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Tax uncertainty and investments by private and public firms in the European Union (2018-2022)

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Abstract

This study investigates the relationship between tax uncertainty and investments, using data from Amadeus on private and public firms in the European Union (EU) between 2018 and 2022. In a difference-in-difference setting, exploiting a change in the EU's blacklist for non-cooperative tax jurisdictions as a proxy for tax uncertainty, panel regressions, hazard models, and a propensity score matching method are used to assess the effects on both the level and the timing of investments. The results show delayed capital investments and lower investment hazards due to tax uncertainty, especially for financially constrained firms and firms exposed to complex tax systems. Among financially unconstrained firms and firms subject to less complex tax systems, tax uncertainty leads to higher capital investments, while no effect is found for constrained firms or firms situated in countries with relatively complex tax systems. Tax uncertainty does not affect investments in intangible fixed assets.

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1 Introduction

The international tax environment is rapidly changing. A few years ago, tax competition was of major concern for many countries to attract foreign investments: countries competed with low tax rates or other favorable tax conditions for multinational enterprises (Genschel & Schwarz, 2011). However, the situation has changed as the public opinion on companies paying low taxes has switched. As a response, the Organisation for Economic Co-operation and Development (OECD) launched the Base Erosion and Profit Shifting (BEPS) plan to reduce companies' tax avoidance activities (OECD, 2022). For example, it includes a global minimum tax and other anti-tax avoidance regulations that member states can implement. As one can imagine, this changing fiscal environment can be risky for companies since it creates uncertainty about the after-tax profitability of investments. This might lead these companies to postpone investments or decrease their magnitude. In this research, I assess the relationship between tax uncertainty and investments in the European Union (EU) between 2018 and 2022.

There is already some existing literature examining the effect of tax uncertainty on investments. For example, Jacob et al. (2022) investigated this relationship covering a period from 1992 until 2015 by looking at firms from North America and found that firms delayed large capital investments as tax uncertainty increased. Likewise, Niemann (2011) concluded that investment delays occur when the expected tax payments increase.

Although these studies consider investment timing effects of tax uncertainty, most research has been done on the effects on the level of investments. For example, Edmiston (2004) found a significant negative relationship between tax uncertainty and investments in Europe by looking at a firm's effective tax rate (ETR) volatility. Similarly, Bratten et al. (2017) discovered that tax complexity, which is a source of tax uncertainty, leads to more audit complexity. This implies higher audit fees for firms facing more tax risk, and thus, fewer resources are available for investments among these corporations. In addition, Amberger et al. (2023) investigated the increasing complexity of tax systems and their effect on firms' investments. The results indicate that more complex tax systems decrease the transmission of fiscal policy in encouraging investments. Furthermore, Hanlon et al. (2017) showed that domestic and multinational corporations hold higher cash balances when faced with more tax uncertainty. According to the authors, this implies that companies have fewer resources to invest in new projects.

Prior literature has also investigated the effect of tax uncertainty on investments as a result of a new regulation. Researchers have been especially interested in the implementation of Financial Interpretation No. 48 (FIN 48) in the United States. In short, FIN 48 requires companies to disclose information on their estimated uncertain tax benefits (FASB, 2006). Beck and Lisowsky (2014), De Simone et al. (2020) and Jacob et al. (2022) found a relationship between the implementation of FIN 48 and tax uncertainty, while Goldman et al. (2023) and Williams and Williams (2021) concluded that there was a negative investment effect due to FIN 48. Jacob et al. (2022) discovered that FIN 48 led to larger investment

delays. Related, Hasan et al. (2014) found that companies with positive FIN 48 reserves were confronted with higher loan spreads, which might reduce the cash available for investments.

When considering the investment effects of new tax regulation in Europe, De Simone and Olbert (2022) found that the Country-by-Country Reporting (CbCR) directive of the EU led to increased investments in European low-tax jurisdictions, whereas investments in high-tax jurisdictions decreased. Furthermore, Fox et al. (2022) investigated the so-called *state aid cases* and concluded that it resulted in fewer investments of United States multinationals in European subsidiaries located in these state aid countries. In contrast, Nesbitt et al. (2023) discovered that investors reacted positively to the leaks of confidential tax rulings in Luxembourg that were the foundation of the *state aid cases*.

In summary, prior literature has investigated the effects of tax uncertainty on investments, but this was done primarily in the United States by, for example, Jacob et al. (2022) and Hanlon et al. (2017). The literature investigating the EU mostly considers only one specific country or a small subset of countries (De Simone & Olbert, 2022; Fox et al., 2022; Nesbitt et al., 2023). Besides, most studies address the effects on publicly listed firms, whereas the effect on private firms remains unclear. Additionally, in the literature on European firms, the effect of tax uncertainty on the timing of investments has not yet been investigated to my knowledge. Therefore, the following research question will be examined in this thesis:

How has tax uncertainty impacted investments of public and private firms in the EU between 2018 and 2022?

In 2017, the EU decided to publish and continuously update a list of so-called 'non-cooperative jurisdictions for tax purposes', also known as the EU blacklist (Coucil, 2024). Its purpose is to limit tax avoidance activities by encouraging member states to take protective tax measures against countries on the list. However, each member state can decide independently whether it takes any measures, which might create uncertainty about the tax position of firms that would be affected by such a measure. Therefore, it can be argued that a firm subject to a change in the EU blacklist is exposed to uncertainty, which makes it a valid proxy for tax uncertainty.

In a difference-in-difference setting, I examine such a change in the EU blacklist in 2020. The treatment group thus consists of firms that were exposed to the change in the EU blacklist in 2020. A firm is considered to be subject to the change if it has a subsidiary or parent company located in one of the countries added to the list in 2020. Next, I use two different control groups to compare the treatment group with. The first control group only consists of firms that were exposed to the EU blacklist after the initial introduction in 2017 and were not subject to any change afterward. Together with the treatment group, this sample comprises 8,373 firm-year observations. The second control group consists of a larger sample of EU multinationals with characteristics similar to the treatment group, resulting in 117,086 observations.

The data originate from Amadeus (Bureau van Dijk) and contain annual information on private and public companies within the EU-27. In the further analysis, I divided the

study into two parts: one focusing on the timing of investments and the other on the level of investments.

The level of investment by a company in a year is determined by computing the change in total assets compared with the year before, then adding depreciation and dividing it by the total assets of the current year. This is consistent with the academic literature such as Fox et al. (2022). In order to understand how a firm's investments compare to the industry's, a second measure of investment is defined as a firm's investment scaled by the median investment level in the firm's industry. Furthermore, investments in intangible fixed assets are examined by looking at the change in intangible fixed assets as a share of total assets, following Adu-Ameyaw et al. (2024) and Lim et al. (2020).

To assess the impact of tax uncertainty on investment timing, I calculate the time between two large investments, known as investment spikes, and use this as a proxy for investment timing. Consistent with Billett et al. (2011), an investment spike is determined if an investment is 1.5, 2, or 2.5 times larger than the median investment level in a firm's industry. For robustness, I also compare a firm's investment to the firm's median investment level for defining investment spikes, which is in line with Whited and Wu (2006), Billett et al. (2011), De Angelo et al. (2011), Eckbo and Kisser (2015), Bargeron et al. (2018) and Jacob et al. (2022).

Several methods are used to examine the effects of tax uncertainty on the timing of investments. First, a panel linear regression model is implemented with the spell between two investment spikes a dependent variable of interest, consistent with, for example, Jacob et al. (2022). I used year and firm-fixed effects together with multiple control variables based on the academic literature to mitigate omitted variable bias concerns. Next, a hazard model is applied to determine the effect of tax uncertainty on the probability of making a large investment today as a function of the time since the last investment spike. This method is commonly applied by researchers investigating investment timing effects (Billett et al., 2011; Jacob et al., 2022; Whited & Wu, 2006). Furthermore, a propensity score matching process is implemented to verify the results of the panel regression.

The investment-level effects are then estimated using panel regression models and a propensity score matching procedure similar to those used for the investment timing analysis. Next, the panel regressions are run on two subsamples to determine the drivers behind the results. First, the sample is split into financially constrained and unconstrained firms using the Whited-Wu index, developed by Whited and Wu (2006), to see whether the results differ between these firms. Additionally, a distinction is made between firms subject to complex tax systems and those subject to less complex tax systems, using the Tax Complexity Index of Hoppe et al. (2023). Finally, several robustness checks, including different models and investment spike measures, are implemented to verify the results.

The findings suggest that uncertainty about taxes as a result of a change in the EU blacklist causes delays in investments with a magnitude of more than 1.5 times the median investment rate in a firm's industry. This effect is most pronounced when considering tangible fixed assets investments among firms affected by the EU blacklist, and it is largely driven

by financially constrained firms and corporations located in countries with complex tax systems. Additionally, among enterprises affected by the EU blacklist, tax uncertainty results in reduced hazards of investments in tangible fixed assets as a function of the time since the last investment spike. Specifically, the instant probability of investing at least two times the industry's median investment level for a firm exposed to tax uncertainty from the change in the EU blacklist was 61.1 percent lower than non-exposed firms. Only weak evidence of delays is observed in the case of intangible fixed assets investments. Moreover, the results indicate that tax uncertainty increases capital investments among financially unconstrained firms and firms subject to less complex tax systems. Negative associations are found for financially constrained firms, but no causal relationships are identified, and no effects are observed for intangible fixed asset investments.

These results contribute to the existing academic literature by providing new insights into the investment effects of tax uncertainty among private and public firms in the EU. Besides, it confirms prior studies suggesting different effects of uncertainty between financially constrained and financially unconstrained firms. Furthermore, policymakers can learn from the results when developing new regulations, as the results suggest that tax uncertainty leads to delays in corporate investments, especially when a corporation is financially constrained and when regulation is relatively complex. If policymakers aim to prevent firms from delaying their investments, it can be important to consider tax uncertainty.

This paper is structured as follows. First, related literature will be discussed in Section 2 before the data are described in Section 3. Section 4 then elaborates on the methodology, and Section 5 presents the results that are discussed in Section 6. The thesis is concluded in Section 7.

2 Theoretical Framework

This section reviews the existing literature on the relationship between uncertainty, taxation, and investments. First, the more general literature on the effects of taxes on a firm's (investment) decisions is discussed before investments are linked with general uncertainty and, finally, tax uncertainty. The section ends with the development of the main hypotheses.

2.1 The effects of taxation on corporate decision-making

Corporate taxes are an important cost to companies, which means they can significantly impact a firm's decisions. A foundation of the academic literature on the effects of taxation on corporate decisions was created by Myers (1984). Specifically, this study concludes that in the *static tradeoff* theory, the optimal capital structure is reached when the marginal tax advantages of debt equal the marginal costs of financial distress. Hence, firms should base their capital structure decisions partly on the impact of taxation (Myers, 2001). Furthermore, Graham (2003) concludes that high taxation results in firms seeking ways to avoid these taxes, based on a review of finance literature. According to Ftouhi and Ghardallou (2020), international companies choose their capital structure based on differences in taxation across countries for tax minimization purposes, underscoring the importance of taxation. However, an even more recent study found that the effects of taxation on corporate decision-making are smaller than previously thought (Hanlon & Heitzman, 2022).

2.1.1 Investment peaks

Next to choosing the right capital structure, firms also continuously have to make new decisions on (the financing of) new investments to stay ahead of the competition. Building further on the theories discussed by Myers (1984), a wide range of academic literature has investigated the financing of (large) investments. A large investment is also known as an *investment spike* in the literature, so I will use this term throughout the study as well. Regarding investment spikes, Bargeron et al. (2018) examined firms in the years around the First World War in the United States and found that companies prefer using debt instead of equity to finance these large investments. Besides, De Angelo et al. (2011) provide evidence for their dynamic capital structure model in explaining, among others, the amount of leverage changes due to investment spikes. Moreover, Eckbo and Kisser (2015) conclude from their analysis that firms with debt levels above the target, issue transitory debt to finance a large investment. In the short run, this increases the leverage ratio of these companies, while the effect disappears as time passes. Furthermore, Im et al. (2020) found substantial differences between firms in how they finance investment spikes. For example, they conclude that small firms use less equity than large firms in financing large investments. Finally, Gries et al. (2012) link investment decisions to taxes by concluding that taxes affect each investment project individually and thus, on aggregate, cannot be neutral for uncertain projects.

2.1.2 Investment timing

Another interesting area of research examined how often companies make substantial investments. In the literature, papers refer to this as the *investment spell*: the time between two peaks in investments. Consistent with the literature, I will use this term to indicate the time between two investment spikes. One of the first studies to address the timing of investment spikes is Whited (2006). This study used hazard model estimation to investigate the relationship between external financing constraints and the timing of large investment projects. The authors found that small, financially unconstrained firms face increased investment hazards compared to small, financially constrained firms. Moreover, Billett et al. (2011) conclude that strong corporate governance results in longer time gaps between large investments. Finally, linking investment decisions to taxation, Niemann (2011) concludes that investment delays occur when the expected tax payments increase.

The above-mentioned literature highlights the importance of taxation in corporate decision-making. Furthermore, it underscores multiple factors that impact investment decisions. Most studies investigate the level of investments, although some papers look at investment timing. A general question that can then be posed is how investment behavior might change under uncertainty.

2.2 Uncertainty and investments

The academic literature has been extensively trying to answer that question. For example, Bloom et al. (2007) investigated the effects of uncertainty on corporate investments and found that firms are less responsive to demand shocks during times of high uncertainty. They conclude that this implies that monetary and fiscal policies are less effective in such periods. Furthermore, Gulen and Ion (2016) discovered a negative relationship between corporate investments and policy uncertainty, which is stronger for firms with large irreversible investments and those dependent on government spending. Besides, using a new measure of economic uncertainty, Baker et al. (2016) concluded that higher political uncertainty led to lower levels of investment, output, and employment in the United States. The results were stronger in more policy-dependent sectors. In addition, Jens (2017) specifically examined the investment effects of uncertainty arising from political elections in the United States and concluded that investments declined. Furthermore, around the elections, firms delayed equity and debt issuances related to investments. Besides, by studying various types of uncertainty, Alfaro et al. (2024) found that firms facing financial constraints reduced their investments more than unconstrained firms following an uncertainty shock. Finally, Favara et al. (2021) discovered that new legislation that reduced uncertainty led to higher levels of intangible fixed assets in industries more exposed to uncertainty.

These studies thus suggest that (political) uncertainty can have a major impact on corporate investments.

2.3 Tax uncertainty

A form of uncertainty is the uncertainty arising from taxation, also known as *tax uncertainty* or *tax risk* in the literature. As Saragih and Ali (2023) pointed out, tax risk should not be confused with, for example, tax avoidance, which is the practice of firms pursuing the lowest possible tax burden. Saragih and Ali (2023) then split tax uncertainty into a current and a future component. The former comprises uncertainty about the taxation process and taxation issues, such as unexpected financial losses. The latter consists of tax risk arising from unknown or uncertain future tax payments, tax burdens, or tax liabilities.

In the following subsections, several sources of tax uncertainty based on the academic literature are discussed first. Next, some studies finding effects of tax uncertainty on corporate performance are reviewed.

2.3.1 Sources of Tax Uncertainty

As mentioned by Saragih and Ali (2023), tax avoidance can be a source of tax risk. In this context, researchers have begun to explore the relationship between tax uncertainty and tax avoidance.

For example, Drake et al. (2019) concluded that tax avoidance and tax risk are highly interrelated, as tax risk lowers an investor's valuation of tax avoidance. Moreover, Dyreng et al. (2019) found that tax-avoiding firms experience higher tax uncertainty, especially when these firms have relatively many intangible assets. Furthermore, the results of Neuman et al. (2020) indicate a negative association between long-run ETRs, which is a proxy for tax avoidance, and tax risk. Building further on this, Chen et al. (2021) examined the relationship between tax risk and corporate in-house tax departments, finding less volatile and lower ETRs for firms with larger tax departments. In addition, the paper highlights the existing trade-off between tax avoidance on the one hand, which implies that a firm is aiming for a low ETR, and tax risk on the other hand, which implies that a firm is aiming for a less volatile ETR. Besides, Dhawan et al. (2020) found that firms employing tax avoidance activities face a higher bankruptcy risk, implying that tax avoidance results in tax risk. Moreover, Hasan et al. (2014) conclude that banks consider tax avoidance as risky, resulting in higher spreads on bank loans.

In contrast to the findings in these papers, other researchers have found factors that reduce tax risk. For example, Gallemore and Labro (2015) argue that higher internal information quality is beneficial for tax avoidance and reduces tax risk, especially for firms with, for example, foreign activities. In this context, Hamilton and Stekelberg (2017) found that firms with high-quality information technology experience lower and less volatile ETRs.

Another source of tax risk is the uncertainty arising from legislation uncertainty, according to Saragih and Ali (2023). For example, complex tax rules can reduce the clarity of a firm's tax position. Little papers have investigated this source of tax uncertainty, but Bratten et al. (2017) found that tax complexity leads to more audit complexity, which implies higher audit fees for firms facing more tax risk. Besides, Amberger et al. (2023) investi-

gated the increasing complexity of tax systems and their effect on firms' investments. The results indicate that more complex tax systems decrease the transmission of fiscal policy in encouraging investments.

2.3.2 Effects of tax uncertainty

Although more research has been done on tax avoidance, an emerging literature exists on the effects of tax uncertainty. For example, Abernathy et al. (2021) discovered that tax risk results in higher audit fees for firms. This implies that tax risk leads to higher costs for firms, yielding less internal funds available for investments. The reason for these higher fees might be found in the results of Nguyen (2021), as he concludes that firms with relatively high levels of tax avoidance have lower financial statement readability. The effect is stronger among companies in industries with a higher tax risk. Implicitly, these results thus indicate a negative relationship between tax risk and investments.

Furthermore, Chen et al. (2022) concluded that career concerns of executives lead to lower tax burdens and less risky tax planning strategies. This might imply more room for investments as less cash is required to pay taxes or to reserve money for uncertain tax positions. In the same context, Rego and Wilson (2012) provided proof for a positive effect of equity risk incentives of managers on tax risk. Next, Lin et al. (2019) examined the relationship between corporate social responsibility (CSR) and tax risk. The authors found that CSR reduces a firm's tax risks, but this effect vanishes when the company performs poorly. This suggests a relationship between profitability and tax risk. Besides, Hutchens and Rego (2015) found a positive relationship between tax risk and firm risk when using the volatility of the effective tax rate (ETR) as a proxy for tax risk, while the authors did not find such a relationship when using measures based on unrecognized tax benefits. Finally, Saavedra (2019) investigated whether tax risk is valued by lenders in the syndicated loan market, and he found that, indeed, tax risk is a relevant factor in explaining the pricing of syndicated loans.

Concluding on the mentioned literature on tax uncertainty, it can be stated that tax uncertainty plays an important role within firms and can have various impacts on corporate decisions, such as investment decisions.

2.4 Investment effects of tax uncertainty

The direct link between investments and tax uncertainty will be made in this subsection. First, the literature that considers aggregated effects to investigate this relationship is discussed. Second, studies examining the investment effect of uncertainty arising from the implementation of a new regulation are reviewed.

2.4.1 Aggregated investment effects of tax uncertainty

When considering the aggregated investment effects of tax uncertainty, Niemann (2004) examined the behavior of individual investors using a capital budgeting model and real

option valuation. The author found that it cannot be concluded that uncertain tax policy reduces real investments. These results persist under both risk aversion and risk neutrality. In addition, Hasan et al. (2014) concluded that banks consider tax avoidance a risky activity, resulting in higher spreads on bank loans. This, in turn, also increases the cost of debt and thus implies less access to resources for investments.

Furthermore, Hanlon et al. (2017) found that national and multinational companies have higher cash reserves as tax uncertainty increases, using a sample of United States firms from 2007 until 2014. It can be argued that these higher reserves lead to lower investments, as fewer resources will be available. Zwick and Mahon (2017) found evidence for increased investments as a reaction to tax incentives and documented that the effect primarily exists when the tax policy generates immediate cash flows. This might indicate that if the tax consequences of a tax incentive are not entirely clear in the long run, tax uncertainty arises, and the investment effects of the tax incentive are lowered. Hence, a link can be made between this study and the literature on tax complexity as a source of tax uncertainty.

Besides, Dhawan et al. (2020) found that firms employing tax avoidance activities face a higher bankruptcy risk. This might imply that tax avoidance is risky for lenders and shareholders, resulting in higher costs of debt and equity, respectively. This, in turn, can reduce investments. Moreover, Jacob et al. (2022) concluded that tax uncertainty leads to firms delaying large investments. Also, the authors showed that the results are driven by firms holding higher cash balances. These findings are consistent with the aforementioned general literature on the effects of uncertainty on investments. Finally, Edmiston (2004) examined the relationship between investments and the volatility of the ETR on capital income in multiple European countries using data from 1970 until 1998 and found a significant negative relationship.

2.4.2 Investment effects of uncertain regulations in the United States

As can be read in the previous subsection, most of these papers consider the aggregated effects of general tax uncertainty, using general measures of tax uncertainty based on the financial statements. However, another way to test the effects of tax uncertainty on investments is by examining the implementation of a new regulation that creates tax uncertainty. A substantial part of the literature investigating such regulation in this context is clustered around the implementation of Financial Interpretation No. 48 (FIN 48), which became effective in 2007 in the United States. In short, FIN 48 required companies to disclose information on their estimated uncertain tax benefits (UTB) (FASB, 2006).

First of all, Beck and Lisowsky (2014) found that the implementation of FIN 48 led to more voluntary real-time tax audits and that firms participating in these voluntary audits reduced their FIN 48 reserves significantly. This implies that FIN 48 reserves are powerful in explaining tax aggressiveness and uncertainty. Goldman et al. (2023) found, by using a difference-in-differences design, that FIN 48 resulted in considerably fewer investments, as proxied by patent applications. The authors suggest that this implies that firms decrease investments in projects with tax benefits when they have to disclose information about this,

which can be observed by the tax authorities.

Somewhat contrasting to the previously described literature, Robinson et al. (2016) found that FIN 48 reserves do not have much predictive power in explaining future tax cash outflows. Besides, investors do not actively adjust their valuations accordingly if the FIN 48 reserves overstate future tax outflows. The authors explain this by stating that the relevance of income tax accounting has been negatively affected by FIN 48, but the results might as well indicate that investors consider tax uncertainty less relevant.

In addition, after implementing a difference-in-differences design, Hasan et al. (2014) concluded that companies with positive FIN 48 reserves were confronted with higher loan spreads than firms without FIN 48 reserves. These higher loan spreads mean a higher cost of debt, which affects the profitability of investments and access to credit. Building on this, Williams and Williams (2021) discovered decreased investment output by firms after the implementation of FIN 48. They concluded that regulation enforcing mandatory disclosure of tax positions can significantly affect the effectiveness of tax policy.

Jacob et al. (2022) investigated the effects of another policy change that was likely to increase tax uncertainty: the staggered implementation of Schedule UTP. This regulation required firms in the United States to privately disclose information about uncertain tax positions to the tax authorities (IRS, 2010). The authors discovered that companies impacted by this policy change, particularly those with high UTBs and those under greater financial constraints, postponed large capital investments. Besides, the authors show that the results are driven by firms holding higher cash balances.

2.4.3 Investment effects of uncertain regulations in the European Union

Although most studies used to focus on the United States when investigating the effects on investments after a policy change that is likely to increase tax uncertainty, recently, literature on the European Union (EU) has started to emerge. For example, De Simone and Olbert (2022) investigated the real effects of the Country-by-Country Reporting (CbCR) directive in the EU using a difference-in-differences method. They conclude that CbCR reduced aggressive tax strategies, which resulted in the reallocation of capital in Europe. Companies subject to the CbCR regulation increased investments in European low-tax jurisdictions but decreased investments in high-tax jurisdictions.

Besides, Fox et al. (2022) aimed to quantify investment effects resulting from the investigations of the European Commission on preferential tax agreements between countries and firms, also known as the *state aid cases*. The authors found that the uncertainty of taxation arising from these *state aid cases* decreased investments of United States multinationals in European subsidiaries located in these state aid countries.

Related to Fox et al. (2022), Nesbitt et al. (2023) examined the tax uncertainty coming from tax rulings in Europe by performing an event study on the leaks of confidential tax rulings in Luxembourg. In contrast to the findings of Fox et al. (2022), the authors concluded that investors reacted positively to the leaks. Additionally, investors in companies with activities in Luxembourg perceived tax uncertainty as less important than previously thought.

Finally, Zhen Li et al. (2023) analyzed the same Luxembourg tax leaks and concluded that advanced tax rulings did not affect tax risk. However, the authors did find that advanced tax rulings in one country might result in more tax uncertainty in another unaffected country.

2.5 Hypothesis development

In summary, the academic literature finds real effects of tax uncertainty on the investment decisions of firms in both the US and, recently, in the EU. Specifically, based on the earlier-mentioned literature, there seems to be a negative relationship between tax uncertainty and investments. However, most studies conducted in the EU focus only on individual countries or a small group of countries. As a result, the impact on investments by companies across the entire EU is not well understood. Additionally, the existing research mainly examines publicly listed firms, leaving the implications for private firms unclear. Besides, although the effects of general uncertainty on the timing of investments have been investigated by, for example, Whited (2006), Billett et al. (2011), and Niemann (2011), Jacob et al. (2022) is the only paper addressing investment delays due to tax uncertainty.

In conclusion, there is a gap in the literature that considers the investment behavior, that is, the magnitude and the timing of investments, of both private and public firms in the EU under tax uncertainty. Therefore, I will investigate the following hypothesis:

H1: *Tax uncertainty has negatively impacted corporate investments among private and public firms in the EU between 2018 and 2022.*

As mentioned earlier, Whited (2006) found that financially unconstrained firms face higher investment spike hazards. Besides, Jacob et al. (2022) argued that firms hold higher cash balances to buffer against potential higher tax claims in the context of tax uncertainty. As financially constrained firms have less internal cash available, these firms should rely on more expensive external financing. Since this increases the financing costs for these firms, it is expected that this will result in smaller investments and more delayed investments. Jacob et al. (2022) confirmed this hypothesis by discovering that the investment effects of tax uncertainty indeed are stronger for financially constrained firms. Additionally, according to Alfaro et al. (2024), companies with financial constraints decreased their investments more than unconstrained firms after experiencing uncertainty. Hence, if present, the effect of tax uncertainty on investments is expected to differ between financially constrained and unconstrained firms. Therefore, I will test the following second hypothesis:

H2: *The effect of tax uncertainty on corporate investments among public and private firms in the EU between 2018 and 2022 is stronger for financially constrained firms.*

According to Saragih and Ali (2023), uncertainty arising from legislation uncertainty is a source of tax risk. In addition, Bratten et al. (2017) found that firms located in countries with a more complex tax system experience higher audit fees due to increased audit complexity. This indicates that tax system complexity results in higher costs to the firm, implying fewer resources available for investments. Furthermore, Amberger et al. (2023) showed that the

increasing complexity of tax systems resulted in lower effects of fiscal investment incentives. Related to this, the results of Zwick and Mahon (2017) indicate that the investment effects of tax incentives are reduced when the policy does not generate immediate cash flows. If a regulation is complex, firms may struggle to immediately take advantage of the tax incentive, leading to a diminished impact of the regulation.

Hence, based on the literature, the complexity of a tax system seems to be related to tax uncertainty and investments. Therefore, it is interesting to investigate whether the potential effects of tax uncertainty on investments are stronger in countries with complex tax systems. More formally, the third hypothesis that will be investigated states the following:

H3: *The effect of tax uncertainty on corporate investments among public and private firms in the EU between 2018 and 2022 is stronger for firms subject to complex tax systems.*

3 Data

In this section, the research design and sample construction process are described. Next, the data source and filtering procedure are specified before the descriptive statistics are shown.

3.1 Research design

In 2017, the European Union (EU) presented its very first 'blacklist' of countries with a so-called non-cooperative tax regime (Coucil, 2024). The list is constructed based on several criteria that are important for 'good tax governance,' according to the EU. These include 'tax transparency', 'fair taxation', and 'measures against base erosion and profit shifting'. I refer to this list in the remainder of this study as 'the EU blacklist' or 'the blacklist'. The EU blacklist is frequently updated by adding new countries or removing countries that started to meet the requirements of the EU for good tax governance. If a country is on the list, member states of the EU are encouraged and permitted to implement defensive tax measures against that jurisdiction. Thus, the list does not directly impact the tax burden of active companies in these countries; it only impacts a firm if a member state adopts protective measures. Hence, it can be argued that a firm subject to a change in the EU blacklist is exposed to uncertainty about its future tax burden. This makes a change in the EU blacklist a valid proxy for tax uncertainty. Therefore, I will use this setting to measure the effects of tax uncertainty on investments.

To analyze the relationship, I implement a difference-in-differences (DID) design, which is consistent with prior literature in analyzing the effects of regulation (Goldman et al., 2023; Hasan et al., 2014; Jacob et al., 2022). In particular, I consider a change in the EU blacklist in 2020.

The treatment and control groups are constructed as follows. First, several dummy variables are created to identify whether a firm has a subsidiary or owner in a blacklisted country in a particular year. Then, I construct a variable that determines whether a company was subject to a new addition of a country to the blacklist via a subsidiary or its ultimate owner. The firms that experienced such a change in 2020 are assigned to the treatment group via the variable $Treatment$, which is equal to one for these firms. This results in 7,305 firm-year observations.

These treated firms are then compared with two different control groups. First, a sample is used consisting of firms in the EU with characteristics similar to those of the firms in the treatment group, resulting in a total of 117,086 firm-year observations. I will refer to this sample as the 'full sample'. Next, I perform the same analysis in a sample where the control group consists only of firms that were initially subject to the blacklist at its introduction in 2017 and did not experience any change afterwards. This sample consists of 8,373 firm-year observations and will be called the 'blacklist sample'. An overview of the number of observations in the treatment group per blacklist country, and the year(s) of addition to and removal from the list per country, is displayed in Appendix A in Table 16. Most observations stem from Bermuda and the United Arab Emirates.

The use of the blacklist sample is intended to mitigate potential endogeneity problems. The control group of the blacklist sample is likely to be more comparable to the treatment group than the control group in the full sample, as the control group in the blacklist sample only consists of firms that have or have had subsidiaries or parent companies in blacklisted countries, which likely are countries that facilitate tax avoidance activities. Hence, in the blacklist sample, it can be argued that the treatment and control groups are similar in potentially time-varying and unobservable characteristics regarding aggressive tax minimization strategies. Therefore, this design helps to mitigate concerns about the potentially biasing effects of companies' tax aggressiveness.

The intervention variable, called *post*, then is a dummy variable equalling 1 if a firm-year observation was after a new addition of a subsidiary's or owner's country to the blacklist and 0 otherwise. For a treatment firm to be in the sample, it must have at least two observations before and two after the change. As a robustness test, I also use an alternative definition of *post*, where I include the year of change.

3.2 Subsample analysis

Two subsample analyses will be performed to investigate the second and third hypothesis. These analyses are discussed in the next two subsections.

3.2.1 Financial constraints

To test the second hypothesis, the sample will be divided into a part consisting of financially constrained firms, and a part consisting of financially unconstrained firms. To determine whether a firm is financially constrained or unconstrained, I use the Whited-Wu index, developed by Whited and Wu (2006). The use of this index is also consistent with Jacob et al. (2022). Due to data constraints on dividend distributions, which is one of the factors considered in the index, I omit this part of the index in the computations. The applied formula to calculate the index is shown in Equation 1. I define financially constrained firms as firms with a median index value larger than the median index in the sample, while financially unconstrained firms have a median index value in the bottom 50 percent of the sample. In the equation, $CashFlow_{i,t}$, $LongTermDebt_{i,t}$, $ln(TotalAssets)_{i,t}$, and $SalesGrowth_{i,t}$ comprise a firm's cash flow, long term debt, natural logarithm of total assets, and sales growth in a year, respectively. $SalesGrowthIndustry_t$ is the median sales growth of the firm's industry in a particular year.

$$\begin{aligned} WW_{i,t} = &-0.091 \times CashFlow_{i,t} + 0.021 \times LongTermDebt_{i,t} \\ &-0.044 \times ln(TotalAssets)_{i,t} + 0.102 \times SalesGrowthIndustry_t \\ &-0.035 \times SalesGrowth_{i,t} \end{aligned} \tag{1}$$

3.2.2 The complexity of a country's tax system

To test the third hypothesis, the sample is split into firms located in countries with complex tax systems and firms located in countries with less complex tax systems, based on the same tax complexity index as used for the variable *Tax Complexity*. A detailed description of this variable is provided in the text below and in Table 15 of Appendix A. A country is considered to have a complex tax system in a particular year if the value of *Tax Complexity* belongs to the highest 50 percent of the sample. Alternatively, a less complex tax system is defined as such if the value of *Tax Complexity* is in the bottom 50 percent of the sample.

3.3 Data Source and data filtering

The data used in this study are obtained from the Amadeus database and accessed via Wharton Research Data Services (WRDS). The Amadeus database, part of Bureau van Dijk, contains a wide range of financial information on public and private European companies. Furthermore, it provides me with data about the owners and subsidiaries of firms of various sizes. The sample period ranges from 2018 to 2022.

As a first step in establishing the blacklist sample, the ownership and subsidiaries data are downloaded from Amadeus. I require the country of a subsidiary or owner to be non-missing, and I only keep firms with a subsidiary or parent company that has been on the EU blacklist at least once between 2018 and 2022. Next, all Bureau van Dijk ID numbers of the European firms present in the resulting data are used to obtain the financial data in a second download and construct the dataset. In this step, financial firms with a US SIC industry code starting with a 6 are excluded from the download and the analysis as is commonly done in the literature. Besides, I require each firm-year observation to have non-missing values for all necessary input variables to construct the control variables used in the analysis. Additionally, I only consider companies in countries that are part of the EU-27. These steps then result in the blacklist sample. The treated firms for all analyses are obtained from this sample, as well as the control firms for the analyses that only consider this sample.

The control firms in the full sample are then obtained by downloading new data from Amadeus. I require the values of all relevant covariates in the analysis of all firm-year observations to be higher than the minimum and lower than the maximum value of each variable based on the blacklist sample. Besides, each control firm should have at least one subsidiary in a country that is not part of the EU-27. In this way, the control group will be more aligned with the treatment group.

3.4 Construction of the dependent variables

3.4.1 *TFA Investment*

The main measure of investment used throughout this study is calculated based on the change in total assets of a firm. Specifically, *Tangible Fixed Assets Investment*, or *TFA*

Investment in short, is defined as the change in tangible fixed assets compared with the year before plus depreciation and scaled by total assets of the current year. This approximates a firm's yearly capital expenditures (CAPEX) and is consistent with Fox et al. (2022), who also used data from Amadeus to assess investment effects. *TFA Investment* is winsorized at the 2.5 percent level.

3.4.2 *IFA Investment*

Next, *Intangible Fixed Assets Investment*, or *IFA Investment* in short, comprises the change in intangible fixed assets compared to the year before and scaled by total assets. This measure is consistent with academic literature investigating the investment effects of intangible assets, such as Adu-Ameyaw et al. (2024) and Lim et al. (2020). Due to limited data in the control group of the blacklist sample, which is likely to influence the results substantially, I only estimate the effects of intangible fixed assets investments on the full sample. In order to mitigate the effect of many negative 'investments' in intangible fixed assets, I exclude the first quartile of *IFA Investment* in the analysis. Besides, to reduce the effect of large positive outliers that are present, possibly due to low amounts of total assets, I also exclude the fourth quartile of the sample based on the level of *IFA Investment*. Summarizing, I only consider the second and third quartile of *IFA Investment* in the analysis.

3.4.3 *TFA Investment Industry* and *IFA Investment Industry*

Finally, *TFA Investment Industry* and *IFA Investment Industry* are used as dependent variables. They are based on *TFA Investment* and *IFA Investment*, respectively. The difference is, however, that *TFA Investment Industry* and *IFA Investment Industry* depict *TFA Investment* and *IFA Investment* as a fraction of the median level of *TFA Investment* and *IFA Investment* in a firm's industry, respectively. Besides, *IFA Investment Industry* is winsorized at the 5 percent level, whereas *TFA Investment Industry* is winsorized at the 2.5 percent level.

3.4.4 Investment Spell

The spell between two large investments of a company is analyzed to measure the extent to which a large investment is delayed because of tax uncertainty. The spell length is the number of years between two investment spikes.

An investment spike can be measured in multiple ways, but the most commonly applied method is based on the deviation of the 'base' investment level of a firm. For example, Whited and Wu (2006) define an investment spike as such if the deviation of the investment amount scaled by total assets is 2, 2.5, or 3 times larger than the median of this ratio for that particular firm in the sample. Bargeron et al. (2018), Billett et al. (2011), De Angelo et al. (2011), Eckbo and Kisser (2015) and Jacob et al. (2022) apply the same method as Whited and Wu (2006), where the last four mentioned papers use 2 times the median as threshold, and Bargeron et al. (2018) takes 50 percent above the median as threshold. I will

use the 1.5, 2, and 2.5 benchmarks in the analysis. However, due to data limitations, these comparisons with the firm median likely result in biased outcomes for the blacklist sample as it lacks enough observations per firm, especially in the control group of that sample. Therefore, I will largely rely on investment spikes compared to the median investment level in the industry of a particular company in a year, which is also consistent with Billett et al. (2011). I use the Fama-French 12 industry classification method based on the 3-digit SIC industry codes to determine the industry. The firm-level measures are included as a robustness test for the analysis of the full sample. The blacklist sample is disregarded in this robustness check because of the relatively small amount of observations in the control group, limiting the relevance of computing a firm's median investment rate.

3.5 Descriptive Statistics

This subsection displays and discusses the descriptive statistics of the variables used in the analyses. First, general summary statistics are shown before they are split by group and year.

3.5.1 General descriptive statistics

Table 1 displays the descriptive statistics of every dependent and independent variable used in the analysis, including variables considered in the model specification procedure, as described in the next section. Panel A displays these statistics for the full sample, and Panel B for the blacklist sample. For a detailed description of every dependent variable used in the analysis, I refer to Table 14 of Appendix A. The independent variables are described in Table 15 of Appendix A.

The mean tangible fixed asset investment rate in the full and in the blacklist sample is 4%, whereas the value for intangible fixed assets investments is -0.03% in the full sample. *TFA spell industry 2* has a mean of 1.0379 in the full sample, implying that on average, a firm had a gap of 1.0379 years between two investments with a magnitude of at least two times the median investment level in a firm's industry. This gap is 0.9756 years in the blacklist sample, on average. The average total assets in the full sample are 30.7 million euros, while this is slightly smaller in the blacklist sample, with a mean of 39.4 million euros. In the full sample, 22.2 percent of the observations are loss-years, while this is 27.5 percent in the blacklist sample. Furthermore, the sales growth in the full sample on average is 5.1 percent, which is slightly higher than the value of 4.3 percent in the blacklist sample. Additionally, the amount of intangible assets in the full sample on average is 35,596 euros, whereas this is 23,156 euros in the blacklist sample, and the mean of the three-year average cash flow as a share of total assets is one percentage point higher in the full sample compared to the blacklist sample. Furthermore, on average, firms in the full sample have 10.8 percentage points less debt and 3.9 percentage points more working capital than firms in the blacklist sample.

Table 1: SUMMARY STATISTICS

	Mean	Standard Deviation	Minimum	Maximum	Number of observations
Panel A: Full Sample					
TFA Investment	0.0361	0.051	-0.040	0.239	117,086
TFA Investment Industry	2.1853	3.368	-1.572	16.980	117,086
IFA Investment	-0.0311	0.092	-0.262	0.188	47,765
IFA Investment Industry	2.6952	8.218	-69.507	98.887	47,765
TFA spell firm 1.5	1.0831	1.170	0.000	4.000	117,086
TFA spell firm 2	1.2935	1.268	0.000	4.000	117,086
TFA spell firm 2.5	1.4008	1.309	0.000	4.000	117,086
TFA spell industry 1.5	0.8906	1.191	0.000	4.000	117,086
TFA spell industry 2	1.0379	1.251	0.000	4.000	117,086
TFA spell industry 2.5	1.1543	1.290	0.000	4.000	117,086
IFA spell firm 1.5	0.7372	1.151	0.000	4.000	117,086
IFA spell firm 2	0.7308	1.160	0.000	4.000	117,086
IFA spell firm 2.5	0.7288	1.166	0.000	4.000	117,086
IFA spell industry 1.5	1.2461	1.307	0.000	4.000	117,086
IFA spell industry 2	1.2203	1.304	0.000	4.000	117,086
IFA spell industry 2.5	1.2001	1.301	0.000	4.000	117,086
Treatment	0.0624	0.242	0.000	1.000	117,086
post	0.5111	0.500	0.000	1.000	93,964
Cash Flow 3yr	0.2593	0.326	-0.565	1.194	117,086
ETR 3yr	0.2120	0.201	0.000	1.000	117,086
Leverage	0.5854	0.275	0.053	1.483	117,086
Profitability	0.0510	0.120	-0.350	0.422	117,086
Loss	0.2229	0.416	0.000	1.000	117,086
Sales Growth	0.0505	0.356	-1.150	1.137	117,086
Size	17.2431	2.128	6.544	29.233	117,086
Working Capital	0.0858	0.279	-0.745	0.669	117,086
Intangibles	10.4820	5.677	0.000	25.145	117,086
Tax Complexity	0.4534	0.064	0.247	0.574	117,086
Panel B: Blacklist sample					
TFA Investment	0.0359	0.058	-0.040	0.239	8,373
TFA Investment Industry	2.3744	3.896	-1.572	16.980	8,373
TFA spell industry 1.5	0.8412	1.161	0.000	4.000	8,373
TFA spell industry 2	0.9756	1.227	0.000	4.000	8,373
TFA spell industry 2.5	1.0671	1.262	0.000	4.000	8,373
Treatment	0.8724	0.334	0.000	1.000	8,373
post	0.4888	0.500	0.000	1.000	6,496
Cash Flow 3yr	0.2407	0.353	-0.565	1.194	8,373
ETR 3yr	0.2044	0.219	0.000	1.000	8,373
Leverage	0.6933	0.328	0.053	1.483	8,373
Profitability	0.0390	0.133	-0.350	0.422	8,373
Loss	0.2751	0.447	0.000	1.000	8,373
Sales Growth	0.0433	0.401	-1.150	1.137	8,373
Size	17.4869	2.863	7.515	29.233	8,373
Working Capital	0.0470	0.308	-0.745	0.669	8,373
Intangibles	10.0452	6.732	0.000	25.145	8,373
Tax Complexity	0.4545	0.057	0.247	0.574	8,373

Notes: This table shows the summary statistics of all variables used in the analyses. The mean, standard deviation, minimum, maximum, and the number of observations for each variable is displayed. All ratios are winsorized at the 2.5% level. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15.

3.5.2 Descriptive statistics by group

To assess the extent to which the treatment and control groups differ regarding firm characteristics, Table 2 displays the means of the control variables used in the analysis and the differences between the groups. Again, panel A shows the statistics for the full sample, whereas panel B covers the same statistics for the blacklist sample. It can be observed that both groups differ significantly from one another in terms of all characteristics when looking at the p-values and t-statistics in panel A. Compared to the control group, the treatment

group, on average, has higher cash flows, less intangible assets, less debt, is more profitable, is less often loss-making, has higher levels of sales growth, is smaller, has more working capital and is located in a country with a less complex tax system. For example, the difference in intangible assets is 7.5 thousand euros, while this is 28.1 million euros when considering the total assets. The profitability is 3.9 percentage points higher in the treatment group compared to the control group.

Next, in panel B, a similar pattern is observed in the blacklist sample, although the difference of *Sales Growth* becomes insignificant. Besides, the differences in *Intangibles* and *Size* are substantially larger than in the full sample. For example, the difference in total assets now becomes 54.8 million euros, while this is 42.4 thousand euros for intangible assets. The treatment group, on average, has higher cash flows, less intangible assets, less debt, is more profitable, is less often loss-making, has higher levels of sales growth, is smaller, has less working capital, and is located in a country with a less complex tax system compared to the control group.

Table 2: DIFFERENCES IN VARIABLES PER GROUP

Panel A: Full sample					
	Treatment	Control	Difference	t-statistic	P-value
Cash Flow 3yr	0.262	0.223	-0.039	9.84	<0.000***
Intangibles	10.470	10.663	0.193	-2.82	0.005***
Leverage	0.578	0.698	0.120	-36.40	<0.000***
Profitability	0.052	0.034	-0.018	12.27	<0.000***
Loss	0.219	0.279	0.060	-11.99	<0.000***
Sales Growth	0.051	0.043	-0.008	1.90	0.057*
Size	17.201	17.870	0.668	-26.07	<0.000***
Working Capital	0.088	0.055	-0.032	9.60	<0.000***
Tax Complexity	0.453	0.457	0.004	-4.67	<0.000***
Panel B: Blacklist sample					
	Treatment	Control	Difference	t-statistic	P-value
Cash Flow 3yr	0.362	0.223	-0.139	12.13	<0.000***
Intangibles	5.818	10.663	4.845	-22.63	<0.000***
Leverage	0.659	0.698	0.039	-3.65	<0.000***
Profitability	0.071	0.034	-0.037	8.46	<0.000***
Loss	0.245	0.279	0.034	-2.33	0.020**
Sales Growth	0.046	0.043	-0.003	0.26	0.794
Size	14.868	17.870	3.002	-34.17	<0.000***
Working Capital	-0.011	0.055	0.066	-6.61	<0.000***
Tax Complexity	0.439	0.457	0.018	-9.39	<0.000***

Notes: This table shows the means of the treatment and control group and the differences between them in both the Blacklist and the Full sample. A detailed description of every independent variable can be found in Table 15 of Appendix A. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

3.5.3 Descriptive statistics by year

To understand how the values of the dependent variables of interest differ between the treatment and the control group around the year of intervention, that is, in 2020, the differences between the treatment and control group are computed for each year and shown in Table 3. For the investment spell measures, 2018 is omitted because this is the first year of observation, which means that all spells are equal to zero in that year.

In Panel A, the differences in the mean for *TFA spell industry 2* are first displayed for the blacklist sample and then for the full sample. For the blacklist sample, almost all differences are significantly different from zero at a one percent level. Only the significance in 2019 is lower, at a level of five percent. It can be observed that the differences are increasing over the years in the blacklist sample.

In the full sample, only the difference in the year after the intervention, which is 2021, is significantly different from zero, while in all other years, the spells do not differ significantly. The sample size is relatively constant over the years, indicating that observed differences are less likely to stem from substantially different amounts of observations each year. For the intangible fixed assets measure, the difference is significantly different from zero at a one percent level in 2019, whereas it is not in the other years.

In Panel B, the same statistics are shown for the investment level measures. For the tangible fixed assets measure in the blacklist sample, the difference between both groups again is statistically significantly different from zero at a one percent level in 2018, 2021, and 2022 and at a five percent level in 2019 and 2020. However, when looking at the full sample, no significant differences are observed in 2018, 2019, and 2020, whereas the groups do differ significantly at a five and one percent level in 2021 and 2022, respectively. As these two years are right after the year of intervention, these statistics provide some indications that there might be an effect after the intervention. Finally, when considering the *IFA Investment industry* measure in the full sample, almost no differences between the treatment and control group are observed in all years, except for 2018.

Table 3: SUMMARY STATISTICS BY YEAR

Panel A: Investment timing analysis

Year	Mean Treatment group	Mean control group	Difference	t-statistic	p-value	N Treatment group	N control group
TFA spell industry 2: Blacklist sample							
2019	0.620	0.532	0.089	-2.26	0.024**	1,457	173
2020	1.061	0.745	0.316	-4.73	<0.000***	1,529	216
2021	1.540	0.983	0.558	-6.16	<0.000***	1,514	231
2022	1.951	0.500	1.451	-11.55	<0.000***	1,402	190
TFA spell industry 2: Full sample							
2019	0.620	0.603	0.018	-1.35	0.178	1,457	21,510
2020	1.061	1.044	0.018	-0.74	0.460	1,529	23,076
2021	1.540	1.478	0.063	-1.83	0.068*	1,514	23,224
2022	1.951	1.933	0.018	-0.40	0.691	1,402	22,023
IFA spell industry 2: Full sample							
2019	0.717	0.671	0.061	-2.76	0.006***	545	8,909
2020	1.276	1.205	0.052	-1.34	0.179	578	9,167
2021	1.816	1.781	-0.020	0.37	0.709	578	9,449
2022	2.275	2.286	-0.056	0.76	0.449	516	9,030

Panel B: Investment level analysis

Year	Mean Treatment group	Mean control group	Difference	t-statistic	p-value	N Treatment group	N control group
TFA Investment Industry: Blacklist sample							
2018	2.139	3.096	-0.957	3.83	<0.000***	1,403	258
2019	2.403	3.146	-0.743	2.40	0.017**	1,457	173
2020	2.114	2.662	-0.549	1.98	0.047**	1,529	216
2021	2.261	3.221	-0.959	3.45	0.001***	1,514	231
2022	2.408	3.603	-1.194	3.74	<0.000***	1,402	190
TFA Investment Industry: Full sample							
2018	2.139	2.202	-0.063	0.69	0.488	1,403	19,948
2019	2.403	2.268	0.135	-1.45	0.146	1,457	21,509
2020	2.114	2.234	-0.120	1.32	0.187	1,529	23,076
2021	2.261	2.065	0.197	-2.25	0.024**	1,514	23,224
2022	2.408	2.140	0.269	-2.90	0.004***	1,402	22,023
IFA Investment Industry: Full sample							
2018	3.291	2.389	0.902	-2.48	0.013**	531	8,462
2019	3.034	2.495	0.539	-1.51	0.130	545	8,909
2020	2.536	3.047	-0.510	1.44	0.149	578	9,167
2021	2.925	2.682	0.243	-0.68	0.494	578	9,449
2022	2.587	2.784	-0.196	0.52	0.602	516	9,030

Notes: This table shows the mean of the investment spell between two investment spikes, split by the treatment and the control group for both the blacklist and the full sample. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

3.5.4 Descriptive statistics propensity score matching sample

As can be read in the next section, a propensity score matching procedure will be applied in this study. To assess whether the matching process has resulted in comparable groups in terms of firm characteristics, the difference between the means of the treatment and control group for each covariate is tested on being statistically significantly different from zero using t-tests in Table 4. Small differences between both groups are observed. For example, the total assets of a firm in the treatment group, on average, amount to 55.0 million euros, while this is 57.4 million euros in the control group. Similarly, the groups have a difference in profitability of 0.2 percentage points. This results in very small t-statistics, which in turn translates into high and thus insignificant p-values. Hence, it can be concluded that the matching process indeed resulted in comparable groups in terms of the covariates specified.

Table 4: DIFFERENCES IN VARIABLES PER GROUP AFTER MATCHING

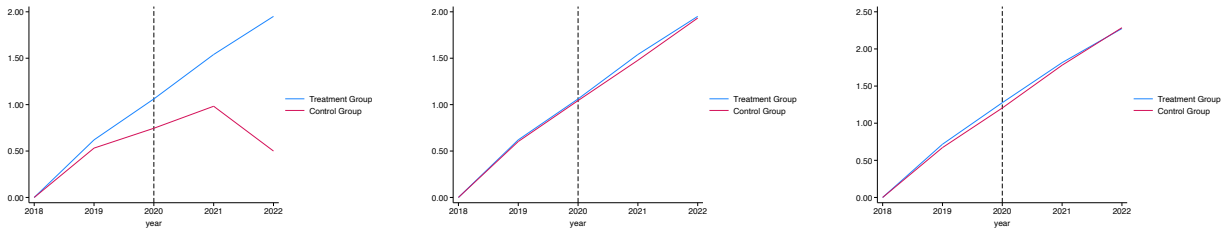
	Treatment	Control	Difference	t-statistic	P-value
Cash Flow 3yr	0.226	0.220	0.006	1.04	0.297
Intangibles	10.641	10.686	-0.045	-0.43	0.667
Leverage	0.687	0.681	0.006	1.16	0.246
Profitability	0.036	0.034	0.002	1.10	0.273
Loss	0.272	0.283	-0.011	-1.43	0.153
Sales Growth	0.042	0.045	-0.003	-0.48	0.634
Size	17.824	17.865	-0.041	-0.99	0.324
Working Capital	0.062	0.059	0.003	0.68	0.499
Tax Complexity	0.457	0.456	0.001	1.22	0.222

Notes: This table shows the means of the treatment and control group and the differences between them in the full sample after the propensity matching process is applied. A detailed description of every independent variable can be found in Table 15 of Appendix A. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

3.6 The parallel trends assumption

An important assumption of a DID design is that the treatment and control groups experience parallel trends in investment behavior before the intervention. This assumption, in short, means that the treatment and the control groups should show similar patterns in terms of the outcome variable before the intervention, which is the mentioned change in the EU blacklist in 2020. To test this assumption visually, the means of the respective dependent variables for investment spells are plotted in Figure 1. In panel 1a, the mean of *TFA spell industry 2* in the blacklist sample is shown, whereas the same plot is made for the full sample in panel 1b. Panel 1c then shows the mean of *IFA spell industry 2* in the full sample.

In panel 1a, a more or less parallel trend can be observed before the year of intervention, represented via the vertical dotted line, as the lines seem to move in the same direction. In panels 1b and 1c, the means are almost identical for the entire sample period. On the one hand, this means that the assumption of parallel trends is not violated with high certainty, but on the other hand, it indicates that there might be no effect on the timing of investments when considering the full sample. Thus, based on this visual inspection, I assume the parallel trends assumption to hold in further analysis.



(a) Mean investment spell using the *TFA spell industry 2* measure in the Blacklist sample

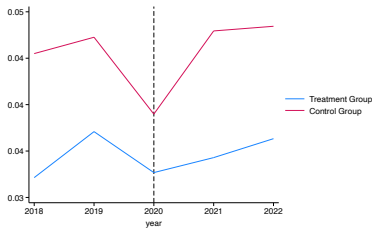
(b) Mean investment spell using the *TFA spell industry 2* measure in the Full sample

(c) Mean investment spell using *IFA spell industry 2* measure in the Full sample

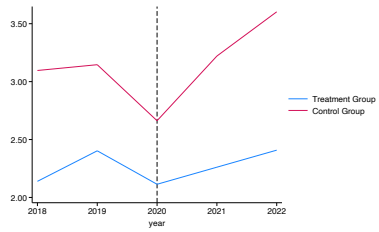
Figure 1: Investment spell means by year, split by the treatment and control group

Next, the median investment level using *TFA Investment*, *TFA Investment Industry*, *IFA Investment*, and *IFA Investment Industry* is plotted in Figure 2. When looking at *TFA Investment* and *TFA Investment industry* in panels 2a and 2b using the blacklist sample, a parallel trend is visible before 2020 for *TFA Investment industry* as both lines move into the same direction. The same holds for panels 2c and 2d for the full sample. However, there is an indication that the parallel trends assumption might be violated in panel 2e using the *IFA Investment industry* measure in the full sample before 2019 as the mean for the treatment group is increasing between 2018 and 2019, whereas it is decreasing for the control group in that period. Finally, a clear violation of the parallel trends assumption is observed for *IFA Investment industry* before 2019 in panel 2f. Therefore, I only include the years after 2018 in the analysis of these measures.

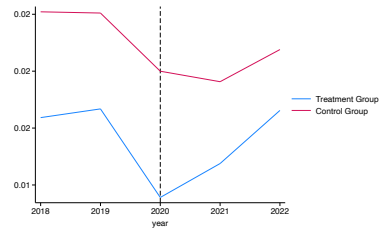
To conclude, a parallel trend can be observed for most of the measures used, and I will assume that this assumption holds when performing any further analysis.



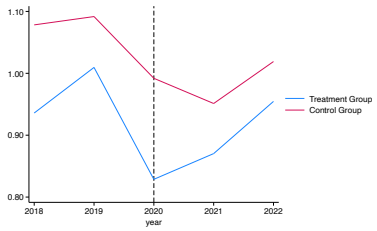
(a) Median of *TFA Investment* per year (blacklist sample)



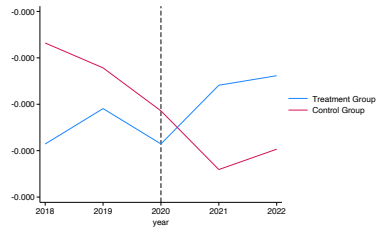
(b) Median of *TFA Investment industry* per year (blacklist sample)



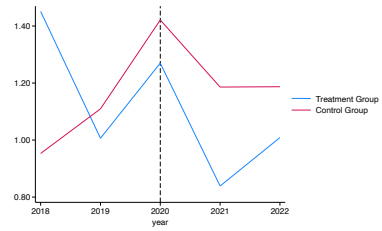
(c) Median of *TFA Investment* per year (full sample)



(d) Median of *TFA Investment industry* per year (full sample)



(e) Median of *IFA Investment* per year (full sample)



(f) Median of *IFA Investment industry* per year (full sample)

Figure 2: The medians of the investment level measures per year, split by the treatment and control group

4 Methodology

In this section, the methods used in the analysis are discussed. The analysis is split into a part that considers the effect of tax uncertainty on the timing of investments and a part that considers the effect on the magnitude of investments. First, the methods used in the investment timing analysis are discussed before the investment level analysis methods are presented. The section ends with a discussion of the propensity score matching method, which is applied to the analysis of both the investment timing and the investment level effects.

4.1 Investment timing analysis

Prior literature has used either hazard models to analyze the spell length of time between two large investments (Billett et al., 2011; Jacob et al., 2022; Whited & Wu, 2006) or panel regressions (Jacob et al., 2022). Consistent with these papers, I will use both hazard models and panel regressions to investigate the effect of tax uncertainty arising from the blacklist on the timing of investments. Besides, I use propensity score matching as an additional method.

4.1.1 Panel regression analysis

The formal representation of the panel regressions is shown in Equation 2. The main dependent variable of interest is the spell length in years between two investment spikes, as described in Section 3 and in Table 14 in Appendix A.

$$\begin{aligned} InvestmentSpell_{i,t} = \alpha_i + \zeta_t + \beta_1 \times Post_{i,t} \times Treatment_i \\ + \beta_2 \times Post_{i,t} + \beta_i \times X_{i,t} + \epsilon_{i,t} \end{aligned} \tag{2}$$

In this equation, the coefficient β_1 captures the average treatment effect of tax uncertainty coming from the change in the EU blacklist on the spell between two investment spikes of a company. Firm-fixed effects are included by the term α_i, controlling for time-invariant firm characteristics influencing both investments and tax uncertainty, while time-fixed effects are added through ζ_t to control for common year-specific effects influencing the results. Note that $Treatment_i$ itself is excluded from the regressions, as $Treatment_i$ is firm-specific and time-invariant. Hence, there would be perfect multicollinearity between the firm-fixed effects and $Treatment_i$ if it were included in the regression. Hausman tests will be performed to check whether a fixed effects model should be estimated or whether a random effects model yields more efficient estimators. Besides, the Breusch-Pagan test will be used to check for the presence of heteroscedasticity. If indeed the variance of the errors is not constant, *robust standard errors* clustered at the firm level will be used to account for this problem.

To reduce endogeneity concerns, the estimated effects are controlled by several control variables likely to influence both $InvestmentSpell_{i,t}$ and tax uncertainty. These variables

are displayed in Equation 2 via $X_{i,t}$. Each independent variable used in any of the analyses is described in Table 15 in Appendix A.

To determine which variables should be included in $X_{i,t}$, a model specification procedure is implemented, which starts with a baseline regression without any control variables. Next, in every step, one extra control variable is added to the regression in order to determine whether it is relevant in the model. If a control variable is insignificant or does not change the size or significance of the coefficient of the main independent variable of interest, *Treatment* × *post*, it is not included in the analysis. Besides, Aikaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are considered in each step. The entire procedure for the investment spell measures *TFA spell industry 2* and *IFA spell industry 2* is displayed in Table 26 and Table 27 in Appendix C, respectively. The procedures result in the inclusion of *ETR 3yr*, *Profitability*, *Loss*, *Sales Growth*, *Size*, *Tax Complexity*, and *Tax Complexity* × *Size* for the regressions estimating the effects of tax uncertainty on tangible fixed assets investments. For investments in intangible assets, the variables *Sales Growth* and *Size* are included. Below, I provide explanations for including each control variable in the model specification process.

To begin with, multiple control variables used by Whited and Wu (2006), Billett et al. (2011), Hanlon et al. (2017) and Jacob et al. (2022) are considered to be included in the final model. First, *Cash Flow 3yr* accounts for investment opportunities as more cash available to a firm might increase the probability that it will invest, affecting the timing of investments. In addition, higher cash flows can provide more certainty within a company, as more internal cash is available to use if resources are needed to adapt to rapidly changing business conditions. Second, *Sales Growth* is used as a proxy for innovation, and *Working Capital* accounts for alternative fund sources for investments. Innovation can impact investments as more innovative companies are likely to invest more. At the same time, innovation can also affect tax uncertainty as innovative companies mostly make use of complex tax incentives such as tax credits, which can create uncertainty if a firm is unsure whether it can benefit from these tax provisions.

Third, general firm characteristics such as size, proxied by the natural logarithm of total assets, and leverage are included. Larger firms might experience different amounts of uncertainty than smaller firms because these corporations are likely to have more expertise on taxes, resulting in less uncertainty. Besides, larger enterprises might invest relatively less in tangible assets as a percentage of total assets than small corporations, as these firms have larger amounts of total assets, reducing the ratio. Furthermore, higher leverage levels typically result in higher interest payments. Although interest costs, in general, are deductible from taxable income, many countries have specific regulations that restrict the deductibility of interest costs. Hence, this might create uncertainty for firms if it is unclear whether the interest costs are indeed deductible from taxable income. In addition, De Angelo et al. (2011) show a relationship between leverage and investment spikes.

Besides, *ETR 3yr* captures a firm's three-year average effective tax rate, which enables me to control for tax avoidance effects. As De Simone et al. (2020) point out, using the ETR

is a good proxy for tax avoidance in the absence of tax reserves on which Amadeus does not provide data. As tax avoidance can result in tax uncertainty according to Saragih and Ali (2023), it is likely to affect tax uncertainty. Besides, a lower ETR results in a lower tax burden for a company, meaning more resources are available for investments. Furthermore, a firm's profitability is included because the results of Lin et al. (2019) suggest a relationship between profitability and tax risk. Besides, more profitable firms are likely to have more cash available to use in new investments.

In addition, the results of Dyreng et al. (2019) indicate that tax-avoiding firms experience higher tax uncertainty, especially when these firms have relatively many intangible assets. Hence, a potential problem when examining the effect of tax uncertainty on tangible fixed assets investments is the biasing effect of tax avoidance via the use of intangible assets. Therefore, I also control for the amount of intangible fixed assets of a firm when estimating tangible fixed investment effects.

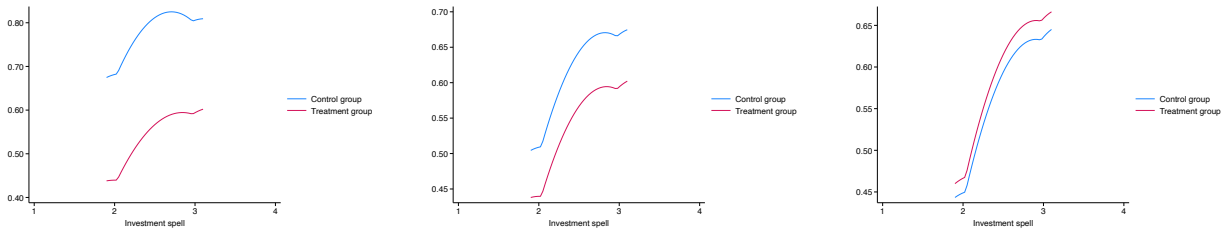
Finally, *Tax Complexity* controls for the complexity of a country's tax system. Amberger et al. (2023) showed that the increasing complexity of tax systems resulted in lower effects of fiscal investment incentives. Besides, uncertainty arising from legislation uncertainty is a source of tax uncertainty, according to Saragih and Ali (2023). Hence, this is a country-specific and time-varying variable that is likely to influence both investment behavior and uncertainty. I include this variable, as firm-fixed effects do not account for time-varying characteristics, while the year-fixed effects only control for common year-specific factors across all countries. Thus, the fixed effects do not control for time-varying country-specific factors, such as the complexity of a country's tax system. The variable is constructed based on the tax complexity index created by Hoppe et al. (2023).[1]

This index is based on a wide range of complexity indicators, but I only consider three factors that are likely to be most relevant when examining the effects of a country being added to the EU blacklist. First, *Guidance* captures the extent to which the tax authorities provide guidance on resolving uncertain tax issues. Second, *Enactment* comprises the complexity and duration of the formal process for a tax proposal to become a law, which proxies the amount of time that is needed in a country to adopt measures against a new blacklisted country. Third, *General Anti-Avoidance* is a factor that shows the amount of broad and general regulations to prevent tax avoidance. Since the index is only updated once every two years, I take the mean of the index of the year before and the year after a missing year. *Tax Complexity* is then interacted with *Size*, as Amberger et al. (2023) found that the effects of tax complexity on investments are heterogeneous across firm size.

4.1.2 Hazard modelling

As a second method of analysis, hazard models are implemented to estimate the instant probability that an investment spike occurs, conditional on the time elapsed since the last investment spike. A plot of the smoothed hazard estimates of tangible and intangible fixed

[1]The data on the index are retrieved from the corresponding website: https://www.taxcomplexity.org/



(a) Hazard estimates for *TFA spell industry 2* (Blacklist sample)

(b) Hazard estimates for *TFA spell industry 2* (Full sample)

(c) Hazard estimates for *IFA spell industry 2* (Full sample)

Figure 3: Hazard estimates, split by $Treatment_i$. Panel A shows the estimates for the blacklist sample, whereas panels B and C correspond to the full sample.

assets investments is displayed in Figure 3 to determine which hazard model fits the data best. In each panel, the estimates are split by the treatment and the control group. Panel 3a is based on the blacklist sample, while panels 3b and 3c correspond to the full sample. In all three panels, the estimates are calculated for investment spikes of at least as large as two times the industry's median.

To begin with, the lines in panel 3a are moving in the same direction for each value of the investment spell, and it can be argued that the lines are parallel. The same holds in panel 3b, although the lines seem to diverge slightly as the investment spell becomes larger. This also applies to panel 3c. When the lines of the hazard estimates are parallel, the hazards change proportionally over time, resulting in a constant hazard ratio. Based on the visual inspection, I assume the hazards are proportional in the baseline models, and thus, a proportional hazards (PH) model will be applied. A parametric model is preferred, as it yields the most accurate predictions when it fits the data well. Since the hazards are increasing, using a Weibull PH model seems appropriate because this model allows the hazards to increase or decrease over time proportionally. An exponential distribution is applied as a robustness check, consistent with Jacob et al. (2022). Similar plots have been made for the other investment spike measures on which the investment spell is based and showed comparable results except for the *TFA spell industry 1.5* measure in the blacklist sample, as can be seen in Figure 5 in Appendix B. Hence, when considering the results from this measure, it should be taken into account that there might be a bias in the outcome.

Equation 3 displays the regression equation for the Weibull PH models. In this equation, $h_i(t|X_{i,t})$ captures the hazard rate of investment for firm i at time t, considering the covariates $X_{i,t}$ and given that it has not invested yet since the last investment spike. In other words, it covers the probability that a firm will make a large investment today, conditional on the time since its last investment spike. Based on the plots with increasing hazard estimates, the baseline hazard, h_0, is expected to increase over time. This is implemented via the parameter ρ, also known as the 'shape parameter'. Therefore, it is expected that the shape parameter is larger than 1.

The remaining part of the model is similar to the panel regression models; firm and year-fixed effects are included via α_i and ζ_t and the same control variables based on the

mentioned model specification procedures are added to the regression.

$$h_i(t|X_{i,t}) = h_0 \times t \times \rho^{\rho-1} \times \exp(\alpha_i + \zeta_t + \beta_1 \times Post_{i,t} \times Treatment_i + \beta_2 \times Post_{i,t} + \beta_i \times X_{i,t}) + \epsilon_{i,t} \tag{3}$$

4.2 Investment level analysis

For the analysis of investment level effects of tax uncertainty, panel regressions are used. Equation 4 shows the corresponding regression equation, where $Investment_{i,t}$ can be either $TFA\ Investment_{i,t}$, $TFA\ Investment\ Industry_{i,t}$, $IFA\ Investment_{i,t}$, or $IFA\ Investment\ Industry_{i,t}$. The explanation of the difference between these variables can be found in Section 3 and in Table 14 in Appendix A.

Other than the dependent variables, there are no differences in the methods used in Equation 4 compared to Equation . However, the outcome of the model specification tests is different, as can be seen for *TFA Investment industry* in Table 28 of Appendix C, and for *IFA Investment industry* in Table 29 of Appendix C. This time, *Cash Flow 3yr*, *Intangibles*, *Leverage*, *Profitability*, *Loss*, *Sales Growth*, and *Size* are included in the regressions considering tangible fixed assets investments, whereas *Cash Flow 3yr*, *Profitability*, *Sales Growth*, and *Size* are used when estimating the effects on intangible fixed assets investments. As a robustness check, the model will be estimated using industry, country, and year-fixed effects instead of firm and year-fixed effects in the main specification.

$$Investment_{i,t} = \alpha_i + \zeta_t + \beta_1 \times Post_{i,t} \times Treatment_i + \beta_2 \times Post_{i,t} + \beta_i \times X_{i,t} + \epsilon_{i,t} \tag{4}$$

4.3 Propensity Score matching

As a different way of testing the investment effects of tax uncertainty arising from the change in the EU blacklist, a propensity score matching process is implemented by using the guidelines of Caliendo and Kopeinig (2008). The process works as follows.

First, a probit regression is estimated, with $Treatment_i$ as the dependent variable. To use the most appropriate model in explaining $Treatment_i$, again, the same model selection approach as for the other models is used. However, the 'base' model now starts with only year, industry, and country dummies. Next, the same covariates as in the regression model selection procedure are added step-by-step to determine whether the variable is relevant in explaining $Treatment_i$. The results from this procedure are shown in Table 30 in Appendix C. Based on these results, *Cash Flow 3yr*, *Intangibles*, *Leverage*, *Profitability*, *Loss*, *Working Capital*, *Size*, and *Tax Complexity* are used to estimate the propensity scores.

After estimating the propensity scores, the firms are matched by applying the *Nearest Neighbor (NN) Matching* method, in which all treated firms are matched with three untreated ones with the closest propensity scores. An advantage of NN matching is that it accounts better for the *overlap* condition than other methods (Caliendo & Kopeinig, 2008).

The *overlap* assumption means that firms with the same characteristics should have a positive probability of being treated or not. In other words, it should be avoided that incomparable firms are compared (Dehejia & Wahba, 1999). As NN matching only matches firms with the three closest propensity scores in the sample, incomparable firms are unlikely to be compared. Besides, to further improve the matching quality, I use replacement of observations, as this reduces the bias according to Caliendo and Kopeinig (2008). Furthermore, treatment observations for which the propensity score is higher than the maximum or lower than the minimum propensity score of the control group are excluded from the matching process, and the 2.5 percent of the treatment observations where the density of the propensity score of control observations is the lowest, are excluded from the analysis.

To visually check the overlap assumption following Lechner (2001), the propensity score distribution for the treated and untreated firms is displayed in Figure 4. The figure indicates that most treated observations are supported by control observations, as the density of propensity scores is comparable between both groups. The 'unsupported' observations are displayed on the right-hand side of the figure and represent 182 treatment observations. This results in total treatment observations with support of 7,123, supported by 109,750 control observations.

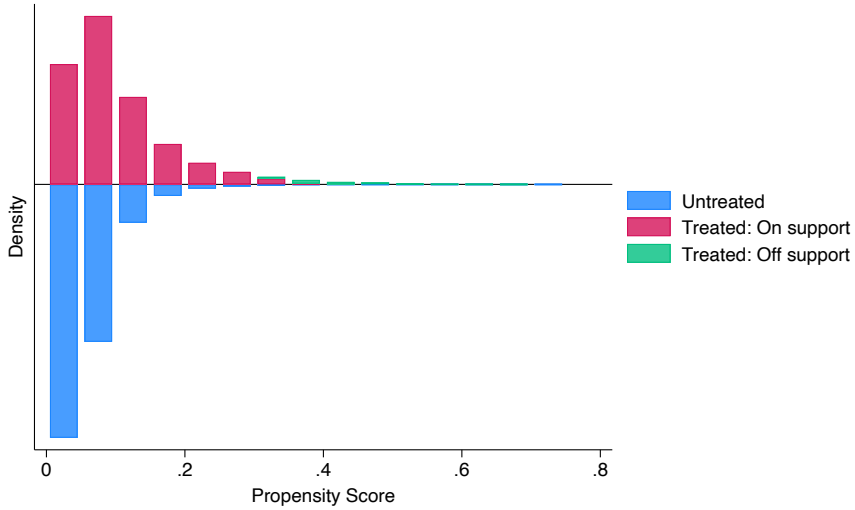


Figure 4: Propensity score distribution using the full sample

To test whether the matching process resulted in comparable treatment and control groups, I performed t-tests to compare the means of the covariates used in the probit regression to determine whether they differed significantly after the matching. As can be read in the previous section, the treatment and control groups in the matched sample do not differ significantly from one another in terms of the control variables, indicating that the matching process has resulted in comparable groups.

After completing the matching process, the final step is to estimate the average treatment effect on the various definitions of the investment spells and investment level using a univariate regression.

5 Results

In this section, the results of the analyses are described. To begin with, the outcomes regarding investment timing and investment-level effects of tax uncertainty to assess the first hypothesis are discussed. Next, the results of the second and third hypotheses are presented. The section concludes with a discussion of several robustness checks.

5.1 Investment timing analysis

In this subsection, the results of the investment timing analysis are presented for each applied method.

5.1.1 Panel regression analysis

The results of the panel regression analysis are shown in Table 5. The Hausman tests, displayed in Table 17 in Appendix B, show that the null hypothesis of random effects being more efficient is rejected at a one percent significance level. Therefore, in all models, firm and year-fixed effects are applied. The Breusch-Pagan test results, covered in Table 18 in Appendix B, show the presence of heteroscedasticity in all models except for the regressions in columns one and seven of Table 5. However, robust White standard errors clustered at the firm level are applied in every regression to be consistent across models.

The first six columns in Table 5 display the effects of tax uncertainty arising from the EU blacklist on the investment spells of tangible fixed assets investments, whereas columns seven to nine comprise the effects on intangible fixed assets investments. The results in the first three columns are obtained from the blacklist sample, while the results in the other columns stem from the full sample. The control variables, in general, show expected signs. For example, the coefficients of *ETR 3yr*, *Profitability* and *Tax Complexity* are positive in most columns, indicating that firms with a higher effective tax rate, higher profitability, and firms subject to more complex tax systems, on average have longer investment spells. On the other hand, *Loss* and *Size* show negative signs, indicating that loss-making firms and larger firms are associated with shorter spells between investments. For example, in column five, the at one percent significant coefficient of *Size* implies that an increase of one percent in a firm's total assets is associated with a decrease of 0.231 years in the time between two investments of at least two times the industry's median investment rate. The coefficient of *Sales Growth* is negative but insignificant in the blacklist sample models, while it is positive and significant when using the full sample. However, it should be noted that not all coefficients of these control variables are significant, and thus, no conclusions can be drawn on any causal effects of these variables.

When considering the main results of the blacklist sample analysis in columns one, two, and three, a positive and significant coefficient of $Treatment \times post$ is observed. The significance level is one percent for the models considering the *TFA spell industry 1.5* and *TFA spell industry 2.5* measure, while it is five percent for *TFA spell industry 2*. The

coefficient of $Treatment \times post$ of 0.349 in column three implies, for example, that the tax uncertainty arising from a change in the EU blacklist, on average, results in a delay of 0.349 years for investments that are at least 2.5 times higher than the industry's median investment rate, compared to firms not having experienced such a change. This effect seems stable across different measures of investment spikes, as the mentioned coefficient is comparable in size in all three columns.

Next, when assessing the same dependent variables but applied to the full sample instead of the blacklist sample in columns four to six, the coefficient of $Treatment \times post$ remains positive, but the earlier observed significance disappears. Hence, no statistical inference can be made based on the investment timing results using the full sample.

Finally, the last three columns show the effects on intangible fixed assets investments in the full sample. As opposed to the other results, the coefficients of $Treatment \times post$ are negative, implying that the EU blacklist resulted in shorter delays of investments in intangibles. However, the average treatment effect in the models considering the intangible fixed assets measures is insignificant, and thus, it is concluded that no effects are found for this type of investment.

Table 5: INVESTMENT TIMING EFFECTS: PANEL REGRESSION

	TFA spell industry 1.5	*TFA spell industry 2*	*TFA spell industry 2.5*	*TFA spell industry 1.5*	*TFA spell industry 2*	*TFA spell industry 2.5*	*IFA spell industry 1.5*	*IFA spell industry 2*	*IFA spell industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment × post	0.309***	0.302**	0.349***	0.063	0.073	0.045	-0.048	-0.041	-0.007
	(0.09)	(0.10)	(0.10)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.06)
post	1.579***	1.925***	2.092***	-0.172	-0.131	-0.095	-0.288	-0.217	-0.226
	(0.09)	(0.10)	(0.10)	(0.11)	(0.12)	(0.11)	(0.20)	(0.20)	(0.21)
ETR 3yr	0.023	-0.006	0.036	0.080**	0.100***	0.086***			
	(0.09)	(0.08)	(0.08)	(0.02)	(0.02)	(0.02)			
Profitability	0.041	0.024	0.070	0.015	0.009	-0.003			
	(0.19)	(0.19)	(0.20)	(0.06)	(0.06)	(0.06)			
Loss	-0.029	-0.025	-0.029	-0.026	-0.026	-0.020			
	(0.05)	(0.05)	(0.05)	(0.01)	(0.01)	(0.01)			
Sales Growth	-0.049	-0.055	-0.050	0.082***	0.089***	0.080***	0.064***	0.065***	0.067***
	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Size	-0.069	-0.052	-0.041	-0.239***	-0.231***	-0.229***	-0.065*	-0.057	-0.046
	(0.06)	(0.06)	(0.06)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Tax Complexity	2.482***	1.874**	1.944**	2.053***	1.911***	1.753***			
	(0.68)	(0.70)	(0.71)	(0.27)	(0.28)	(0.28)			
Tax Complexity × Size	-0.113	-0.100	-0.055	-0.313**	-0.248*	-0.099			
	(0.24)	(0.24)	(0.24)	(0.10)	(0.10)	(0.10)			
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Blacklist	Full	Full	Full	Full	Full	Full
No. of observations	6,496	6,496	6,496	93,964	93,964	93,964	38,577	38,577	38,577
Adj. R-squared	0.48	0.56	0.62	0.47	0.55	0.61	0.31	0.28	0.26

Notes: This table shows the results derived from applying Equation 2 on the blacklist sample (columns one to three) and the full sample (columns four to nine). The dependent variables are the spells between a firm's investment spikes. The measure used in each column to determine an investment spike is shown. For example, *TFA spell industry 1.5* in column one shows the investment spell between tangible fixed assets investments larger than 1.5 times the median investment rate in a firm's industry. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.1.2 Hazard model analysis

Next, to further assess the effects of tax uncertainty on the timing of investments, the outcomes of the hazard models are presented in Table 6. The results are displayed in hazard ratios, and the covariates are standardized at a mean of zero and a standard deviation of one

for interpretation purposes. Again, the dependent variable in the first six columns is based on tangible fixed assets investments, while it is based on intangible fixed assets investments in the last three columns. The blacklist sample is represented in columns one up to three, and the full sample is used in columns four up to nine. The shape parameter ρ is statistically significant for all models and is larger than one, implying that the hazards increase over time, and thus, the application of the Weibull distribution seems appropriate compared to an exponential distribution. The hazard ratios of *ETR 3yr*, *Size*, and *Tax Complexity* are smaller than one in most columns, indicating a negative effect on the investment hazard, albeit insignificant. For example, the hazard ratio of 0.895 of *Size* in column four implies that a one standard deviation increase in the natural logarithm of total assets results in an 11.5 percent decrease in the hazard rate of investment. This can be interpreted as an 11.5 percent decrease in the probability of investing today as a function of the time elapsed since the last investment spike. Furthermore, *Profitability*, *Loss*, *Sales Growth* and *Tax Complexity* $\times$ *Size* mostly have hazard ratios greater than one, implying a positive relationship.

Turning to the main results, the hazard ratio of $Treatment \times post$ in the first three columns is smaller than one and significantly different from zero at a five percent level in columns one and two and at a 10 percent level in column three. For example, the hazard ratio of 0.389 in the second column implies that at a given moment in time, the probability of a firm investing at least two times the industry's median investment rate after it was exposed to the change in the EU blacklist, given that it has not made such an investment yet, is 0.389 times the probability of a firm that was not exposed to such a change. Or in other words, the probability of investing today at least two times the industry's median investment rate was 61.1 percent lower for firms exposed to tax uncertainty arising from changes in the EU blacklist, given that it has not made such an investment yet since the last investment spike.

Second, when considering the full sample instead of the blacklist sample in columns four to six, the hazard ratio of $Treatment \times post$ again is smaller than one. This would indicate a lower investment hazard for treatment firms due to tax uncertainty arising from changes in the EU blacklist. However, the hazard ratios are insignificant across all three measures of investment spells, and hence, no statistical inference can be made from this.

Third, the results of the intangible fixed assets investments in the full sample are shown in columns seven to nine. The hazard ratio of $Treatment \times post$ is smaller than one, again implying negative effects of tax uncertainty on the timing of intangible fixed assets investments. However, the hazard ratios are not significantly different from zero, meaning no conclusions can be drawn on intangible fixed assets investments.

Table 6: INVESTMENT TIMING EFFECTS: HAZARD MODEL

	TFA spike industry 1.5	*TFA spike industry 2*	*TFA spike industry 2.5*	*TFA spike industry 1.5*	*TFA spike industry 2*	*TFA spike industry 2.5*	*IFA spike industry 1.5*	*IFA spike industry 2*	*IFA spike industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment × post	0.355**	0.389**	0.434*	0.984	0.960	0.995	0.965	0.967	0.950
	(0.13)	(0.13)	(0.15)	(0.06)	(0.05)	(0.05)	(0.04)	(0.05)	(0.04)
post	0.001***	0.001***	0.001***	1.738	1.286	0.837**	0.000***	0.000***	0.000***
	(0.00)	(0.00)	(0.00)	(1.21)	(0.52)	(0.05)	(0.00)	(0.00)	(0.00)
ETR 3yr	1.029	0.990	0.947	0.966*	0.975	0.978			
	(0.07)	(0.07)	(0.09)	(0.02)	(0.02)	(0.02)			
Profitability	0.978	1.028	1.064	1.025	1.023	1.025			
	(0.06)	(0.07)	(0.08)	(0.01)	(0.01)	(0.01)			
Loss	1.074	1.184	1.248	1.052	1.061*	1.046			
	(0.11)	(0.15)	(0.17)	(0.03)	(0.03)	(0.03)			
Sales Growth	1.000	1.016	1.031	1.004	1.011	1.002	0.999	1.003	0.996
	(0.04)	(0.05)	(0.06)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	0.964	0.956	0.962	0.895***	0.883***	0.890***	1.013	1.015	1.017
	(0.04)	(0.04)	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tax Complexity	0.815**	0.805**	0.731***	0.836***	0.829***	0.826***			
	(0.05)	(0.06)	(0.06)	(0.01)	(0.01)	(0.01)			
Tax Complexity × Size	0.998	1.040	1.049	1.085***	1.095***	1.097***			
	(0.05)	(0.05)	(0.07)	(0.02)	(0.02)	(0.02)			
Constant	1.034	0.987	0.973	1.005	1.016	1.020	0.997	0.996	0.996
	(0.06)	(0.06)	(0.06)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
$\ln(\rho)$	1.834***	1.842***	1.780***	1.929***	1.936***	1.918***	2.245***	2.235***	2.217***
	(0.10)	(0.11)	(0.10)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Blacklist	Full	Full	Full	Full	Full	Full
No. of observations	6,496	6,496	6,496	93,964	93,964	93,964	38,577	38,577	38,577
Chi^2	166.17	174.42	199.91	1783.80	1841.35	1855.99	636.56	638.04	648.85

Notes: This table shows the results derived from applying Equation 3 on the blacklist sample (columns one to three) and the full sample (columns four to nine). The dependent variables are the hazards of the various investment spikes. For example, *TFA spike industry 1.5* in column one shows the hazard of investment spikes of tangible fixed assets investments larger than 1.5 times the median investment rate in a firm's industry. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. A Weibull proportional hazards model is applied, and the results are presented in hazard ratios. All financial ratios are winsorized at the 2.5% level. Variables are standardized with a mean of zero and a standard deviation of one. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.1.3 Propensity score matching analysis

Finally, the propensity score matching results are shown in Table 7. As opposed to the results derived from the panel regressions and the hazard models, all coefficients are now highly significant. The sign in all columns is positive. For example, when looking at *TFA spell industry 2* as the dependent variable of interest, firms that were exposed to the change in the EU blacklist, on average delayed investments of at least 2.5 times the firm-median investment level by 0.168 years compared to firms that did not experience such a change. When using *TFA spell industry 2.5* as the investment spell measure, the effect becomes slightly larger with a delay of 0.177 years. Comparing these results with the results obtained from the panel regression, it can be noted that the effect size for the various tangible fixed assets investment spike measures is smaller compared to the results from the blacklist sample and larger compared to the results from the full sample. The significance improves for all measures.

Furthermore, the average treatment effect on the investment spells of intangible fixed assets investments in columns four, five, and six becomes positive and highly significant as opposed to the results presented before using regular panel regressions and hazard modeling. For instance, the coefficient of 0.162 in column five indicates an average delay of 0.162 years for investments in intangible fixed assets that are at least twice the median investment

rate in the firm's industry among firms exposed to changes in the EU blacklist, compared to non-exposed corporations. Hence, based on the propensity score matching results, tax uncertainty affects the timing of investments in intangible fixed assets.

Table 7: INVESTMENT TIMING ANALYSIS: PROPENSITY SCORE MATCHING

	TFA spell industry 1.5	*TFA spell industry 2*	*TFA spell industry 2.5*	*IFA spell industry 1.5*	*IFA spell industry 2*	*IFA spell industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment × *post*	0.148***	0.168***	0.177***	0.151***	0.162***	0.172***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Treatment	-0.000	-0.004	-0.011	-0.002	-0.002	-0.000
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
post	1.129***	1.335***	1.488***	1.635***	1.598***	1.571***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.286***	0.326***	0.357***	0.380***	0.372***	0.364***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
No. of observations	19,722	19,722	19,722	19,722	19,722	19,722

Notes: This table shows the results derived from applying the propensity score matching process. The measure used in each column to determine an investment spike is shown. For example, *TFA spell industry 1.5* in column one shows the investment spell between tangible fixed assets investments larger than 1.5 times the median investment rate in a firm's industry. A detailed description of every dependent variable can be found in Table 14 of Appendix A. White robust standard errors clustered at the firm lever are shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.2 Investment Level analysis

This subsection elaborates on the results of the panel regressions and propensity score matching method used to assess the investment-level effects of tax uncertainty.

5.2.1 Panel regression analysis

The results from the panel regressions in the investment level analysis are presented in Table 8. Again, fixed effects models are applied as the Hausman tests shown in Table 17 of Appendix B reject the null hypothesis of consistent random effect estimators. Besides, White robust standard errors are used in each model since the results of the Breusch-Pagan tests for heteroscedasticity indicate the presence of heteroscedasticity.

The first four columns in Table 8 show the investment level effects of tangible fixed assets investments. In columns one and two, the regressions are applied to the blacklist sample, and in columns three and four, to the full sample. Columns five and six show the results for intangible fixed assets investments in the full sample. The coefficients of *Cash flow 3yr*, *Intangibles*, *Sales Growth*, and *Size* are positive, while the signs of *Profitability* and *Loss* are negative in each column. The coefficient of *Leverage* is negative for the blacklist sample in columns one and two, while it is positive for the full sample in columns three and four. For example, based on column one, an increase of one percentage point in a firm's debt ratio, on average, results in a 1.6 percentage points lower investment rate. In contrast, an increase

of one percentage point in the debt ratio, on average, leads to an increase in the investment rate of 2.5 percentage points among firms in the full sample.

When looking at the main results on tangible fixed assets investments, a positive and insignificant coefficient of $Treatment \times post$ is observed for the regressions applied on the blacklist sample. Hence, there seems to be a positive association between tax uncertainty and the level of tangible fixed assets investments, but this cannot be statistically confirmed based on the results in the blacklist sample.

However, when looking at the results of the same model applied to the full sample in columns three and four, small and at 10 significant coefficients of $Treatment \times post$ can be observed. For example, the coefficient of 0.003 in column three implies that a firm exposed to tax uncertainty arising from the change in the EU blacklist, on average, invested 0.3 percentage points more in tangible fixed assets than firms not exposed to such a change. Similarly, the coefficient of 0.194 in column four suggests that these firms subject to the change in the EU blacklist, on average, had an investment rate that was 19.4 percentage points higher than the median investment level in the firm's industry compared to non-exposed firms.

Finally, when assessing the investment level effects of intangible fixed assets investments, the coefficient of $Treatment \times post$ is positive in column five, while it is negative in the sixth column. However, none of these coefficients is significantly different from zero, and hence, no effects of tax uncertainty on the level of investments in intangible fixed assets are found based on the results in columns five and six.

Table 8: INVESTMENT LEVEL EFFECTS: PANEL REGRESSIONS

	TFA Investment	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*IFA Investment*	*IFA Investment industry*
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment × post	0.004	0.392	0.003*	0.194*	0.005	-0.551
	(0.01)	(0.39)	(0.00)	(0.09)	(0.01)	(0.49)
post	-0.007	-0.543	0.000	0.263	0.028	-2.257
	(0.01)	(0.40)	(0.01)	(0.83)	(0.03)	(2.25)
Cash Flow 3yr	0.006	0.490	0.022***	1.359***	0.008	-0.585
	(0.01)	(0.36)	(0.00)	(0.10)	(0.01)	(0.52)
Intangibles	0.002***	0.127***	0.001***	0.085***		
	(0.00)	(0.03)	(0.00)	(0.01)		
Leverage	-0.016*	-0.692	0.025***	1.519***		
	(0.01)	(0.48)	(0.00)	(0.13)		
Profitability	-0.046**	-2.806**	-0.057***	-3.281***	0.021	-2.199*
	(0.01)	(1.00)	(0.00)	(0.24)	(0.01)	(1.07)
Loss	-0.009**	-0.470*	-0.003***	-0.164***		
	(0.00)	(0.20)	(0.00)	(0.04)		
Sales Growth	0.005	0.357*	0.015***	0.844***	0.006**	-0.568**
	(0.00)	(0.16)	(0.00)	(0.05)	(0.00)	(0.18)
Size	0.014***	0.772***	0.004***	0.223***	0.020***	-1.888***
	(0.00)	(0.21)	(0.00)	(0.05)	(0.00)	(0.33)
Working Capital					-0.010	0.861
					(0.01)	(0.51)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Full	Full
No. of observations	6,496	6,496	93,964	93,964	29,609	29,609
Adj. R-squared	0.04	0.03	0.04	0.03	0.01	0.01

Notes: This table shows the results from applying Equation 4 on the blacklist sample (columns one and two) and the full sample (columns four, five, and six). The dependent variables are the various investment measures; columns one to four correspond to tangible fixed assets investments, whereas columns five to eight correspond to intangible fixed assets investments. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.2.2 Propensity score matching analysis

The results of the propensity score matching analysis for assessing the effects of tax uncertainty on investment levels are presented in Table 9. First of all, it can be observed that the coefficient of *TFA Investment* does not change much in size compared to the results obtained from the regular panel regressions applied on the full sample, as the coefficient of $Treatment \times post$ increases by 0.001 to 0.004 in column one. Besides, the significance level stays relatively low at 10 percent. Secondly, the coefficient of *TFA Investment industry* in column two increases slightly from 0.194 to 0.242, while the significance level remains the same. Hence, it can be concluded that the effects of tax uncertainty coming from changes in the EU blacklist on the level of tangible fixed assets investments are positive, small, significant and robust to the methods used.

Next, turning to the results on the level of intangible fixed assets investments, no significant coefficient of $Treatment \times post$ can be found. Similar to the results in the panel regressions, the sign of the coefficient in the model using *IFA Investment* as the dependent variable is positive, while it is negative when using *IFA Investment industry*. Due to the lack of significance, it is concluded that no effects are found for investments in intangible fixed

assets.

Table 9: INVESTMENT LEVEL EFFECTS: PROPENSITY SCORE MATCHING

	TFA Investment	*TFA Investment industry*	*IFA Investment*	*IFA Investment industry*
	(1)	(2)	(3)	(4)
Treatment × *post*	0.004*	0.242*	0.011	-0.527
	(0.00)	(0.10)	(0.01)	(0.56)
Treatment	-0.004**	-0.304**	-0.008	0.723
	(0.00)	(0.09)	(0.00)	(0.46)
post	-0.003***	-0.213***	-0.001	0.085
	(0.00)	(0.06)	(0.00)	(0.27)
Constant	0.039***	2.521***	-0.028***	2.484***
	(0.00)	(0.05)	(0.00)	(0.22)
No. of observations	19,722	19,722	6,223	6,223

Notes: This table shows the results derived from applying the propensity score matching process. The dependent variables are the various investment measures; columns one and two correspond to tangible fixed assets investments, whereas columns three and four correspond to intangible fixed assets investments. A detailed description of every dependent variable can be found in Table 14 of Appendix A. White robust standard errors clustered at the firm level are shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.3 Hypothesis 1

The first hypothesis stated that tax uncertainty negatively affected the investments of public and private firms in the EU between 2018 and 2022.

First, considering the effects of tax uncertainty on the timing of investments using the blacklist sample, a clear effect is observed. The tax uncertainty coming from the change in the blacklist resulted in a delay of investments based on the panel regressions and in a decreased investment hazard as a function of the time since the last large investment. Besides, when using propensity score matching as the method of analysis, the delay of investments in tangible fixed assets is present in both samples. Additionally, significant delays in intangible fixed assets investments are observed when applying this method.

In conclusion, the null hypothesis of no effects or positive effects in the context of the first hypothesis should be rejected when assessing the investment timing effects of tax uncertainty for investments in tangible fixed assets. However, the results for investments in intangible fixed assets are mixed, and thus, the null hypothesis cannot be rejected.

Second, when examining the level of investments, positive signs but no significant effects are found for investments in tangible fixed assets using the blacklist sample, whereas positive and significant investment effects appear when considering the full sample. These significant positive effects are observed in both the panel regression and the propensity score matching results. In contrast, no effects are found in any of the analyses for investments in intangible fixed assets.

In summary, the null hypothesis of no effect or positive effects cannot be rejected when considering the effects on the level of investments in tangible fixed assets, as positive effects are discovered. Additionally, no evidence is found to reject the null hypothesis for investments in intangible fixed assets.

5.4 Subsample analysis: financial constraints

In this subsection, the results of the subsample analysis on financially constraint and financially unconstrained firms in assessing the second hypothesis, are presented. Since the baseline results only indicate effects on tangible fixed assets investments, I perform the subsample analysis on these investments. Besides, only the largest two investment spike measures are applied in the analysis as the largest effects are expected for these measures since financially constrained firms are likely to be more restricted on larger investments.

5.4.1 Investment timing analysis

In Table 10, the results of Table 5 are split into financially constrained firms in the first four columns and financially unconstrained firms in the last four columns. To begin with, for financially constrained firms in the blacklist sample, the coefficient of $Treatment \times post$ is positive and significant at a five percent level in columns one and two. Besides, the coefficients' size is comparable to those in columns two and three of the baseline results in Table 5. However, the significance vanishes when considering financially unconstrained firms in columns five and six. Hence, the main results in Table 5 seem to stem from financially unconstrained firms in the blacklist sample.

Next, when considering the effects in the full sample, again, a positive coefficient of $Treatment \times post$ is found for financially constrained firms in columns three and four of Table 10. Furthermore, the effect is significant at a 10 percent level when considering the *TFA spell industry 2* measure in column three, which contrasts with the insignificance of the coefficient in column five in Table 5. In addition, the significance of the effect disappears in the last two columns of Table 10 when performing the same analysis on financially unconstrained firms. In summary, the results indicate a small delay effect of investments as a result of tax uncertainty coming from a change in the blacklist among financially constrained firms in the full sample, while no effect is found for unconstrained firms.

Table 10: INVESTMENT TIMING EFFECTS: FINANCIALLY CONSTRAINED AND UNCONSTRAINED FIRMS

	Financially constrained				**Financially unconstrained**			
	TFA spell industry 2	*TFA spell industry 2.5*	*TFA spell industry 2*	*TFA spell industry 2.5*	*TFA spell industry 2*	*TFA spell industry 2.5*	*TFA spell industry 2*	*TFA spell industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment × post	0.380**	0.416**	0.124*	0.091	0.100	0.152	0.040	0.017
	(0.14)	(0.14)	(0.06)	(0.06)	(0.17)	(0.16)	(0.05)	(0.05)
post	1.815***	1.987***	-0.234	-0.255	2.168***	2.340***	-0.083	0.015
	(0.14)	(0.14)	(0.20)	(0.19)	(0.17)	(0.16)	(0.18)	(0.15)
ETR 3yr	-0.130	-0.090	0.058	0.073	0.044	0.094	0.120***	0.084**
	(0.15)	(0.15)	(0.04)	(0.04)	(0.11)	(0.10)	(0.03)	(0.03)
Profitability	0.077	0.158	0.124	0.100	-0.139	-0.068	-0.141	-0.145
	(0.26)	(0.27)	(0.08)	(0.08)	(0.29)	(0.29)	(0.09)	(0.09)
Loss	0.041	0.061	-0.031	-0.032	-0.068	-0.078	-0.034	-0.023
	(0.09)	(0.09)	(0.02)	(0.02)	(0.06)	(0.06)	(0.02)	(0.02)
Sales Growth	-0.017	-0.033	0.080***	0.073***	-0.063	-0.045	0.090***	0.082***
	(0.05)	(0.05)	(0.02)	(0.02)	(0.05)	(0.05)	(0.01)	(0.01)
Size	-0.137	-0.115	-0.224***	-0.229***	0.092	0.091	-0.165***	-0.156***
	(0.07)	(0.07)	(0.02)	(0.02)	(0.09)	(0.09)	(0.02)	(0.02)
Tax Complexity	1.174	1.142	1.781***	1.679***	2.522**	2.430**	2.076***	1.740***
	(1.19)	(1.22)	(0.39)	(0.39)	(0.88)	(0.88)	(0.43)	(0.42)
Tax Complexity × Size	-0.139	-0.211	-0.338*	-0.257	-0.352	-0.207	-0.334*	-0.120
	(0.39)	(0.39)	(0.15)	(0.15)	(0.34)	(0.34)	(0.14)	(0.14)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Blacklist	Blacklist	Full	Full
No. of observations	2,795	2,795	44,704	44,704	3,474	3,474	46,380	46,380
Adj. *R*-squared	0.54	0.59	0.51	0.58	0.59	0.64	0.57	0.64

Notes: This table shows the results derived from applying Equation 2 by splitting the sample into financially constrained (columns one to four) and unconstrained firms (columns five to eight), based on the Whited Wu index. The dependent variables are the spells between a firm's investment spikes. The measure used in each column to determine an investment spike is shown. For example, *TFA spell industry 2* in column one shows the investment spell between tangible fixed assets investments larger than two times the median investment rate in a firm's industry. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.4.2 Investment level analysis

To assess whether the results in Table 8 are different between financially constrained and unconstrained firms, the results of the subsample analysis for the investment level analysis are shown in Table 11.

First of all, considering the blacklist sample, the sign of the coefficient of $Treatment \times post$ in column one is negative, indicating a negative association between tax uncertainty and the magnitude of tangible fixed assets investments among financially constrained firms. The coefficient becomes positive when considering financially unconstrained firms in the blacklist sample in column five. The sign of the average treatment effect with *TFA Investment industry* as the dependent variable in the blacklist sample is positive, which is consistent with the corresponding positive coefficient in column three of the baseline results in Table 8. The coefficient of $Treatment \times post$ then remains positive when considering financially unconstrained firms in column six. Thus, no difference in sign is observed for this measure. Besides, none of the coefficients are significant, so no clear conclusions can be drawn based on these results.

Secondly, when looking at the results for financially constrained firms in the full sample in columns three and four of Table 11, again a negative and insignificant coefficient of $Treatment \times post$ is found, which contrasts to the positive and significant coefficient in

columns three and four of Table 8. Then, turning to the effects among financially unconstrained firms in columns seven and eight, a positive and highly significant coefficient of $Treatment \times post$ is found. Besides, the effect size is larger than the effects found in the baseline results. For example, the coefficient of $Treatment \times post$ in column five is 0.007, while it was 0.003 in column three of Table 8. The coefficient of 0.007 implies that financially unconstrained firms that were exposed to tax uncertainty arising from changes in the EU blacklist, on average, made investments in tangible fixed assets that were 0.7 percentage points higher than financially unconstrained firms not exposed to such a change. From these results of the subsample analysis of the investment level effects, it can be concluded that the effects of tax uncertainty on the magnitude of tangible fixed assets investments are driven by the degree of a firm's financial limitations.

Table 11: INVESTMENT LEVEL EFFECTS: FINANCIALLY CONSTRAINED AND UNCONSTRAINED FIRMS

	Financially constrained				**Financially unconstrained**			
	TFA Investment	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment × post	-0.002	0.137	-0.002	-0.075	0.012	0.785	0.007***	0.358***
	(0.01)	(0.55)	(0.00)	(0.16)	(0.01)	(0.64)	(0.00)	(0.11)
post	-0.007	-0.610	0.013	0.942	-0.012	-0.752	-0.013	-0.509
	(0.01)	(0.58)	(0.02)	(1.73)	(0.01)	(0.65)	(0.01)	(0.40)
Cash Flow 3yr	0.014*	0.984	0.025***	1.511***	0.001	0.328	0.020***	1.206***
	(0.01)	(0.51)	(0.00)	(0.15)	(0.01)	(0.51)	(0.00)	(0.13)
Intangibles	0.001	0.098*	0.001***	0.085***	0.002***	0.150***	0.001***	0.090***
	(0.00)	(0.05)	(0.00)	(0.01)	(0.00)	(0.04)	(0.00)	(0.01)
Leverage	-0.003	-0.143	0.030***	1.807***	-0.026**	-1.285*	0.022***	1.320***
	(0.01)	(0.80)	(0.00)	(0.20)	(0.01)	(0.58)	(0.00)	(0.18)
Profitability	-0.052**	-3.453*	-0.045***	-2.562***	-0.041	-2.381	-0.072***	-4.103***
	(0.02)	(1.36)	(0.01)	(0.36)	(0.02)	(1.60)	(0.01)	(0.35)
Loss	-0.003	-0.187	-0.000	-0.008	-0.011**	-0.632**	-0.005***	-0.310***
	(0.01)	(0.39)	(0.00)	(0.07)	(0.00)	(0.23)	(0.00)	(0.05)
Sales Growth	0.007	0.521*	0.013***	0.759***	0.003	0.261	0.016***	0.914***
	(0.00)	(0.25)	(0.00)	(0.07)	(0.00)	(0.21)	(0.00)	(0.06)
Size	0.011*	0.566	0.004***	0.245**	0.022***	1.141***	0.006***	0.310***
	(0.00)	(0.30)	(0.00)	(0.07)	(0.00)	(0.32)	(0.00)	(0.08)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Blacklist	Blacklist	Full	Full
No. of observations	2,795	2,795	44,704	44,704	3,474	3,474	46,380	46,380
Adj. R-squared	0.02	0.02	0.03	0.03	0.07	0.06	0.05	0.05

Notes: This table shows the results from applying Equation 4 by splitting the sample into financially constrained (columns one to four) and unconstrained firms (columns five to eight), based on the Whited Wu index. The dependent variables are the various tangible fixed asset investment measures. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.5 Hypothesis 2

The second hypothesis stated that the effect of tax uncertainty on corporate investments among public and private firms in the EU between 2018 and 2022 is stronger for financially constrained firms.

When looking at the effects on investment timing, it can be concluded that investment delays mostly occur among financially constrained firms, as only significant effects are found for these firms. Furthermore, when assessing the effects on the level of investments, the positive effects of tax uncertainty found in the aggregated results seem to stem to a large extent

from financially unconstrained firms. All in all, the null hypothesis of no difference in the effects of tax uncertainty on investments between financially constrained and unconstrained firms should be rejected.

5.6 Subsample analysis: the complexity of a country's tax system

This subsection presents the results of the second subsample analysis, in which the samples are split into firms located in countries with more complex tax systems and countries with less complex tax systems in order to examine the third hypothesis. Again, for the same reason mentioned above, I only consider tangible fixed assets investments and the largest two investment spike measures.

5.6.1 Investment timing analysis

Table 12 displays the investment timing effects, split by the tax system's complexity. The coefficient of $Treatment \times post$ is positive in each column for both complex and less complex tax systems. Next, when looking at the first two columns where the average treatment effect is estimated for firms in complex tax systems in the blacklist sample, the coefficient of $Treatment \times post$ is significant at a five percent level. This is consistent with the results in the baseline regressions in Table 5, although the significance of the effect on *TFA spell industry 2.5* is higher in the baseline regressions. Furthermore, the effect size increases from 0.302 and 0.349 in columns two and three of the baseline results to 0.410 and 0.444 in columns one and two of the subsample analysis, respectively. When considering companies in countries with complex tax systems in the full sample, the coefficient of $Treatment \times post$ is only significant in column three at a 10 percent level, which contrasts with the insignificance of the coefficient in column five of the baseline results in Table 5.

Turning to the effects of tax uncertainty on the time between two large investments in less complex tax systems, an insignificant coefficient in column five, and an at 10 percent significant coefficient in column six is observed when using the blacklist sample. Besides, the significant coefficient of 0.338 in column six is substantially smaller than the coefficient of 0.444 in column two. Hence, the investment delay effects of tax uncertainty seem to be stronger for firms subject to complex tax systems when considering the blacklist sample. In addition, looking at the results for the full sample, no significant coefficient of $Treatment \times post$ is found, consistent with the earlier presented insignificant results in the baseline regressions. Hence, there seems to be only a small delay effect of tax uncertainty in the full sample for companies exposed to complex tax systems, while no effect is found for firms subject to less complex tax systems.

Table 12: INVESTMENT TIMING EFFECTS: COMPLEX AND LESS COMPLEX TAX SYSTEMS

	Complex tax systems				Less complex tax systems			
	TFA spell industry 2	*TFA spell industry 2.5*	*TFA spell industry 2*	*TFA spell industry 2.5*	*TFA spell industry 2*	*TFA spell industry 2.5*	*TFA spell industry 2*	*TFA spell industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment × post	0.410**	0.444**	0.107*	0.074	0.284	0.338*	0.104	0.081
	(0.16)	(0.15)	(0.05)	(0.05)	(0.15)	(0.15)	(0.07)	(0.07)
post	1.732***	1.957***	-0.060	-0.067	1.944***	2.071***	-0.056	0.117
	(0.16)	(0.15)	(0.17)	(0.16)	(0.14)	(0.15)	(0.28)	(0.19)
ETR 3yr	0.026	0.104	0.148***	0.123***	0.020	-0.012	-0.016	-0.013
	(0.12)	(0.11)	(0.03)	(0.03)	(0.13)	(0.12)	(0.04)	(0.04)
Profitability	0.229	0.285	0.099	0.113	-0.174	-0.104	-0.089	-0.143
	(0.28)	(0.28)	(0.08)	(0.08)	(0.28)	(0.28)	(0.10)	(0.10)
Loss	0.070	0.069	-0.019	-0.012	-0.124	-0.120	-0.027	-0.016
	(0.07)	(0.07)	(0.02)	(0.02)	(0.08)	(0.08)	(0.02)	(0.02)
Sales Growth	-0.055	-0.054	0.084***	0.075***	-0.031	-0.030	0.117***	0.111***
	(0.05)	(0.04)	(0.01)	(0.01)	(0.06)	(0.06)	(0.02)	(0.02)
Size	-0.069	-0.040	-0.264***	-0.255***	0.077	0.045	-0.159***	-0.145***
	(0.09)	(0.09)	(0.02)	(0.02)	(0.09)	(0.09)	(0.03)	(0.03)
Tax Complexity	9.220***	7.392**	5.723***	5.198***	2.345*	2.700**	3.134***	3.084***
	(2.71)	(2.68)	(0.58)	(0.57)	(0.92)	(0.90)	(0.51)	(0.51)
Tax Complexity × Size	-0.195	-0.263	-0.032	-0.037	0.024	0.110	-0.082	0.143
	(0.90)	(0.89)	(0.21)	(0.21)	(0.31)	(0.30)	(0.15)	(0.15)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Blacklist	Blacklist	Full	Full
No. of observations	3,703	3,703	61,122	61,122	2,793	2,793	32,842	32,842
Adj. *R*-squared	0.56	0.62	0.53	0.60	0.58	0.62	0.60	0.66

Notes: This table shows the results derived from applying Equation 2 by splitting the sample into firms located in relatively complex tax systems (columns one to four) and less complex tax systems (columns five to eight), based on the Tax Complexity index, as described in Table 15 in Appendix A. The dependent variables are the spells between a firm's investment spikes. The measure used in each column to determine an investment spike is shown. For example, *TFA spell industry 2* in column one shows the investment spell between tangible fixed assets investments larger than two times the median investment rate in a firm's industry. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.6.2 Investment level analysis

The results of the subsample analysis on the investment level effects of tax uncertainty are presented in Table 13. The sign of $Treatment \times post$ is positive in every column except column five, which is largely consistent with the baseline results in Table 8.

First, considering the effects in countries with more complex tax systems in columns one to four, no significant investment effects are observed for both the full sample and the blacklist sample. For the blacklist sample, this is consistent with the baseline results in columns one and two of Table 8. In contrast, for the full sample, the insignificant coefficients in columns three and four are not in line with the significant coefficients in columns three and four of the baseline results.

Second, turning to the effects among firms in less complex tax systems in columns five to six, again, no significant effects are found for the analysis of the blacklist sample. However, the average treatment effect on both *TFA Investment* and *TFA Investment industry* is significant at a five percent level when considering the full sample, which is also higher than the significance level of 10 percent of the positive effect in the baseline results. Besides, the coefficients of 0.008 and 0.447 in columns seven and eight are substantially higher than the coefficients of 0.003 and 0.194 in columns three and four of Table 8. In short, the positive investment effects of tax uncertainty, as proxied by the change in the EU blacklist, are only

present among firms located in countries with less complex tax systems.

Table 13: INVESTMENT LEVEL EFFECTS: COMPLEX AND LESS COMPLEX TAX SYSTEMS

	Complex tax systems				**Less complex tax systems**			
	TFA Investment	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment × post	0.010	0.810	0.001	0.081	-0.001	0.107	0.008**	0.447**
	(0.01)	(0.70)	(0.00)	(0.11)	(0.01)	(0.53)	(0.00)	(0.17)
post	-0.013	-0.888	0.001	0.239	-0.005	-0.554	-0.010	-0.815
	(0.01)	(0.73)	(0.02)	(1.11)	(0.01)	(0.53)	(0.01)	(0.81)
Cash Flow 3yr	0.005	0.441	0.022***	1.350***	0.009	0.627	0.022***	1.335***
	(0.01)	(0.50)	(0.00)	(0.13)	(0.01)	(0.60)	(0.00)	(0.16)
Intangibles	0.002**	0.121**	0.001***	0.072***	0.001	0.084*	0.001***	0.095***
	(0.00)	(0.04)	(0.00)	(0.01)	(0.00)	(0.04)	(0.00)	(0.01)
Leverage	-0.019	-0.962	0.025***	1.474***	-0.015	-0.583	0.027***	1.719***
	(0.01)	(0.70)	(0.00)	(0.17)	(0.01)	(0.76)	(0.00)	(0.21)
Profitability	-0.054**	-3.246*	-0.062***	-3.502***	-0.048	-2.834	-0.056***	-3.265***
	(0.02)	(1.28)	(0.00)	(0.30)	(0.03)	(1.72)	(0.01)	(0.43)
Loss	-0.004	-0.242	-0.002**	-0.131**	-0.011*	-0.536	-0.003**	-0.187*
	(0.00)	(0.26)	(0.00)	(0.05)	(0.01)	(0.34)	(0.00)	(0.07)
Sales Growth	0.003	0.251	0.013***	0.712***	0.010*	0.726*	0.019***	1.128***
	(0.00)	(0.20)	(0.00)	(0.05)	(0.00)	(0.28)	(0.00)	(0.09)
Size	0.013**	0.599*	0.005***	0.220**	0.025***	1.484***	0.003**	0.215*
	(0.00)	(0.25)	(0.00)	(0.07)	(0.01)	(0.43)	(0.00)	(0.09)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Blacklist	Blacklist	Full	Full
No. of observations	3,703	3,703	61,122	61,122	2,793	2,793	32,842	32,842
Adj. *R*-squared	0.03	0.03	0.03	0.03	0.05	0.04	0.05	0.05

Notes: This table shows the results from applying Equation 4 by splitting the sample into firms located in relatively complex tax systems (columns one to four) and less complex tax systems (columns five to eight) based on the Tax Complexity index, as described in Table 15 in Appendix A. The dependent variables are the various tangible fixed asset investment measures. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

5.7 Hypothesis 3

The third hypothesis stated that the effect of tax uncertainty on corporate investments among public and private firms in the EU between 2018 and 2022 is stronger for firms subject to complex tax systems.

Summarizing the effects of tax uncertainty on the timing of investments, the effect size of investment delays is smaller, and the significance is not present or lower for firms located in countries with less complex tax systems. Thus, the effect of tax uncertainty on the delay of investments is primarily present in countries with a relatively complex tax system. Besides, concluding on the investment level effects, the positive and significant effect of tax uncertainty on capital investments found in the analysis of the full sample in the baseline results is only observed among firms subject to complex tax systems.

Taking these findings together, the null hypothesis of no differences in the effects of tax uncertainty on investments between firms subject to complex and less complex tax systems should be rejected.

5.8 Robustness tests

This section discusses the applied robustness tests to confirm the presented baseline results.

5.8.1 Investment timing analysis

Several additional analyses have been performed to assess the robustness of the presented results of the effect of tax uncertainty on the timing of investments. The outcomes are presented in Appendix C.1.1.

First of all, in Table 19 in Appendix C.1.1, the same regressions as in Table 5 are performed on the full sample, using a firm-based definition of investment spikes instead of an industry-based measure. Specifically, spikes are identified relative to a firm's median investment rate instead of the industry's median investment rate. It is observed that the signs of $Treatment \times post$ are negative in columns one, two, and three, contradicting the main results in columns four, five, and six in Table 5. However, again, the coefficients are insignificant, and thus, no causal effects are found. The coefficient of $Treatment \times post$ for the intangible fixed assets investments in columns four, five, and six of Table 19 in Appendix C.1.1 are negative and insignificant, which is consistent with the results in columns seven, eight, and nine in Table 5. The robustness test, therefore, confirms the findings that tax uncertainty does not affect the timing of investments in tangible and intangible fixed assets.

Secondly, in Table 21 in Appendix C.1.1, the same robustness test as described above is performed for the baseline hazard models using the full sample in Table 6. For the tangible fixed assets investment spike measures, shown in columns one, two, and three, the hazard ratio of $Treatment \times post$ is larger than one, as opposed to the results observed in columns four, five, and six of Table 6. Consistent with the results in columns seven, eight, and nine of Table 6, the hazard ratio of $Treatment \times post$ is smaller than one in columns four and six of Table 21 in Appendix C.1.1. The ratio is larger than one in column five of the mentioned table. However, all results in Table 21 in Appendix C.1.1 are insignificant, which is consistent with the main results in finding no effects.

Since the results for both the panel regressions and the hazard models do not change substantially when a different measure of investment spikes is applied, the baseline results from the analysis of the full sample are robust to a change in the investment spike measure.

Third, in Table 20 in Appendix C.1.1, a different definition of *post* is applied to the same models as in Table 5. This time, the year of intervention, that is, 2020, is included in the regressions as part of the post-treatment period. When comparing the first three columns of Table 20 in Appendix C.1.1 to the first three columns of Table 5, the coefficient of $Treatment \times post$ remains highly significant at a one percent significance level, whereas the effect size slightly decreases. For example, the effect becomes 0.290 years in column three when considering the *TFA spell industry 2.5* instead of the earlier mentioned result of 0.349 years in the baseline results.

Furthermore, considering the results of the full sample in columns four to nine in Table 20 in Appendix C.1.1, the signs of the average treatment effect remain the same compared to the results in columns four to nine in Table 5 when using either the tangible fixed asset investment spell measures or the intangible fixed assets investment measures as the dependent variable. Again, the results for these models are insignificant.

The same robustness check is also applied to the hazard models of Table 6, and is pre-

sented in Table 22 of Appendix C.1.1. A similar pattern as for the robustness check for the panel regressions can be observed. To begin with, the hazard ratio of $Treatment \times post$ remains highly significant for the tangible fixed assets investment hazards in the blacklist sample, while it slightly increases from 0.389 in column two of Table 6 to 0.446 in column two of Table 22 in Appendix C.1.1. The significance level remains at five percent. Hence, the effect size slightly decreases, which was observed in the robustness test of the panel regressions as well. Furthermore, the hazard ratios for the models applied to the full sample are insignificant and close to one. Specifically, the ratios in columns four and six are just above one, which is different from the main results in columns four and six of Table 6. On the other hand, the ratios are just below one in columns five, seven, eight, and nine of Table 22 in Appendix C.1.1, which is consistent with the same column numbers in Table 6.

In summary, it can be concluded that the presented significant baseline results in Table 6 are robust to changes in the definition of the intervention variable, while the signs of insignificant coefficients are subject to change.

Finally, an additional robustness check has been performed on the hazard model in Table 6 by applying an exponential distribution instead of a Weibull distribution. It should be noted that the natural logarithm of the shape parameter, which is presented as ρ in Equation 3, in the baseline model is significantly different from zero and substantially larger than one, implying that a Weibull model is likely to fit the data better. The results of the robustness check are shown in Table 23 in Appendix C.1.1. Once again, a similar pattern as in the baseline results can be found in terms of significance: all hazard ratios of $Treatment \times post$ in the first three columns, using the blacklist sample, are significantly different from zero, while the hazard ratios in the other columns, using the full sample, are not. However, the effect size when using the blacklist sample changes substantially; higher hazard ratios are observed for $Treatment \times post$. For example, the hazard ratio of 0.389 in column two of the baseline model in Table 6 becomes 0.723 when applying the exponential distribution. Thus, the investment probability of investing today in tangible fixed assets for at least two times the industry's median investment rate among firms exposed to tax uncertainty arising from changes in the EU blacklist, given that it has not invested yet since the last investment spike, has changed from being 61.1 percent lower than the control group in the baseline model to 27.7 percent in the model using an exponential distribution. The hazard ratios for the models applied to the full sample, shown in columns four to nine of Table 23 in Appendix C.1.1, are insignificant and just below one except for column six, which is consistent with the baseline results.

From this, it can be concluded that the results of the hazard models are robust to the distribution chosen when considering the significance levels. However, the size of the effects in the blacklist sample is sensitive to the applied distribution. The direction of the effects remains the same.

5.8.2 Investment level analysis

Similar to the investment timing analysis, a robustness check on the definition of the intervention variable, *post*, is applied to the investment level analysis. The results of this robustness test are shown in Table 24 in Appendix C.1.2. Consistent with the baseline results, the coefficient of $Treatment \times post$ is positive and insignificant for the tangible fixed assets investment measures using the blacklist sample.

However, inconsistent with the baseline results, the significant effects on *TFA Investment* and *TFA Investment industry* in columns three and four of Table 4 disappear when a different definition of *post* is applied, although the signs remain the same. The opposite is true for the effects on *IFA Investment* and *IFA Investment industry*; while the effects were insignificant in the baseline regressions, the coefficient of $Treatment \times post$ becomes significantly different from zero at a 10 percent significance level for *IFA Investment industry*. The size of the coefficient remains the same.

From the robustness analysis, it can be concluded that the results on the investment level change notably when a different definition of *post* is applied. The changes occur primarily in the results' significance, while the coefficients' size and sign are comparable.

The outcomes of the second robustness test, in which industry and country-fixed effects instead of firm-fixed effects are applied to Equation 4, are shown in Table 25 of Appendix C.1.2. In contrast to the main results, the coefficient of $Treatment \times post$ in the blacklist sample becomes negative and significantly different from zero for both *TFA Investment* and *TFA Investment industry* in columns one and two. Hence, negative investment level effects of tax uncertainty arising from changes in the EU blacklist are observed when using a different model specification. When considering the full sample, the earlier observed positive and significant investment effect of tax uncertainty has changed to an insignificant average treatment effect for *TFA Investment* as well as for *TFA Investment industry*. The investment level effects remain insignificant for investments in intangible fixed assets. In summary, the investment level results change substantially when the model specification is altered. However, it should be noted that the use of firm-fixed effects, as in the baseline regressions, is preferred since country and industry-fixed effects do not adjust the outcomes of the model for time-invariant firm-specific characteristics. On the other hand, a firm's industry and country are, in most cases, constant through time and thus part of the firm-fixed effects. Hence, the use of firm-fixed effects is likely to result in a smaller bias of the results.

6 Discussion

6.1 Hypothesis 1

The first hypothesis stated that tax uncertainty negatively impacted investments by public and private firms in the EU between 2018 and 2022. The academic literature has investigated the relationship between tax uncertainty and investments. For example, Niemann (2011) concluded that firms delay investments when the expected tax payments increase, and Jacob et al. (2022) found that tax uncertainty led to delayed capital investments. Furthermore, Hasan et al. (2014) and Williams and Williams (2021) discovered that the implementation of FIN 48 impacted the magnitude of investments negatively. In Europe, De Simone and Olbert (2022) found that companies increased their investments in low-tax European jurisdictions and, at the same time, scaled back investments in high-tax jurisdictions in response to the Country-by-Country Reporting (CbCR) directive in the EU. Besides, Fox et al. (2022) concluded that tax uncertainty related to the *state aid cases* in the EU decreased investments of United States multinationals in European subsidiaries located in these state aid countries. In contrast to the mentioned literature, Niemann (2004) found, examining individual investors, that it cannot be concluded that uncertain tax policy reduces real investments.

Hence, most of the previous literature has found (negative) effects of tax uncertainty on investments, although there is literature that finds an opposite effect. These findings are consistent with my results on the first hypothesis when considering tangible fixed assets investments, as I conclude that tax uncertainty increases the time between large investment projects. However, when considering investments in intangible assets, I find no delay effects, and thus, the existing literature cannot be confirmed for that type of investment.

In addition, the aggregated results of the investment level analysis suggest that tax uncertainty coming from the change in the EU blacklist resulted in higher investment levels. However, after performing subsample analyses, it is observed that this positive effect is only present among financially unconstrained firms and firms located in countries with less complex tax systems. Hence, the results for these firms are in clear contrast with the literature. Among financially constrained firms and firms subject to complex tax systems, no effects are found. Hence, for these firms, the results cannot confirm the literature.

6.2 Hypothesis 2

The second hypothesis stated that the effect of tax uncertainty on corporate investments among public and private firms in the EU between 2018 and 2022 is stronger for financially constrained firms. Other literature has examined differences between financially constrained and unconstrained firms when assessing the effects of uncertainty on investments. For instance, according to Whited (2006), small, financially unconstrained firms face higher investment hazards for large investments compared to small, financially constrained firms. Besides, Jacob et al. (2022) conclude that their findings that tax uncertainty led to delayed capital investments were more prominent among financially constrained firms. Moreover, accord-

ing to Alfaro et al. (2024), organizations encountering financial constraints decreased their investments to a greater extent than unconstrained firms following periods of uncertainty.

Consistent with this literature, I find that the effects of tax uncertainty on investments differ substantially between financially constrained and financially unconstrained firms. Specifically, financially constrained firms, on average, face longer investment spells than financially unconstrained firms, while they do not increase investments as opposed to financially unconstrained firms.

6.3 Hypothesis 3

The third hypothesis stated that the effect of tax uncertainty on corporate investments among public and private firms in the EU between 2018 and 2022 is stronger for firms exposed to tax complexity.

Academic studies on the effects of complex tax systems showed the relevance of complexity for investments. For example, Bratten et al. (2017) discovered that companies in countries with a more complex tax system face higher audit fees because of increased audit complexity, implying higher costs to the firm, which might result in fewer resources available for investments. In addition, according to Amberger et al. (2023), the rise in complexity within tax systems led to decreased impacts of fiscal investment incentives.

My results confirm the relevance of the complexity of a country's tax system, as I find that investment delays due to tax uncertainty were primarily present in countries with relatively complex tax systems. However, I do not find that these firms also cut the level of investments, which is in contrast to the findings of Amberger et al. (2023). On the other hand, firms in countries with less complex tax systems increased their investments after they were exposed to tax uncertainty compared to non-exposed firms. Hence, relative to these firms, enterprises subject to complex tax systems have lower investment output, which then is consistent with Amberger et al. (2023).

7 Conclusion

In this study, the relationship between tax uncertainty and investments has been examined. Previous literature has shown that (tax) uncertainty generally results in firms making smaller investments. Other academic research also finds that firms delay investments when exposed to tax uncertainty. However, most of these studies were performed in the United States, while the existing literature on this topic in the EU is still emerging. Besides, these effects of tax uncertainty were unclear among private firms. Hence, there was a gap in the literature assessing the investment effects of tax uncertainty among public and private firms in the EU. Therefore, the purpose of this study was to fill this gap by answering the following research question:

How has tax uncertainty impacted investments of public and private firms in the EU between 2018 and 2022?

This question has been investigated by considering a change in a regulation of the EU that is likely to increase tax uncertainty among exposed firms: the 'blacklist' of countries with a so-called non-cooperative tax regime. The research design was based on a difference-in-difference design, where the treatment group consisted of firms with a subsidiary or parent company in a country that was added to the blacklist in 2020. Next, analyses have been performed on two different control groups. First, a control group was constructed out of firms that had a subsidiary or parent company in one of the blacklist countries from the implementation in 2017 onwards but were not exposed to any change in the list (the 'blacklist sample'). Second, a sample of European multinationals with characteristics similar to those of the treatment group was used (the 'full sample'). The data were obtained from Amadeus, and the full sample consisted of 117,086 firm-year observations, while the blacklist sample comprised 8,373 firm-year observations. The applied estimation methods included panel regressions, hazard modeling, and propensity score matching.

The results indicate that delays of investments in tangible fixed assets larger than 1.5 times the median investment rate in a firm's industry occur due to the change in the EU blacklist. This effect is strongest when only considering tangible fixed assets investments among firms exposed to the EU blacklist and is primarily driven by financially constrained firms and firms located in countries with complex tax systems. Besides, among firms exposed to the EU blacklist, tax uncertainty leads to decreased capital investment hazards. Only weak delay effects are found for intangible fixed assets investments. Furthermore, the results show that tax uncertainty leads to higher investments in tangible fixed assets among financially unconstrained firms and firms subject to less complex tax systems. Negative associations but no causal relationships are found for financially constrained firms, and no effects are observed for investments among firms subject to complex tax systems. Lastly, no effects are discovered for intangible fixed assets investments.

These findings are particularly relevant for policymakers developing new regulations; corporate investment delays might have substantial consequences for the economy. For example, when an economy is in a downturn, a delay in corporate investments due to new,

uncertain regulations might worsen the situation. Furthermore, as the results are different for financially constrained and financially unconstrained firms, it could be worthwhile for policymakers to assess the ways in which a new regulation affects these types of firms. In addition, as firms in jurisdictions with complex tax systems experience more delays in capital investments compared to those located in countries with less complex tax systems, it is relevant for policymakers to evaluate the complexity of fiscal regulation continuously. In this way, new regulations can become more accurate in achieving their purpose without potentially having a destructive effect on the economy.

Furthermore, the results add to the existing literature by providing new insights into the effects of fiscal regulation in the EU, which has become increasingly relevant in the past decade due to an international trend in developing new regulations to reduce tax avoidance by multinational corporations. Besides, this study is one of the few examining the investment effects of tax uncertainty for public and private firms in the EU.

Some limitations are present in this thesis. First, the control group of firms exposed to the EU blacklist is relatively small compared to the treatment group, which could bias the results. Second, the period of the analysis is quite short, which reduces the implications for long-term investments, and third, possibly omitted variables in the applied models and differences in accounting measures between firms might bias the results. Lastly, the findings are subject to change when a different definition of the intervention variable is applied. Further research could extend the sample period, include extra control variables, or gather additional data to improve the size of the control group of firms exposed to the EU blacklist. Besides, it would be interesting to investigate whether the results found in this study lead to real effects on the aggregate economy by looking at differences between countries in the EU. Finally, further research might investigate more deeply what drives the findings of positive investment level effects of tax uncertainty when considering the full sample.

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A Supporting information

Table 14: Variable Descriptions (Dependent variables)

Variable	Description
Panel A: Tangible fixed assets investments	
TFA Investment	Change in tangible fixed assets (TFAS) compared with the year before, plus depreciation (DEPR) and scaled by total assets (TOAS) in the current year. The variable is winsorized at the 2.5 percent level.
TFA Investment industry	*TFA Investment* as a share of the median level of *TFA Investment* in the firm's industry. The variable is winsorized at the 2.5 percent level.
TFA spike industry 1.5	Dummy variable equalling 1 for a firm in a year if *TFA Investment* was at least 1.5 times as high as the median level of *TFA Investment* in the firm's industry.
TFA spike industry 2	Dummy variable equalling 1 for a firm in a year if *TFA Investment* was at least 2 times as high as the median level of *TFA Investment* in the firm's industry.
TFA spike industry 2.5	Dummy variable equalling 1 for a firm in a year if *TFA Investment* was at least 2.5 times as high as the median level of *TFA Investment* in the firm's industry.
TFA spike firm 1.5	Dummy variable equalling 1 for a firm in a year if *TFA Investment* was at least 1.5 times as high as the firm's median level of *TFA Investment*.
TFA spike firm 2	Dummy variable equalling 1 for a firm in a year if *TFA Investment* was at least 2 times as high as the firm's median level of *TFA Investment*.
TFA spike firm 2.5	Dummy variable equalling 1 for a firm in a year if *TFA Investment* was at least 2.5 times as high as the firm's median level of *TFA Investment*.
TFA spell industry 1.5	Variable containing the number of years since the last investment spike, determined by *TFA spike industry 1.5*.
TFA spell industry 2	Variable containing the number of years since the last investment spike, determined by *TFA spike industry 2*.
TFA spell industry 2.5	Variable containing the number of years since the last investment spike, determined by *TFA spike industry 2.5*.
TFA spell firm 1.5	Variable containing the number of years since the last investment spike, determined by *TFA spike firm 1.5*.
TFA spell firm 2	Variable containing the number of years since the last investment spike, determined by *TFA spike firm 2*.
TFA spell firm 2.5	Variable containing the number of years since the last investment spike, determined by *TFA spike firm 2.5*.
Panel B: Intangible fixed assets investments	
IFA Investment	Change in intangible fixed assets (IFAS) compared to the year before and scaled by total assets (TOAS) and multiplied by 100 percent. The first and the fourth quartile in the sample based on the value of this variable are excluded from the analysis of intangible fixed assets investments and the variable is winsorized at the 5 percent level.
IFA Investment industry	*IFA Investment* as a share of the median level of *IFA Investment* in the firm's industry. The variable is winsorized at the 5 percent level.
IFA spike industry 1.5	Dummy variable equalling 1 for a firm in a year if *IFA Investment* was at least 1.5 times as high as the median level of *IFA Investment* in the firm's industry.
IFA spike industry 2	Dummy variable equalling 1 for a firm in a year if *IFA Investment* was at least 2 times as high as the median level of *IFA Investment* in the firm's industry.
IFA spike industry 2.5	Dummy variable equalling 1 for a firm in a year if *IFA Investment* was at least 2.5 times as high as the median level of *IFA Investment* in the firm's industry.
IFA spike firm 1.5	Dummy variable equalling 1 for a firm in a year if *IFA Investment* was at least 1.5 times as high as the firm's median level of *IFA Investment*.
IFA spike firm 2	Dummy variable equalling 1 for a firm in a year if *IFA Investment* was at least 2 times as high as the firm's median level of *IFA Investment*.
IFA spike firm 2.5	Dummy variable equalling 1 for a firm in a year if *IFA Investment* was at least 2.5 times as high as the firm's median level of *IFA Investment*.
IFA spell industry 1.5	Variable containing the number of years since the last investment spike, determined by *IFA spike industry 1.5*.
IFA spell industry 2	Variable containing the number of years since the last investment spike, determined by *IFA spike industry 2*.
IFA spell industry 2.5	Variable containing the number of years since the last investment spike, determined by *IFA spike industry 2.5*.
IFA spell firm 1.5	Variable containing the number of years since the last investment spike, determined by *IFA spike firm 1.5*.
IFA spell firm 2	Variable containing the number of years since the last investment spike, determined by *IFA spike firm 2*.
IFA spell firm 2.5	Variable containing the number of years since the last investment spike, determined by *IFA spike firm 2.5*.

Notes: This table contains the descriptions of all dependent variables used in the analyses. The variable name in Amadeus is shown between parentheses.

Table 15: Variable Descriptions (Independent variables)

Variable	Description
Cash Flow 3yr	The sum of cash flow in the current year and the previous two years, divided by total assets (TOAS) in the same period. Cash flow is computed by taking net income (PL) and adding depreciation (DEPR) and taxation (TAXA).
ETR 3yr	The sum of taxation (TAXA) in the current year and the previous two years, divided by earnings before interest and taxes in the same period (EBIT). This variable is winsorized at 0 and 1.
Intangibles	Natural logarithm of the Intangible Fixed Assets (IFAS) of a firm.
Leverage	Current liabilities (CULI) plus non-current liabilities (NCLI) scaled by total assets (TOAS), and winsorized at 2.5%.
Profitability	Return on assets, measured by dividing earnings before interest and taxes (EBIT) by total assets (TOAS). The ratio is winsorized at 2.5%.
Loss	Dummy variable equalling 1 if earnings before interest and taxes (EBIT) is negative, and 0 otherwise.
Sales growth	Natural logarithm of 1 plus Turnover (TURN) in the current year minus the turnover in the previous year, divided by the turnover in the previous year. The ratio is winsorized at the 2.5% level.
Size	Natural logarithm of total assets (TOAS).
Tax Complexity	Tax complexity index per country and year, created by Hoppe et al. (2023). Only *Guidance* and *Enactment* are considered as input for the complexity index. The index can be found at https://www.taxcomplexity.org. For missing years, the mean of the year before and the year after that year is assumed to be the complexity index.
Working Capital	Working capital (WKCA) minus cash (CASH), scaled by total assets and winsorized at the 2.5% level.

Notes: This table contains the descriptions of all independent variables used in the analyses. The variable name in Amadeus is shown between parentheses.

Table 16: EU Blacklist countries

Country	Number of observations	Year(s) of addition	Year(s) of Removal
Anguilla	0	2020, 2022	2021
Aruba	0	2019	2019
Bahamas (the)	0	2017, 2019, 2020	2018, 2019, 2021
Bahrain	0	2017	2018
Barbados	29	2017, 2019, 2020	2018, 2019, 2021
Belize	100	2019, 2023	2019
Bermuda	1,285	2019	2019
Cayman Islands	8	2020	2020
Dominica	0	2019, 2021	2019, 2021
Fiji	0	2019	-
Grenada	0	2017	2018
Korea (the Republic of)	0	2017	2018
Macao SAR	0	2017	2018
Marshall Islands (the)	59	2017, 2019, 2023	2018, 2019, 2023
Mongolia	0	2017	2018
Namibia	0	2017	2018
Oman	110	2019	2020
Palau	0	2017, 2020	2018
Panama	4	2017, 2020	2018
Saint Kitts and Nevis	0	2018	2018
Saint Lucia	0	2017	2018
Samoa	0	2017	-
Seychelles	0	2020, 2023	2021
Trinidad and Tobago	0	2017	-
Tunisia	0	2017	2018
United Arab Emirates	1,991	2017, 2019	2018, 2019
Vanuatu	8	2019	-

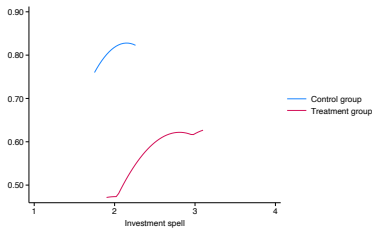
Notes: This table shows the number of observations in the treatment group for each country listed on the EU blacklist. Besides, for completeness, all year(s) in which any country was added to or removed from the list is (are) shown.

B Diagnostic tests

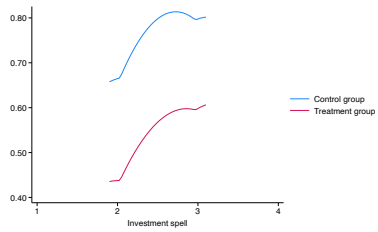
Table 17: HAUSMAN TESTS

Model	Chi^2	p-value	Degrees of freedom
Table 5, column 1	55.45	< 0.000***	9
Table 5, column 2	63.24	< 0.000***	9
Table 5, column 3	67.22	< 0.000***	9
Table 5, column 4	282.55	< 0.000***	9
Table 5, column 5	280.05	< 0.000***	9
Table 5, column 6	268.95	< 0.000***	9
Table 5, column 7	68.82	< 0.000***	4
Table 5, column 8	85.73	< 0.000***	4
Table 5, column 9	86.14	< 0.000***	4
Table 4, column 1	214.04	< 0.000***	9
Table 4, column 2	192.73	< 0.000***	9
Table 4, column 3	1791.24	< 0.000***	9
Table 4, column 4	1414.02	< 0.000***	9
Table 4, column 5	84.69	< 0.000***	11
Table 4, column 6	94.69	< 0.000***	11

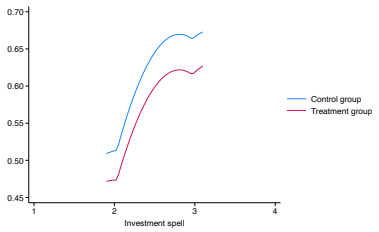
Notes: In this table, the results of the Hausman tests for the main regression models are covered to assess whether a fixed or a random effects model is preferred. The Chi^2, p-value, and degrees of freedom are indicated. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.



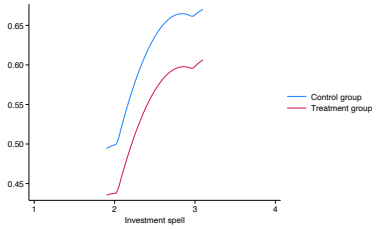
(a) Hazard estimates for *TFA spell industry 1.5* (Blacklist sample)



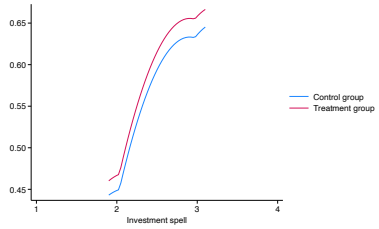
(b) Hazard estimates for *TFA spell industry 2.5* (Blacklist sample)



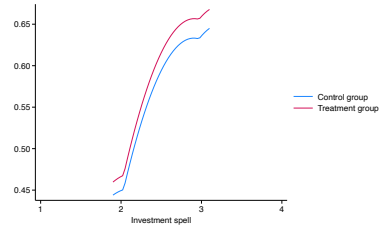
(c) Hazard estimates for *TFA spell industry 1.5* (Full sample)



(d) Hazard estimates for *TFA spell industry 2.5* (Full sample)



(e) Hazard estimates for *IFA spell industry 1.5* (Full sample)



(f) Hazard estimates for *IFA spell industry 2.5* (Full sample)

Figure 5: Hazard estimates, split by $Treatment_i$. Panels A and B show the estimates for the blacklist sample, whereas panels C, D, E, and F correspond to the full sample.

Table 18: BREUSCH-PAGAN TESTS

Model	Chi^2	p-value	Degrees of freedom
Table 5, column 1	13.24	0.104	8
Table 5, column 2	15.15	0.056*	8
Table 5, column 3	24.06	0.002***	8
Table 5, column 4	189.65	$<$ 0.000***	9
Table 5, column 5	343.89	$<$ 0.000***	9
Table 5, column 6	531.42	$<$ 0.000***	9
Table 5, column 7	5.73	0.333	5
Table 5, column 8	11.99	0.035**	5
Table 5, column 9	19.49	0.002***	5
Table 4, column 1	683.75	$<$ 0.000***	9
Table 4, column 2	683.75	$<$ 0.000***	9
Table 4, column 3	14443.08	$<$ 0.000***	9
Table 4, column 4	14443.08	$<$ 0.000***	9

Notes: In this table, the results of the Breusch-Pagan tests for the main regression models are covered to assess whether heteroscedasticity is present. The Chi^2, p-value, and degrees of freedom are indicated. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

C Regressions

C.1 Robustness tests

C.1.1 Investment Timing analysis

Table 19: INVESTMENT TIMING ROBUSTNESS TEST: FIRM-MEDIAN MEASURE (PANEL REGRESSION)

	TFA firm spell 1.5	*TFA firm spell 2*	*TFA firm spell 2.5*	*IFA firm spell 1.5*	*IFA firm spell 2*	*IFA firm spell 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment × post	-0.022	-0.017	-0.031	-0.075	-0.060	-0.055
	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)
post	-0.094	-0.085	-0.109	-0.015	-0.073	-0.263
	(0.17)	(0.18)	(0.17)	(0.24)	(0.26)	(0.15)
ETR 3yr	-0.015	-0.020	-0.019			
	(0.02)	(0.02)	(0.02)			
Profitability	-0.006	0.005	-0.007			
	(0.06)	(0.05)	(0.05)			
Loss	-0.029*	-0.014	-0.001			
	(0.01)	(0.01)	(0.01)			
Sales Growth	0.054***	0.039***	0.035***	0.038**	0.020	0.016
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	-0.066***	-0.032*	-0.009	0.002	0.024	0.028
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Tax Complexity	1.582***	1.843***	1.512***			
	(0.25)	(0.25)	(0.24)			
Tax Complexity × Size	0.389***	0.540***	0.592***			
	(0.08)	(0.08)	(0.08)			
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full	Full	Full	Full	Full	Full
No. of observations	93,964	93,964	93,964	38,577	38,577	38,577
Adj. R-squared	0.56	0.68	0.75	0.14	0.14	0.14

Notes: This table shows the results derived from applying Equation 2 when applying firm-level investment spike measures instead of -level measures such as in Table 5. The dependent variables are the spells between a firm's investment spikes. The measure used in each column to determine an investment spike is shown. For example, *TFA spell firm 1.5* in column one shows the investment spell between tangible fixed assets investments larger than 1.5 times a firm's median investment rate. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 20: INVESTMENT TIMING ROBUSTNESS TEST: DIFFERENT DEFINITION OF *post* (PANEL REGRESSION)

	TFA spell industry 1.5	*TFA spell industry 2*	*TFA spell industry 2.5*	*TFA spell industry 1.5*	*TFA spell industry 2*	*TFA spell industry 2.5*	*IFA spell industry 1.5*	*IFA spell industry 2*	*IFA spell industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment × post	0.247***	0.248**	0.290***	0.039	0.049	0.025	-0.033	-0.022	-0.005
	(0.07)	(0.08)	(0.08)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)
post	1.648***	1.978***	2.154***	1.882***	2.207***	2.474***	1.328***	1.218***	1.126***
	(0.08)	(0.08)	(0.08)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
ETR 3yr	0.013	-0.026	0.016	0.061**	0.077***	0.062**			
	(0.07)	(0.07)	(0.07)	(0.02)	(0.02)	(0.02)			
Profitability	-0.073	-0.079	-0.005	0.009	0.001	-0.018			
	(0.15)	(0.15)	(0.16)	(0.05)	(0.05)	(0.05)			
Loss	-0.042	-0.047	-0.040	-0.017	-0.016	-0.009			
	(0.04)	(0.04)	(0.04)	(0.01)	(0.01)	(0.01)			
Sales Growth	-0.012	-0.012	-0.015	0.086***	0.090***	0.084***	0.061***	0.066***	0.067***
	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	-0.050	-0.028	-0.019	-0.210***	-0.201***	-0.199***	-0.054	-0.042	-0.034
	(0.05)	(0.05)	(0.05)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
Tax Complexity	1.840***	1.478**	1.504**	1.427***	1.333***	1.167***			
	(0.51)	(0.52)	(0.52)	(0.18)	(0.19)	(0.18)			
Tax Complexity × Size	-0.112	-0.143	-0.149	-0.242***	-0.206**	-0.099			
	(0.17)	(0.18)	(0.18)	(0.07)	(0.07)	(0.07)			
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Blacklist	Full	Full	Full	Full	Full	Full
No. of observations	8,025	8,025	8,025	116,738	116,738	116,738	47,671	47,671	47,671
Adj. R-squared	0.46	0.54	0.60	0.44	0.52	0.59	0.27	0.25	0.23

Notes: This table shows the results derived from applying Equation 2, but with a different definition of *post*: now, the year of change (2020) is included, whereas it was excluded in the main regression models in Table 5. The dependent variables are the spells between a firm's investment spikes. The measure used in each column to determine an investment spike is shown. For example, *TFA spell industry 1.5* in column one shows the investment spell between tangible fixed assets investments larger than 1.5 times the median investment rate in a firm's industry. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 21: INVESTMENT TIMING ROBUSTNESS TEST: FIRM-MEDIAN MEASURE (HAZARD MODEL)

	TFA spike firm 1.5	*TFA spike firm 2*	*TFA spike firm 2.5*	*IFA spike firm 1.5*	*IFA spike firm 2*	*IFA spike firm 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment × post	1.015	1.008	1.019	0.989	1.033	0.926
	(0.04)	(0.04)	(0.05)	(0.20)	(0.18)	(0.13)
post	0.830***	0.835***	0.851**	0.793**	0.813**	0.000***
	(0.05)	(0.04)	(0.05)	(0.06)	(0.06)	(0.00)
ETR 3yr	0.972*	0.964**	0.970*			
	(0.01)	(0.01)	(0.01)			
Profitability	1.017	1.013	1.019			
	(0.01)	(0.01)	(0.01)			
Loss	1.054**	1.049*	1.065**			
	(0.02)	(0.02)	(0.02)			
Sales Growth	1.004	1.010	1.009	0.960**	0.970*	0.963**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	0.889***	0.910***	0.912***	0.993	0.994	0.989
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tax Complexity	0.837***	0.855***	0.866***			
	(0.01)	(0.01)	(0.01)			
Tax Complexity × Size	1.054***	1.047***	1.041**			
	(0.01)	(0.01)	(0.02)			
Constant	0.994	0.981*	0.979*	1.000	1.000	1.001
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
$\ln(\rho)$	1.921***	2.123***	2.186***	2.090***	2.208***	2.276***
	(0.02)	(0.03)	(0.03)	(0.05)	(0.06)	(0.06)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Full	Full	Full	Full	Full	Full
No. of observations	93,964	93,964	93,964	38,577	38,577	38,577
Chi^2	3397.08	2426.90	1878.76	2123.95	2172.91	277.29

Notes: This table shows the results derived from applying Equation 3 on investment spike measures based on the firm's median. The dependent variables are the hazards of the various investment spikes. For example, *TFA spike firm 1.5* in column one shows the hazard of investment spikes of tangible fixed assets investments larger than 1.5 times a firm's median investment rate. A Weibull proportional hazards model is applied, and the results are presented in hazard ratios. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level. Variables are standardized with a mean of zero and a standard deviation of one. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 22: INVESTMENT TIMING ROBUSTNESS TEST: DIFFERENT DEFINITION OF *post* (HAZARD MODEL)

	TFA spike industry 1.5	*TFA spike industry 2*	*TFA spike industry 2.5*	*TFA spike industry 1.5*	*TFA spike industry 2*	*TFA spike industry 2.5*	*IFA spike industry 1.5*	*IFA spike industry 2*	*IFA spike industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment × post	0.467**	0.446**	0.445**	1.001	0.993	1.017	0.961	0.955	0.952
	(0.11)	(0.12)	(0.12)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
post	0.000***	0.000***	0.001***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ETR 3yr	1.019	0.985	0.936	0.968*	0.975	0.978			
	(0.06)	(0.06)	(0.06)	(0.01)	(0.01)	(0.01)			
Profitability	0.967	1.015	1.028	1.015	1.013	1.015			
	(0.05)	(0.06)	(0.05)	(0.01)	(0.01)	(0.01)			
Loss	1.057	1.136	1.143	1.044*	1.040	1.029			
	(0.10)	(0.11)	(0.12)	(0.02)	(0.02)	(0.02)			
Sales Growth	1.023	1.014	1.026	1.006	1.011	1.006	1.008	1.010	1.004
	(0.04)	(0.05)	(0.05)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	0.949	0.938	0.946	0.913***	0.901***	0.906***	1.020*	1.022*	1.023**
	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tax Complexity	0.835***	0.827**	0.805***	0.851***	0.842***	0.842***			
	(0.04)	(0.05)	(0.05)	(0.01)	(0.01)	(0.01)			
Tax Complexity × Size	0.994	1.038	1.024	1.063***	1.072***	1.070***			
	(0.04)	(0.05)	(0.06)	(0.01)	(0.01)	(0.01)			
Constant	1.033	0.999	0.984	1.003	1.015	1.018	0.995*	0.995*	0.995*
	(0.05)	(0.04)	(0.05)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
$\ln(\rho)$	1.884***	1.919***	1.855***	2.025***	2.060***	2.043***	2.294***	2.285***	2.266***
	(0.09)	(0.10)	(0.09)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Blacklist	Full	Full	Full	Full	Full	Full
No. of observations	8,025	8,025	8,025	116,738	116,738	116,738	47,671	47,671	47,671
Chi^2	209.97	218.10	236.78	2375.72	2502.71	2308.02	848.26	856.80	859.21

Notes: This table shows the results derived from applying Equation 3, but with a different definition of *post*: now, the year of change (2020) is included, whereas it was excluded in the main regression models in Table 6. The dependent variables are the hazards of the various investment spikes. For example, *TFA spike industry 1.5* in column one shows the hazard of investment spikes of tangible fixed assets investments larger than 1.5 times the median investment rate in a firm's industry. A Weibull proportional hazards model is applied, and the results are presented in hazard ratios. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level. Variables are standardized with a mean of 0 and a standard deviation of 1. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 23: INVESTMENT TIMING ROBUSTNESS TEST: EXPONENTIAL DISTRIBUTION (HAZARD MODEL)

	TFA spike industry 1.5	*TFA spike industry 2*	*TFA spike industry 2.5*	*TFA spike industry 1.5*	*TFA spike industry 2*	*TFA spike industry 2.5*	*IFA spike industry 1.5*	*IFA spike industry 2*	*IFA spike industry 2.5*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment × post	0.691***	0.696***	0.723**	0.996	0.986	1.000	0.974	0.976	0.971
	(0.07)	(0.07)	(0.07)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
post	0.438***	0.424***	0.409***	1.185	1.088	0.920***	0.289***	0.289***	0.289***
	(0.04)	(0.04)	(0.04)	(0.24)	(0.15)	(0.02)	(0.00)	(0.00)	(0.00)
ETR 3yr	0.989	0.975	0.962	0.979**	0.982**	0.984*			
	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)			
Profitability	1.021	1.042	1.046	1.012*	1.012*	1.015**			
	(0.03)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)			
Loss	1.041	1.089	1.093	1.021	1.025*	1.024*			
	(0.04)	(0.05)	(0.05)	(0.01)	(0.01)	(0.01)			
Sales Growth	0.999	1.008	1.015	1.002	1.003	1.000	0.997	0.998	0.995
	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size	0.983	0.979	0.982	0.949***	0.944***	0.947***	1.003	1.003	1.004
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Tax Complexity	0.927***	0.938***	0.907***	0.936***	0.935***	0.934***			
	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)			
Constant	1.004	0.984	0.989	0.998	1.002	1.003	0.999	0.999	0.999
	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Blacklist	Full	Full	Full	Full	Full	Full
No. of observations	6,496	6,496	6,496	93,964	93,964	93,964	38,577	38,577	38,577
Chi^2	2604.49	3568.23	3245.52	28472.63	31365.23	72001.73	48346.06	47366.99	45935.39

Notes: This table shows the results derived from applying Equation 3, but with an exponential distribution instead of a Weibull distribution; ρ is equal to one. The dependent variables are the hazards of the various investment spikes. For example, *TFA spike industry 1.5* in column one shows the hazard of investment spikes of tangible fixed assets investments larger than 1.5 times the median investment rate in a firm's industry. The results are presented in hazard ratios. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level. Variables are standardized with a mean of zero and a standard deviation of one. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

C.1.2 Investment Level analysis

Table 24: INVESTMENT LEVEL ROBUSTNESS TEST: DIFFERENT DEFINITION OF *post*

	TFA Investment	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*IFA Investment*	*IFA Investment industry*
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment × post	0.008	0.555	0.001	0.058	0.005	-0.568
	(0.00)	(0.31)	(0.00)	(0.08)	(0.00)	(0.40)
post	-0.012*	-0.749*	-0.006***	-0.303***	-0.003	0.342*
	(0.01)	(0.33)	(0.00)	(0.03)	(0.00)	(0.14)
Cash Flow 3yr	0.006	0.538	0.021***	1.252***	0.008	-0.594
	(0.00)	(0.33)	(0.00)	(0.09)	(0.00)	(0.45)
Intangibles	0.002***	0.121***	0.001***	0.082***		
	(0.00)	(0.03)	(0.00)	(0.01)		
Leverage	-0.021**	-1.081*	0.018***	1.194***		
	(0.01)	(0.44)	(0.00)	(0.12)		
Profitability	-0.050***	-3.210***	-0.058***	-3.272***	0.010	-0.999
	(0.01)	(0.82)	(0.00)	(0.21)	(0.01)	(0.85)
Loss	-0.007**	-0.379*	-0.002***	-0.136***		
	(0.00)	(0.17)	(0.00)	(0.04)		
Sales Growth	0.007***	0.545***	0.014***	0.828***	0.005***	-0.474***
	(0.00)	(0.13)	(0.00)	(0.04)	(0.00)	(0.14)
Size	0.016***	0.887***	0.007***	0.332***	0.023***	-2.101***
	(0.00)	(0.20)	(0.00)	(0.05)	(0.00)	(0.28)
Working Capital					-0.009*	0.747
					(0.00)	(0.41)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Full	Full
No. of observations	8,025	8,025	116,738	116,738	38,703	38,703
Adj. *R*-squared	0.04	0.03	0.03	0.03	0.01	0.01

Notes: This table shows the results from applying Equation 4, but with a different definition of *post*: now, the year of change (2020) is included, whereas it was excluded in the main regression models in Table 8. The dependent variables are the various investment measures; columns one to four correspond to tangible fixed assets investments, whereas columns five to eight correspond to intangible fixed assets investments. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 25: INVESTMENT LEVEL ROBUSTNESS TEST: INDUSTRY AND COUNTRY FIXED EFFECTS

	TFA Investment	*TFA Investment industry*	*TFA Investment*	*TFA Investment industry*	*IFA Investment*	*IFA Investment industry*
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment × post	-0.010**	-0.658***	0.000	-0.015	0.002	0.191
	(0.00)	(0.13)	(0.00)	(0.08)	(0.00)	(0.46)
post	0.011**	0.731***	-0.009	-0.097	0.030*	-2.541
	(0.00)	(0.12)	(0.01)	(0.30)	(0.01)	(1.16)
Cash Flow 3yr	0.044***	2.840***	0.060***	3.786***	0.006*	-0.379
	(0.00)	(0.21)	(0.00)	(0.53)	(0.00)	(0.26)
Intangibles	0.002***	0.141***	0.002***	0.136***		
	(0.00)	(0.02)	(0.00)	(0.02)		
Leverage	0.006*	0.366*	0.017***	1.085***		
	(0.00)	(0.12)	(0.00)	(0.15)		
Profitability	-0.105***	-6.780***	-0.136***	-8.366***	-0.006	0.743
	(0.01)	(0.79)	(0.01)	(0.91)	(0.01)	(0.90)
Loss	-0.002	-0.077	-0.001	-0.088		
	(0.00)	(0.23)	(0.00)	(0.06)		
Sales Growth	0.017***	1.109***	0.022***	1.286***	0.010***	-0.911**
	(0.00)	(0.13)	(0.00)	(0.07)	(0.00)	(0.24)
Size	-0.003***	-0.208***	-0.003***	-0.183***	0.003**	-0.307**
	(0.00)	(0.03)	(0.00)	(0.03)	(0.00)	(0.09)
Working Capital					-0.006**	0.546***
					(0.00)	(0.10)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	Blacklist	Blacklist	Full	Full	Full	Full
No. of observations	6,496	6,496	93,964	93,964	29,609	29,609
Adj. R-squared	0.09	0.10	0.12	0.12	0.01	0.01

Notes: This table shows the results from applying Equation 4, but with industry, country, and year fixed effects instead of firm and year fixed effects. The dependent variables are the various investment measures; columns one to four correspond to tangible fixed assets investments, whereas columns five to eight correspond to intangible fixed assets investments. A detailed description of every dependent variable can be found in Table 14 of Appendix A, while the independent variables are described in Table 15. All financial ratios are winsorized at the 2.5% level, and every control variable is centered around the sample mean. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

C.2 Model Specification procedures

Table 26: DIFFERENCE-IN-DIFFERENCE MODEL SPECIFICATION PROCEDURE INVESTMENT TIMING (*TFA spell industry 2*)

	Dependent variable: *TFA spell industry 2*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treatment × post	0.075*	0.075*	0.075*	0.075*	0.075*	0.075*	0.074	0.075*	0.075*	0.070	0.070	0.073
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
post	-0.110	-0.110	-0.119	-0.120	-0.119	-0.119	-0.119	-0.112	-0.115	-0.103	-0.122	-0.131
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)
Cash Flow 3yr		-0.034										
		(0.03)										
ETR 3yr			0.098***	0.098***	0.097***	0.097***	0.098***	0.099***	0.098***	0.104***	0.101***	0.100***
			(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Intangibles				-0.002								
				(0.00)								
Leverage					-0.031							
					(0.04)							
Profitability						0.086	0.027	-0.022	-0.022	0.014	0.011	0.009
						(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Loss							-0.028*	-0.023	-0.023	-0.026	-0.026	-0.026
							(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Sales Growth								0.061***	0.061***	0.089***	0.088***	0.089***
								(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Working Capital									0.020			
									(0.03)			
Size										-0.232***	-0.229***	-0.231***
										(0.02)	(0.02)	(0.02)
Tax Complexity											1.783***	1.911***
											(0.27)	(0.28)
Tax Complexity × Size												-0.248*
												(0.10)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964
Adj. R-squared	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
AIC	204224.13	204222.32	204195.53	204194.15	204195.97	204192.12	204187.42	204138.39	204139.41	203568.00	203482.38	203468.76
BIC	204280.83	204288.48	204261.68	204269.75	204271.57	204267.73	204272.48	204232.89	204243.37	203671.96	203595.79	203591.62

Notes: This table shows the process of the model selection. The dependent variable used in this table is the *TFA spell industry 2* investment spell measure. From left to right, in each column, a new control variable is added to the regression. If a control variable does not change the coefficient or significance of the main independent variable of interest, *Treatment × post*, it is not included in further analysis. Besides, Aikaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are considered in each step. The preferred model is shown in the column 12. The procedure is applied to the Full sample. All financial ratios are winsorized at the 2.5% level. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 27: DIFFERENCE-IN-DIFFERENCE MODEL SPECIFICATION PROCEDURE INVESTMENT TIMING (*IFA spell industry 2*)

	Dependent variable: *IFA spell industry 2*										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment × *post*	-0.043	-0.042	-0.043	-0.042	-0.043	-0.042	-0.043	-0.043	-0.041	-0.040	-0.040
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
post	-0.231	-0.231	-0.229	-0.232	-0.226	-0.232	-0.219	-0.218	-0.217	-0.222	-0.221
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.20)	(0.20)	(0.20)
Cash Flow 3yr		-0.017									
		(0.05)									
ETR 3yr			-0.014								
			(0.04)								
Leverage				0.056							
				(0.07)							
Profitability					0.095						
					(0.10)						
Loss						0.010					
						(0.02)					
Sales Growth							0.059**	0.059**	0.065***	0.065***	0.065***
							(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Working Capital								-0.007			
								(0.05)			
Size									-0.057	-0.057	-0.057
									(0.03)	(0.03)	(0.03)
Tax Complexity										0.343	0.368
										(0.42)	(0.46)
Tax Complexity × *Size*											-0.021
											(0.18)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577
Adj. R-squared	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
AIC	75208.10	75209.82	75209.87	75208.64	75208.26	75209.65	75192.97	75194.93	75186.60	75187.30	75189.27
BIC	75259.46	75269.75	75269.79	75268.56	75268.18	75269.58	75252.89	75263.41	75255.09	75264.35	75274.88

Notes: This table shows the process of the model selection. The dependent variable used in this table is the *IFA spell industry 2* investment spell measure. From left to right, in each column, a new control variable is added to the regression. If a control variable does not change the coefficient or significance of the main independent variable of interest, *Treatment* × *post*, it is not included in further analysis. Besides, Aikaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are considered in each step. The preferred model is shown in the column 9. The procedure is applied to the Full sample. All financial ratios are winsorized at the 2.5% level. Robust White standard errors clustered at the firm level are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 28: DIFFERENCE-IN-DIFFERENCE MODEL SPECIFICATION PROCEDURE INVESTMENT MAGNITUDE (*TFA Investment*)

	Dependent variable: *TFA Investment*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treatment × post	0.131	0.131	0.131	0.154	0.171	0.182*	0.178*	0.191*	0.191*	0.194*	0.194*	0.194*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
post	0.096	0.101	0.097	0.147	0.173	0.174	0.170	0.274	0.267	0.263	0.266	0.267
	(0.82)	(0.82)	(0.82)	(0.83)	(0.85)	(0.84)	(0.84)	(0.83)	(0.83)	(0.83)	(0.83)	(0.83)
Cash Flow 3yr		0.319***	0.317***	0.328***	0.804***	1.199***	1.207***	1.402***	1.403***	1.359***	1.359***	1.359***
		(0.08)	(0.08)	(0.08)	(0.09)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
ETR 3yr			0.043									
			(0.07)									
Intangibles				0.102***	0.101***	0.100***	0.099***	0.090***	0.090***	0.085***	0.085***	0.085***
				(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Leverage					1.898***	1.790***	1.792***	1.521***	1.521***	1.519***	1.520***	1.520***
					(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
Profitability						-1.769***	-2.261***	-3.284***	-3.284***	-3.281***	-3.280***	-3.280***
						(0.22)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.24)
Loss							-0.234***	-0.167***	-0.166***	-0.164***	-0.164***	-0.164***
							(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Sales Growth								0.869***	0.869***	0.844***	0.844***	0.844***
								(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Working Capital									0.051			
									(0.08)			
Size										0.223***	0.222***	0.222***
										(0.05)	(0.05)	(0.05)
Tax Complexity											-0.315	-0.322
											(0.81)	(0.85)
Tax Complexity × Size												0.013
												(0.34)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93,964	93964	93964
Adj. *R*-squared	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
AIC	405074.85	405038.07	405039.36	404258.40	403655.94	403453.06	403399.66	402206.20	402207.47	402147.34	402149.01	402151.00
BIC	405131.55	405104.23	405114.96	404334.00	403741.00	403547.57	403503.62	402319.61	402330.33	402270.20	402281.32	402292.76

Notes: This table shows the process of the model selection. The dependent variable used in this table is *TFA Investment*. From left to right, in each column, a new control variable is added to the regression. If a control variable does not change the coefficient or significance of the main independent variable of interest, *Treatment × post*, it is not included in further analysis. Besides, Aikaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are considered in each step. The procedure is applied to the Full sample. The preferred model is shown in column 10. All financial ratios are winsorized at the 2.5% level. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 29: DIFFERENCE-IN-DIFFERENCE MODEL SPECIFICATION PROCEDURE INVESTMENT MAGNITUDE (*IFA Investment*)

	Dependent variable: *IFA Investment*										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment × post	-0.901*	-0.885	-0.885	-0.884	-0.880	-0.885	-0.882	-0.875	-0.839	-0.850	-0.840
	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.45)	(0.45)	(0.46)
post	-1.040	-1.047	-1.056	-1.050	-1.197	-1.193	-1.290	-1.411	-1.352	-1.302	-1.291
	(1.26)	(1.25)	(1.26)	(1.25)	(1.30)	(1.30)	(1.31)	(1.34)	(1.38)	(1.39)	(1.39)
Cash Flow 3yr		-1.096**	-1.100**	-1.065**	-0.459	-0.445	-0.749	-0.750	-0.411	-0.419	-0.418
		(0.37)	(0.37)	(0.39)	(0.41)	(0.42)	(0.42)	(0.42)	(0.42)	(0.42)	(0.42)
ETR 3yr			0.081								
			(0.34)								
Leverage				0.122							
				(0.55)							
Profitability					-2.848**	-3.282***	-1.675	-1.643	-1.748	-1.741	-1.737
					(0.88)	(1.00)	(0.90)	(0.90)	(0.90)	(0.90)	(0.90)
Loss						-0.187					
						(0.18)					
Sales Growth							-0.777***	-0.773***	-0.618***	-0.619***	-0.618***
							(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Working Capital								0.851*	0.684	0.694	0.698
								(0.42)	(0.42)	(0.42)	(0.42)
Size									-1.603***	-1.607***	-1.597***
									(0.24)	(0.24)	(0.25)
Tax Complexity										-4.159	-3.151
										(3.45)	(3.83)
Tax Complexity × Size											-0.871
											(1.99)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577	38,577
Adj. *R*-squared	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AIC	236672.79	236657.91	236659.79	236659.82	236640.62	236640.87	236601.32	236594.92	236499.36	236498.45	236499.68
BIC	236724.15	236717.83	236728.27	236728.30	236709.11	236717.91	236678.37	236680.53	236593.52	236601.18	236610.96

Notes: This table shows the process of the model selection. The dependent variable used in this table is *IFA Investment*. From left to right, in each column, a new control variable is added to the regression. If a control variable does not change the coefficient or significance of the main independent variable of interest, *Treatment × post*, it is not included in further analysis. Besides, Aikaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are considered in each step. The procedure is applied to the Full sample. The preferred model is shown in column nine. All financial ratios are winsorized at the 2.5% level. Robust White standard errors are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 30: PROPENSITY SCORE MATCHING: PROBIT MODEL SPECIFICATION PROCEDURE

Dependent variable: *Treatment*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Cash Flow 3yr		-0.192***	-0.193***	-0.188***	0.033	0.119*	0.117*	0.114*	0.106*	0.172***	0.172***	0.171***
		(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
ETR 3yr			0.006									
			(0.05)									
Intangibles				0.005*	0.004	0.004	0.004	0.004	0.004	-0.016***	-0.016***	-0.016***
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage					0.660***	0.654***	0.652***	0.653***	0.653***	0.732***	0.733***	0.733***
					(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Profitability						-0.323***	-0.155	-0.141	-0.142	-0.199	-0.200	-0.198
						(0.10)	(0.11)	(0.12)	(0.11)	(0.12)	(0.12)	(0.12)
Loss							0.074**	0.072**	0.068*	0.073**	0.073**	0.072**
							(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Sales Growth								-0.017				
								(0.02)				
Working Capital									-0.099*	-0.113**	-0.113**	-0.112*
									(0.04)	(0.04)	(0.04)	(0.04)
Size										0.109***	0.109***	0.109***
										(0.01)	(0.01)	(0.01)
Tax Complexity											-0.532***	-0.556***
											(0.16)	(0.17)
Tax Complexity × *Size*												0.061
												(0.11)
Constant	-1.751***	-1.745***	-1.743***	-1.763***	-1.732***	-1.735***	-1.753***	-1.753***	-1.740***	-1.892***	-1.920***	-1.916***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	117,055	117,055	117,055	117,055	117,055	117,055	117,055	117,055	117,055	117,055	117,055	117,055
Pseudo-R-squared	0.04	0.04	0.04	0.04	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.07
AIC	52726.17	52617.27	52619.22	52597.26	51750.56	51732.26	51717.68	51718.73	51699.22	50726.17	50725.94	50726.41
BIC	53074.31	52975.08	52986.70	52964.74	52127.70	52119.08	52114.17	52124.88	52105.38	51142.00	51151.44	51161.58

Notes: This table shows the process of the selection of the probit model used in the propensity score analysis. The dependent variable used in this table is *Treatment*. From left to right, in each column, a new control variable is added to the regression. If a control variable does not change the coefficient or significance of the main independent variable of interest, *Treatment*, it is not included in further analysis. Besides, Aikaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are considered in each step. The process is applied to the Full sample. The preferred model is shown in column 11. All financial ratios are winsorized at the 2.5% level. Robust White standard errors clustered at the firm level are used and shown within parentheses. *** means significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.