TAXING THE DIGITAL ECONOMY: INVESTOR REACTION TO THE EUROPEAN COMMISSION'S DIGITAL TAX PROPOSALS

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This study analyzes investor reaction to the European Commission's proposals on the taxation of digital firms. Examining the stock returns of potentially affected firms surrounding the proposals' release, we find a significant abnormal capital market reaction of −0.692 percent. This corresponds to an absolute market value reduction of more than 52 billion euros, 40 percent of which is attributable to US firms. Investor reaction is stronger for firms that engage more in tax avoidance and for those with higher European Union exposure. Overall, investors perceive the event as a threat to digital firms' future profitability and react in line with the proposals' intentions to secure tax revenues and to extract location-specific rent.

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

JEL Codes: H25, K34, G14

I. INTRODUCTION

To curb tax avoidance of digital firms and to increase tax revenues within the European Union (EU), on March 21, 2018, the European Commission published a "digital tax package" containing two proposals for tax measures directly targeted at a single industry: the digital economy (European Commission, 2018a). The first proposal suggests the immediate introduction of an interim digital services tax

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(DST) of 3 percent on gross revenues from certain digital services of large digital firms, deviating from the current system of taxing corporate profits. The second proposal lays down the rules for taxing corporate profits that are attributable to a significant digital presence in the long run.

In this study, we analyze whether investors perceive the introduction of digital tax measures as a threat to future profitability. We also analyze heterogeneous effects depending on the specific characteristics of digital firms. In doing so, we provide evidence regarding whether investors understand and react to legislative drafts' underlying intentions.

Because firm-specific costs and benefits will ultimately be reflected in a change in firm value, we focus on the proposals' effect on firm value. 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 (Wagner, Zeckhauser, and Ziegler, 2018a). At the time of the proposals' release, it was seen as very likely that a new measure, such as the DST, would become effective.[1] Pierre Moscovici, commissioner of taxation, stated on March 21, 2018, "Digital taxation is no longer a question of 'if' — this ship has sailed" (European Commission, 2018b).

We employ a short-term event study design to measure digital firms' investor reaction and find a significant cumulative average abnormal return of −0.692 percent in response to the release of the proposals. This finding suggests that investors, on average, perceive the increased likelihood of the introduction of digital tax measures as negative news for digital firms' future profitability. Moreover, it suggests that investors perceive the demand for digital services to be not perfectly inelastic, so the capital market expects that digital firms will be unable to pass through all of the additional tax expenses.

To evaluate whether investors react in line with the proposals' intentions, we analyze the variation of abnormal returns across firm characteristics. The proposed tax measures are designed to reach two specific goals: first, to safeguard national tax revenues from large digital firms in the EU that are perceived to avoid taxation (European Commission, 2018e; Fuest et al., 2018), and second, to extract part of the location-specific rent of digital firms, which is expected to emerge through high user involvement in market countries, that is, countries with many consumers (European Commission, 2018e; Cui, 2019; Cui and Hashimzade, 2019). These objectives are particularly reflected in the conception of the DST proposal, including arbitrarily chosen size thresholds and the taxation of revenues in market countries.

In line with the first objective, we find that the negative abnormal return is significantly stronger for firms that engage more in tax avoidance and for firms that

[1] The finance ministers of the EU member states have expressed a large interest in a temporary digital tax measure and the EU Commission explicitly points out that "this proposal answers these calls for action, and addresses in an interim way the problem that the current corporate tax rules are inadequate for the digital economy" (European Commission, 2018a). Hence, from the political context in March 2018, investors and corporate managers could expect with some certainty that a DST will be introduced.

have higher profit-shifting potential. This is attributable to the fact that the mechanisms to avoid corporate taxation or to relocate net income are not applicable to the proposed gross revenues DST.[2] Our finding suggests that firms receive a market premium for tax avoidance and that the premium diminishes when the European Commission releases the "digital tax package." In line with the second objective, we find that the stock market reaction is more severe for firms with a higher proportion of revenues generated in the EU. Overall, the investor reaction reflects the intention of the European Commission's proposals to secure tax revenues and to extract location-specific rent, suggesting that the capital market expects that the proposals' objectives are achievable.

Furthermore, we examine the magnitude of the observed market reaction. We estimate the total abnormal market value change to be at least −52 billion euros over the two-day event window. Approximately 40 percent of the economically meaningful reduction is attributable to firms located in the United States, supporting the argument that a DST will mainly affect large US firms. It remains questionable whether additional tax revenues, which are estimated to be approximately 3.9–5 billion euros per annum, can outweigh the effect on shareholders' wealth (European Commission, 2018c; Fuest et al., 2018). Based on a theoretical present-value evaluation, we estimate that it will take at least six years for the additional tax revenues to compensate for the initial drop in shareholder wealth. The magnitude of the abnormal market value reduction indicates that investors do not expect that the DST will quickly be repealed.

Our analysis adds to the recent call in the literature for empirical research on the proposed measures of taxing the digital economy and the adaptation of the international tax framework to the digital era (Devereux and Vella, 2018; Olbert and Spengel, 2019). While prior studies mostly focus on a technical evaluation of the DST and a virtual permanent establishment concept (Becker and Englisch, 2018; Nieminen, 2018; Cui, 2019; Russo, 2019; Vella, 2019), the literature is largely silent about the economic effects of such measures on firms. However, such an evaluation is especially critical against the background of ongoing tax discussions at the level of the Organisation for Economic Co-operation and Development (OECD) and unilateral actions of several jurisdictions to introduce a DST (Pellefigue, 2019; Vella, 2019). Our results indicate that policymakers should be aware that investors perceive digital taxes as a threat to firms' profitability. The economic effects of reduced profitability and growth disincentives of digital companies may outweigh potential tax revenue benefits.

Furthermore, this paper complements the literature that examines the effect of anti-tax avoidance policies to safeguard tax revenues. Prior research shows that the introduction of anti-tax avoidance policies, such as thin capitalization rules or

[2] Note that the DST is deductible from the corporate income tax base. Hence, if firms are unable to avoid the DST on gross revenues, the effective tax burden of firms that currently avoid more corporate income taxes will increase relatively more.

controlled foreign company rules, have positive tax revenue effects for governments and lead to real effects at the level of the firm in the form of altered capital structures and investment behavior (Blouin et al., 2014; Egger and Wamser, 2015; Clifford, 2019; de Mooij and Liu, 2021). Our results indicate that firms receive a market price premium for higher tax avoidance activities, which the proposed digital tax measures effectively diminish.

Moreover, we contribute to the mixed evidence on the elasticity of demand in the digital economy. On the one hand, Einav et al. (2014) and Baugh, Ben-David, and Park (2018) found a relatively high elasticity of demand for online sales over platforms such as eBay or Amazon. On the other hand, Cohen et al. (2016) and Bibler, Teltser, and Tremblay (2020) show that demand is relatively inelastic on sharing economy platforms. Our capital market analysis reveals that investors expect to bear some of the incidence of the digital tax package and perceive the elasticity of demand for digital services to be relatively high.

Finally, our study contributes to the literature concerned with the effect of tax reforms on shareholder value. Doidge and Dyke (2015), among others, show that additional corporate taxes imply a negative effect on firm value. Several studies analyze the stock market reaction in response to the recent US tax reform and find heterogeneous stock price reactions across firms and countries (Wagner, Zeckhauser, and Ziegler, 2018b; Gaertner, Hoopes, and Williams, 2020; Overesch and Pflitsch, 2021). Hoopes, Thornock, and Williams (2016) analyze the events around the US sales tax reform for online retail companies. Their study provides evidence of negative abnormal returns for targeted online retailers. Different studies find inconclusive results on investor reaction to the introduction of mandatory tax disclosure rules in Europe and Australia (Johannesen and Larsen, 2016; Chen, 2017; Hoopes, Robinson, and Slemrod, 2018; Dutt et al., 2019). To the best of our knowledge, we are the first to examine the stock market reaction in response to reforms on taxing digital corporations.

II. INSTITUTIONAL BACKGROUND AND HYPOTHESES DEVELOPMENT

A. The Digital Tax Initiatives in the European Union

Despite the innovative character of most digital business models and their positive contribution to economic growth, digital firms are repeatedly subject to intensive public and political debate on their tax avoidance activities.[3] The dependence on a physical presence for the establishment of a taxable nexus, which is a central feature of the existing international tax framework, poses a significant challenge for

[3] The effective tax rate of big tech companies is regularly discussed in the public media and Margrethe Vestager, European commissioner for competition, has become publicly known for her focus on illegal state aid cases and tax affair investigations (see, e.g., *Financial Times*, 2018b; *Guardian*, 2018; Bodoni and White, 2019).

the taxation of cross-border transactions of digital businesses. In response, the European Commission published a "digital tax package" on March 21, 2018, containing two proposals that are concerned with the taxation of digital activities and services (European Commission, 2018a, 2018d, 2018e). The first proposal aims to introduce a new EU-wide DST on revenues from certain digital services as an interim solution. The second proposal focuses on a long-term solution, presenting rules and provisions for the corporate taxation of a significant digital presence (European Commission, 2018d).

The DST constitutes a gross revenue tax of 3 percent.[4] Those revenues that result from the provision of three types of digital services are taxable: 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 (European Commission, 2018e). The DST paid is deductible from the corporate income tax base.

The proposal suggests limiting the DST to firms that exceed two size thresholds. First, the consolidated amount of worldwide company turnover must exceed 750 million euros within a financial year. Second, the total amount of taxable revenues within the EU — those revenues that are taxable under the scope of the DST — must exceed 50 million euros in the same financial year (European Commission, 2018e).[5]

The second proposal of the European Commission aims for a comprehensive solution for the long run. It intends to establish a new taxable nexus for firms that maintain a nonphysical but significant digital presence in one or more EU member states. Using a significant digital presence as a taxable nexus extends the existing physical permanent establishment concept by the concept of a "virtual permanent establishment." According to the proposal, a significant digital presence exists in a member state if a firm supplies digital services through a digital interface and meets one or more of the following thresholds of digital activity in a member state in the tax period: first, revenues from supplying digital services to users exceed 7 million euros; second, the number of users of digital services exceeds 100,000; or third, the number of business contracts concluded for the supply of digital services exceeds 3,000 (European Commission, 2018d).

Overall, the finance ministers of EU member states have expressed a large interest in a temporary digital tax measure (European Council, 2017). The EU Commission points out that the DST proposal "answers these calls for action, and addresses in an interim way the problem that the current corporate tax rules are inadequate for the digital economy" (European Commission, 2018e). Consequently, the DST proposal

[4] In contrast to net income, the management of the gross revenue figure on the income statement is to a lesser extent at the discretion of firms.

[5] The explanatory memorandum in the proposal limits the scope of the DST to corporations.

contains detailed provisions on the tax subject, the tax base, and the tax rate. In contrast, the European Commission explicitly states that the proposal concerning the corporate taxation of a significant digital presence is thought of as a long-term solution and subordinate to a multilateral agreement at the level of the OECD. As a result, the proposal's conceptual framework is not as developed as that of the DST proposal.

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 collective understanding.[6] The two concepts remain formal proposals, and the European Commission indicated that it may revive the proposals if no consensus at the level of the OECD is reached.[7] The European Commission's vice president recommended that member states use the DST proposal as a framework for legislative actions at the national level.[8] Several countries followed this recommendation and started to introduce a DST unilaterally.[9] As of the beginning of 2021, the European Commission restarted the formal process to introduce a DST.[10] The political and academic debate on digital tax measures is ongoing, and empirical insights into the economic effects of such methods are highly valuable.

B. Implications of the Digital Tax Package and Hypotheses

It is widely accepted that tax policy changes may have significant effects on stock prices and that it is crucial to be aware of the potential effects (Downs and Tehranian, 1988; Doidge and Dyck, 2015). In general, stock prices are related to the cash flow distributions expected to be generated by the firm and incorporate all available information of the market (McWilliams and Siegel, 1997). Therefore, ceteris paribus and without perfectly inelastic demand, additional corporate taxes intuitively and negatively affect a firm's stock price as they reduce the after-tax cash flow (DeAngelo and Masulis, 1980; Doidge and Dyck, 2015; Wagner, Zeckhauser, and Ziegler, 2018a).[11]

With regard to the digital tax package, stock prices might be affected both by the interim DST proposal and by the proposed long-term tax reform for digital companies. From the proposals' different levels of conceptual detail and the political

[6] For the main results of the ECOFIN meetings on December 04, 2018, and March 12, 2019, see European Council, 2018, 2019.

[7] As of 2021, the OECD member states are proceeding with an initiative to reframe the international corporate tax system. The OECD proposes a corporate tax reform that intends to shift taxing rights to the market jurisdiction and to introduce a global minimum tax and deduction disallowance (OECD, 2019).

[8] See Debate in the European Parliament on April 15, 2019 (European Parliament, 2019).

[9] For an overview of the countries, see Tax Foundation (2021).

[10] In January 2021, the European Commission started a public consultation process to introduce a digital tax to address the issue of fair taxation of the digital economy (European Commission, 2021).

[11] While the "asset price" models of shareholder incidence take general equilibrium effects from the taxation of existing and new assets into account, we lean on the "cash flow" model of incidence, which leaves relative price effects of tax reforms aside (Cutler, 1988).

context in March 2018, investors and corporate managers could expect with some certainty that the DST will be introduced while the adoption of the significant digital presence proposal was always doubtful (Cui, 2019). Thus, we assume that investors mainly evaluate and react to the proposed DST. However, throughout the paper, we will reflect on this assumption. Academics and practitioners immediately and heavily criticized both proposals for being populist and shortsighted (e.g., Fuest et al., 2018; Næss-Schmidt et al., 2018; Spengel, 2018). With regard to the detailed proposal of a DST, prior literature points out that a gross revenue tax deviates from the conceptual fundamentals of the existing tax framework of corporate profit taxation and that this addition to the existing system is likely to create a complex and discriminatory tax system that distorts competition and harms the position of EU member states in terms of international tax competitiveness (CFE Fiscal Committee, 2018; Petruzzi and Koukoulioti, 2018; Sheppard, 2018; van Horzen and van Esdonk, 2018).

In contrast to the corporate income tax, which is a net profit tax, the DST is, in essence, an additional *ad valorem* excise tax. The statutory incidence of the proposed DST lies on the producer side and is not levied per customer transaction but on an aggregate level on the overall revenues from digital services. However, the economic incidence of an excise tax is not clear upfront. Prior literature shows that the demand for digital services on sharing economy platforms is relatively inelastic but that additional sales taxes on e-tailers can lead to a quite elastic change in demand (Cohen et al., 2016; Baugh, Ben-David, and Park, 2018; Bibler, Teltser, and Tremblay, 2020). Research also shows that comparable excise taxes on products with inelastic demand functions, such as gasoline or alcohol, can be fully passed through (Marion and Muehlegger, 2011; Hindriks and Serse, 2019). To the extent that the incidence of the additional tax burden is not on customers or labor, owners will bear the burden of the newly proposed DST.

Due to the inverse relation between corporate profitability and the effective tax burden, the effect of a gross revenue tax on the after-tax cash flow may well exceed the burden of an income tax.[12] This may cause severe consequences for firms with relatively low profit margins in terms of competitiveness, forcing them to either raise prices or go out of business.

Furthermore, the fixed thresholds lead to the undesirable effect that around the limit value, additional gross income reduces the net income of a firm. 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. As a consequence, large digital firms are subject to an additional tax, even though several researchers show the impracticability and distortive effect of such practices (Schön, 2018; Olbert and Spengel,

[12] A 3 percent gross revenue tax translates to a 30 percent income tax for firms with a profit margin of 10 percent and to a 60 percent income tax for firms with a profit margin of 5 percent.

2019). Simultaneously, the broadly defined digital service revenue categories increase the risk that the scope of firms affected by the proposed digital tax measures is overshooting.[13] In addition, the newly proposed measures introduce considerable tax uncertainty for affected firms, and prior literature has shown that this increasing uncertainty is positively associated with costly cash holdings (Hanlon, Maydew, and Saavedra, 2017).

Based on the findings in prior literature and our assessment of the European Commission's proposals, we expect a mean negative investor reaction in response to the European Commission's proposals and extensive media attention on March 21, 2018.

> H1: The abnormal stock price reaction in response to the European Commission's digital tax proposals is negative for affected firms.

In addition, the digital tax proposals are motivated by the widespread political perception that digital firms pay fewer taxes (OECD, 2015; European Commission, 2018d). The European Commission promotes the newly proposed measures to compensate tax revenue losses from aggressive profit shifting. The design of both proposed measures intends to safeguard tax revenues and allocate taxing rights to market jurisdictions (European Commission, 2018a). The interim DST is designed as a nonavoidable gross revenue tax, and the virtual permanent establishment proposal is designed as a countermeasure to base erosion in market jurisdictions. Hence, we expect that the proposals will have larger effects on firms that engage more in tax avoidance and firms with more profit-shifting potential.

> H2: The negative stock market reaction is more pronounced for digital firms that avoid taxes more or have more profit-shifting potential than others.

Moreover, the proposals' objective is to extract part of the location-specific rent of digital businesses (Cui, 2019; Cui and Hashimzade, 2019). The European Commission considers digital firms' business models to rely heavily on users and assumes, in line with Evans and Schmalensee (2010), that they play a vital role in the value-creation process by creating network effects. Given that these users are located in the EU, a fair share of taxation should be allocated there (European Commission, 2018a). In this regard, the DST is designed to explicitly apply to the location-specific digital revenues generated within the EU single market. As the precise amount of such taxable revenues is hardly observable, investors may consider the

[13] Nondigital 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 proposed digital taxes.

overall engagement in the European market as a proxy to evaluate whether a firm is affected. We expect that the stock market reaction is more negative for firms with a greater share of revenue attributable to the European market. Because the tax burden of the DST is proportional to revenues rather than profits, we also expect that the capital market reaction is in absolute terms larger for firms with higher revenues. Furthermore, investors might perceive the proposals as a threat to firm growth and expect that loss-making firms might not have the necessary funds to finance the additional taxes on gross revenues. Hence, we expect investors to differentiate their response depending on a firm's characteristics.

> H3: The negative stock market reaction is more pronounced for digital firms with a greater share of revenue in the European market, larger digital firms, digital firms in a state of loss, or digital firms with higher growth potential.

III. 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. The event study methodology, which measures the magnitude of the effect an event has on the expected profitability, is based on three assumptions. First, we assume markets are efficient. Hence, we interpret the change between the preevent and after-event price of a stock, adjusted by general market movements, as the market's unbiased estimate of the effect of that event on the value of a firm and the wealth of investors (Fama et al., 1969; Kothari and Warner, 2007). Second, we assume that market participants were not aware of — and did not anticipate — the digital tax package's detailed content before its release by the European Commission and only subsequently started to process and incorporate the relevant information into stock prices. Third, we rely on the assumption that no confounding event systematically affects the stock market reaction of treated and control firms around the event date.

To support the adequacy of our assumptions, we undertake several analyses. In line with prior studies, we first conduct a Google Trends analysis to capture the event date that is most likely to be relevant for the stock price effect (Gaertner, Hoopes, and Maydew, 2019; Gaertner, Hoopes, and Williams, 2020). Google Trends provides the frequency of search requests on a specified topic of interest over a time horizon as an index value. Figure 1 depicts the Google Trends analysis for the term *EU digital tax*.[14] We can see a considerable spike on March 21, 2018,

[14] We search for several terms that could relate to the EU digital tax proposals, such as: *digital tax, EU commission proposal, digital services tax, digital permanent establishment*, and *significant digital presence*. All terms lead to similar patterns around the release of the directive proposals. Our main

which corresponds to the date the European Commission released the proposals accompanied by a major press release. The interest in the EU digital tax proposals reached an even higher level on March 22, 2018. Second, we analyze the media attention toward the EU digital tax proposals, which follows a similar pattern. We use the global news database Factiva to systematically search newspapers and media reports for the coverage of the digital tax proposals over time. Appendix Figure 1 (Appendix Figures 1–4 and Tables 1–12 are available online) shows the number of articles on that topic per day. Most articles on the EU digital tax were published on March 21, 2018, and the day after. Especially, major US newspapers reported on March 21, 2018 (Drozdiak and Schechner, 2018; Schreuer, 2018). Ultimately, we include March 21, 2018, and March 22, 2018, the days with the highest online search activities and media attention, in our event window.

In the next step, we check that no decisive information regarding the detailed content of the digital tax proposal has entered the market before our event window. First, considering the importance of major accounting firms for analyst and shareholder information, we search the websites of the Big Four accounting firms to see when they first report about the tax proposals. While KPMG, Deloitte, and PwC publish their first statements on our event date March 21, 2018, EY does not report until March 22, 2018. Second, we use the Edgar advanced full-text search to systematically search for different keywords regarding digital taxation in all available 10-K reports of the last 10 years.[15] Overall, we find 98 10-K reports speaking about digital taxation. However, none of them mentions digital taxation before March 2018. We provide the results in Appendix Table 1. In addition, for every US firm in our treatment group, we hand-search the respective 10-K statements regarding digital taxation. We find that none of the treated US firms mentions digital taxation in their annual report before March 2018. We further find that 14 of the 88 US firms in the treatment group actively report digital taxation as a risk factor, often explicitly mentioning the EU Commission's proposals. We outline the statements in Appendix Table 2. This analysis suggests that our event window in March 2018 measures the indicated effect and that digital taxation is seen as a threat by digital firms. It also suggests that no detailed information has been incorporated into stock prices beforehand. However, if this were the case, this should rather attenuate potential stock market reactions.

Finally, we again use the global news database Factiva to search for topics that could alternatively and systematically affect digital firms' stock price movement in

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specification relies on the most commonly used term to describe both proposals: *EU digital tax*. Furthermore, for the term *EU digital tax*, most searches stem from the UK, followed by the United States. We find the same spike using the key words in other languages, for example, German (*EU Digitalsteuer*). The top country searches in our event window for the term *digital tax* originate from Ireland, UK, Sweden, and the United States.

[15] We search for the terms *digital services tax, digital service tax, digital services taxes, digital service taxes, digital tax, taxation of the digital economy, taxation of specified digital services*, and *taxation of digital services* in the Edgar database: https://www.sec.gov/edgar/search/#.

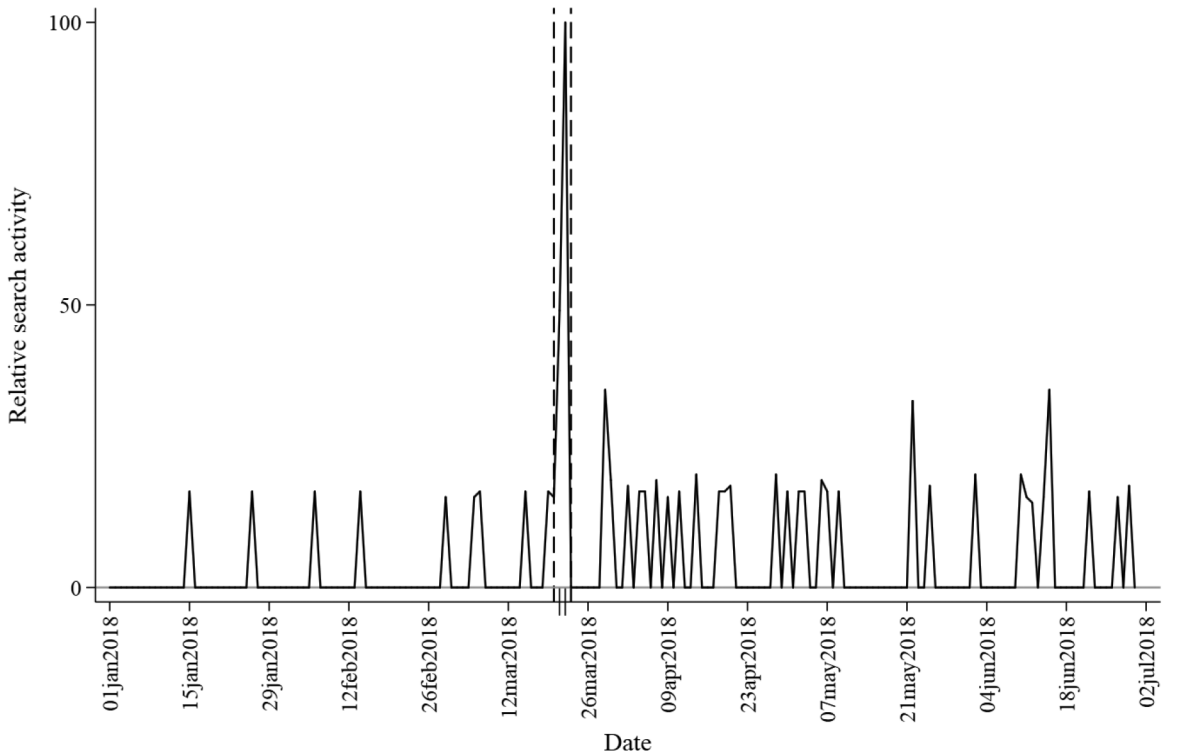

Figure 1. Google Trends Index for "EU Digital Tax" over the first half of 2018. We plot the Google Trends Index for "EU Digital Tax" over the first six months of 2018 when EU policymakers were actively working on the digital tax proposals. The index (*y*-axis, relative search activity) varies from 0 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 dates enclosed by the light grey scattered lines are our event window. The crossing ticks on the *x*-axis represent March 21 and 22, 2018, respectively.

our event window. We search all newspaper articles in the *Wall Street Journal, Washington Post, New York Times* and *Guardian* on March 21, 2018, and March 22, 2018, and create clusters by counting the number of articles referring to the same topic. We provide the results of our search in Appendix Table 3. In addition to the release of digital tax proposals, we identify two other clusters with heightened media attention: first, the apology of Mark Zuckerberg, CEO of Facebook, after Facebook collaborated with a third-party company that improperly kept and used Facebook's user data; second, US president Donald Trump's announcement of potential tariffs against Chinese origin goods as well as steel and aluminum imports. However, we are confident that none of the identified clusters confound our results since the Facebook data scandal had already become public on March 17, 2018. International trade conflicts should lead to general market movements rather than to systematic reactions against digital firms. In particular, by using the market model or a portfolio of all nondigital firms for estimating abnormal returns, the results should be robust against the identified clusters. Hence, the release of the proposed directives is, to the best of our knowledge, the only event that could affect all digital firms targeted by the proposals' specifications. Moreover, in contrast to other European Commission directives, the proposed measures were not part of a broader policy package that could confound the analysis.[16]

We select treated firms based on the characteristics outlined in the proposals. We base our sample selection procedure on two studies that estimate the expected additional tax revenue from the proposed DST (European Commission, 2018c; Fuest et al., 2018). We use data from the Bureau van Dijk ORBIS database to identify all publicly listed corporations with consolidated worldwide turnover above 750 million euros 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."[17] There are 192 corporations that satisfy the size and industry criteria. Furthermore, accompanying the proposals, the European Commission released an impact assessment. It explicitly refers to 112 top digital corporations that are assumed to be affected by the measures (United Nations Conference on Trade and Development, 2017; European Commission, 2018c). We add 58 listed firms to our sample that are named in the impact assessment and exceed the size threshold but are not captured by our initial classification.

We obtain one year of daily stock market data from the Thomson Reuters EIKON database ending 10 trading days after our event date. We use the return index (RI), which shows the theoretical value of a shareholding, assuming that dividends are reinvested to purchase additional shares at the closing price applicable

[16] See, e.g., the introduction of country-by-country reporting for banks, which was part of the major Capital Requirements Directive IV (Dutt et al., 2019).

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

Table 1

Descriptive Statistics

Variable	*N*	Mean	SD	P25	Median	P75	Min	Max
Stock return	53,724	0.08	1.65	−0.72	0	0.87	−5.14	5.62
Market return (S&P 1200)	53,724	0.05	0.57	−0.15	0.07	0.33	−4.07	1.61
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 (last year)	53,724	0.09	0.29	0	0	0	0	1
Revenue growth (last year)	52,514	0.17	1.11	−0.07	0.01	0.12	−0.54	12.26
Asset growth (last year)	52,514	0.1	0.64	−0.06	0.01	0.11	−0.39	8.59

Note: Treated firms are listed firms with consolidated annual turnover above 750 million euros that are classified to be affected by the digital tax proposals. All values, except for the number of firms *N*, *Loss-making (last year)* and *Revenues in billion euro*, are stated in percent.

on the ex-dividend date as a base for our daily return calculations.[18] In line with Frischmann, Shevlin, and Wilson (2008) and Dutt et al. (2019), we drop 22 firms without sufficient stock market information and trading activity. Finally, we exclude six corporations that had an earnings announcement immediately before, on, or after the event date to eliminate all stock market reactions not directly linked to the proposals. Overall, our final sample consists of 222 corporations, which are listed in Appendix Table 4.[19] We show descriptive statistics for the sample in Table 1. The average daily stock return of treated firms is 0.08 percent, with a standard deviation of 1.65 percent.

For our main analysis, we follow the event study design of Eckbo, Masulis, and Norli (2007) and Frischmann, Shevlin, and Wilson (2008). Our event window covers the day of the release of the proposals, March 21, 2018, and the subsequent day (0 through +1). We set our estimation window to contain trading days −11 through −250 relative to the event day. We estimate the following conditional market model:

$$R_{it} = \alpha + \beta R_{mt} + \gamma D_t + e_{it}. \quad (1)$$

[18] With P_{it} as share price of firm i on day t, $RI_{it} = RI_{it-1} \times P_{it}/P_{it-1}$. Except when t equals the ex-dividend-date, then: $RI_t = RI_{t-1} \times P_t + D_t/P_t - 1$ with D_t being the dividend payment associated with the ex-date. Based on this price information, daily (total) returns (R_{it}) are calculated. Daily returns are winsorized at the 1 and 99 percent levels, which amount to −5.136 and 5.618 percent, respectively. We acknowledge the view that winsorizing return data may distort the "true" market movement. Untabulated tests reveal that our inferences remain unaffected if we use nonwinsorized returns.

[19] The DST has been accused of directly targeting US digital firms (e.g., Hufbauer and Lu, 2018). In our sample, approximately 40 percent of the firms are headquartered in the United States and 24 percent in the EU at the time of the proposal.

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. α provides an estimate for the alpha of an equally weighted portfolio of all 222 treated firms, and β is the estimate of the portfolio's market beta.[20] The coefficient γ provides an estimate for the average abnormal return during the event window. This coefficient has to be multiplied by the number of days in the event window to obtain an estimate for the cumulative average abnormal return (CAAR) (Eckbo, Masulis, and Norli, 2007; Doidge and Dyck, 2015).[21]

For our cross-sectional analyses (*H2* and *H3*), we include a parameter to account for a firm's level of tax avoidance, profit-shifting potential, or other firm-specific characteristics, which we obtain from the ORBIS database. The conditional market model expands as follows:

$$R_{it} = \alpha + \beta R_{mt} + \gamma D_t + \rho I_i + \delta I_i D_t + e_{it}. \quad (2)$$

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

IV. RESULTS

A. Main Results

The baseline results of the event study are presented in Table 2. In the event period of interest, we find a mean negative CAAR of −0.692 percent, which is significant at the 1 percent level. The analysis provides significant statistical evidence of a mean negative stock price reaction of affected firms to EU digital tax proposals relative to the market (S&P Global 1200).[22] This result 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, that is, the net present value

[20] We would obtain similar results, if we use the return of an equally weighted portfolio of all affected firms as the dependent variable ($R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma D_t + e_{pt}$), where the subscript p stands for the portfolio (Frischmann, Shevlin, and Wilson, 2008). However, our setting allows us to extend our model by including firm-specific characteristics, as depicted in Equation (2).

[21] Equivalently, computing a regression for each individual firm ($R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i D_t + e_{it}$) and taking the coefficients' averages would lead to similar results (Kothari and Warner, 2007). We describe this analysis in Appendix Table 5.

[22] We replicate our analysis employing the Fama-French three-factor model and the model used by Kothari and Warner (2007) and obtain similar results. See Appendix Tables 5 and 6. Furthermore, our results remain similar if we use a value-weighted portfolio instead of an equally weighted portfolio (Appendix Table 7). Finally, to mitigate concerns with the statistical significance of the results, we employ additional parametric and nonparametric significance tests (Appendix Table 8).

Table 2

Cumulative Average Abnormal Return — Baseline Result

	Stock return
Alpha	0.044**
	(0.019)
Market return (S&P 1200)	0.715***
	(0.048)
March 21–22, 2018	−0.692***
	(0.070)
Observations	53,724
Firms	222
Adjusted R^2	0.063

Note: The table presents the results of the conditional market model: $R_{it} = \alpha + \beta R_{mt} + \gamma D_t + e_{it}$. R_{it} is the return of firm i on day t that is likely to fall under the scope of the digital tax proposal, 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 provides an estimate for the alpha of an equally weighted portfolio of all 222 treated firms and β is the estimate of the portfolio's market beta. The coefficient estimate of γ (and the corresponding standard error) is multiplied by 2 to account for the length of the two-day event window (Eckbo, Masulis, and Norli, 2007). γ 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 10 trading days immediately prior to the event date. Clustered standard errors by firm and trading days are in parentheses. Asterisks denote significance at the 1% (***) and 5% (**) levels.

that is associated with the proposals (Johannesen and Larsen, 2016; Wagner, Zeckhauser, and Ziegler, 2018a). Our result is consistent with investors expecting an increased likelihood of the introduction of digital taxes, which constitute negative news for digital firms' future profitability. Moreover, the result indicates that the capital market expects some part of the tax incidence to lie with shareholders. This implies that investors believe that the additional expenses cannot be fully passed through to consumers or labor and that the demand for digital services is not perfectly inelastic.[23]

To further understand the investor reaction, we test our second hypothesis by analyzing the market reaction with regard to firms' tax avoidance activities. We interact our event date dummy with different measures of tax avoidance. We define the

[23] We acknowledge that a clear-cut distinction between the effects of the two directives is unfeasible as they were released at the same time. However, in contrast to the proposal on a significant digital presence, the precise and detailed proposal on the DST allows investors to perceive a direct analysis of the effect of the potential new legislation on profits.

variable *Tax avoidance* as the negative of the effective tax rate (ETR). Based on financial statement information, we calculate a one-year short-term and a five-year long-run ETR measure for all potentially affected firms (Dyreng, Hanlon, and Maydew, 2008). The one-year short-term ETR measure is based on the most recent financial statement information that is at hand for investors on the event date. The five-year measure is based on the annual statements from 2013 to 2017. We assume that firms with lower ETRs engage more actively in tax planning and tax avoidance. In addition, we define the variable *Profit-shifting potential* as the ratio of intangible assets to total assets. Various studies show that intangible assets, and implicitly the level of research and development activities, are positively associated with engagement in profit shifting (Griffith, Miller, and O'Connell, 2014; Heckemeyer, Richter, and Spengel, 2014; De Simone, Mills, and Stomberg, 2016).

Table 3 depicts the results. As expected, the regression results in Column 1 show that the capital market reaction is more pronounced for firms that avoid more taxes. A firm with an ETR of 25.63 percent (the average in our sample) has a negative stock market reaction in our event window of 0.679 percent, and a 1 percentage point decrease in the ETR is associated with a 0.021-percentage-point-lower two-day CAAR. We find similar results if we use the long-run ETR measure to proxy tax avoidance (Column 2). Furthermore, stock prices seem to decrease more for firms with a higher profit-shifting potential, albeit not significantly in conventional terms (Column 3). Overall, the results are in line with our second hypothesis. The findings indicate that investors pay a premium for the shares of tax-avoiding digital firms and that investors believe that the proposed measures will hamper tax avoidance, increasing affected firms' effective tax burdens to similar levels as those of less tax-avoiding firms.[24] Hence, the price premium for tax-avoiding firms diminishes upon the proposals' release, which is in line with the European Commission's intention to safeguard tax revenues from base erosion and profit shifting.

Next, we test our third hypothesis to evaluate whether investors perceive the digital tax as effective in extracting location-specific rent from digital firms. Because exact information about the amount of user value creation is not observable and the extent of firms' digital activity, digital revenues, or number of users in a country is not disclosed publicly, it is difficult for investors to assess precisely to what extent a firm is affected by digital tax proposals. For this reason, investors may instead 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 are recognized in the financial statements of European affiliates of multinational groups. We define the variable *EU exposure* as the ratio of EU affiliates' revenues to

[24] Note that due to the deductibility of the DST from the corporate income tax base, those firms that currently pay more corporate income tax will be able to deduct more of the DST paid. Assuming that firms are unable to avoid the DST since it is a tax on revenues and, thus, pay taxes in proportion to their digital revenues in the EU, the effective tax burdens of affected firms will converge.

Table 3

Cross-sectional Analysis — Tax Avoidance

	Stock Return		
	(1)	(2)	(3)
Alpha	0.047**	0.047**	0.044**
	(0.020)	(0.020)	(0.019)
Market return (S&P 1200)	0.676***	0.676***	0.714***
	(0.050)	(0.050)	(0.048)
March 21–22, 2018	−0.679***	−0.727***	−0.692***
	(0.166)	(0.154)	(0.078)
Tax avoidance	0.001		
	(0.001)		
Tax avoidance × March 21–22, 2018	−0.021***		
	(0.006)		
Tax avoidance (5-year)		0	
		(0.001)	
Tax avoidance (5-year) × March 21–22, 2018		−0.022**	
		(0.010)	
Profit-shifting potential			−0.001
			(0.001)
Profit-shifting potential × March 21–22, 2018			−0.009
			(0.010)
Observations	42,350	42,350	53,482
Firms	175	175	221
Adjusted R^2	0.060	0.060	0.062

Note: The table presents the results of the conditional market model: $R_{it} = \alpha + \beta R_{mt} + \gamma D_t + \rho I_i + \delta I_i D_t + e_{it}$. R_{it} is the return of firm i on day t that is likely to fall under the scope of the digital tax proposal, 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 estimate for the tax avoidance or the profit-shifting potential of a firm. Column 1 measures *Tax avoidance* as the negative of a firm's effective tax rate (ETR). Column 2 uses the five-year long-run ETR measure. In both specifications, firms with negative ETRs are excluded from the sample. The negative conversion allows for an intuitive interpretation of the coefficient δ on the two-day *CAAR*. The *Tax avoidance* variable is centered on the mean. Column 3 measures *Profit-shifting potential* as the ratio of intangible to total assets. Coefficients can be interpreted as in Table 2. In addition, ρ measures the effect of the firm-specific indicator on the stock return, respectively. δ 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 10 trading days immediately prior to the event date. Clustered standard errors by firm and trading days are in parentheses. Asterisks denote significance at the 1% (***) and 5% (**) levels.

the total revenue of the group's affiliates. The higher the ratio, the more a group is engaged in the European market. Table 4 depicts the results of the regressions that include firm-specific interaction variables. Column 1 highlights that higher EU exposure has a significant negative effect on the two-day CAAR. This result indicates

Table 4

Cross-sectional Variation — Firm-Specific Characteristics

	Stock Return		
	(1)	(2)	(3)
Alpha	0.043**	0.043**	0.043**
	(0.019)	(0.020)	(0.019)
Market return (S&P 1200)	0.703***	0.715***	0.715***
	(0.048)	(0.048)	(0.048)
March 21–22, 2018	−0.621***	−0.668***	−0.619***
	(0.112)	(0.080)	(0.188)
EU exposure	0		
	(0)		
EU exposure × March 21–22, 2018	−0.012**		
	(0.006)		
Revenues		0	
		(0)	
Revenues × March 21–22, 2018		−0.012**	
		(0.005)	
Loss-making (2017) = 1			0.015
			(0.039)
Loss-making (2017) = 1 × March 21–22, 2018			−0.770
			(1.348)
Observations	50,820	53,724	53,724
Firms	210	222	222
Adjusted R^2	0.063	0.063	0.063

Notes: The table presents the results of the conditional market model: $R_{it} = \alpha + \beta R_{mt} + \gamma D_t + \rho I_i + \delta I_i D_t + e_{it}$. R_{it} is the return of firm i on day t that is likely to fall under the scope of the digital tax proposal, 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. Column 1 includes *EU exposure* as the ratio of revenues by subsidiaries located in the EU to the overall revenue of all the firm's subsidiaries. Column 2 includes *Revenues* as a firm's consolidated revenues. The variable is centered on the mean. Column 3 includes *Loss-making* as a dummy variable indicating firms with losses in the financial year 2017. Coefficients can be interpreted as in Table 2. In addition, ρ measures the effect of the firm-specific indicator on the stock return, respectively. δ 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 10 trading days immediately prior to the event date. Clustered standard errors by firm and trading days are in parentheses. Asterisks denote significance at the 1% (***) and 5% (**) levels.

that investor reaction is in line with the scope of the proposals that are limited to digital services provided in the EU. This analysis also corroborates our assumption that investors mainly reacted to the DST proposal. The DST is an additional tax in the European market, regardless of whether a taxable nexus already exists. In contrast,

the virtual permanent establishment proposal is designed to create a new nexus for firms that thus far do not have a taxable nexus but engage in significant digital activities in the EU. Thus, if investors had reacted to the significant digital presence proposal rather than to the DST proposal, we should have observed no or a positive association between EU exposure and stock prices.

Column 2 indicates that, as intuitively expected, investor reaction is more negative for firms with higher revenues. Our data do not allow us to disentangle digital services revenues and nondigital revenues, but we assume that digital revenues are proportional to the overall revenues of digital firms. 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 4 indicates that the reduction in stock prices is higher for corporations that have suffered a loss in the preceding financial year, although the interaction coefficient is not significant in traditional terms.[25]

Furthermore, we analyze whether investors perceive the proposals as a threat to future growth rates. Given that future growth perspectives are based on investors' expectations and are uncertain, we use the revenue growth and total asset growth of past years as a predictor for future growth. Table 5 depicts the results. The first (second) column shows that the two-day CAAR is more negative for firms that experienced larger (mean) revenue growth rates one year (over five years) before the release of the proposals. The effect on the two-day CAAR is similar for firms' total assets growth rate, as depicted in Columns 3 and 4. Investors seem to devalue firms with higher growth rates preceding the proposals' release more than firms with lower growth rates. This result indicates that investors perceive proposals to mitigate the future growth potential of digital firms.

Overall, the findings imply that the market differentiates its response depending on firm characteristics when evaluating the effect of the "digital tax package." The cross-sectional results suggest that investors incorporate the intention of the European Commission's proposals to secure tax revenues and extract location-specific rent in their reaction.

B. Additional Analyses

In this section, we apply two additional analyses to corroborate our main result. First, we directly leverage all listed firms' returns — affected and not affected by the EU proposal. For this reason, we obtain stock market data on all actively traded firms in the countries of our initial sample, that is, all countries from which the treated digital firms are coming. Our extended sample consists of 17,370 firms, which can be grouped into four categories. The first category comprises 13,360 nondigital and small firms (revenue below 750 million euros). The second category

[25] The small fraction of loss-making firms in our sample (only 20 firms with negative earnings before income and tax in 2017) limits the statistical power of this analysis.

Table 5

Cross-sectional Variation — Growth Ratios

	Stock Return			
	(1)	(2)	(3)	(4)
Alpha	0.045**	0.045**	0.045**	0.045**
	(0.020)	(0.020)	(0.020)	(0.020)
Market return (S&P 1200)	0.720***	0.720***	0.720***	0.720***
	(0.049)	(0.049)	(0.049)	(0.049)
March 21–22, 2018	−0.720***	−0.718***	−0.720***	−0.718***
	(0.073)	(0.082)	(0.075)	(0.083)
Revenue growth (last year)	0**			
	(0)			
Revenue growth (last year) × March 21–22, 2018	−0.004***			
	(0.001)			
Revenue growth (5-year)		0**		
		(0)		
Revenue growth (5-year) × March 21–22, 2018		−0.009***		
		(0.003)		
Asset growth (last year)			0**	
			(0)	
Asset growth (last year) × March 21–22, 2018			−0.010***	
			(0.002)	
Asset growth (5-year)				0
				(0)
Asset growth (5-year) × March 21–22, 2018				−0.005**
				(0.002)
Observations	52,514	52,514	52,514	52,514
Firms	217	217	217	217
Adjusted R^2	0.063	0.063	0.063	0.063

Notes: The table presents the results of the conditional market model: $R_{it} = \alpha + \beta R_{mt} + \gamma D_t + \rho I_i + \delta I_t D_t + e_{it}$. R_{it} is the return of firm i on day t that is likely to fall under the scope of the digital tax proposal, 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 growth ratios. Column 1 includes the revenue growth rate of 2016–2017, that is, the year preceding the release of the proposals. Column 2 includes the five-year average revenue growth rate for the years 2013–2017. Column 3 includes the total assets growth rate of 2016–2017. Column 4 includes the five-year average total assets growth rate for the years 2013–2017. The growth rates are centered on the mean. Coefficients can be interpreted as in Tables 2 and 4. Clustered standard errors by firm and trading days are in parentheses. Asterisks denote significance at the 1% (***) and 5% (**) levels.

comprises 767 digital and small firms. The third category consists of 3,021 non-digital and large firms. Finally, we have — as in our initial sample — 222 digital and large firms.

We begin by demonstrating the descriptive differences in average returns for each group before and within the event window. Figure 2 depicts the coefficients graphically. For each group, the figure shows that the average return in the event window is below the preevent period but that for digital and large firms, the average return is the most negative and is significantly different from zero in the event window. The strong negative investor reaction in contrast to the other groups validates that the reaction can be tied to the release of digital tax proposals.

Furthermore, we use this extended sample to apply an alternative empirical approach and reestimate the event study using the following empirical design:

$$R_{it} = \alpha + \beta_1 Large_i + \beta_2 Digital_i + \beta_3 Event_t + \beta_4 Large_i \times Digital_i + \beta_5 Large_i \times Event_t + \beta_6 Digital_i \times Event_t + \beta_7 Large_i \times Digital_i \times Event_t + e_{it}.$$

R_{it} is, as in our main specification, the return of firm i on day t. $Large_i$ is a dummy variable that identifies firms above the revenue threshold of 750 million euros. $Digital_i$ is a dummy variable that identifies all firms that are part of the digital economy.[26] $Event_t$ is a dummy variable that takes the value of 1 in the event window. The coefficient of the triple interaction, β_7, is our coefficient of interest and indicates whether the return of large and digital firms, those affected by the proposals, is different in the event window relative to nonaffected firms. While in the main analysis the abnormal return is estimated as the return's deviation from the expected return using a firm's alpha, beta, and the general market movement, in this analysis, we estimate the abnormal return of affected firms relative to nonaffected firms. We find a negative and statistically significant average abnormal return of −0.832 percent of large and digital corporations in the two-day event window relative to the groups of nonaffected firms.[27] Hence, we find a qualitatively similar result to our main specification.

Second, we exploit the fact that many European countries started introducing a DST unilaterally, as no consensus at the EU level had been reached. Among others, France passed a DST in July 2019, which applied retroactively as of January 1, 2019. We exploit this legislation to analyze how investors react to the actual passing of a DST policy. Due to the ongoing debate in the EU and France, investors knew well before the bill passed the French Senate on July 11, 2019, that digital

[26] As in the initial specification, the relevant NACE Rev. 2 codes are: 6201, 6209, 6311, 6312, 4791, and 5811–5819.

[27] The results are depicted in Appendix Table 9. Inferring that the average abnormal return in the event window is attributable to the news about digital taxes rather than to general trends between groups is contingent on the assumption that affected and nonaffected firms share parallel trends in the preevent period. Appendix Figure 2 confirms that the stock market movement is not systematically different between affected and nonaffected firms in the preevent period.

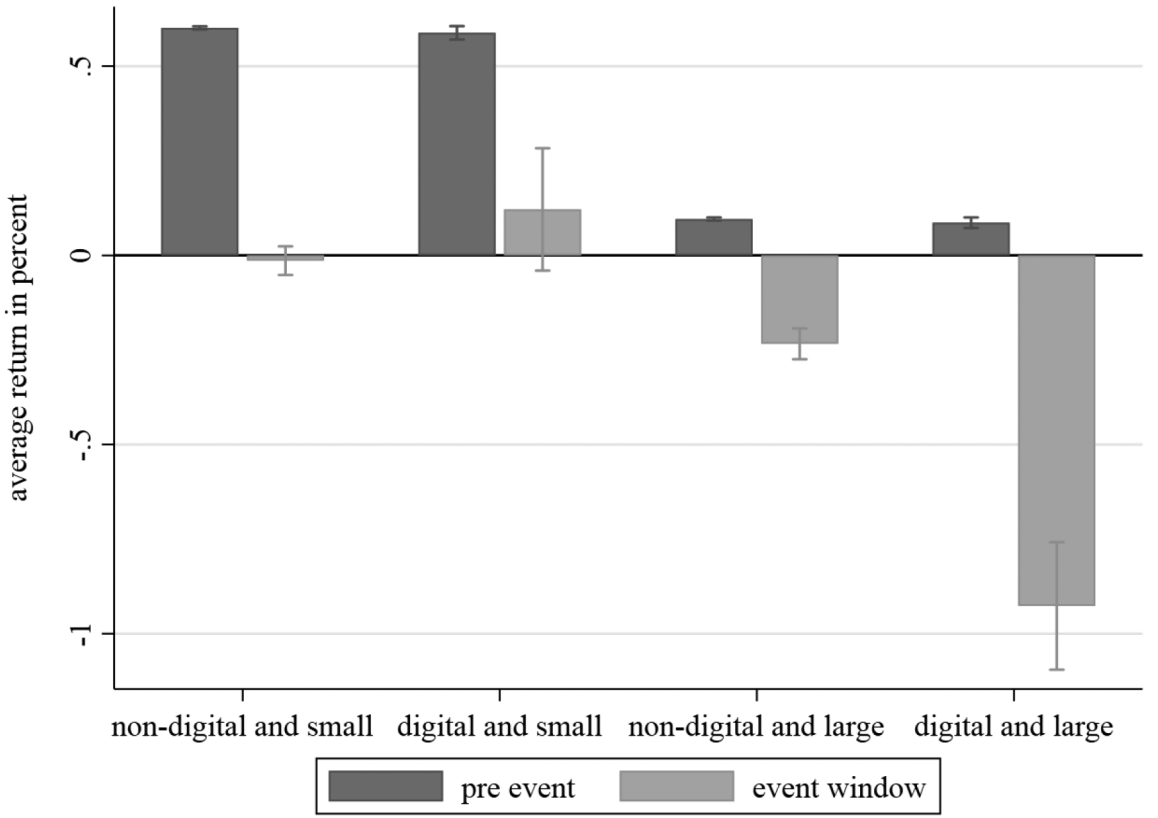

Figure 2. Comparison of affected and unaffected firms by size and industry. The graphic depicts the average returns of four different groups of firms over 250 trading days before the event date, excluding the 10 trading days immediately prior to the event date and within the two-day event window from March 21 to 22, 2018. Of the firms, 13,360 are nondigital and small (revenue below 750 million euro), 767 are digital and small, 3,021 are nondigital and large, and 222 are digital and large. The vertical lines represent the 95 percent confidence intervals.

Table 6

Analysis of French Enactment of the Digital Services Tax

	Stock Return
Alpha	0.044
	(0.044)
Market return (S&P 1200)	1.105***
	(0.129)
July 11–12, 2019	−0.282***
	(0.069)
Observations	1,679
Firms	23
Adjusted R^2	0.164

Note: The table presents the results of the conditional market model: $R_{it} = \alpha + \beta R_{mt} + \gamma D_t + e_{it}$. R_{it} is the return of firm i on day t that is likely to fall under the scope of the French digital tax proposal, 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 provides an estimate for the alpha of an equally weighted portfolio of all 23 treated firms, and β is the estimate of the portfolio's market beta. The coefficient estimate of γ (and the corresponding standard error) is multiplied by 2 to account for the length of the two-day event window (Eckbo, Masulis, and Norli, 2007). γ 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 82 trading days before the event date, excluding the 10 trading days immediately prior to the event date. Clustered standard errors by firm and trading days are in parentheses. Asterisk denote significance at the 1% (***) levels.

firms might be subject to an additional tax. Hence, it is feasible that we do not observe any market reaction because the effect was already incorporated into market prices. However, the French DST introduction was subject to significant public attention and political pressure by the US government (Alderman, 2019; Mauldin, 2019; US Trade Representative, 2019). Hence, investors could also believe that an introduction is unlikely due to the threat of a costly US intervention. Notwithstanding the US government's pressure, the French Senate voted in favor of a DST, which is widely based on the European Commission's proposal. An impact assessment before the introduction identifies 23 listed digital MNEs to be affected (Pellefigue, 2019). We find a significant negative CAAR for these firms of −0.28 percent and depict the analysis in Table 6.[28] Exploiting this setting is particularly valuable because it shows investors' reaction to the actual enactment of a DST. Finding a negative reaction at the actual policy passing, and in addition to the

[28] We limit the estimation period in this analysis to the months between the final rejection of the DST on an EU-wide level to avoid any confounding events during our preevent period.

reaction to the European Commission's proposal release, supports our suggestion that investors perceive the effect of digital taxes to be highly negative and extends our previous findings.

C. Economic Magnitude

Based on our findings of a negative capital market reaction, we estimate the market value reduction in absolute terms. Market values are obtained from the EIKON database and converted into euros using the applicable exchange rate on our event date. The total market value of all 222 affected firms is more than four trillion euros. We estimate the firm-specific change in abnormal market value as the product of a firm's market value and the firm-specific abnormal return in our two-day event window (Malatesta, 1983; Peterson, 1989; Cline, Walkling, and Yore, 2018).[29] 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 EU digital tax proposals dropped by 52.854 billion euros in excess of the normal market movement. A considerable share of the abnormal market value change is born by US-based firms, which constitute the largest group of treated firms. In numbers, approximately 40 percent of the market value reduction is attributable to firms headquartered in the United States.

Intuitively, the economically significant abnormal change in market value stands in contrast to the annual tax revenue estimates generated from the DST of 3.9–5 billion euros (European Commission, 2018c; Fuest et al., 2018). We translate the annual tax revenue estimates in present-value figures to compare them with the market value reduction. Unfortunately, we cannot directly observe a firm's digital revenue generated in the EU to directly compare market value changes with tax payments at the firm level. In a back-of-the-envelope calculation, we proxy the aggregated present value (PV) of the estimated tax revenues to find the breakeven point of the reduction in shareholder wealth and the increase in social wealth.[30] We graphically depict the PV of the estimated annual tax revenues in Appendix Figure 3. For example, if we assume five billion euros of annual tax revenues, which the European Commission expects to increase by 20 percent per annum and the current zero-interest rate environment as a discount rate for the PV calculation, it will take approximately six years to recover the initial drop in market value with tax revenue. Altering the assumptions, it will take seven or 11 years. We acknowledge

[29] We estimate $\Delta MV = \Sigma_{i=1}^{222}\Sigma_{t=0}^{1} MV_{it} \times AR_{it+1}$, where MV_{it} refers to the closing market value of firm i at trading day t. AR denotes the abnormal return. Variable $t = 0$ refers to March 20, 2018. The firm-specific AR is estimated using the method by Kothari and Warner (2007); see Appendix Table 5 for an explanation. We do this because multiplying our result of the CAAR from the regression analysis with the market value of the treated firms would lead to slightly different results, as the CAAR in our baseline regression is drawn from an equally weighted portfolio.

[30] We estimate a model of the following form: $PV_0 = TaxRevenue_0 \times \Sigma_{t=1}^{T}(1+g)^t/(1+r)^t$, where g refers to the expected annual growth rate of tax revenue per year t and r to the discount rate.

that both figures are not precisely comparable because the deadweight loss and the economic incidence of the newly proposed tax are unclear and tax revenues might develop differently and certainly nonlinearly over time.

D. Additional Robustness Tests

We conduct additional tests to verify the robustness of our main results. In Appendix Table 10, we replicate our main analysis for four alternative event dates to mitigate concerns that the event has materialized at different points in time.[31] We test the market reaction on, first, dates before the release of the proposals, on which some rumors about a new European DST spread publicly; and second, dates after the release of the proposals on which it became more certain that an EU-wide political agreement on the DST would not be reached. All results are indistinguishable from zero. Except on March 12, 2019, the abnormal return estimates are significantly negative. This finding is counterintuitive, as the date marks the time when it became more certain that the EU would not enact a common DST in the near future. However, several economy-wide shocks regarding the ongoing debate about the exit of Great Britain from the EU hit the market on the same date.

Next, we address concerns that news regarding a trade war could have triggered the market reaction. If the firms affected by the digital tax proposals had reacted to the increased probability of a trade war, investors would presumably also react similarly on other dates of the heightened probability of a trade war. Hence, we test the market reaction on dates with heightened media attention on a potential trade war. Conducting a Google Trends analysis, we find that on at least four dates in 2018, the term *trade war* received great attention. We replicate the event study analysis for these dates and depict the results in Appendix Table 11. Overall, we cannot see a significant negative capital market reaction on one of the alternative dates that heightened the risk for a (tax-)trade war.

Finally, we analyze the dates surrounding our event window to mitigate concerns that other events close to our event window confound our findings. In Appendix Figure 4, we show the abnormal buy-and-hold return for the portfolio of treated digital firms. That is, we display the abnormal value development of a portfolio that is bought one trading day before the event window and held until 12 days after the event window. We confirm that a significant negative abnormal return drop is observable only during our event window and that this drop does not revert over the subsequent days. Next, we quantitatively disentangle the dates surrounding the

[31] 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; Dendrinou and Chrysoloras, 2018; *Financial Times*, 2018a). At the Economic and Financial Affairs Councils on December 4, 2018, a strong opposition against the proposals was formed and on March 12, 2019, the EU digital services tax proposal was finally taken off the agenda in an official debate.

event. Appendix Table 12 shows the results. The daily abnormal returns range between −0.380 and 0.167 percent.[32] The positive abnormal return on the date before our event window indicates no stock market anticipation of the proposals' release. In line with this result, we find a smaller CAAR if we extend our event window length to a three-day window. This confirms the event window choice based on Google Trends analysis and media search.

V. CONCLUSION

The era of digitalization has led to an intense political and academic debate on how to adapt the principles of corporate taxation to the digital economy. However, empirical evidence on the effects of proposed adjustments to corporate taxation is scarce. Our study contributes to the recent call for further research on the proposed policies of taxing the digital economy and helps to evaluate the effects of digital tax measures.

Analyzing the capital market reaction in response to the European Commission's digital tax proposals, we find a significant reduction in the firm value of 222 digital firms, which are likely to be affected. The negative abnormal market reaction of −0.692 percent translates to a market value decrease of digital corporations by at least 52 billion euros, 40 percent of which is attributable to US-based corporations. Our main result has three central implications: first, it suggests that investors, on average, perceive the increased likelihood of the introduction of digital tax measures as negative news for firms' future profitability, and investors do not anticipate that firms are able to easily avoid the additional tax; second, our evidence implies that investors expect that firms will not be able to pass through all of the additional tax expenses to labor or customers; third, the economic magnitude of the reaction implies that the capital market does not expect these tax measures to be repealed in the short term.

Our cross-sectional analyses reveal that the market differentiates its response depending on firm characteristics. We find that the negative abnormal return is significantly stronger for firms that are more tax-avoiding and for firms that have higher profit-shifting potential. This result suggests that firms receive a market premium for tax avoidance and that the premium diminishes with the proposed tax measures.

Overall, the investor reaction reflects the intention of the European Commission's proposals to secure tax revenues and extract location-specific rent, suggesting that the capital market expects that the proposals' objectives are achievable. However, our results indicate that increasing the tax burden for a highly innovative industry contradicts political initiatives to promote an attractive investment climate and interferes with the EU's core objective to foster innovation and economic growth.

[32] In an untabulated analysis, we also confirm that our results are not biased by a small number of sizeable negative abnormal returns. Of the 222 affected firms, 144 firms have negative abnormal returns in our event window.

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