Erasmus School of Economics[1]

Bachelor Thesis Fiscale Economie

What is the effect of dividend taxation on corporate investment in European OECD countries between 2013 and 2019?

An empirical study on the relationship between dividend taxation and corporate investment.

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Abstract

For decades, there is debate about dividend taxation and the effect on the economy. Some politicians argue that a lower dividend tax rate increases wealth because it leads to higher corporate investment, and thus to more jobs, others disagree. Empirical research finds different relationships between dividend taxation and corporate investment. This paper examines if it is recommended for countries to lower their dividend tax rate. This is done by estimating a regression using panel data of 5.447 different companies located in 22 European OECD countries between 2013 and 2019. I find that dividend taxation has a positive effect on corporate investment. Therefore, lowering the dividend tax rate is not recommended.

Keywords: Dividend taxation, corporate investment, European OECD countries.

[1] The views stated in this thesis are those of the author and not necessarily those of Erasmus School of Economics or Erasmus University Rotterdam.

1. Introduction

In 2017 and 2018, there was a lot of debate about a potential dividend tax cut in The Netherlands. Prime Minister Mark Rutte argued that the dividend tax rate should be lowered or cut entirely for The Netherlands to keep its attractive business environment. He used multiple arguments for this (Fernandez & Bieckmann, 2018). Firstly, he argued that it would make it harder for foreign investors to acquire Dutch corporations because a dividend tax cut would lead to higher stock prices. As a result, a foreign company would need more resources to buy the Dutch company. Secondly, he argued that it would lead to higher aggregate investment because the cost of capital would decrease. Businesses could pay the same amount of net dividend with less cash because less money would go to the tax authorities. As a result, companies have more money left to invest. The third argument is connected to the second, higher investment will generate more jobs. This benefits Dutch citizens and results in more economic welfare.

The opposition argued that the dividend tax cut does not have significant effects on the competitiveness of the Dutch business environment (Groenlinks, 2018). They rejected all economic arguments of Prime Minister Rutte by using research of Fernandez and Bieckmann (2018) and Jacobs (2018). Because of the huge resistance, the dividend tax rate in the Netherlands stayed the same.

The Netherlands is not the only country in which dividend taxation is discussed. Greece announced plans to reduce its dividend tax rate from 15% to 10% in early 2019 (Deloitte, 2019). The country reduced its dividend tax again to 5% for dividends received from 1 January 2020 onwards. This was done to further improve the business environment for foreign investors (Deloitte, 2020). Albania reduced its dividend tax from 15% to 8% for dividends received from 1 January 2019 onwards (Deloitte, 2019). The France parliament also stated in its Finance Bill that it will gradually reduce its dividend tax (KPMG, 2020).

The scope of this paper is on the arguments of Jacobs (2018) which claim that a dividend tax decrease does not result in an increase in aggregate investment. In his paper, he argued that a dividend tax reduction will only increase investment under three unlikely circumstances. Firstly, companies are not able to receive enough financing from foreign investors. Secondly, there are no international tax laws. Thirdly, companies would finance investments by issuing new shares instead of using retained earnings. Jacobs uses theoretical arguments to conclude that a dividend tax reduction therefore does not lead to more investment in The Netherlands. In addition, Jacobs shows that the Netherlands already has a relatively low dividend tax rate compared to other countries. If dividend taxation does not influence investment, this would mean that companies operating in low dividend tax rate countries investment as much as companies operating in high dividend tax countries. The main research question of this study is listed as follows:

What is the effect of dividend taxation on corporate investment in European OECD countries between 2013 and 2019?

Two different views on the relationship between dividend taxation and corporate investment can be distinguished. The neoclassical view argues that dividend taxation has a negative effect on corporate investment. This view disagrees with Jacobs (2018). The "new-view" finds that dividend taxation does not affect investment. More recent research finds that dividend taxation has an ambiguous effect on investment. Characteristics of the two views are discussed in the literature review.

A database of 5.447 companies located in 22 different countries between 2013 and 2019 is used. By estimating a regression using OLS and fixed effects, I find that dividend taxation and corporate investment are positively correlated, meaning that a tax decrease has a negative effect on corporate investment. For every 1 percent of dividend tax, companies on average investment 0.075% more. A potential explanation comes from Cheatty and Saez (2010) who find that companies decrease dividend payment when dividend taxes increase. Therefore, they have more funds available to invest. Therefore, I reject the arguments of the Prime Minister of the Netherlands that say that a dividend tax decrease would result in higher investment.

The rest of this paper is organised as follows. Section 2 presents a literature review in which existing research is summarized and compared to each other. In addition, this section develops the hypothesis. Sections 3 and 4 contain the sample selection and the research design. Section 5 presents and discusses the findings. Section 6 contains various robustness checks. And finally, section 7 contains the conclusions, limitations, and recommendations for future research.

2. Literature review

This section summarizes the findings from previous research. Subsection 2.1. explains what dividend taxes are. Subsection 2.2 summarizes the different views on how dividend taxation affects corporate investment. Section 2.3. discusses the main findings from two empirical studies. Subsection 2.4. introduces the hypothesis.

2.1. Dividend taxes

Corporate profits are subject to taxation in most countries (Becker et al., 2013). This is not only done by a corporate income tax, but also by taxing payouts in the form of a dividend or share repurchase tax. Dividend taxes can lower the net dividend shareholders receive when citizens are not compensated by, for example, a reduction in their income taxes. Investments can be funded by internal equity (retained earnings) or external equity (share issues). Generally, the dividend tax is withheld from the dividend payment by the company. Payout taxes drive a wedge between the cost of internal and external equity. Retained earnings are taxed when they are paid as dividend, or when they are reinvested now and paid out later. Therefore, dividend taxes do not distort investment when the marginal source of the finance for investment is retained earnings. When external equity is used, investors can have a lower return on investment because of the dividend tax. Therefore, they could decide to consume now or make other investments that are not affected by the dividend tax. As a result, the dividend tax distorts investment because it affects the capital cost of the company. Because distributions to shareholders are taxed, their return decreases.

2.2. Different views

There is existing literature about the relationship between dividend taxation and corporate decision making. Two contrasting views can be distinguished: the neoclassical view, the “new-view", and recent research which contradicts the first two views.

2.2.1. Neoclassical view

Investments can be made by internal funding and external funding. The neoclassical view argues that dividend taxation has a negative effect on corporate investment for cash-constrained firms (Harberger, 1962; Feldstein, 1970; Poterba & Summers; 1985). Low-cash companies do not have enough liquidity and therefore need external funding. A dividend tax reduces the marginal return on investments made by issuing equity because taxes are paid when cash is distributed back to the shareholders. The cost of the investment does not change, while the return decreases. As a result, companies issue less equity. Companies can substitute expensive equity by funding investments with debt. Dividend taxation has no effect on interest paid on loans. Therefore, if all cash-constrained companies could, instead of issuing shares, take on debt, the negative effect on corporate investment would be muted (Becker et al. 2013). However, this is not the case because companies may not have suitable collateral, have already taken on too much debt, or are reluctant to borrow.

2.2.2. "New-view"

In contrast to the neoclassical view, the "new-view" argues that dividend taxation does not affect dividend payments and investment levels (Auerbach, 2002). Corporate income taxes, on the other hand, do have a distortive effect because, unlike dividend taxes, they are paid immediately. The "new-view" assumes that companies do neither issue new shares, nor repurchase them. Thus, investments are funded by retained earnings. As mentioned in section 2.1., dividend taxes do not affect investments made by retained earnings. The most common ways of distributing wealth to shareholders are dividends and share buybacks. As a result of the share repurchase restriction, the only way to return money to shareholders is by issuing a dividend (Gordon & Dietz, 2006).

2.2.2.1 Viability of the "new-view"

Gordon and Dietz (2006) examine which of the following three model is most corresponding with stylized facts: the "new-view", an agency cost explanation model, and a signaling model. Characteristics of the 'new-view' model are discussed in section 2.2.2. The agency cost model focuses on the agency cost associated with management's tendency to overinvest. In order to constrain this empire-building, shareholders can force management to pay out a certain amount of cash each period. This leaves the company with less retained earnings. If management wants to make sizable investments, it needs to get external finances, for example, loans. These funds are only available if the return on investment is sufficient. By demanding a dividend, shareholders reduce the chances of empire building but also lower return on investments because of the costs of external funding. The signaling model uses dividends in order to show investors that the company has sufficient cash on hand. By doing so, management hopes to show investors that the company is performing well.

These three models are tested by comparing their outcomes to stylized facts and strong empirically confirmed findings. I will only go over the stylized fact that is related to dividend taxation and corporate investment. It has been documented many times that an increase in the dividend tax rate leads to lower dividend payout rates (see, e.g. Brown, Liang, and Weisbenner, 2004; Poterba, 2004). As a result, retained earnings increases, meaning that more funds are available to invest. Both the agency-cost and signaling model find the same results. The "new-view" model, however, finds that there is no relationship between dividend taxation and the dividend payout ratio. This model therefore predicts no effect on investments, although the entry of new firms is discouraged. Gordon and Dietz (2006) conclude that the agency-cost model and signaling model are able to predict better the effect of dividend taxation on corporate investment than the "new-view" model. However, they argue that past empirical studies found only limited evidence that there is no relationship between dividend taxation and investment (see section 2.2.2.) and that this is not enough to conclude that dividend taxation has no effect on investment.

2.2.3 Jacobs

Jacobs (2018) takes a theoretical approach to the question if dividend taxes affect the capital cost, and thus corporate investment, of Dutch companies. Dividend taxes cannot be subtracted for the corporate income tax. Jacobs argues that dividends could be taxed twice when a dividend tax exists, but that this is unlikely to have an effect on corporate investment for three reasons.

First, he argues that the international cost of capital is not affected by the Dutch dividend tax when international markets are perfectly integrated. The gross dividends a company pays, are determined by how much gross dividends investors of other international financial markets receive. When foreign investors demand higher gross dividend to compensate for dividend taxes, companies look for other investors that are located in countries with lower or no dividend taxes. In other words, dividend taxes are passed on to the shareholders.

Second, there are international tax laws such as, for example, the OECD Model Tax Convention. Because of this model, OECD countries have similar tax treaties with each other. As a result, dividends are not taxed twice because foreign investors can deduct dividend taxes paid in the Netherlands from their own tax payments. The dividend tax rate of the Netherlands is irrelevant for a foreign investor because this way the same amount of taxes is paid.

Third, even if dividends are taxed twice because, for example, countries have no tax treaties, this would not per se mean that dividend taxes affect corporate investment. Dividend taxes effect the cost of capital when investments are funded by issuing new shares, not when new investments are funded by retained earnings (see section 2.1.). So even if there are no tax treaties, dividend taxes only negatively affect a company's investment when they do not have enough cash to finance investments without issuing shares.

2.2.4 Anticipated and unanticipated tax changes

Korinek and Stiglitz (2009) analyze the effects of changes in a country's dividend tax policy. A life-cycle model is used where new companies first use the equity markets, then fund investments internally and finally pay dividends. Korinek and Stiglitz (2009) distinguish anticipated and unanticipated tax changes. Unanticipated permanent changes in the tax rate have small effects on aggregate investment because they only affect young firms that raise new equity.

Anticipated tax changes have a macroeconomics effect of a higher magnitude. These changes allow mature companies to engage in inter-temporal tax arbitrage. Dividend payments will shift from the high tax rate period to the low period. An anticipated tax rate increase incentivizes companies to accelerate dividend payments. As a result, companies have lower cash balances when good investment opportunities arise.

2.2.5. Ambiguous effect

Chetty and Saez (2010) also create an agency-cost model to find that a decrease in dividend taxation has an ambiguous effect on total investment. Instead of maximizing profits, managers are interested in their own personal status. As a result, they make unprofitable investments. A lower dividend tax rate reduces the incentives of management of cash-rich companies to invest in pet projects. Retained earnings can be distributed with a lower 'tax penalty'. As a result, managers have less cash left to finance their pet projects. This also works the other way around; a tax increase results in lower dividend payments. Therefore, more cash is available to invest in unprofitable pet projects that yield no returns and thus are not affected by the dividend tax. The same results do not apply to cash-poor companies. A tax cut leads to cheaper equity financing because the return on investment increases. Thus, a dividend tax cut reallocates investments from cash-rich to cash-constrained companies. Chetty and Saez (2010) therefore conclude that the effect of dividend taxation on total investments is ambiguous.

2.3. Empirical evidence

The relationship between dividend taxation and corporate investment is also investigated by researching single country tax reforms. Yagan (2015) and Alstadsæter et al. (2017) performed single country studies to identify the effect of a tax cut on corporate investment. Both studies estimated regressions. Yagan (2015) focused on the 2003 US dividend tax cut, while Alstadsæter et al. (2017) looked at Sweden's 2006 dividend tax reduction.

2.3.1. 2003 US dividend tax cut

The 2003 US dividend tax cut was one of the largest changes ever to the US capital income tax (Yagan, 2015). One of the purposes of the tax reduction was that it would lead to higher total investments and more jobs. The tax cut had the same goals as the proposed Dutch dividend tax reduction. Yagan (2015) uses a dataset of 76.101 firms to estimate multiple regression to research if the purpose of the tax cut is achieved. The results of the regression show that the tax cut led to an insignificant negative effect on total investment. As a result of the dividend tax cut, payout rates increased. Yagan (2015) therefore concludes that the tax cut failed to achieve its goal of increasing investment and creating more jobs. Two potential reasons are given, either the dividend tax cut had little effect on company's cost of capital, or the cost of capital changed less than recent evidence predicts, or both. The tax cut could have failed to lower the cost of capital because investments are funded by retained earnings (see section 2.1.).

2.3.2. 2006 Sweden dividend tax cut

Alstadsæter et al. (2017) investigate the 2006 dividend tax cut in Sweden using panel data and a difference-in-difference approach. First, difference-in-indifference is used to test whether the 2006 dividend tax cut increased investment of cash-constrained closely held firms relative to closely held firms with enough internal resources. Second, the same difference-in-difference analysis is used on widely held firms. Third, the difference in the response to the tax cut of closely held corporations and widely held corporations is investigated using a triple difference approach. As a result of the tax cut, cash-constrained companies, relative to cash-rich companies, invest more. However, Alstadsæter et al. (2017) find that the tax cut did not increase aggregate investment. Similarly to Chetty and Saez (2010), the results show a reallocation of investment from cash-rich to cash-constrained companies. The tax cut led to cash-constrained firms increasing the use external equity, while cash-rich companies increased dividends.

2.4. Hypothesis development

As mentioned in section 2.2., there are contrasting views on the relationship between dividend taxation and corporate investment. The neoclassical view argues that dividend taxation has a negative effect on aggregate investment. The "new-view" finds that there is no relationship, while Chetty and Saez (2010) and Alstadsæter et al. (2017) find that there is an ambiguous effect. No research has found evidence for a positive relationship between dividend taxation and aggregate investment. In order to get more insight in how dividend taxation affects corporate investment, this paper will use panel data to estimate a regression with fixed effects. The papers in section 2.3., focused on a tax cut in one country. When researching one country, there is often not enough variation in the dividend tax rate (Becker et al, 2013). A panel data analysis can solve this problem. Because of findings by Yagan (2015) and Alstadsæter et al. (2017), the hypothesis is stated in the following way:

H1: Dividend taxation has no effect on corporate investment.

Support for this hypothesis provides additional evidence that dividend tax decreases do not result in higher aggregate investment. Therefore, tax cuts do not benefit the economy. If H1 is not rejected, the argument of the Dutch Prime Minister that a lower dividend tax rate would help the Dutch economy by increasing investment is incorrect.

3. Data

I use panel data to test the hypothesis. The following sections discuss the sample selection, data transformations and descriptive statistics. In addition, two tables are created to describe the data.

3.1. Sample selection

I use accounting and dividend tax data to test the hypothesis. Company investment data is obtained from Compustat Global, while country dividend taxation data is retrieved from the OECD tax database. Compustat Global consists of annual and quarterly report data from companies listed all over the world and represents 90% of the world's market capitalization. The OECD database contains current taxation rates and is therefore adjusted for historical rate changes. In addition, the data is checked manually for errors. Only OECD countries are used because they all use the OECD Model Tax Convention. This model includes rules on how dividends should be taxed between the member countries. One digit Standard Industrial Classification (hereafter, SIC) codes are used to distinguish the following industries:

agriculture, mining, construction, manufacturing, transportation, wholesale trade, retail trade, finance, services and public administration. The finance division is dropped from the sample because this makes the findings of this paper comparable to previous research that also dropped this division from their sample (e.g., Auerbach & Hassett, 2003 and Chetty & Saez, 2005). In order to increase observations, quarterly data is used from 2013 till 2019. This timeframe is chosen because there is no financial crisis during this period (e.g. 2008-2009 banking crisis or 2011-2012 Greek government-debt crisis). Observations that do not contain data about investment or other variables used in statistical tests (see section 4.) are removed from the sample. All continuous variables are winsorized at the 1st and 99th percentiles. The final raw sample contains 28,004 observations of 5,447 companies.

3.2. Data transformations and variables

In order to test the hypothesis, multiple new variables are created. Subsections 3.2.1 to 3.2.3 discuss the dependent variable, the independent variable of interest and control variables, respectively.

3.2.1. Relative investment

The dependent variable is a relative investment ratio. In accordance with Black et al. (2000) and Alstadsæter et al. (2017), this variable is created in two steps. First, total investment is used, which is created by adding R&D to capital expenditure. R&D is added because Lev and Sougiannis (1996) find that R&D costs, similarly to capital expenditure, are capitalized by the market and that this capitalization provides useful information about future earnings. Thus, not only a company's investment in fixed assets is taken into account, but also in intangible assets. Second, total investment is divided by prior year's fixed assets to calculate the relative size of the investment. Where fixed assets is the book value of assets that are used for more than one production period. The relative investment provides more information than the total investment of a company because it takes the size of a company into account. Total investment cannot be compared between small and large companies, while the relative investment can. Table 1 presents the descriptive statistics. The mean (median) of relative investment is 16.504 (13.803) and shows that companies in the dataset had, on average, a positive net investment of between 2013 and 2019. More specifically, on average, companies invested equal to roughly 16.5% of their prior year's fixed assets.

Appendix B contains a correlation matrix of the same 16 variables. The matrix provides an indication of the relationship between two variables. However, because omitted variable bias can exist, this matrix is not enough to simply predict the relationship between the dividend tax rate and relative investment of a company because it does not take variables in consideration that are correlated with both the dividend tax rate and the investment of a company. Relative investment is significantly positively correlated with the dividend tax rate of a country. This indicates that, at first glance, a higher dividend tax rate could lead to more investments. However, more research is needed to conclude this with certainty. Size is significantly negatively correlated with relative investment. This can be explained by the fact that growth companies with a smaller asset bases invest relatively more than mature companies. However, the fact that sales growth is insignificantly correlated with relative investment contradicts this. Growth companies grow revenue quickly, do not have a lot of assets yet, and want to make large investments. Therefore, it would be expected that sales growth would be positively correlated with relative investment. Furthermore, we see that there is no significant relationship between leverage and relative investment. This is also unexpected since research from Becker et al. (2013) showed that companies with a lot of debt can invest less because of borrowing restrictions (see section 2.2.1.).

Table 1 Descriptive statistics companies in European OECD countries between 2013 and 2019

Variable	Obs.	Mean	Median	Std. Dev.	Min.	Max.
Relative Investment	28004	16.504	13.803	10.363	4.406	36.856
Dividend tax rate	28004	18.733	22.000	11.281	.000	30.000
Size	28004	5.585	5.416	2.007	2.694	8.878
Return on assets	28004	.019	.026	.089	-.194	.110
Sales growth	28004	.060	.049	.129	-.108	.246
Leverage	28004	.190	.106	7.944	-868.182	274.75
Cash flow	28004	109.393	11.625	193.829	-5.518	602.154
Agriculture	28004	.008	.000	.088	.000	1.000
Mining	28004	.048	.000	.213	.000	1.000
Construction	28004	.037	.000	.189	.000	1.000
Manufacturing	28004	.458	.000	.498	.000	1.000
Transportation	28004	.069	.000	.254	.000	1.000
Wholesale Trade	28004	.042	.000	.200	.000	1.000
Retail Trade	28004	.054	.000	.226	.000	1.000
Services	28004	.247	.000	.432	.000	1.000

Administration	28004	.006	.000	.079	.000	1.000

3.2.2. Dividend tax rate

The dividend tax rate is the independent variable of interest and is defined as the rate of the dividend withholding tax in a country. Table 2 displays the distribution of the dividend tax rate in the dataset. More than a quarter of the companies are operating in a country whose tax rate is 30%. This can be explained by the fact that France, the third largest economy of Europe, has a 30% tax rate and accounts for 11.73% of the sample. Sweden also has a 30% dividend tax and 10.27% of the companies in the dataset are located in Sweden. 22.7% of the companies in the sample are operating in a country with no dividend withholding tax. These companies are mostly located in the UK. The UK accounts for 21.72% of the sample. Therefore, we see that one country can have a large effect on the sample.

Table 2 Dividend tax rate distribution

Tax Rate	Freq.	Percentage of sample	Cum.
0%	6139	21.92	21.92
7%	84	0.30	22.22
10%	1025	3.66	25.88
15%	2118	7.56	33.45
19%	4115	14.69	48.14
20%	215	0.77	48.91
22%	745	2.66	51.57
25%	1187	4.24	55.81
26%	1545	5.52	61.32
26.375%	2990	10.68	72.00
27.5%	332	1.19	73.19
30%	7509	26.81	100.00
Total	28004	100.00	

3.2.3. Control variables

In order to prevent omitted variable bias, six control variables are used. In line Jugurnath et al. (2008), both firm-level and non-tax control variables are used. Firm-specific variables are used to control for other determinants of corporate investment (Black et al., 2000). Although these control variables are uncorrelated with the dividend tax rate, they can absorb noise in the outcome and therefore help lowering, for example, the standard error. Size is defined as the natural logarithm of total assets and is used to control for the size of a company. The size of a company affects the ability of a firm to raise capital to invest and is therefore correlated with relative investment (Black et al. 2000). In addition, the variable return on assets is created by dividing net income by total assets. Return on assets is used as a proxy for profitability. In line with Alstadsæter et al. (2017), the variable sales growth is created by taking the percentage change in sales from periode T and T-2. This variable helps to control for the fact that growth companies invest, on average, more than mature companies. Leverage is defined as long-term debt divided by total assets. This variable controls for the fact that it is harder to get loans for companies that have already taken on a lot of debt. The natural logarithm of operational cash flow is used as a proxy for how cash-rich a company is. Gilchrist and Himmelberg (1995) find evidence that cash flow affects corporate investments. A company with higher cash flow has more internal funds to invest, and therefore invests more. In addition, previous research finds that dividend taxation has a negative effect on investments made by cash-rich firms and that is has a positive effect for cash-poor companies (see section 2.3.2.). Cash flow controls for this. Nine sectors (see section 3.1.) are identified by using dummy variables. Some sectors are more capital intensive than others, and therefore require relatively more investment. Appendix A includes a description of all variables. Summary statistics of the control variables are available in table 1.

Several elements are illustrated in table 1. First, the mean of return on assets (0.019) shows that on average, the return on assets was slightly positive. Second, companies in the dataset grew sales on average by 6.0%. This is relatively high compared to -2.9% of Alstadsæter et al. (2017). The standard deviation of sales growth is 0.129, which is relatively low compared to 0.614 of Alstadsæter et al. (2017), meaning that the values of the observations in the dataset used in this paper are clustered more around the mean. Finally, the mean of the dummy variables manufacturing, and services shows that 45.8% and 24.7%

of the companies in the dataset are operating in the manufacturing and services sector, respectively. The mean of the dummy variables agriculture, construction, and administration shows that these sectors have a relatively low representation in the database.

3.3. Sample distribution

Table 3 shows the distribution of the companies over the countries. Seven of the twenty-two countries in the dataset represent less than one percent of the total observations. These countries are not dropped from the sample because they increase the diversity of the dataset. Furthermore, we see again that some countries have a large presence in the dataset, for example, the UK and France.

Table 3 Country distribution

Country	Freq.	Percentage of Sample	Cum.
Austria	332	1.19	1.19
Belgium	523	1.87	3.05
Switzerland	1109	3.96	7.01
Czech Republic	56	0.20	7.21
Germany	2990	10.68	17.89
Denmark	662	2.36	20.25
Spain	834	2.98	23.23
Estonia	84	0.30	23.53
Finland	825	2.95	26.48
France	3284	11.73	38.21
United Kingdom	6083	21.72	59.93
Greece	1025	3.66	63.59
Hungary	112	0.40	63.99
Ireland	215	0.77	64.76
Iceland	83	0.30	65.05
Italy	1545	5.52	70.57
Luxembourg	209	0.75	71.31
Netherlands	688	2.46	73.77
Norway	909	3.25	77.02
Poland	3281	11.72	88.73
Portugal	278	0.99	89.73
Sweden	2877	10.27	100.00
Total	28004	100.00	

4. Methodology

In order to test H1, I will estimate a regression using ordinary least-squares (OLS) with fixed effects and relative investment as the dependent variable. The next paragraphs explain why this test is used. They will go into more depth about the variable of interest and control variables used.

4.1. Hypothesis 1

Previous research has found mixed results about the relationship between corporate investment and dividend taxation (see section 2.2.). The correlation matrix in section 3.2.1. shows that, at first glance, there is a positive relationship between both variables. This would mean that an increase in the dividend tax rate results in higher corporate investment. However, omitted variable bias can occur when the dividend tax rate is correlated with another variable that is also correlated with relative investment. A correlation matrix does not capture the effect of variable X. Therefore, a regression with control variables is estimated.

H1 examines if dividend taxation influences a company's relative investment. To investigate this relationship, the following regression is estimated with fixed effects. Fixed effects are used because of the time variance in the panel data. They control for time-invariant unobserved individual characteristics that could be correlated with the observed independent variables. By doing so, the net effect of the predictors is found. Model 1 is specified as follows:

$$
\begin{aligned}
&\text{Relative investment}_{i,c,t} \\
&\quad = \alpha + \beta_1 \text{Dividend tax rate}_{c,t} + \beta_2 \text{Size}_{i,c,t} + \beta_3 \text{Return on assets}_{i,c,t} \\
&\quad + \beta_4 \text{Sales growth}_{i,c,t} + \beta_5 \text{Leverage}_{i,c,t} + \beta_6 \text{Cash flow}_{i,c,t} \\
&\quad + \sum_{n=1}^{n} \beta_n \text{Industry}_{i,c,t,n} + \alpha_{i,} + \delta_t + \varepsilon_{i,c,t}
\end{aligned}
$$

Where relative investment is the dependent variable representing the relative investment of company i, which is located in country c, t represents time in quarters, α is the constant, and ε is the error term. Dividend tax rate is the independent variable of interest which is the rate of the dividend withholding tax of the country in which company i is located.

As mentioned in section 3.2.3., both firm-level and non-tax control variables are used. I use total assets as a proxy to control for the size of a company. Return on assets is used to control for profitability. Sales growth is used as a proxy for the growth. The debt-to-equity ratio is used as a proxy for how leveraged a company is. Cash flow is defined as the operational cash flow of the company. The dummy variable industry controls for the fact that some industries invest more than others. Nine different industries are distinguished. Firm fixed effects are represented by α_i and time fixed effects by δ_t. The reason for using fixed effects is the assumption that the error term might be correlated with firm and time independent variables. For example, when investment is affected by a country-specific variable (e.g. tax incentives set by the government) that are correlated to the dividend tax rate. This bias is eliminated by using fixed effects (Torres-Reyna, 2007).

An assumption of ordinary least squares is that the variance of the error term is constant across all observations (Hayes & Cai, 2007). Violating this assumption reduces the precision of the estimates because the variance of the estimated coefficients increases. In accordance with the existing literature, robust standard errors are used to not violate this assumption (White, 1980; Alstadsæter et al., 2017).

4.2. Endogeneity issues

There are three sources of endogeneity: omitted variable bias, measurement errors and reserve causality or simultaneity (Renders & Gaeremynck, 2006). Omitted variable bias occurs when no control variables are added that are correlated with both the dependent and independent variables of interest. To control for this, several control variables are added (see section 3.2.3). Both firm-level and non-tax control variables are used.

Measurement errors exist when there is a difference between the observed value and true value of a variable. This form of endogeneity is not expected to cause a problem because accounting data is used for the dependent variable. This data is audited well by specialized firms. The independent variable of interest is a tax rate, which is measured accurately as well.

Reverse causality exists when, in the regression in section 4.1., the dependent variable affects the independent variable. This would mean that the relative investment of a company increases or decreases a country's dividend tax rate. No existing literature predicts this relationship. Simultaneity occurs when dividend taxation affects relative investment, but relative investment also affects dividend taxation. Again, this requires corporate investment to affect taxation set by the government, which is highly unlikely.

5. Results

I present the results from the estimated regression in section 5.1. Section 5.2. contains the interpretation of the results.

5.1. Hypothesis 1

Hypothesis 1 researches the relationship between corporate investment and the dividend withholding tax rate of the country in which the company is located. Table 4 displays the results of the estimated OLS regression. Column (1) provides the predicted sign of the variables. Predictions are based on previous research discussed in section 2.3., and the correlation matrix (see section 3.2.1.). Column (2) reports the estimated coefficients and column (4) the degree of significance.

Table 4 Results of the estimated OLS regression of the relationship between the relative investment and the dividend tax rate

Relative Investment	(1) Predicted Sign	(2) Coef.	(3) St. Err.	(4) P-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.075	.007	.000	.062	.087
Size	-	-2.026	.039	.000	-2.104	-1.949
Return on assets	+	4.925	.949	.000	3.065	6.784
Sales growth	+	.960	.197	.000	.573	1.346
Leverage	-	-.003	.005	.531	-.012	.006
Cash flow	+	.009	.001	.000	.008	.010
Agriculture	+	1.340	.446	.003	.467	2.214
Mining	?	3.067	.330	.000	2.421	3.714
Construction	?	-1.835	.399	.000	-2.618	-1.053
Manufacturing	?	1.242	.191	.000	.868	1.617
Transportation	?	1.813	.296	.000	1.233	2.393

Wholesale trade	?	-1.261	.333	.000	-1.915	-.608
Retail trade	?	3.017	.247	.000	2.533	3.500
Services	?	-.185	.198	.350	-.572	.202
Administration	?	-.539	.351	.125	-1.226	.149
Constant	?	24.497	.251	.000	24.006	24.989

Mean dependent var	0.165	SD dependent var	0.104
R-squared	0.082	Number of obs.	28,004.000
F-test	164.597	Prob > F	0.000
Akaike crit. (AIC)	-49828.090	Bayesian crit. (BIC)	-49696.263
Sigma u	0.487	Sigma e	9.924

The first column provides the predicted sign of the variables. Column (2) and (3) report the average coefficient estimate and standard error, respectively. Column (4) contains the p-value of the coefficient. Column (5) shows the confidence interval. Column (6) presents the significance where *, **, and *** indicate 10, 5, and 1% significance levels, respectively. Both firm and time fixed effects are used. All variables are described in Appendix A. Continuous variables are winsorized at 1% and 99%.

The coefficient estimate for dividend tax rate in column (2) shows that a dividend tax results in significantly higher relative investment (0.075, p-value < 0.01). The coefficient can be interpreted as follows: for every 1 percent of dividend withholding tax, companies on average investment 0.075% more. If the dividend tax rate increases by one standard deviation, the relative investment increases by 0.115 standard deviations. The beta coefficients for size and cash flow are -0.55 and 0.239, respectively. Although dividend taxation has a significant effect, we see that the magnitude is relatively low compared to the accounting fundamentals of the company. Furthermore, we see that all control variables, except for leverage and the industry dummy variables services and administration, are significant. As expected, the regression shows that large companies invest less (-2.026, p-value<0.01) than small companies. In addition, we see that the more a company grows its sales, the higher their relative investment is (0.960, p-value<0.01). Furthermore, profitable companies invest more than their counterparts (4,925, p-value<0.01). For the sectors, we see that the relatively capital intensive sectors (mining, manufacturing and transport) invest significantly more than non-capital intensive companies. Construction, however, invests significantly less (-1,835, p-value<0.01). A possible explanation for this is that only 3.7% of the companies in the dataset are in the construction sector (see section 3.2.3.). The coefficient for the sectors services and administration is insignificantly negative. Therefore, no conclusions can be drawn. The R-squared is 0.082, which is lower than OLS regressions of previous research (Jugurnath et al., 2008; Alstadsæter et al., 2017).

To summarize the findings, the coefficient for dividend tax rate shows that a higher tax rate results in higher relative investment. Therefore, H1 is rejected. This finding contradicts research from the neoclassical view that argues that dividend tax rates have a negative effect on corporate investment. This finding is also not in line with research from the "new-view" that finds that there is no relationship.

5.2. Potential Explanations

The first potential explanation for why an increase in the dividend tax rate has a positive effect on aggregate investment comes from the use of internal funds. Cheatty and Saez (2010) predict that companies decrease dividend payments when withholding taxes increases. Therefore, they have more funds available to invest. Using internal funds as the marginal source of investment is in-line with a "new-view" model. However, according to this model, it would then be expected that dividend taxation has no effect on corporate investment because investments are funded by retained earnings. However, companies can use both internal and external funding. As a result, the assumptions of the "new-view" models are violated.

The second potential explanation relates to the fact that the relationship between dividend taxation and relative investment may be different per sector. Chetty and Saez (2010) and Alstadsæter et al. (2017) find that this relationship is heterogenous. Because some sectors are represented more than others in the dataset (see section 3.2.3.), it could be that a sector with a large presence that has a positive relationship between dividend taxation and relative investment influences the coefficient for dividend tax. In order to check this, per industry, a regression with the same control variables is estimated in Appendix C. The single industry regressions are all significant at a 10%-level. Just as the regression in table 4, every industry, except for retail trade, has a positive relationship between dividend taxation and relative investment. Therefore, this explanation holds not true.

6. Robustness check

This chapter is an extension on section .5 as it contains different robustness checks. Section 6.1. researches if the large presence of UK companies in the sample causes a bias. Section 6.2. tests if fixed effects or random effects are preferred by using the Hausman test.

6.1. Sample size

Robust tests are executed to find out if the same results are found in a different setting or under a different circumstance. Robustness check results provide an indication on how reliable the results are (Heyden et al., 2006). In order to find out if the results are skewed because of the large presence of UK companies in the dataset, a similar regression as in section 4.1. without UK companies is estimated. As mentioned in section 3.2.3., 21.72% of the companies in the sample are located in the UK. With a unique dividend tax rate of 0%, this could affect the coefficients of the regression. Table 14 in Appendix D contains the estimated regression coefficients excluding the UK.

The results show that the coefficient for dividend tax is slightly less positive (0.075 to 0.073). Both regressions show a positive relationship between the dividend tax rate and relative investment. The regression excluding UK companies has a slightly higher p-value (0.006) than the regression with UK companies (0.000). However, both coefficients are significant at the 1%-level. Furthermore, the coefficient for return on assets is nearly doubled from 4.986 in the regression including UK companies, to 9.578 in the regression excluding UK companies. Return on assets is used as a proxy for profitability. We can conclude that profitability has a significantly lower influence on investments made by UK companies compared to companies in other European OECD countries. I conclude that the large presence of UK companies in the sample does not result in a bias because of the similar coefficient for dividend tax in the estimated regressions.

6.2. Hausman test

The Hausman test is executed because panel data is used. The dataset contains companies from different countries over multiple time periods. For estimating panel data, two different techniques can be used, namely, fixed effects and random effects (Torres-Reyna, 2007). The fixed effects model has the following two assumptions:

1. We need to control for the fact that, within the panel individual, something may impact the predictor or outcome variables.
2. The time-invariant characteristics are unique to the individual and are uncorrelated with other characteristics of the individual.

An assumption for the random effects model is that the variation across entities is random and that the error term is uncorrelated with the predictors. The Hausman test tests the null hypothesis that the random effects model is the preferred model. The alternative hypothesis is that the fixed effects model is the preferred model.

Table 15 in Appendix D contains the results of the Hausman test. With a p-value of 0.000, the null-hypothesis of the Hausman test is rejected. Therefore, I conclude that the fixed effects model is preferred over the random effects model.

7. Summary and main results

The main objective of this paper is to examine the relationship between dividend taxation and corporate investment. This is done by using panel data to estimate a regression with fixed effects. In order to answer the research question "*What is the effect of dividend taxation on corporate investment in European OECD countries between 2013 and 2019?",* section 7.1. summarizes the results of the tested hypothesis. Section 7.2. contains limitations of this paper and recommendations for future research.

7.1. Main findings

Hypothesis 1 tests the relationship between corporate investment and dividend taxation by estimating a regression with fixed effects. In order to compare investment of small and large companies, the variable relative investment is taken as the dependent variable. Two contrasting views about dividend taxation and investment can be distinguished: the neoclassical view and the "new-view". The neoclassical view argues that dividend taxation has a negative effect on aggregate corporate investment. The "new-view" finds that dividend taxation has no effect on corporate investment (Chetty and Saez, 2010). Research from

Alstadsæter et al. (2017) finds that the effect of a dividend tax cut depends on whether the company is cash-rich or cash-poor.

The results of the regression in table 4 show that a higher dividend tax rate significantly increases relative investment. This also means that a dividend decrease results in less investment. This contradicts the neoclassical view and “new-view”. It cannot be concluded with certainty that this finding also contractics research from Alstadsæter et al. (2017), because the dataset made no distinguishment between cash-rich and cash-poor companies (see section 7.2.).

Because H1 is rejected, and thus the dividend tax rate is positively correlated with relative investment, I reject the arguments of the Dutch Prime Minister that a dividend tax reduction would lead to higher aggregate investment. Higher corporate investment and lower unemployment were two of the biggest benefits of the proposed dividend tax cut plan. This paper shows that these benefits do not exist. Therefore, I conclude that Dutch citizens benefit from the cancelation of the rate decrease plans.

7.2. Limitations and recommendations for future research

This study is subject to the following limitations. The first limitation relates research of Alstadsæter et al. (2017) that finds that cash-constrainted companies invest more than cash-rich companies following a dividend tax cut. Because the dataset does not include cash variables, no distinction can be made between cash-rich and cash-poor companies. The control variable cash flow is not a good proxy to control for this because it only tells us the annual cash flow, not the total cash a company has to make investments. Large investments often take multiple years of cash savings, while cash flow only takes one year in consideration. Not having a good proxy can lead to endogeneity issues in the form of omitted variable bias. A potential explanation for why this paper finds a positive relationship between investment and the dividend tax rate, is that the dataset used contains mostly cash-rich companies. However, this cannot be said with certainty because the necessary control variables are not available in the regression. For future research, it is recommended to use control variables that allow the distinction between cash-rich and cash-poor companies. This could be done in the same way as Alstadsæter et al. (2017), namely by denoting companies as cash-rich if they are in the top quantile of the 4-year industry average cash-to-assets ratio. Firms are cash-constrained if they are in the bottom quantile.

The second limitation is that the dataset used contains relatively few observations compared to existing literature that only focused on listed companies. Becker et al. (2013) had, for example, roughly 81,000 observations, while this paper used roughly 28,000. As a result, there are not enough observations in the sectors agriculture and administration. This could lead to biased or insignificant coefficients in the estimated regression.

The third limitation is also related to the dataset. As mentioned in 3.4., the United Kingdom accounts for 21.72% of the observations. Other countries with large presence in the dataset are France (11.73%) and Germany (10.68%). Tax incentives from the UK government could affect investments from UK firms which results in a large effect on the dependent variable relative investment. In order to find out if the predicted positive effect still holds without UK companies in the sample, another regression model is estimated in Appendix C. For this regression, the coefficient for dividend tax rate is also significant (0.073, p-value<0.01) which is comparable to the coefficient (0.075, p-value<0.01) in table 4. However, other countries than the UK with large presence in the dataset could still affect the coefficient for dividend tax rate. Future research could study more countries and focus on both listed and non-listed companies. This would decrease the presence of large countries in the dataset and would increase observations by adding different types of companies.

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8. Appendix

Appendix A. Variable definitions

Variable	**Description**
Relative investment	Total investment divided prior year’s fixed assets
Total investment	Capital expenditure + depreciation + R&D
Dividend tax rate	The rate at which dividend is taxed in country X
Size	Natural logarithm a company’s total assets
Return on assets	Net income divided by total assets
Sales growth	The quarter-over-quarter sales change
Leverage	Long-term debt divided by total assets.
Cash Flow	Operationele cash flow
Industry	The industry in which the company operates

Appendix B. Correlation matrix

	Relative investment	Dividend tax rate	Size	Return on assets	Sales growth	Leverage	Cash flow
Relative investment	1						
Dividend tax rate	0.0352***	1					
Size	-0.225***	0.149***	1				
Return on assets	-0.0450***	0.0167**	0.333***	1			
Sales growth	0.00645	0.0222***	0.0922***	0.128***	1		
Leverage	-0.00471	0.0115	0.0141*	-0.00331	0.00236	1	
Cash flow	-0.0988***	0.0905***	0.760***	0.258***	0.0562***	0.00809	1

Where *, **, and *** indicate significance at the 10, 5, and 1% level, respectively.

Appendix C. Industry regressions

Table 5. Agriculture

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.119	.052	.056	-.004	.243
Size	-	-3.101	.357	0	-3.945	-2.256
Return on assets	+	6.153	6.064	.344	-8.186	20.492
Sales growth	+	1.446	3.077	.653	-5.829	8.721
Leverage	-	.25	.262	.373	-.37	.87
Cash flow	+	.014	.005	.02	.003	.025
Constant	?	30.489	1.692	0	26.488	34.491

Mean dependent var	16.685	SD dependent var	9.873
R-squared	0.178	Number of obs.	218.000
F-test	33.529	Prob > F	0.000
Akaike crit. (AIC)	1577.237	Bayesian crit. (BIC)	1597.544

**** p<.01, ** p<.05, * p<.1*

Table 6. Mining

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.095	.024	.005	.039	.15
Size	-	-.856	.229	.007	-1.397	-.314
Return on assets	+	-1.615	4.487	.729	-12.225	8.994
Sales growth	+	1.422	.456	.017	.343	2.501
Leverage	-	.065	.011	.001	.038	.091
Cash flow	+	.01	.003	.009	.003	.017
Constant	?	30.489	1.692	0	26.488	34.491

Mean dependent var	16.685	SD dependent var	9.873
R-squared	0.178	Number of obs.	218.000
F-test	33.529	Prob > F	0.000
Akaike crit. (AIC)	1577.237	Bayesian crit. (BIC)	1597.544

**** p<.01, ** p<.05, * p<.1*

Table 7. Construction

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.196	.028	0	.141	.251
Size	-	-.671	.158	0	-.982	-.361
Return on assets	+	17.421	4.51	0	8.581	26.261
Sales growth	+	1.742	.898	.052	-.017	3.502
Leverage	-	-.016	.069	.813	-.152	.119
Cash flow	+	.196	.028	0	.141	.251
Constant	?	20.86	.905	0	18.721	22.999

Mean dependent var	17.497	SD dependent var	10.944
R-squared	0.090	Number of obs.	1333.000
F-test	220.956	Prob > F	0.000
Akaike crit. (AIC)	10036.950	Bayesian crit. (BIC)	10073.316

**** p<.01, ** p<.05, * p<.1*

Table 8. Manufacturing

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.107	.007	0	.089	.124
Size	-	-1.811	.05	0	-1.929	-1.692
Return on assets	+	8.592	.589	0	7.199	9.985
Sales growth	+	.818	.214	.007	.312	1.324
Leverage	-	-.012	.004	.018	-.022	-.003
Cash flow	+	.006	.001	0	.004	.007
Constant	?	24.245	.253	0	23.647	24.843

Mean dependent var	16.904	SD dependent var	9.895
R-squared	0.070	Number of obs.	12807.000
F-test	11759.580	Prob > F	0.000
Akaike crit. (AIC)	94127.573	Bayesian crit. (BIC)	94172.319

**** p<.01, ** p<.05, * p<.1*

Table 9. Transportation

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.024	.011	.063	-.002	.05
Size	-	-1.868	.115	0	-2.139	-1.597
Return on assets	+	1.263	3.798	.749	-7.717	10.243
Sales growth	+	1.523	.568	.032	.179	2.867
Leverage	-	-.161	.112	.192	-.425	.103
Cash flow	+	.012	.001	0	.01	.014

Constant	?	25.567	.647	0	24.038	27.097

Mean dependent var	16.461	SD dependent var	9.843
R-squared	0.051	Number of obs.	1942.000
F-test	86.881	Prob > F	0.000
Akaike crit. (AIC)	14298.075	Bayesian crit. (BIC)	14331.504

**** p<.01, ** p<.05, * p<.1*

Table 10. Wholesale trade

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.098	.037	.032	.011	.186
Size	-	-1.233	.153	0	-1.595	-.871
Return on assets	+	3.075	4.366	.504	-7.249	13.399
Sales growth	+	.389	.614	.546	-1.063	1.841
Leverage	-	.238	.046	.001	.129	.347
Cash flow	+	-.001	.002	.511	-.005	.003
Constant	?	19.184	.781	0	17.336	21.031

Mean dependent var	14.209	SD dependent var	9.059
R-squared	0.069	Number of obs.	1170.000
F-test	96.755	Prob > F	0.000
Akaike crit. (AIC)	8391.201	Bayesian crit. (BIC)	8421.589

**** p<.01, ** p<.05, * p<.1*

Table 11. Retail trade

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	-.062	.025	.039	-.12	-.004
Size	-	-2.436	.2	0	-2.91	-1.963
Return on assets	+	13.34	4.139	.015	3.552	23.127
Sales growth	+	.991	1.086	.391	-1.576	3.558
Leverage	-	-2.182	.841	.036	-4.171	-.193
Cash flow	+	.01	.001	0	.007	.013
Constant	?	32.311	1.006	0	29.932	34.689

Mean dependent var	17.835	SD dependent var	10.606
R-squared	0.133	Number of obs.	1506.000
F-test	136.431	Prob > F	0.000
Akaike crit. (AIC)	11179.077	Bayesian crit. (BIC)	11210.980

**** p<.01, ** p<.05, * p<.1*

Table 12. Services

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.066	.008	0	.049	.084
Size	-	-2.804	.054	0	-2.931	-2.677
Return on assets	+	-.126	1.883	.948	-4.578	4.325
Sales growth	+	.741	.56	.227	-.582	2.065
Leverage	-	.002	.006	.737	-.012	.016
Cash flow	+	.015	.001	0	.013	.018
Constant	?	27.847	.35	0	27.02	28.674

Mean dependent var	16.603	SD dependent var	11.532
R-squared	0.112	Number of obs.	6920.000
F-test	8345.859	Prob > F	0.000
Akaike crit. (AIC)	52662.191	Bayesian crit. (BIC)	52703.244

**** p<.01, ** p<.05, * p<.1*

Table 13. Administration

Relative investment	(1) Predicted sign	(2) Coef.	(3) St. Err.	(4) p-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.251	.043	.001	.147	.355
Size	-	-1.929	.748	.042	-3.759	-.099
Return on assets	+	-36.518	17.596	.083	-79.574	6.539
Sales growth	+	1.391	1.635	.428	-2.61	5.392
Leverage	-	-3.134	1.406	.067	-6.573	.305
Cash flow	+	.002	.003	.506	-.006	.01
Constant	?	22.5	4.893	.004	10.527	34.473

Mean dependent var	13.076	SD dependent var	9.389
R-squared	0.165	Number of obs.	178.000
F-test	9.794	Prob > F	0.008
Akaike crit. (AIC)	1280.623	Bayesian crit. (BIC)	1299.713

**** p<.01, ** p<.05, * p<.1*

Appendix D. Robustness check

Table 14. Estimated regression without companies located in the UK

Relative Investment	(1) Predicted Sign	(2) Coef.	(3) St. Err.	(4) P-value	(5) [95% Conf	Interval]
Dividend tax rate	?	.073	.019	.006	.029	.117
Size	-	-2.107	.044	0	-2.211	-2.002
Return on assets	+	9.578	1.174	0	6.801	12.355
Sales growth	+	.881	.295	.02	.183	1.58
Leverage	-	.001	.022	.971	-.051	.052
Cash flow	+	.009	.001	0	.008	.01
Agriculture	+	1.103	.641	.129	-.412	2.617
Mining	?	3.298	.201	0	2.823	3.773
Construction	?	-1.247	.332	.007	-2.032	-.462
Manufacturing	?	1.558	.152	0	1.199	1.918
Transportation	?	1.938	.247	0	1.354	2.521
Wholesale trade	?	-1.145	.258	.003	-1.755	-.534
Retail trade	?	1.959	.212	0	1.458	2.46
Services	?	.013	.183	.945	-.42	.446
Administration	?	-.697	.284	.044	-1.368	-.026
Constant	?	24.811	.413	0	23.835	25.787

Mean dependent var	16.619	SD dependent var	10.281
R-squared	0.086	Number of obs.	28,004.000
F-test	.	Prob > F	.
Akaike crit. (AIC)	162248.685	Bayesian crit. (BIC)	162304.646
Sigma u	0.800	Sigma e	9.828

The first column provides the predicted sign of the variables. Column (2) and (3) report the average coefficient estimate and standard error, respectively. Column (4) contains the p-value of the coefficient. Column (5) shows the confidence interval. Column (6) presents the significance where *, **, and *** indicate 10, 5, and 1% significance levels, respectively. Both firm and time fixed effects are used. All variables are described in Appendix A. Continuous variables are winsorized at 1% and 99%.

Table 15. Hausman test results

Chi-square test value	43.33
P-value	.000
H0: Difference in coefficients is not systematic (apply RE model)	
H1: Difference in coefficients is systematic (apply FE model)	