine accounting data provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES) and data from the Survey on corporate gross investments (INV-1) conducting yearly by the Statistical office of the Republic of Slovenia. AJPES database includes income statements and balance sheets of all Slovenian firms, while INV-1 that include data about corporate investments and financing resources used to fund the investments covers the firms with more than 10 employees. To approximate the user cost of capital we needed some additional data that were obtained by the Statistical office of the Republic of Slovenia and the Bank of Slovenia.

The variables we use in our models are investments, stock of capital, output, the user cost of capital, cash flow and corporate income tax. We consider investments in property, plants and equipment, as well as intangible assets. We also try to measure investments only by taking into account investments in tangible assets, but the results remains roughly the same. The data were obtained from INV-1. The stock of capital is approximated by the book value of property, plants and equipment, and intangible assets or only book value of tangible assets, depending on what is considered to represent the investments. We approximated output by the firm's sales. The data for the stock of capital and output were obtained from AJPES.

We constructed a measure of the user cost of capital based upon Jorgenson (1963) and Hall and Jorgenson (1967). The user cost of capital ($UCC_{i,j,t}$) for firm i in industry j at time t is the weighted average of the firm's asset-specific user costs ($UCC_{i,j,a,t}$) and can be expressed as:

$$UCC_{i,j,t} = \sum_{a=1}^{n} \alpha_{i,t}^{a} UCC_{i,j,a,t} = \sum_{a=1}^{n} \left[\frac{p_{j,t}^{I}}{p_{j,t}^{Y}}\right] \left[\left(1 - m_{a,t} - z_{a,t}\right)/\left(1 - \tau_t\right)\right]\left[r_t + \delta_j\right] \qquad (7)$$

where $\alpha_{i,t}^{a}$ is the firm-specific share of asset a at time t, $p_{j,t}^{I}$ is the industry-specific purchase price at time t, $p_{j,t}^{Y}$ is the industry-specific output price at time t, $m_{a,t}$ is the asset-specific investment tax allowance at time t, $z_{a,t}$ is the asset-specific tax depreciation allowance at time t, τ_t is the tax rate at time t, r_t is the cost of capital at time t and δ_j is the assets-specific economic depreciation rate. We considered two types of assets, buildings and equipment.

We approximated the firm-specific share of asset ($\alpha_{i,t}^{a}$) by the firm's share of investments in each type of assets in total investments in fixed assets. The data were obtained from INV-1.
We obtained the industry-specific purchase prices ($p_{j,t}^{I}$) by dividing the industry investments in fixed assets in current prices by the industry investments in fixed assets in constant prices. We obtained the industry-specific output price ($p_{j,t}^{Y}$) by dividing the industry value added in current prices by the industry value added in constant prices. Both, the data about industry investments in fixed assets and the industry value added are reported yearly by the Statistical office of the Republic of Slovenia.

The asset-specific investment tax allowance ($m_{a,t}$) is defined according to the Slovenian corporate income tax law. The law offers two types of investment allowances, the allowance for the investments in equipment and intangible assets, and the allowance for the investments in R&D. We assume 0 % allowance for the investments in buildings and 20 %, 0 and 30 % for the investments in equipment in years 2006, 2007 and 2008-10, respectively and 20 % and 40 % for the investments in R&D in years 2006-09 and 2010, respectively. Since the law recognizes investments in equipment under both types of allowances, we calculated a weighted average of the allowances for the investment in the equipment by using the share of each allowance in all allowances used by the firm in particular year. The data on the allowances used by the firm were obtained from INV-1. The Slovenian corporate income tax law is also the source to approximate the asset-specific tax depreciation allowance ($z_{a,t}$) and the tax rate(τ_t). The tax depreciation allowance for buildings ($z_{a,t}$) amount to 3 %, while we assume an average 35 % for equipment. The tax rate amounts to 25 %, 23 %, 22 %, 21 % and 20 % in year 2006, 2007, 2008, 2009 and 2010, respectively.

The cost of capital (r_t) is approximated by the after tax cost of debt. Despite some studies used a weighted average of the different sources of finance (Auerbach and Hassett, 1992; and Chirinko et al., 1999), others argue that simplifying the proxy and resorting to the cost of debt, that is easier to estimate, does not influence the result. Simmler (2012), for example, who used the after cost of debt obtained identical results as Dwenger (2009) who conducted the same tests and used a weighted average cost of capital. Besides, he argues that the simplification and using cost of debt is in line with the hierarchy of finance theory. Cummins et al. (1994) obtained the same result using a fixed required rate of return of 4 % and using the firm-specific cost of debt approximated using the Compustat data on firms' interest expense and total long-term and short-term debt, and firms' S&P debt rating and bond rating. Beside time series variation, we take into account the variability of the cost of debt depending on the volume of the investments and thus the loan. In particular, we distinguish the cost of debt for loans below 1 million EUR and above 1 million EUR. The data for the interest rate on the corporate loans are reported by the Bank of Slovenia.

The assets-specific economic depreciation rate (δ_t) is defined as in Dwenger (2009) who assumed a depreciation rate of 12,25 % per year for fixed tangible assets and 3,61 % per year for buildings.

We calculated a measure of cash flow by adding back depreciation and net interest to the reported net income. The data were obtained from AJPES.

To control for the effect of taxes in financially constrained firms that materialize through the cash flow effect, we use a measure that is based on the effective average tax (*EAT*). The effective average tax (*EAT*) is the value firm's corporate income tax. The data were obtained from AJPES.

Combining the data from AJPES and INV-1, as well as other resources, and calculating the variables of interests, we end up with a panel that consists of 14.439 firm-year observations. Table 1 in the appendix shows descriptive statistics of the panel. The firms in the panel generated on average 17 million EUR of sales, 1 million EUR of EBIT and 420 thousands EUR of net income yearly. The firms had on average 19 million EUR of assets and employed 118 employees. The median values of the corresponding variables that amount to only 20-30 % of the average value suggest that the size distribution is highly skewed.

In table 2 we present the means and standard deviations of the variables in our models. The investment rate (I_t/K_{t-1}) amounted to almost 0,5 in 2006 but dropped to 0,4 in years 2007 and 2008 and as low as 0,3 in years 2009 and 2010. A somewhat similar trend can be observed when analyzing the growth rate of sales (Δy_t) The growth rate of sales (Δy_t) decreased from 0,17 in 2007 to as low as -0,10 in 2009 when the crisis most severely hit the economy, but picked up again in 2010 when it reached 0,08. The growth rate of user cost of capital (Δucc_t) is negative throughout the whole period, meaning that the user cost of capital is decreasing. The user cost of capital is decreasing in the studied period mainly because there was an increase of the investment tax allowances and a drop in the corporate income tax rate. The cash flow rate (CF_t/K_{t-1}) decreased from the level of around 0,8 in the years 2006-08 to 0,72 and 0,75 in years 2009 and 2010. Effective average tax rate (EAT_t/K_{t-1}) increased to 0,13 in 2007 (from 0,1 in 2006) because the tax allowance for investments in the equipment ceased to exist but is decreasing thereafter in line with the increase of investment tax allowances and the decrease of corporate income tax. It amounted to 0,08 in 2010.

4. Results

In table 3, we report the regression results for the error-correction model outlined in equation (4). The model was estimated using GMM method, the instruments used include lagged values of RHS variables ($t – 1$ and $t – 2$). GMM controls for biases due to unobserved firm-specific effect, as well as endogenous explanatory variables. GMM eliminates the firm-specific effects by differencing the equations, and then uses lagged values of endogenous variables as instruments. If the error term (v_{it}) in levels is serially uncorrelated, then the error term in first differences is MA(1), and instruments dated $t – 2$ and earlier should be valid in the differenced equations and thus consistent estimates can be obtained. We test the validity of the instruments used by reporting Sargan test of the overidentifying restrictions.
As seen in table 3, the results do not support the hypothesis that corporate investments in Slovenian firms are affected by taxes. The results suggest that corporate investments are not affected by taxes through the user cost of capital, however we found a weak evidence of the effect that materialize through the cash flow effect. The coefficient of the user cost of capital (Δucc_t) is insignificant in all specifications. However, we found a negative and significant effect of the effective average tax rate (EAT_t/K_{t-1}) in specification (2) in which we consider only investments in property, plants and equipment. On the other hand, in specification (1) we consider investments in tangible, as well as intangible assets.

Two caveats one has to have in mind when evaluating the results. When including the user cost of capital (Δucc_t) in the model, the estimated coefficient of the key variable in the model – the error-correction term $(k_{t-2} – y_{t-2})$ becomes insignificant. The other caveat refers to the possibility that the effective tax rate (EAT_t/K_{t-1}) that should proxy for the effect that materialize through the cash flow effect could proxy for the omitted expected future profitability, rather than the additional cash flow obtained by the firm due to lower taxes paid by the firm because of higher investment tax allowances. In fact, we found very high partial correlation of the effective tax rate (EAT_t/K_{t-1}) to EBIT normalized by lagged value of the stock of capital, as well as positive effect of the current and lagged value of the effective tax rate (EAT_t/K_{t-1}) in the specification in which we omit the user cost of capital (Δucc_t).[1]

To investigate the difference in the effects of taxes on corporate investments in financially unconstrained and financially constrained firms, we first had to identify the firms that face financial constraints. The criteria used in the literature are dividend payout behavior and the leverage of the firms (Fazzari et al.,1988); Bond and Meghir, 1994). Because Slovenian firms have been highly indebted, moreover banks mention overleverage as a main argument to deny credit, we used the firm's leverage as a sample splitting criteria. We identified financially constrained firms if the firm's leverage exceeds median leverage, while the firms with leverage bellow median leverage were regarded as financially unconstrained.

In (3) and (4), we test the model on subsamples of financially unconstrained firms and financially constrained firms, respectively. Again, the coefficient of the user cost of capital (Δucc_t) is insignificant in both subsamples and all specifications. In one specification we found a significant and negative coefficient of the effective tax rate (EAT_t/K_{t-1}) in financially unconstrained firms, and surprisingly insignificant coefficient in financially constrained firms. Coefficient on the error-correction term $(k_{t-2} – y_{t-2})$ is correctly signed only in models tested on financially constrained firms. This contradicts the findings obtained by Črnigoj and Verbič (2013) who investigated the effects of financial constraints on corporate investments in Slovenia in the same period. They (2013) found a lower and insignificant coefficient in financially constrained firms and argue that these firms have difficulties to close the gap between the desired and actual stock of capital. Specification (5) is aimed to evaluate the significance of the difference of the tax effects, thus being again estimated on the whole sample and including financially unconstrained and financially constrained firms but including two interactive term that were obtained by multiplying the effective tax rate and the user cost of capital with the dummy for financially constrained firms ($EAT_{t-1}/K_{t-2} * d\_FC$ and $\Delta ucc_t * d\_FC$). The results confirm the findings obtained when testing the model on the subsamples.

We also tested the model on subsamples of small, medium-sized and large firms. Again, the coefficient of the user cost of capital (Δucc_t) is insignificant in all subsamples and all specifications. Meanwhile, we find mixed results for the effect of the effective tax rate (EAT_t/K_{t-1}). Coefficient on the error-correction term $(k_{t-2} – y_{t-2})$ is correctly signed only in small firms.[2]

[1] The results of the latter are not reported in the paper but are available upon request from the authors.
[2] The results of the latter are not reported in the paper but are available upon request from the authors.

5. Conclusions

In other to investigate the effect of corporate taxation, in particular the investment tax allowances, on corporate investments in Slovenian firms, we constructed a panel data set that covers Slovenian firms in the period 2006-10. Since, as argued by Črnigoj and Verbič (2013), Slovenian firms tend to be recently to a large extent financially constraint, we modeled the tax effects in our investment model via two different channels, one being crucial for financial unconstrained firms and the other for financially constrained firms. In financially unconstrained firms, investments should be affected by taxes through the user cost of capital, while for financially unconstrained firms the effect that materializes through the cash flow effect is expected to prevail.

Based on the results we cannot argue that Slovenian corporate investments are affected by taxes and that can be stimulated by more favorable corporate taxation. We have not found any effect of the user cost of capital on corporate investments and only a weak evidence of the effect that materialize through the cash flow effect.

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Appendix

Table 1: Descriptive statistics

The table present descriptive statistics of the panel (mean, median and standard deviations). Leverage ratio is calculated as the ration of short and long term debt to total assets.

	2006	2007	2008	2009	2010	Sum
Sales	16.536.793	17.133.344	17.243.008	15.932.880	17.198.090	16.821.673
	4.236.386	4.307.632	4.510.836	4.086.970	4.310.009	4.290.371
	68.903.579	72.258.470	77.846.868	70.738.415	77.625.621	73.650.515
EBIT	967.356	1.006.010	1.005.741	948.362	982.149	982.795
	189.768	209.176	212.019	179.232	168.484	192.885
	5.025.026	4.872.768	5.465.442	5.409.774	5.438.082	5.249.126
Net income	663.497	736.067	310.608	208.633	184.043	420.911
	82.636	87.992	62.655	41.570	40.919	61.998
	4.603.579	4.935.485	6.585.176	5.158.676	6.611.109	5.664.518
ROA	0,03363	0,05599	0,04159	0,01203	0,01464	0,03212
	0,04116	0,04850	0,04255	0,02707	0,02759	0,03684
	0,49317	0,26035	0,21578	0,28084	0,28888	0,31911
Assets	17.552.010	18.360.894	19.678.509	20.570.276	19.752.086	19.192.749
	3.646.434	3.617.642	3.753.338	3.841.653	3.727.497	3.719.408
	73.906.018	85.206.944	95.718.859	99.458.114	94.709.042	90.411717
Leverage	0,22818	0,23883	0,27115	0,32192	0,28410	0,26875
	0,18476	0,19330	0,23368	0,24814	0,24334	0,21824
	0,22685	0,25133	0,26884	2,27685	0,38050	1,03963
Employees	127,60810	122,10660	115,57220	112,12850	111,04930	117,66320
	47,50000	45,05000	44,32000	44,16500	43,25000	44,89000
	401,84350	387,34100	374,04220	348,12920	356,12250	374,06850
N	2.740	2.966	3.158	2.824	2.751	14.439

Table 2: Means and standard deviations of the variables in the models

The table present means and standard deviations of the variables used in the models and number of firms/observations in the studied period.

	2006	2007	2008	2009	2010	Sum
I_t / K_{t-1}	0,530418	0,416292	0,461266	0,330848	0,374348	0,423051
	5,265516	1,490417	2,290841	2,651656	4,093577	3,385885
Δy_t	0,140976	0,173406	0,121756	–0,095664	0,076683	0,084793
	0,286341	0,309089	0,300284	0,310424	0,294236	0,314829
$k_{t-2} - y_{t-2}$	–	–1,379896	–1,474771	–1,525466	–1,535086	–1,479869
	–	1,304847	1,319557	1,354492	1,360340	1,336260
Δucc_t	–	–0,022465	–0,106470	–0,042922	–0,203504	–0,094714
	–	0,049362	0,125729	0,115967	0,238056	0,164034
CF_t / K_{t-1}	0,598	0,690	0,650	0,548	0,539	0,606
	1,248	1,381	1,298	1,051	0,974	1,204
$CFBT_t / K_{t-1}$	0,817721	1,010620	0,972209	0,910427	0,909796	0,926538
	1,845537	2,216862	2,146274	2,176188	2,193509	2,123197
EAT_t / K_{t-1}	0,113236	0,144739	0,116584	0,089121	0,092322	0,111662
	0,349669	0,416424	0,368024	0,309259	0,322384	0,356657
N	2.650	2.836	3.029	2.732	2.653	13.900

Table 3: Error-correction model

*The table presents regression results for the error-correction model (regression coefficients, statistical significance of the coefficients where * denotes significance at 0,1 probability level, ** significance at 0,05 probability level and *** significance at 0,01 probability level). Besides, Sargan test for overidentifiying restrictions and corresponding p-value is reported.*

	(1)	(2)	(3)	(4)	(5)
I_{t-1} / K_{t-2}	0,000010	0,024897*	0,051800	–0,011881	0,000140
Δy_t	0,139630**	0,097929**	0,087802	0,167086**	0,134758**
Δy_{t-1}	0,156207**	0,103127*	0,058718	0,189449**	0,145318**
$k_{t-2} - y_{t-2}$	–0,064340	–0,049031	0,117384	–0,163831***	–0,058600
Δucc_t	0,027230	0,017701	0,018173	0,029843	–0,009530
$CFBT_t / K_{t-1}$	0,239971***	0,234901***	0,243662***	0,237086***	0,241940***
$CFBT_{t-1} / K_{t-2}$	0,061992***	0,029233	0,118753***	0,011776	0,055054***
EAT_{t-1} / K_{t-2}	–0,356959***	–0,106202	–0,589504***	–0,013827	–0,438760***
$EAT_{t-1} / K_{t-2} \cdot d\_FC$			–	–	0,395261***
$\Delta ucc_t \cdot d\_FC$			–	–	0,063840
Observations	5.995	5.997	3.002	2.993	5.995
Firms	2.562	2.564	1.417	1.494	2.562
Sargan test	10,993	6,0704	0,9278	33,356	11,409
p–value	0,0515	0,2994	0,9682	0,0000	0,0439

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