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Ring-fencing Digital Corporations: Investor Reaction to the European Commission's Digital Tax Proposals

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Abstract:

We study the effect of digital tax measures on firm value. By employing an event study methodology, we analyze investor reaction to the European Commission's proposals on the taxation of digital corporations. Examining the stock returns of potentially affected corporations surrounding the draft directives' release, we find a significant abnormal capital market reaction of -0.692 percentage points. The investor reaction is more pronounced for firms that engage more actively in tax avoidance, have a higher profit shifting potential, and for those with higher exposure to the EU. The market value of digital and innovative corporations decreased by at least 52 billion euro in excess of the regular market movement during the event window. Overall, our study reveals that expectations about ring-fencing digital tax measures impact firm values.

JEL Classification: H25, H26, K34, G14

Keywords: digital taxation, corporate tax, digital economy, event study

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1 Introduction

The rapid and ongoing process of digitalization has given rise to a new industry – the digital economy. Despite the innovative character of most digital business models and their positive contribution to economic growth, digital firms have been repeatedly subject to an intensive public and political debate on their tax avoidance activities.[1] The dependence on physical presence for the establishment of a taxable nexus, which is a main feature of the existing, ancient tax framework, poses a great challenge for the taxation of cross-border transactions of digital businesses. In recent years, policymakers and academics across the globe have developed reform proposals to address the tax challenges of the digital economy (Andersson, 2017; Brauner and Pistone, 2018; Devereux and Vella, 2018; OECD, 2018, 2019; Schön, 2018).

In March 2018, the European Commission published a "digital tax package" containing two drafts for council directives presenting tax measures directly targeting digital corporations (European Commission, 2018a). The first draft suggests the introduction of a Digital Services Tax (DST) as interim solution, focusing on revenues from digital services of large corporations. The share of digital revenues that is generated in the European Union (EU) shall be taxed with a flat tax rate of three percent. The second draft aims for a comprehensive solution in the long run. A Significant Digital Presence shall establish a new taxable nexus within the current permanent establishment concept ("virtual permanent establishment"). Despite the importance of understanding the economic effects of such tax changes, no previous study explores the impact of digital taxation on firms. In this study, we fill this gap in the literature.

[1] The effective tax rate of big tech companies is regularly discussed in the public media and Margarethe Vestager, European Commissioner for Competition, has become publicly known for her focus on illegal state aid cases and tax affair investigations. See for example, https://www.ft.com/content/79b56392-dde5-11e8-8f50-cbae5495d92b; https://www.theguardian.com/technology/2018/oct/08/facebook-uk-tax-bill-sales-margaret-hodge and https://www.bloomberg.com/news/articles/2019-09-16/apple-takes-on-eu-s-vestager-in-record-14-billion-tax-battle

Since firm-specific costs and benefits will ultimately be reflected in a change in firm value, we focus on the impact of the draft directives on firm value. Generally, the observable change in firm value is a combination of investors' expectations of the effects of the proposed measures on a firm's future profitability and the ex-ante probability of enactment. Investors' expectations of the potential effects of the proposals may be manifold. First, additional corporate taxes decrease a firm's expected after-tax cash flow, thereby reducing investment opportunities and growth potential (Doidge and Dyck, 2015; Wagner et al., 2018a). Second, investors may evaluate that the conceptions of the draft directives, including arbitrarily chosen size thresholds, cause the discrimination of certain digital firms and lead to a distortion of competition. Third, the newly proposed measures – envisaged as an addition to the existing tax framework – lead to enhanced reporting complexity as well as legal uncertainty and increase the risk of corporate double taxation. Finally, investors may also consider the uniqueness of the proposed measures and perceive the specific targeting of a supranational institution on the digital economy as a threat to future profitability. At the time of the draft directive release, it was seen as very likely that new measures would become effective. Pierre Moscovici, Commissioner of Taxation, stated: "Digital taxation is no longer a question of 'if' – this ship has sailed" (European Commission, 2018b). Overall, we expect to observe a negative capital market reaction in response to the digital tax proposals.

We employ a short-term event study design to measure investor reaction. In line with Gaertner et al. (2019), we apply a Google Trends analysis and find heightened attention towards the EU digital tax proposals on March 21, 2018, the day of the detailed and official communication of the new draft directives, and on the subsequent day. Hence, we use a two-day event window to examine the short-term stock market reaction for 222 potentially affected digital corporations. Our sample is selected in a similar vein as the samples used to estimate the additional tax revenues to be generated through a DST (European Commission, 2018c; Fuest et al., 2018).

We find a significant negative capital market reaction in response to the release of the draft directives. The cumulative average abnormal return over a two-day window starting at the event day and ending on the day with the highest public attention is negative 0.692 percent. This suggests that investors, on average, perceive the introduction of digital tax measures as both a likely event and negative news for firms' profitability. The observed significant wealth reduction of shareholders may be translated into reduced opportunities for affected firms to invest and grow in the future.

Furthermore, we analyze the cross-sectional variation in market reaction. The negative abnormal return is significantly stronger for firms that are more aggressively avoiding taxes and for firms that have higher profit shifting potential. This suggests that (some) digital firms are currently able to avoid taxation in the EU, but that investors believe that this opportunity would vanish through the introduction of the digital tax package. Thus, the proposed digital tax may be an effective measure to prevent base erosion and profit shifting (BEPS). In line with our expectations, we further find that the stock market reaction is more severe for firms with higher exposure to the EU and for firms with higher revenues.

Next, we translate the cumulative average abnormal return drop into absolute terms. In line with Cline et al. (2018), we calculate the change in market value based on firm-specific abnormal returns. The total abnormal market value change is estimated to be economically meaningful by at least minus 52 billion euro over the two-day event window. Thereof, about 40 percent is attributable to firms located in the U.S., supporting the argument that a DST will mainly affect large U.S. firms and justifying the concern of increased political and economic costs due to potential U.S. countermeasures.

Our analysis adds to the recent call in the literature for further empirical research on the proposed measures of taxing the digital economy and the adaption of the international tax framework to the digital era (Devereux and Vella, 2018; Olbert and Spengel, 2019). While prior studies have mostly focused on a technical evaluation of the DST and virtual permanent establishment concept (e.g., Nieminen, 2018; Becker and Englisch, 2018), the literature is largely silent about the real effects of such measures on firms. Such an evaluation, however, is especially important against the background of ongoing tax discussions at the level of the OECD and unilateral actions of several jurisdictions to introduce a DST. Our results indicate that policymakers should proceed with caution before imprudently introducing digital tax measures. The economic effects of reduced investments and growth of digital companies may outweigh potential benefits.

Furthermore, our study contributes to the literature concerned with the effect of tax reforms on shareholder value. Previous literature has predominately focused on non-European events when assessing the capital market reaction around major tax reforms and reform proposals. Doidge and Dyke (2015) show, amongst others, that additional corporate taxes imply a negative effect on firm value. Several scholars analyze the stock market reactions in response to the recent U.S. tax reforms and find heterogeneous stock price reactions across firms and countries (Gaertner et al., 2019; Overesch and Pflitsch, 2019; Wagner et al., 2018a, 2018b). Hoopes et al. (2016) analyze the events around the U.S. sales tax reform for online retail companies. The study provides evidence of negative abnormal returns for targeted online retailers. A different line of literature has found inconclusive results on investor reaction to the introduction of mandatory tax disclosure rules in Europe and Australia (Chen, 2017; Dutt et al., 2019; Hoopes et al., 2018; Johannesen and Larsen, 2016). To the best of our knowledge, we are the first to examine the stock market reaction in response to the European Commission's draft directives on a tax reform for digital corporations.

Finally, this paper contributes to the literature that examines the effectiveness of anti-tax avoidance policies and BEPS countermeasures. One strand of the literature focuses on the effects of countermeasure on firm behavior and finds that increased transfer pricing documentation regulation and controlled foreign corporation legislation mitigate the possibilities to relocate income (Beer and Loeprick, 2015; Buettner and Wamser, 2013). An alternative strand of the literature shows that a variety of factors such as public scrutiny, executive characteristics, firm's ownership structure or the capital structure of firms affect the tax avoidance behavior of multinational corporations (Armstrong et al., 2012; Blouin et al., 2014; Dyreng et al., 2016). Yet, to the best of our knowledge, only Blouin et al. (2014) analyze the effects of countermeasures on tax avoidance and firm value. Our results indicate that the draft directives effectively target firms with higher tax avoidance activities and higher profit shifting potential.

The remainder of the paper is structured as follows. Chapter two provides an overview of the proposed digital tax initiatives and derives the hypotheses. The third chapter highlights our data sources and the methodological approach. The main results are depicted in chapter four. Furthermore, we provide heterogeneity analyses, economic implications and additional robustness tests in the fourth chapter. Finally, chapter five concludes.

2 Institutional Background and Hypotheses Development

2.1 The Digital Tax Initiatives in the European Union

In response to the challenges that the ongoing digitalization poses on the well-functioning of the international tax framework, various policymakers currently develop and discuss potential measures to adapt the international tax system.[2] The European Commission published a "digital tax package" on March 21, 2018 containing two drafts for council directives that are concerned

[2] The OECD member states are currently proceeding an initiative to address the tax challenges of the digitalization of the economy. In its most recent public consultation document, the OECD proposes a corporate tax reform that intends to shift taxing rights to the market jurisdiction and picks up the concept of a Significant Digital Presence.

with the taxation of digital activities and services (European Commission, 2018a, 2018d, 2018e). The first draft aims to introduce a new EU-wide system of a turnover tax on certain digital services as an interim solution. The second draft focuses on a long-term solution, presenting rules and provisions for the corporate taxation of a Significant Digital Presence (e.g., Nieminen, 2018; Olbert and Spengel, 2019; Petruzzi & Koukoulioti, 2018; Sheppard, 2018).

The DST, proposed in the first draft directive, shall constitute a gross revenue tax of three percent. Taxable shall be those revenues that result from the provision of three types of digital services (European Commission, 2018e). First, the placement of advertising on digital interfaces targeted on users of that interface, second the provision of digital interfaces to users, which allow users to find each other, to interact and to exchange goods and services, and third the transmission of user data generated from users' activities on digital interfaces.

The proposal further suggests that for the purpose of the DST, only those entities shall qualify as a taxable person that exceed two size thresholds. The consolidated amount of worldwide company turnover must exceed 750 million euro within a financial year and the total amount of taxable revenues within the EU – those revenues that are taxable under the scope of the DST – must exceed 50 million euro in the same financial year (European Commission, 2018e).

The second draft directive of the European Commission aims for a comprehensive solution in the long run and intends to establish a new taxable nexus for firms that maintain a non-physical but Significant Digital Presence in one or more member states of the EU. Using a Significant Digital Presence as taxable nexus extends the existing physical permanent establishment concept by the concept of a virtual permanent establishment. According to the draft directive, a Significant Digital Presence exists in a member state if digital services are supplied through a digital interface and one or more of the following thresholds of digital activity are met in a member state in the tax period by an entity itself or together with its associated enterprises. First, revenues from supplying digital services to users exceed 7 million euro, second, the number of users of digital services supplied exceeds 100,000 or third, the number of business contracts concluded for the supply of digital services exceeds 3,000. With regard to profit allocation, the European Commission recommends the application of the profit split method as the most appropriate method (European Commission, 2018d; Olbert and Spengel, 2019; Sheppard, 2018).

Despite the European Commission's effort to gain political agreement on the DST proposal as a "quick fix" for the international tax framework, member states could not reach a common agreement on the draft directives.[3] Yet, the Vice-President of the European Commission recommended member states to use the DST proposal as a framework for legislative actions at the national level.[4] As depicted in Table 1, several countries have followed this recommendation and started to introduce a DST at the unilateral level. The political and academic debate on digital tax measures is ongoing and empirical insights on the economic effects of such measures are highly valuable.[5]

2.2 Implications of the Digital Tax Package and Hypotheses

It is widely accepted that tax policy changes may have large impacts on stock prices and that it is important to have an awareness of the potential effects implied (Doidge and Dyck, 2015; Downs and Tehranian, 1988). In general, stock prices are related to the cash flow distributions expected to be generated by the firm and incorporate all information that is available to the market (McWilliams and Siegel, 1997). Therefore, ceteris paribus and abstracting from potential tax shields, additional corporate taxes payable intuitively have a negative influence on

[3] See for main results of the ECOFIN meetings on December 04, 2018 and March 12, 2019, https://www.consilium.europa.eu/en/meetings/ecofin/2018/12/04/ and https://www.consilium.europa.eu /en/meetings/ecofin/2019/03/12/.

[4] See Debate in the European Parliament on April, 15 2019: http://www.europarl.europa.eu/doceo/document/CRE-8-2019-04-15-ITM-021_EN.html?redirect.

[5] The European Commissioner-designate for the economy said that he is not willing to wait on a tax for digital corporations (https://www.sueddeutsche.de/wirtschaft/nahaufnahme-herr-gentiloni-und-das-geld-1.4613866).

the stock price of a firm as they constitute additional cash outflows, reducing the after-tax cash flow (DeAngelo and Masulis, 1980; Doidge and Dyck, 2015; Wagner et al., 2018a).

Furthermore, also the conception of the proposed digital tax measures may impact shareholder value. Both academics and practitioners immediately and heavily criticized the digital tax proposals for being populistic and shortsighted (e.g., Fuest et al., 2018; Næss-Schmidt et al., 2018; Spengel, 2018). In particular, the proposal of a DST deviates from the conceptual fundamentals of the existing tax framework of corporate profit taxation. An introduction in addition to the existing system is likely to create a complex and discriminating tax system that distorts competition and harms the position of EU member states in terms of international tax competition (CFE Fiscal Committee, 2018; Petruzzi and Koukoulioti, 2018; Sheppard, 2018; van Horzen and van Esdonk, 2018; Wissenschaftlicher Beirat beim Bundesministerium der Finanzen, 2018).

In general, a tax on gross revenues has a stronger effect on the after-tax cash flow than a corporate net profit tax and may cause serious consequences for affected firms in terms of competitiveness and discrimination (Fuest et al., 2018; Nieminen, 2018; Spengel, 2018). This distress is exacerbated by the inverse proportionality between corporate profitability and the effective tax burden. Furthermore, the proposed method for the relief of double taxation – the possibility to deduct the DST paid from the corporate income tax base – does not eliminate but only mitigate double taxation (European Commission, 2018e). Fuest et al. (2018) point out that the fixed thresholds lead to the undesirable effect that around the limit value additional gross income reduces the net income of a taxable entity. In the same vein, distortion of competition is conceivable, as one competitor, slightly above a threshold, would have to pay the tax, while another competitor, slightly below the relevant threshold, would be tax exempt (Nieminen, 2018). As a consequence, large digital firms are ring-fenced, even though several scholars have shown the impracticability and distortive effect of such practice (Olbert and Spengel, 2019;

Schön, 2018). Simultaneously, the broadly defined digital service revenue categories increase the risk that the scope of the proposed digital tax measures is overshooting.[6]

In addition, the newly proposed measures introduce considerable tax uncertainty for affected corporations. Hanlon et al. (2017) have shown that increasing tax uncertainty is positively associated with costly cash holdings. Furthermore, it is argued that large cash holdings reduce the return on investment and the market misprices it (Dechow et al., 2008; Hanlon et al., 2017).

Based on the findings in prior literature and our assessment of the European Commissions' draft directives, we expect a mean negative investor reaction in response to the communication of the European Commission and large media attention on March 21, 2018.

H1: The abnormal stock price reaction for affected firms is negative in our two-day event window starting on March 21, 2018.

In addition, the digital tax proposals are motivated by the widespread political perception that digital firms pay fewer taxes (European Commission, 2018d; OECD, 2015). In fact, the newly proposed measures have the design of countermeasures to prevent base erosion and profit shifting in the European Union. Hence, we expect that firms that engage more aggressively in tax avoidance and firms with more profit shifting potential are affected to a greater extent by the draft directives.

H2: The negative stock market reaction is more pronounced for digital firms that are more aggressively reducing their tax burden or have more profit shifting potential.

Moreover, the proposed DST shall tax certain digital revenues that are generated in the EU with a flat tax rate of three percent. As the concrete amount of such taxable revenues is

[6] Traditionally non-digital corporations such as the New York Times or the German publishing company Springer, which have a growing online business model, would be subject to the new draft directives.

hardly observable, investors may consider the overall engagement in the European market as a proxy to evaluate whether a firm is affected. Hence, we expect that the stock market reaction is more negative for firms with higher exposure to the European market. Since the tax burden of the DST is proportional to revenues rather than profits, we further expect that the capital market reaction is in absolute terms larger for firms with higher revenues and for loss-making firms that might not have the necessary funds to finance the additional taxes on gross revenues.

H3: The negative stock market reaction is more pronounced for digital firms that are more engaged in the European market, larger digital firms and digital firms in a state of loss.

Finally, we expect that comparable digital firms that are not affected by the draft directives, i.e., that have revenues below the specified threshold of 750 million euro, do not experience a negative abnormal market return on our event date. Firms above the revenues threshold are expected to react negatively, in comparison.

H4: The stock market reaction for digital firms above the proposed revenue threshold is negative in comparison to similar digital firms below the revenue threshold.

3 Data and Research Design

We conduct an event study to estimate the effect of the proposed "digital tax package" on the stock returns of affected firms (Chen, 2017; Eckbo et al., 2007; Frischmann et al., 2008; Thompson, 1985). The event study methodology measures the magnitude of the effect an event has on the expected profitability. In other words, it provides a measure of the impact of that event on the value of a firm and the wealth of investors (Agrawal and Kamakura, 1995; Kothari and Warner, 2007).

On March 21, the European Commission released two drafts for council directives that contained details on the specific design of the digital tax measures and on the characteristics of affected firms. We assume that market participants have not been aware of – or anticipated –

the detailed content of the digital tax package before its release and have just then started to process and incorporate the relevant information into stock prices. In line with prior studies, we conduct a Google Trends analysis to capture the event date that is most likely to be relevant for the stock price effect (Gaertner et al., 2019). Google Trends provides the frequency of search requests on a specified topic of interest over a time horizon as an index value.[7] Figure 1 depicts the Google Trends analysis. We can see a large spike on March 21, 2018, which corresponds to the date the European Commission released the proposals accompanied by a major press release. The interest in the EU Digital Tax proposal reached an even higher level on March 22, 2018. Hence, we include both days in our event window.

We select treated firms based on the characteristics outlined in the draft directives. Table 2 depicts our sample selection procedure. We use data from the Bureau van Dijk ORBIS database to identify all publicly listed corporations with consolidated worldwide turnover above 750 million euro in the last financial year known at the time of the proposal. In line with the study of Fuest et al. (2018), we restrict the sample to firms active in industries that are likely to fall in the scope of the "digital tax package".[8] Based on this classification, we end up with 192 potentially affected corporations. Furthermore, accompanying the proposals, the European Commission released an Impact Assessment of the draft directives, wherein they explicitly refer to 112 top digital corporations that are assumed to be affected by the measures (European Commission, 2018c; United Nations Conference on Trade and Development, 2017). We manually add all named firms that are not yet captured by the industry classification to our sample.

[7] We searched for several terms that could relate to the EU digital tax proposals such as: "Digital Tax", "Commission Proposal", "Digital services Tax", "Digital Permanent Establishment" "Significant Digital Presence" and all results lead to similar patterns around the release of the directive proposals. Our main specification relies on the most commonly used term to describe both proposals: EU Digital Tax.

[8] The relevant NACE Rev. 2 codes are: 6201, 6209, 6311, 6312, 4791 and 5811 to 5819.

We obtain one year of daily stock market data from the Thomson Reuters EIKON database ending ten trading days after our event date. We use the return index (RI) that shows the theoretical value of a shareholding, assuming that dividends are reinvested to purchase additional shares at the closing price applicable on the ex-dividend date as a base for our daily return calculations.[9] In line with Frischmann et al. (2008) and Dutt et al. (2019), we drop firms without sufficient stock market information and trading activity. Finally, we exclude all corporations that held an earnings announcement immediately before, on or after the event date to eliminate all stock market reactions not directly linked to the draft directives. Overall, our final sample constitutes of 222 corporations, which are listed in Table 3. We show descriptive statistics for the sample in Table 4. The average daily return of treated firms is 0.08 percent, with a standard deviation of 1.69 percent. The country dispersion of all treated digital corporations is depicted in Table 5.

For our main analysis, we follow the event study design of Thompson (1985) and Eckbo et al. (2007). Based on our Google Trends Analysis, our event window covers the day of the release of the proposals, March 21st, 2018, and the subsequent day (0 through +1). We set our estimation window to contain the trading days -11 through -250 relative to the event day. We estimate the following conditional market model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}. \quad (1)$$

R_{it} is the return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms). R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*. D_t is a dummy set equal to one in the two-day event window, and e_{it} is an error term.

[9] With $P_{i,t}$ as share price of firm i on day t, $RI_{i,t} = RI_{i,t-1} \times \frac{P_{i,t}}{P_{i,t-1}}$. Except when t equals the ex-dividend-date, then: $RI_t = RI_{t-1} \times \frac{P_t + D_t}{P_t - 1}$ with D_t being the dividend payment associated with the ex-date. Based on this price information, daily (total) returns ($R_{i,t}$) are calculated. Daily returns are winsorized at the 1 and 99 percent level, which amount to -5.136 percent and 5.618 percent, respectively. We acknowledge the view that winsorizing of return data may distort the "true" market movement. Hence, we rerun the analysis with non-winsorized return data confirming our results. The results can be found in Appendix Table 17.

α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of γ_i provides an estimate for the average abnormal return during the event window. The coefficient of interest has to be multiplied by the number of days in the event window to get an estimate for the cumulative average abnormal return (*CAAR*) (Doidge and Dyck, 2015; Eckbo et al., 2007). In line with our two-day event window, we double the coefficient estimate.

For our cross-sectional analyses (*H2-H4*), we include a parameter to account for a firm's level of tax aggressiveness, profit shifting potential or other firm-specific characteristics, which we obtain from the ORBIS database. The conditional market model expands as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + \rho_i I_i + \delta_i I_i D_t + e_{it}. \quad (2)$$

The variables are defined as before and I_i is an indicator for firm-specific characteristics. The estimate of the interaction coefficient, δ_i, becomes the coefficient of interest.

4 Results

4.1 Main Results

The baseline results of the event study are presented in Table 6. In the event period of interest, covering the event day – the day of the release of the digital tax proposals – and the day after, we find a mean negative cumulative average abnormal return of -0.692 percent, which is significant at the one percent level. The regression results further indicate that the portfolio of 222 treated firms has a market beta of 0.676 and a significant alpha of 0.047 percent.

Overall, the analysis provides significant statistical evidence of a mean negative stock price reaction of affected firms to the EU digital tax proposals and confirms our first hypothesis. Assuming efficiency of capital markets, this mean negative change in firm values around the event date represents both the expected costs and profits of the event as well as the ex-ante probability that the event occurs, i.e., the net present value that is associated with the draft directives (Johannesen and Larsen, 2016; Wagner et al., 2018a). Specifically, when analyzing the impact of additional taxes on the value of a stock, what matters to investors is the potential additional amount in taxes that the firm will be liable to pay in the future (Wagner et al., 2018a). Hence, these results are consistent with investors anticipating that the introduction of the digital tax package negatively affects digital firms' future profitability. Figure 2 shows the buy and hold return of an equally-weighted portfolio of all potentially affected firms, bought one day before the event window. The red line in Figure 2 controls for the market return and depicts the abnormal buy and hold return. It becomes evident from this graph that the significant negative abnormal return maintains over the subsequent days after the event window.

In order to further understand investor reactions and test our additional hypotheses, we interact our event date dummy with different firm-specific characteristics. First, we include a measure of the potential tax aggressiveness of our treated firms. We define the variable *Tax aggressiveness* as the negative of the cash effective tax rate (ETR). Based on the financial statements 2017, we calculate the annual ETR for all potentially affected firms. Despite the well-known drawbacks of short-term ETR measures, we assume that firms with lower ETRs engage more strongly in tax planning and tax avoidance (Dutt et al., 2019; Dyreng et al., 2008). In addition, we define the variable *Profit shifting potential* as the ratio of intangible assets to total assets. It has been shown in various studies that intangible assets, and implicitly the level of research and development activities, are positively associated with the engagement in profit shifting (De Simone et al., 2016; Griffith et al., 2014; Heckemeyer et al., 2014).

Table 7 depicts the stock market reaction in our event window, controlling for the tax aggressiveness of affected firms. As expected, the regression results in column (1) show that the capital market reaction is more pronounced for firms that are more tax aggressive. A firm with an average ETR of 25.63 percent in our sample has a negative stock market reaction in our event window of -0.679 and a one percentage point decrease of the ETR is associated with a

0.021 percentage point lower two-day CAAR. Consistently, column (2) highlights that the investor reaction for the most tax aggressive firms, those in the lowest ETR quintile, is considerably more negative in the event window. Furthermore, stock prices seem to decrease more for firms with a higher profit shifting potential, albeit not significant in conventional terms (column 3). The last column of Table 7 indicates that the stock market reaction is lower for firms with the highest ratio of intangible to total assets (p-value of 0.115). Overall, the results are in line with our second hypothesis. These findings further indicate that digital firms are currently able to avoid corporate taxates in the EU and that investors believe that the proposed measures hamper tax avoidance, increasing affected firms' tax burden to similar levels as those of less-avoiding firms (i.e., considering the DST, all firms pay taxes in proportion to their digital revenues in the EU). Consequently, the stock prices of firms that avoid taxes more 'aggressively' and firms with a higher profit shifting potential react stronger to the proposed tax measures.

Next, we test our third hypothesis. Since exact information about the amount and extent of firms' digital activity, digital revenues or number of users in a country is not disclosed publically, it is difficult for investors to assess precisely to what extent a firm is affected by the digital tax proposals. For this reason, investors may rather evaluate a firm's engagement in the European market. We assume that the level of engagement in the European market is positively correlated with the level of revenues that is recognized in the financial statements of European affiliates of multinational groups. We define the variable *EU exposure* as the ratio of revenues of EU affiliates to the total revenue of the group's affiliates. The higher the ratio, the more a group is engaged in the European market. Table 8 depicts the results of the regressions that include firm-specific interaction variables. Column (1) highlights that a higher EU exposure has a significant negative effect on the two-day CAAR. Additionally, the second column of Table 8 confirms our prediction of hypothesis three and shows that the group of firms with the highest quintile of EU exposure is affected the most in the event window. This result is in line with the scope of the draft directives that are limited to digital services provided in the European Union.

Column (3) of Table 8 indicates that, as intuitively expected, investor reaction is more negative for firms with a higher turnover. The capital market seems to have incorporated the effects of a flat gross revenue tax that increases the tax burden proportional to the level of turnover. The last column of Table 8 indicates that the drop in stock prices is higher for corporations that have suffered a loss in the preceding financial year, albeit the interaction coefficient is not significant in traditional terms.

Finally, we check hypothesis four and analyze if comparable firms with revenues below the size thresholds - thus not affected by the EU directive proposals - react significantly different than the firms in our treated sample. We limit our sample of comparable digital corporations to listed firms in the same industries as the firms in our treatment sample and delete all firms with annual consolidated revenues below 200 million euro. By doing so, we prevent to compare large digital corporations with very small and potentially structurally different firms. Our sample of control firms includes 123 firms. Table 9 depicts the results of a difference in differences regression that is similar to equation (2) with the indicator I_i being a dummy variable with the value of one for firms above the size threshold of 750 million euro. The negative and significant interaction coefficient provides an estimate for the difference in CAAR between the two groups. The abnormal return over the two event days seems to be by about 1 percentage point lower for affected firms above the size threshold.

Overall and in line with the assumption of efficient markets, the findings imply that investors, when evaluating the effect of the digital tax package, take not only into account whether a firm is purely affected, but also weigh the impact depending on a firm’s characteristics.

4.2 Economic Magnitude

Based on our findings of a negative capital market reaction, we estimate the reduction of market value in absolute terms. Table 10 depicts the absolute abnormal market value change. Market values are obtained from the EIKON database and converted into euro using the applicable exchange rate on our event date. The total market value of all 222 affected firms is more than 4 trillion euro.[10] We estimate the firm-specific change in abnormal market value as the product of a firm's market value and its abnormal return in our two-day event window (Cline et al., 2018; Malatesta, 1983; Peterson, 1989).[11] The overall abnormal market value change is the sum of all affected firms' abnormal market value changes. We find that the market value of firms that are likely to be affected by the EU digital tax proposals dropped by at least 52 billion euro in excess of the normal market movement. A considerable share of the abnormal market value change is born by U.S. based corporations, which constitute the largest group of treated firms. About 40% of the market value reduction is attributable to firms headquartered in the U.S.

These results suggest that investors have noticed the ring-fencing and unavoidable nature of the European Commission's draft directives and anticipate a considerable increase in tax burden for digital firms. Up to now, investor perceptions and the magnitude of firm value reduction have not been part of the debate on the suitability of the draft directives.

In a back-of-the-envelope comparison, we relate the magnitude of our result to the findings in prior studies. Doidge and Dyck (2015) analyze the surprising proposition of a corporate tax on a group of previously untaxed Canadian publicly traded firms. The authors find that the additional tax of 31.5 percent on net profits was associated with a drop in firm value of about 17.5 percent (an elasticity of -0.56). If we attribute the stock market reaction in

[10] Based on our average abnormal return estimates during the two-day event window, we find an abnormal change in market value of 28,805 million euro. This estimate is our lowest bound for the abnormal change in market value.

[11] $\Delta MV = \sum_{i=1}^{222} \sum_{t=0}^{1} MV_{i,t} \times AR_{i,t+1}$, where $MV_{i,t}$ refers to the closing market value of firm i at trading day t. AR denotes to the abnormal return. $t = 0$ refers to March 20, 2018. The AR is estimated using the Market Model approach, see Table 12.

our event window purely to the more precisely outlined DST of three percent on gross revenues, our results indicate that the magnitude of capital market reaction is slightly lower per percentage point (-0.231 percent per percentage point). This lower effect of our estimates might result from the higher implementation likelihood of the unilaterally proposed additional corporate tax rate in Canada, compared to the – multilateral approval requiring – European Commission's directive proposals. Additionally, Overesch and Pflitsch (2019) and Gaertner et al. (2019) analyze firm value changes in response to the U.S. tax reform. The effect size of their estimated capital market reaction ranges between 0.45 percent and 0.6 percent, which is – in absolute terms – slightly higher than our estimates on the capital market reaction in response to the release of the directive proposals. Finally, Hoopes et al. (2016) investigate the stock market reaction to the legislative process of making online retailers subject to sales taxes in the U.S. In this setting, which targets digital corporations and may be considered the most comparable to our study in prior literature, the authors find a negative cumulative abnormal return of -0.43 percent, pooling their event dates. Despite the conceivability that the draft directives might have a more severe negative impact on the profitability of digital firms than the introduction of sales tax on e-commerce in the U.S., our estimated capital market reaction is lower than their effect.

4.3 Robustness Tests

We conduct a number of robustness tests to verify our main results. First, in Table 11, we replicate our main analysis for four alternative event dates to mitigate concerns that the event has materialized at a different point in time.[12] None of the prior leaked information about the new proposals did result in a significant news reaction and the official release of the draft

[12] On February, 26 2018 the first rumors on a potential digital tax initiative by the European Commission were spread. On March, 15, 2018 occasional reports on the soon to be released directive proposals can be found (Becker and Englisch, 2018); https://www.ft.com/content/0c38dd10-2929-11e8-b27e-cc62a39d57a0 (05.08.2019); https://www.bloomberg. com/news/articles/2018-03-17/tech-giants-set-to-face-3-tax-on-revenue-under-new-eu-plan (05.08.2019). At the Economic and Financial Affairs Councils on December, 04, 2018 a strong opposition against the council directives was formed and on March, 12 the EU Digital Services Tax proposal was finally taken off the agenda in an official debate.

directive contained a hitherto not available level of detail. Hence, we are confident that our main event date captures the most relevant market reaction to the draft directives. Nevertheless, we test the market reaction on the alternative dates. First, for dates before the release of the proposals on which rumors about a new European DST spread publicly.

Second, for dates after the release of the proposals on which it became less likely or certain that an EU wide political agreement on the DST will not be reached. In general, all results are indistinguishable from zero. Except on March 12, 2019, we find a significant capital market reaction over a two-day period. Albeit the date marks the time when it became certain that the EU DST is not introduced in the near future in the common market, the abnormal return estimates are negative. On the same date, several economy-wide shocks regarding the ongoing debate about the exit of Great Britain from the EU have hit the market. The major news could confound our estimates on that event date. We cannot fully exclude that the capital market has already considered the rumors on the digital tax proposals gradually, but our event study analysis of the additional event dates gives us confidence that investors reacted to the digital tax package primarily on the date of the official proposal, March 21, 2018.

Third, we replicate our event study in Table 12 using the method by Kothari and Warner (2007) and calculate the cumulative abnormal return for each firm separately. If the expected return is based on the market model, as shown in column (1) of Table 12, we find – as expected – a comparable and significant CAAR of negative 0.69 percent. In column (2) of Table 12, we use the average return of a control group as an estimate for the expected return (Dutt et al., 2019; Johannesen and Larsen, 2016). The control group consists of comparable digital firms, with the same industry classification, that have annual revenues below the size thresholds and above 200 million euro. In this specification, we find a significant CAAR of minus 0.986 percent.

Moreover, to check if our results are driven by the choice of an equally-weighted portfolio of affected firms, we construct a value-weighted portfolio reflecting the sum of the market capitalization of each firm in the sample on each day in the estimation and event window (Doidge and Dyck, 2015; Ince and Porter, 2006). In a value-weighted portfolio, firms' returns are weighted according to their relative market value. Thus, the capital market reactions of large digital firms such as Amazon or Alphabet have markedly greater effects on the average abnormal returns of the portfolio. We rerun the baseline event study regression with value-weighted returns. The results are tabulated in Table 13. Again, we find a highly significant negative capital market reaction in our event window of -0.59 percent, which is comparable to our main specification.

Fourth, we disentangle the event window and analyze the daily average abnormal returns. Table 14 shows the results for our first robustness analysis. The daily abnormal returns range between -0.42 and 0.167 percentage and immediately prior to our event window, the direction of the abnormal return seems rather inconclusive. To test if the length of our event window affects our results, we employ a three-day event window starting on March 20 to capture potential stock market movements in anticipation of the draft directives (Austin, 1993; Hanlon and Slemrod, 2009). Regression results are displayed in Table 15. Similar to our main specification, we find a negative stock market reaction during this three-day event window. However, the result is not statistically significant in traditional terms.

Finally, we employ additional parametric and non-parametric significance tests (Table 16) to mitigate concerns on the statistical significance of the results of our alternative event study method, which is depicted in Table 12. In order to account for potential event day clustering, we employ an additional parametric test statistic that uses the variability of the time series of the sample's average abnormal returns in the estimation period (Bernard, 1987; Campbell et al., 1997). Furthermore, to ensure that the found significance was not driven by the higher uncertainty in the event period (i.e., greater return variability), we additionally employ a non-parametric rank test (Corrado, 1989). The higher uncertainty in the event period compared to the estimation period may emerge from the incremental uncertainty incorporated into the economic environment by the release of the digital tax package. In contrast to the parametric tests, the nonparametric rank test uses ordinal information about the returns. Overall, both additional test statistics confirm the significance of the evidence found. Similar to Hoopes et al. (2016), we additionally test the frequency of negative abnormal returns in our event window for treated and control firms to ensure that our results are not biased by a small number of sizeable negative abnormal return outliers (Hanlon and Slemrod, 2009). The results are shown in Table 16 Panel B. The test highlights the different capital market reaction between treatment and control group and mitigates concerns that the result is driven by one or two large stock price decreases (Hoopes et al., 2016).

5 Conclusion

In this study, we examine the two draft directives of the European Commission on the taxation of the digital economy published on March 21, 2018. The first draft directive suggests the introduction of an interim tax of three percent on gross revenues from certain digital services. The second draft directive lays down the rules for taxing corporate profits that are attributable to a Significant Digital Presence. We employ an event study to analyze the capital market reaction to the proposed introduction of the digital tax measures. In our two-day event window starting at the day of the release, we find a significant reduction in firm value of 222 digital firms which are likely to be affected. We provide evidence that investors believe that the proposed digital tax measures will be implemented and have a negative impact on affected firms' future profitability and competitiveness.

In various cross-sectional analyses, we find that the capital market reaction is, as expected, stronger for firms that can be assumed to engage more actively in tax avoidance and have a higher profit shifting potential. Moreover, the capital market reaction is more pronounced for firms located in the EU, inversely related to firms' revenues and seems stronger for loss-making firms. Based on our results, we estimate an overall abnormal market value decrease of digital and innovative corporations by at least 52 billion euro in response to the proposed measures. Thereof about 40% is attributable to U.S. based corporations.

Overall, we provide evidence that the introduction of ring-fencing digital taxes leads to disruptive effects on firm value and, potentially, overall economic wealth. Furthermore, our results highlight the distortive nature of the draft directives and substantiate the accusation of being focused on U.S. firms. With regard to the identified shortcomings in the conception and potentially harmful effects of the draft directives on firms, intergovernmental organizations as well as local governments should carefully evaluate the introduction of ring-fencing digital tax measures.

In general, the era of digitalization has led to an intense political and academic debate on how to adapt the principles of corporate taxation to changing means of value creation and innovative business models. Yet, empirical evidence on the effects of proposed adjustments to corporate taxation is scarce. Our findings shall contribute to the recent call in the literature for further research on the proposed policies of taxing the digital economy and help to holistically evaluate the effects of an introduction of digital tax measures.

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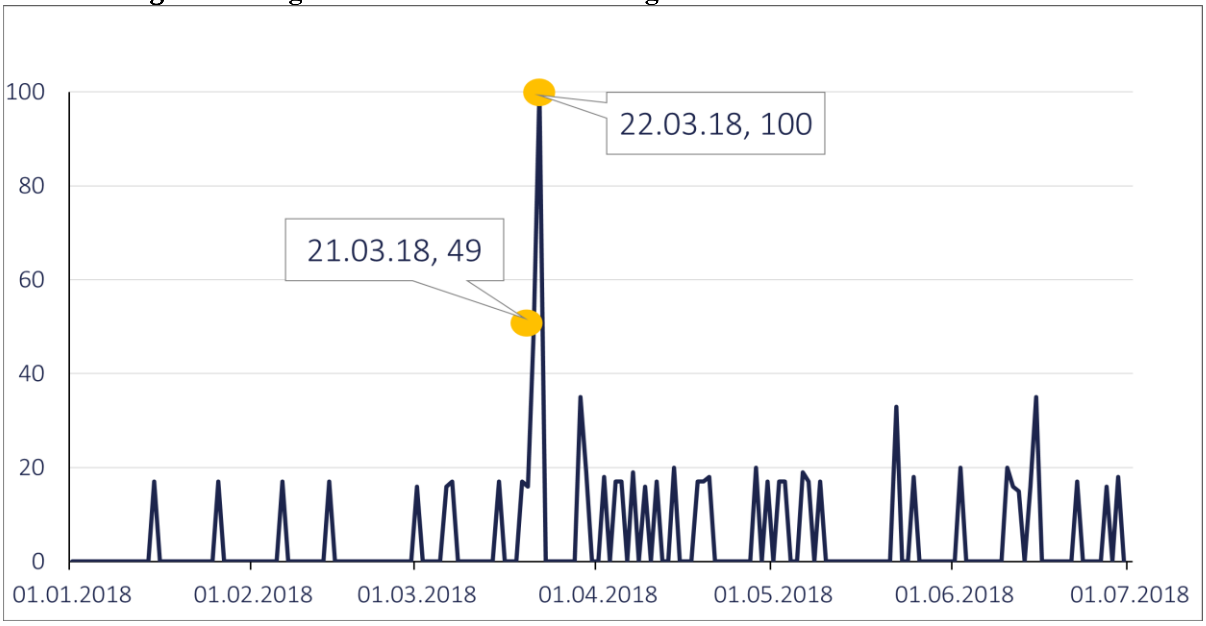
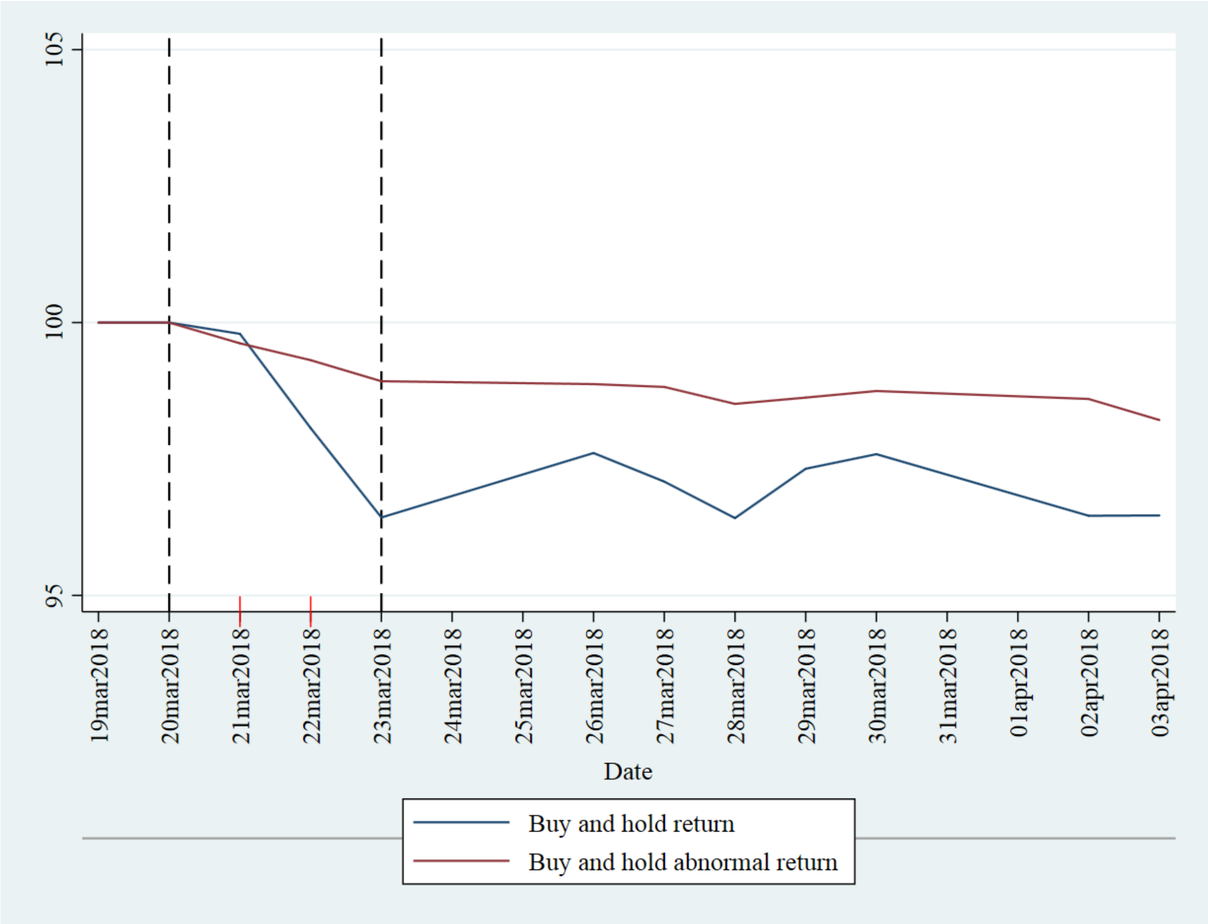
FIGURES

Figure 1 Google Trends Index for "EU Digital Tax" over the first half of 2018



Notes: In Figure 1, we plot the Google Trends Index for "EU Digital Tax" over the first six months of 2018 when EU policymakers were actively working on the draft tax directives. The Index (y-axis) varies from 0 to 100, where 100 represents the highest search activity for a specific time period. All other search activities are displayed relative to the highest search activity. The local peaks correspond to periods of relatively high search activity regarding "EU Digital Tax" and comprise our events of interest. The dots correspond to dates in 2018 and Index values, respectively.

Figure 2: Buy and hold returns – indexed on March 20, 2018



Notes: The figure displays the buy and hold return and the abnormal buy and hold return of an equally-weighted portfolio of all potentially by the draft directives affected firms. The figure is indexed to 100 on March 20, 2018.

TABLES

Table 1 Characteristics of Digital Services Tax proposals

Country	Relevant Dates				Characteristics of the tax			Business categories		
	First discussed	Passed by legal authorities	Effective as of	Date of rejection	Tax rate	Affected firms (global turnover size)	Turnover from digital services (in-country)	online advertising	digital intermediaries	sale of data
EU	21.03.2018	-	-	12.03.2019	3%	750	50	x	x	x
UK	29.10.2018	12.03.2019	01.04.2020	-	2%	500	25	x	x	
France	17.12.2018	24.07.2019	01.01.2019	-	3%	750	25	x	x	x
Spain	23.10.2018	18.01.2019	10.01.2019	-	3%	750	3	x	x	x
Italy	12.2017	01.01.2019	-	-	3%	750	5.5	x	x	x
Austria	29.12.2018	04.04.2019	01.01.2020	-	5%	750	25	x		
Czech Republic	30.04.2019	-	01.01.2020	-	7%	750	2	x	x	x
Belgium	17.01.2019	-	-	-	3%	750	50	x	x	x
Poland	29.04.2019	-	01.01.2020	-	3%	750	50	x	x	x

Notes: The size thresholds are stated in millions of euro. x marks the affected business categories that fall under the scope of the Digital Services Tax.
Sources: EY Tax Alerts; Accountancy Europe available at: https://www.accountancyeurope.eu/wp-content/uploads/190709-Digital-Tax-fact-sheet_FINAL.pdf (accessed 10.07.2019) and Grant Thornton available at: (https://www.grantthornton.global/en/insights/articles/digital-services-tax-in-europe/ (accessed 10.07.2019)

Table 2 Sample selection procedure

Subsample 1: based on ifo Institute	
Firms identified based on turnover, legal status, NACE codes	194
Check for consistently assigned firms	-1
Total subsample 1	193
Subsample 2: based on EU Commission	
Top digital MNEs	100
Check for listed firms and turnover threshold	-8
Total subsample 2	92
Total preliminary combined sample	285
Overlap of firms in samples	-35
Required stock price data not available or infrequent trading	-22
Check for potential confounding events (earnings announcement)	-6
Final sample of treated firms	222

Notes: Turnover refers to the two turnover thresholds incorporated in the Digital Services Tax proposal. NACE codes refer to the codes employed by the ifo Institute. The relevant NACE Rev. 2 codes are: 6201, 6209, 6311, 6312, 4791 and 5811 to 5819.

Table 3 List of affected companies

58.Com Inc.	Digital China Holdings Limited	Line Corporation	Scientific Games Corp
Activision Blizzard, Inc.	Discovery, Inc.	Masmovil Ibercom, S.A.	Scsk Corporation
Akamai Technologies INC	DUN & Bradstreet Corp.	Match Group, Inc.	Senshukai CO LTD
Alibaba Group Holding Limited	DXC Technology Company	Maxar Technologies Inc.	Servicenow, Inc.
Alliance Data Systems Corp	Ebay INC	Mediaset S.P.A.	Seven West Media Limited
Allscripts Healthcare Solutions INC	Econocom Group SA	Meredith Corp	SG & G Coporation
Alphabet Inc.	Elanders AB	Micro Focus International PLC	Shanghai Ganglian E-Commerce Holdings Company Limited
Altran Technologies SA	Electronic Arts INC	Mixi Inc.	SK Holdings Co., Ltd.
Amadeus IT Group, S.A.	Entertainment ONE Limited	Modern Times Group AB	SKY Limited
Amazon.Com, Inc.	EOH Holdings Limited	Moody's Corporation	Softbank Group Corp
AMC Networks Inc.	Epam Systems, Inc.	Mphasis Limited	Solocal Group S.A.
Amdocs Limited	Equifax INC	N Brown Group PLC	Sonda S.A.
Anhui Xinhua Media Company Limited	Equinix INC	Nasdaq, Inc.	Sopra Steria Group
Arnoldo Mondadori Editore SPA	Esprinet S.P.A.	Naspers Limited	Square Enix Holdings Co., Ltd.
Asos PLC	Expedia Group, Inc.	Naver Corporation	Super Micro Computer, Inc.
Asseco Poland S.A.	Experian PLC	NET ONE Systems CO LTD	Sykes Enterprises INC
Atos SE	Facebook, Inc.	Netapp, Inc.	Synaptics Incorporated
Autohome Inc.	Factset Research Systems INC	Netease, Inc.	Systemax INC
Automatic Data Processing INC	Fairfax Media Limited	Netflix, Inc.	T-Gaia Corp.
Axel Springer SE	First Data Corporation	Netscout Systems INC	Take-Two Interactive Software Inc.
Baidu Inc.	Fiserv INC	NEW Media Investment Group Inc.	Takkt AG
Bechtle AG	Formula Systems (1985) Limited	NEW York Times CO	Tata Consultancy Services Limited
Belluna CO LTD	Fuji Soft Inc.	News Corporation	Tech Mahindra Limited
Bitauto Holdings LTD	Gakken Holdings Co., Ltd.	Nexon CO LTD	Teradata Corporation
Booking Holdings Inc.	Gannett Co., Inc.	Next PLC	Thomson Reuters Corporation
Broadridge Financial Solutions, Inc.	Gartner INC	Nielsen Holdings PLC	Transcosmos INC
Caci International INC	Gemalto N.V.	Nomura Research Institute, Ltd.	Transunion
Cancom SE	Global Payments INC	NTT Data Corporation	Travelport Worldwide Limited
Capgemini SE	GMO Internet Inc.	Otsuka Corporation	Trend Micro Incorporated
CBS Corporation	Godaddy Inc.	Overstock.Com, Inc.	Trivago N.V.
CDW Corp	Graham Holdings Company	Paypal Holdings, Inc.	Twenty-First Century Fox, Inc.
Cerner Corp	Groupon, Inc.	PC Connection INC	Twitter, Inc.
Check Point Software Technologies Limited	Grupo Televisa S.A.B. de C.V.	Pcm, Inc.	Ubisoft Entertainment SA
China South Publishing & Media Group Company Limited	GS Home Shopping Inc.	Pearson PLC	Verint Systems, Inc.
Chinasoft International Limited	HCL Technologies Limited	Pivot Technology Solutions, Inc.	Verisign INC
Cimpress N.V.	Henan Dayou Energy Co., Ltd.	Playtech PLC	Verisk Analytics, Inc.
CIR S.P.A. - Compagnie Industriali Riunite Siglabile CIR S.P.A.	Henry Jack & Associates INC	Presidio, Inc.	Viacom, Inc.
Citrix Systems INC	Houghton Mifflin Harcourt Company	Prosiebensat.1 Media SE	Vipshop Holdings LTD
CJ ENM CO. Ltd.	Iliad	Quebecor INC	Virtusa Corporation
Cofide - Gruppo de Benedetti S.P.A.	Indra Sistemas SA	Qurate Retail, Inc.	Vmware, Inc.
Cognizant Technology Solutions Corp	Informa PLC	Rakuten INC	Wayfair Inc.
Comcast Corporation	Infosys Limited	RED HAT INC	Weibo Corporation
Computacenter PLC	Insight Enterprises INC	Redington (India) Ltd.	Wipro Limited
Conexio Corporation	Internet Initiative Japan INC	Relx PLC	Wirecard AG
Constellation Software Inc.	Itochu Techno-Solutions Corporation	Reply S.P.A.	Wolters Kluwer NV
Convergys Corp	Jd.Com Incorporated	Rizap Group, Inc.	Workday, Inc.
Copart INC	Jiangsu Phoenix Publishing & Media Corporation Limited	Rizzoli Corriere Della Sera Mediagroup S.P.A.	Worldline
CoreLogic Inc.	John Wiley & Sons, Inc.	RTL Group SA	Xinhua Winshare Publishing and Media Co., Ltd.
Criteo SA	Kadokawa Dwango Corporation	S&P Global Inc.	Yandex N.V.
Cyberagent INC	Konami Holdings Corporation	Sabre Corporation	Yirendai Ltd.
DAI Nippon Printing CO LTD	Lagardere SCA	Salesforce.Com, Inc.	Yonyou Network Technology Co., Ltd.
Daily Mail and General Trust PLC	Larsen & Toubro Infotech Limited	Samsung SDS Co.,Ltd.	YY Inc.
Daou Tech Inc.	Leidos Holdings, Inc.	Sanoma OYJ	Zalando SE
Dassault Systemes SE	Liberty Expedia Holdings, Inc.	Schibsted ASA	Zozo, Inc.
Datatec Limited	Liberty Global PLC	Scholastic Corp	
DHC Software Co., Ltd.	Liberty Tripadvisor Holdings, Inc.	Science Applications International Corp	

Notes: In total 222 companies are classified to be affected by the EU draft directives.

Table 4 Descriptive statistics

Variable	N	Mean	SD	P25	Median	P75	Min	Max
Stock return	53,724	0.08	1.69	-0.72	0	0.87	-5.87	6.17
Market return (S&P 1200)	53,724	0.05	0.57	-0.15	0.07	0.33	-4.07	1.61
Cash ETR	42,350	25.63	12.29	18.37	25.62	31.66	0.06	85.71
Intangible to total assets	53,482	31.67	23.97	9.05	29	49.96	0	89.46
EU revenue/total revenue	50,820	46.25	39.05	1.54	46.71	85.15	0	100
Revenues in billion euro	53,724	6.15	14.6	1.32	2.35	5.1	0.66	148.31
Loss-making (2017)	53,724	0.09	0.29	0	0	0	0	1

Notes: Treated firms are listed firms with consolidated annual turnover above 750 euro million that are classified to be affected by the digital tax proposals. All values, except for the number of firms N and revenues, are stated in percent.

Table 5 Dispersion of treated firms over countries

Country	Frequency	Percent
Australia	2	0.90
Belgium	1	0.45
Bermuda	2	0.90
Canada	5	2.25
Cayman Islands	12	5.41
Chile	1	0.45
China	8	3.60
Finland	1	0.45
France	11	4.95
Germany	7	3.15
India	8	3.60
Israel	2	0.90
Italy	7	3.15
Japan	28	12.61
Korea (Republic of)	7	3.15
Luxembourg	1	0.45
Mexico	1	0.45
Netherlands	5	2.25
Norway	1	0.45
Poland	1	0.45
South Africa	3	1.35
Spain	3	1.35
Sweden	2	0.90
United Kingdom	15	6.76
United States of America	88	39.64

Notes: Treated firms are stock-listed firms whose global consolidated revenue exceeds 750 million euro and the firms operate in an industry that is likely to be affected by the EU digital tax proposal. The relevant NACE Rev. 2 codes are: 6201, 6209, 6311, 6312, 4791 and 5811 to 5819. In total, we have 222 treated firms in our main sample. The country of origin is the location where the firm is incorporated.

Table 6 Cumulative average abnormal return – baseline result

	(1) Stock return
Alpha	0.044**
	(0.019)
Market return (S&P 1200)	0.715***
	(0.048)
21-22 Mar. 2018	-0.692***
	(0.070)
Observations	53,724
Standard errors clustered on firm level	Yes
Standard errors clustered on trading days	Yes
Firms	222
Adj.-R2	0.063

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}$. R_{it} is the return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*. D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of γ_i (and the corresponding standard error) is multiplied by two to account for the length of the two-day event window (Eckbo et al. 2007). γ_i can thus be interpreted as an estimate for the cumulative average abnormal return *CAAR* over the two-day event window. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 7 Cross-sectional analysis – tax aggressiveness

	(1) Stock return	(2) Stock return	(3) Stock return	(4) Stock return
Alpha	0.047**	0.044**	0.044**	0.046**
	(0.020)	(0.021)	(0.019)	(0.021)
Market return (S&P 1200)	0.676***	0.676***	0.714***	0.714***
	(0.050)	(0.050)	(0.048)	(0.048)
21-22 Mar. 2018	-0.679***	-0.605***	-0.692***	-0.584***
	(0.166)	(0.153)	(0.078)	(0.123)
Tax aggressiveness	0.001			
	(0.001)			
Tax aggressiveness x 21-22 Mar. 2018	-0.021***			
	(0.006)			
Tax aggressiveness: highest quintile=1		0.017		
		(0.030)		
Tax aggressiveness: highest quintile=1 x 21-22 Mar. 2018		-0.485***		
		(0.173)		
Intangible to total assets			-0.001	
			(0.001)	
Intangible to total assets x 21-22 Mar. 2018			-0.009	
			(0.010)	
Intangible to total assets: highest quintile=1				-0.008
				(0.024)
Intangible to total assets: highest quintile=1 x 21-22 Mar. 2018				-0.548
				(0.347)
Observations	42,350	42,350	53,482	53,482
Standard errors clustered on firm level	Yes	Yes	Yes	Yes
Standard errors clustered on trading days	Yes	Yes	Yes	Yes
Firms	175	175	221	221
Adj.-R2	0.060	0.060	0.062	0.062

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + \rho_i TAX_i + \delta_i TAX_i D_t + e_{it}$. R_{it} is the return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*, D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. TAX_i is an estimate for the tax aggressiveness or the profit shifting potential of a firm. First, *Tax aggressiveness* is measured as

Table 7 Cross-sectional analysis – tax aggressiveness

the negative of a firm's effective tax rate (ETR). Firms with negative ETRs are excluded from the sample. The negative conversion allows for an intuitive interpretation of the coefficient δ_i on the two-day *CAAR*. The *Tax aggressiveness* variable is centered on the mean. *Tax aggressiveness: highest quintile* is a dummy variable with the value of one for all firms who's ETR is in the lowest 20 percentile. *Profit shifting potential* is measured as the ratio of intangible to total assets. *Profit shifting potential: highest quintile* is a dummy variable equal to one for all firms who's intangible to total assets ratio is in the highest quintile. Coefficients can be interpreted as in Table 6. In addition, ρ_i measures the effect of the firm-specific indicator on the stock return, respectively. δ_i is an estimate of the effect of the firm-specific indicator on the two-day *CAAR*. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 8 Cross-sectional variation – firm-specific characteristics

	(1) Stock return	(2) Stock return	(3) Stock return	(4) Stock return
Alpha	0.040	0.036*	0.043**	0.043**
	(0.026)	(0.019)	(0.020)	(0.019)
Market return (S&P 1200)	0.703***	0.703***	0.715***	0.715***
	(0.048)	(0.048)	(0.048)	(0.048)
21-22 Mar. 2018	-0.071	-0.387***	-0.668***	-0.619***
	(0.344)	(0.136)	(0.080)	(0.188)
EU exposure	0.000			
	(0.000)			
EU exposure x 21-22 Mar. 2018	-0.012**			
	(0.006)			
EU exposure: highest quintile=1		0.033		
		(0.027)		
EU exposure: highest quintile=1 x 21-22 Mar. 2018		-1.158***		
		(0.264)		
Revenues			0.000	
			(0.000)	
Revenues x 21-22 Mar. 2018			-0.012**	
			(0.005)	
Loss-making (2017)=1				0.015
				(0.039)
Loss-making (2017)=1 x 21-22 Mar. 2018				-0.770
				(1.348)
Observations	50,820	50,820	53,724	53,724
Standard errors clustered on firm level	Yes	Yes	Yes	Yes
Standard errors clustered on trading days	Yes	Yes	Yes	Yes
Firms	210	210	222	222
Adj.-R2	0.063	0.063	0.063	0.063

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + \rho_i I_i + \delta_i I_i D_t + e_{it}$. R_{it} is the return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*, D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. I_i is an indicator for firm-specific characteristics. First, *EU exposure* is measured as the ratio of revenues by subsidiaries located in the EU

Table 8 Cross-sectional variation – firm-specific characteristics

to overall revenue of all the firm's subsidiaries. Second, *EU exposure: highest quintile* is a dummy variable with the value of one for firms with a ratio of EU subsiaries' revenues to total revenue in the highest 20 percentile. Third, *Revenues* measures a firm's consolidated revenues. The variable is centered on the mean. Forth, *Loss-making* is a dummy variable indicating firms with losses in the financial year 2017. Coefficients can be interpreted as in Table 6. In addition, ρ_i measures the effect of the firm-specific indicator on the stock return, respectively. δ_i is an estimate of the effect of the firm-specific indicator on the two-day *CAAR*. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 9 Difference in differences regression

	(1) Stock return
Alpha	0.055**
	(0.027)
Market return (S&P 1200)	0.628***
	(0.047)
21-22 Mar. 2018	0.122
	(0.390)
Treated firms=1	-0.004
	(0.021)
Treated firms=1 x 21-22 Mar. 2018	-0.978**
	(0.471)
Observations	83,490
Standard errors clustered on firm level	Yes
Standard errors clustered on trading days	Yes
Firms	345
Adj.-R2	0.042

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + \rho_i T_i + \delta_i D_t T_i + e_{it}$. R_{it} is the return of firm *i* on day *t*. T_i is a dummy variable set equal to 1 for firms that are likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*. D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. Coefficients can be interpreted as in Table 6. In addition, ρ_i measures if the alpha of the control firm portfolio differs from the treated firm portfolio. δ_i is an estimate of the difference of the two-day *CAAR* between treated and control firms. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 10 Change in market value – two-day window starting on event date

	(1)	(2)
average abnormal return based on	firm-specific market model approach	firm-specific using control group as expected return
21-22 Mar 2018	-52,854	-85,394

Notes: Column (1) and (2) use firm-specific estimates to calculate the abnormal market value change. Column (1) uses the market value approach and column (2) estimates the abnormal return as the difference between actual return and average return of comparable non-affected firms. For both expected return estimation approach, the abnormal return is calculated at the level of each of the 222 treated stock-listed firms whose global consolidated revenue exceed 750 million euro and that are, based on their industry affiliation, likely affected by the EU digital tax proposal. Firms' market values are taken from EIKON in the local currency and converted to euro with the applicable exchange rate. Based on the individual abnormal return calculation, the market value changes are estimated over a two-day period, starting on the event date March 21, 2018. The combined market value change of all 222 affected firms represents the overall effect.
Market value changes are depicted in millions of euro.

ROBUSTNESS TESTS

Table 11 Alternative event dates

	(1) Stock return	(2) Stock return	(3) Stock return	(4) Stock return
Alpha	0.038*	0.045*	0.012	0.028
	(0.019)	(0.019)	(0.023)	(0.023)
Market return (S&P 1200)	0.732***	0.718***	0.787***	0.909***
	(0.054)	(0.050)	(0.047)	(0.044)
26-27 Feb. 2018	-0.148			
	(0.670)			
15-16 Mar. 2018		-0.300		
		(0.285)		
4-5 Dec. 2018			-0.017	
			(0.230)	
12-13 Mar. 2019				-1.275***
				(0.046)
Observations	53,692	53,716	52,734	52,320
Standard errors clustered on firm level	Yes	Yes	Yes	Yes
Standard errors clustered on trading days	Yes	Yes	Yes	Yes
Firms	222	222	222	222
Adj.-R2	0.058	0.057	0.102	0.120

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}$. R_{it} is the return of firm i on day t that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index m (S&P Global 1200) on day t. D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of γ_i (and the corresponding standard error) is multiplied by two to account for the length of the two-day event window (Eckbo et al. 2007). γ_i can thus be interpreted as an estimate for the cumulative average abnormal return *CAAR* over the two-day event window. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 12 Cumulative average abnormal returns – alternative event study method

	(1)	(2)
Expected return estimation	market model	using control group as expected return
21-22 Mar. 2018	-0.690*	-0.986**
	(0.417)	(0.436)

Notes: This model estimates the cumulative average abnormal return (*CAAR*) in line with Kothari and Warner (2007). $CAAR(t_0, t_1) = \sum_{t=t_0}^{t=t_1} \left(\frac{1}{N}\sum_{i=1}^{i=N} AR_{it}\right)$. Daily abnormal returns AR_{it} are calculated as the difference between actual returns and expected returns $AR_{it} = R_{it} - R_{it}^{exp}$. We use two alternatives to estimate $R_{i,t}^{exp}$. First, we use parameters from the market model regression for each individual firm to estimate the expected return:
$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$. Second, we take the average return of a control group, firms operating in the similar industries but below the revenue size threshold, as the expected return: $AR_{it} = R_{it} - \frac{1}{N^{contr}}\sum_{j=n}^{N^{contr}} R_{jt}^{contr}$. The ratio of the *CAAR* and its estimated standard deviation ($\hat{s}$) provides – in the absence of abnormal returns – a normally distributed test statistic. The 222 treated firms are stock-listed firms whose global consolidated revenue exceeds 750 million euro and the firms operate in an industry that is likely to be affected by the EU digital tax proposal.
Standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 13 Value-weighted portfolio

	(1) Stock return
Alpha	0.036**
	(0.016)
Market return (S&P 1200)	0.473***
	(0.125)
21-22 Mar. 2018	-0.590***
	(0.159)
Observations	53,724
Standard errors clustered on firm level	Yes
Standard errors clustered on trading days	Yes
Firms	222
Adj.-R2	0.016

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}$. R_{it} is the value-weighted return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*. D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of γ_i (and the corresponding standard error) is multiplied by two to account for the length of the two-day event window (Eckbo et al. 2007). γ_i can thus be interpreted as an estimate for the cumulative average abnormal return *CAAR* over the two-day event window. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 14 Daily abnormal returns

	(1) Stock return
Alpha	0.044**
	(0.019)
Market return (S&P 1200)	0.716***
	(0.049)
19 Mar. 2018	-0.420***
	(0.066)
20 Mar. 2018	0.167***
	(0.039)
21 Mar. 2018	-0.380***
	(0.044)
22 Mar. 2018	-0.310***
	(0.064)
23 Mar. 2018	-0.389***
	(0.105)
Observations	54,390
Standard errors clustered on firm level	Yes
Standard errors clustered on trading days	Yes
Firms	222
Adj.-R2	0.068

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \sum_{d=-2}^{d=2} \gamma_{di} D_{dt} + e_{it}$. R_{it} is the return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*. D_{dt} is a dummy set equal to 1 on the respective day, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of $\gamma_i$can be interpreted as the daily abnormal return. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 15 Alternative event window length

	(1) Stock return
Alpha	0.044**
	(0.019)
Market return (S&P 1200)	0.718***
	(0.049)
20-22 Mar. 2018	-0.517
	(0.418)
Observations	53,946
Standard errors clustered on firm level	Yes
Standard errors clustered on trading days	Yes
Firms	222
Adj.-R2	0.062

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}$. R_{it} is the return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day *t*, D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of γ_i (and the corresponding standard error) is multiplied by three to account for the length of the three-day event window (Eckbo et al. 2007). γ_i can thus be interpreted as an estimate for the cumulative average abnormal return *CAAR* over the three-day event window. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 16 Alternative test statistics

	(1)	(2)
Expected return estimation	Market model	Average return of control group
Panel A: Additional parametric test statistics		
21-22 Mar 2018	-0.690	-0.986
Parametric test alternative	(-1.809)*	(-2.313)**
Corrado rank-sum test	(-2.438)*	(-1.861)*
Panel B: Frequency of negative abnormal returns		
Treatment group		
Abnormal return<0 (N)	144	
Abnormal return≥0 (N)	78	
Percent<0	64.9%	
Control group		
Abnormal return<0 (N)	63	
Abnormal return≥0 (N)	60	
Percent<0	51.2%	
Pearson's chi square Statistic (1 DOF)	6.140	
P-value (One-Tail)	0.013	

Notes: The 222 treated firms are stock-listed firms whose global consolidated revenue exceeds 750 million euro and the firms operate in an industry that is likely to be affected by the EU digital tax proposal. Panel A depicts additional parametric and non-parametric test statistics for the main results. The parametric test alternative is based on Kothari and Warner (2007) and is calculated as $t_{parametric\ 2} = \frac{CAAR(0,1)}{\sqrt{s^2(CAAR(d))}}$, with $s^2(CAAR(d))$ as the variance of cumulated average abnormal two-day returns in the estimation period. The Corrado rank-sum test is calculated as $z_{Rank} = \frac{\sum_{t=0}^{t=1} \frac{1}{242} \sum_{i=1}^{242} (k_{i,t} - E(k))}{\sqrt{d \times s^2(k)}}$, with $K_{i,t}$ denoting the rank of the abnormal return of firm i at day t in the time series. The expected rank $E(k)$ is one-half plus half the number of time-series days and d is the number of days. The test statistic is assumed to be distributed asymptotic standard normal. Panel B depicts the absolute number and frequency of negative (and positive) abnormal returns for the treatment and control group, for both different expected return estimation method, excluding the control group.

Test statistics are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Table 17 Robustness results – non-winsorized returns

	(1) Stock return
Alpha	0.048**
	(0.021)
Market return (S&P 1200)	0.739***
	(0.052)
21-22 Mar. 2018	-0.740***
	(0.064)
Observations	53,724
Standard errors clustered on firm level	Yes
Standard errors clustered on trading days	Yes
Firms	222
Adj.-R2	0.048

Notes: The Table presents the results of the conditional market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}$. R_{it} is the non-winsorized return of firm *i* on day *t* that is likely to fall under the scope of the digital tax proposal (group of treated firms), R_{mt} is the return of the market index *m* (S&P Global 1200) on day t. D_t is a dummy set equal to 1 in the two-day event window, and e_{it} is an error term. α_i provides an estimate for the alpha of an equally-weighted portfolio of all 222 treated firms and β_i is the estimate of the portfolio's market beta. The coefficient estimate of γ_i (and the corresponding standard error) is multiplied by two to account for the length of the two-day event window (Eckbo et al. 2007). γ_i can thus be interpreted as an estimate for the cumulative average abnormal return *CAAR* over the two-day event window. The model is estimated using returns of 250 trading days before the event date, excluding the ten trading days immediately prior to the event date.
Clustered standard errors are in parenthesis. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

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