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COVID-19 and corporate tax avoidance: International evidence☆

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ABSTRACT

Governments across the globe initiated various tax reforms in the post- Global Financial Crisis period to rein in aggressive corporate tax avoidance for managing budget deficits. These developments created new realities in the international business environment by altering the costs and benefits of corporate tax management. Yet, we have a limited understanding of the effectiveness of tax reforms in controlling corporate tax avoidance at the global level. COVID-19 offers a litmus test for how corporates manage their taxes during the pandemic in light of past tax reforms. We use financial constraints and reputational costs as two contradicting theoretical perspectives to explain corporate tax avoidance during the crisis. Consistent with the financial constraints hypothesis, we find that firms avoid taxes amid COVID-19 to prevent liquidity crunches. Our study also highlights the role of country-level information and governance quality in curbing tax avoidance during extreme events like COVID-19. Our findings call for an immediate tax policy intervention to limit corporate tax avoidance during the ongoing pandemic phases.

1. Introduction

Research indicates the role of tax policies, namely the substantial tax biases in favor of debt financing, in exacerbating the Global Financial Crisis (GFC) of 2007–2009 (Keen et al., 2010; Shaviro, 2012). The aggressive use of debt financing by firms in leveraged buy-outs, take-overs, and hybrid financial instruments, coupled with over-dependence on tax havens, had a decisive role in precipitating the GFC (Alworth & Arachi, 2012). The governments required tax revenues to support banks and corporates and restore financial stability through massive bailouts (Dowling, 2014). During the post-GFC period, governments worldwide initiated various tax reforms, such as Base Erosion and Profit Shifting (BEPS), Transfer Pricing Agreements,[1] Common Consolidated Corporate Tax Base (CCCTB), Global Minimum Tax, and Diverted Profits Tax (DPT) (Desai & Dharmapala, 2018; Dharmapala, 2014; Nebus, 2019) to curb the aggressive tax management practices of corporates to balance their budgets. These new developments in tax policies across the globe created *new realities*[2] in the international business (IB) environment by

altering the costs and benefits of corporate tax management, thus warranting new empirical insights (Ghauri et al., 2021). While the literature largely overlooks this aspect, the COVID-19 pandemic has reignited the discussion on the effectiveness of corporate tax reforms and the government's tax revenue. Changes in the power dynamics between firms and the government due to stringent tax reforms and public appeal necessitate new perspectives and empirical identification on how firms manage their tax during an exogenous shock like COVID-19 (Ghauri et al., 2021). Our research offers a litmus test that delivers empirical insights into how firms manage their tax during COVID-19 in light of prior developments in the international business environment.

COVID-19 was an unprecedented exogenous shock that hit the global economy with the potential for long-lasting macroeconomic consequences. The COVID-19 control measures, such as social distancing, event cancellations, and shut-down decisions, brought down S&P 500 by more than 30 % (Ding et al., 2021) and the global per capita GDP by 6.2 %, the most severe fall since World War II (World Trade Report, 2021). Unlike the GFC, which was an endogenous shock as the financial system,
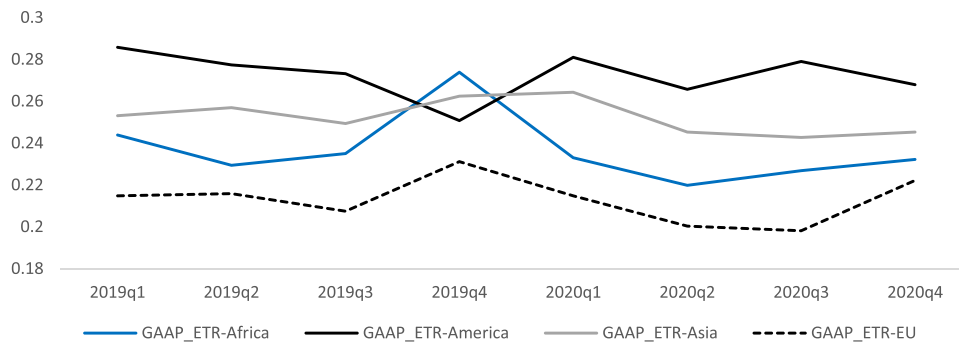
Continent wise distribution of mean GAAP ETR

Fig. 1. Displays the trend of average GAAP ETR for eight quarters for four continents. GAAP ETR is defined as tax expense scaled by pre-tax accounting income. A higher level of GAAP_ETR indicates lower tax avoidance. The description of all variables is presented in Appendix A.

especially banks, were the cause and catalyst of the crisis (Giese & Haldane, 2020), COVID-19 is truly an exogenous shock as the health crisis stalled the real economy and spilled over into the financial sector in a short period (ICI, 2020). Furthermore, COVID-19 is a global crisis, as opposed to the GFC, in which many Asian countries were not severely impacted due to their sound economic fundamentals (Borio, 2020). COVID-19 containment measures have significantly impacted corporates, causing them to struggle to sell existing inventory, freeze trade credit (Banerjee et al., 2020), and experience revenue declines (De Vito & Gómez, 2020).[3] These conditions, in turn, have prompted a rush for cash and firms increasing their cash buffers by drawing down credit lines (Acharya & Steffen, 2020). In addition, higher information risk (Halling et al., 2020), default risk (Liu et al., 2021), reduction in the value of the collateral (Hasan et al., 2021), increase in covenant strictness (Acharya & Steffen, 2020), and loss of business confidence (Baker et al., 2020) led to a rise in the cost of external financing amid COVID-19. In response to financing frictions and the increased cost of external financing during the pandemic, firms depend on their internal resources to manage liquidity (Holmström and Tirole, 2000).

An important internal source of financing is cash tax savings and as financial constraints tighten during COVID-19, saving an extra dollar by non-payment of tax is more valuable to firms (Edwards et al., 2015). Law and Mills (2015) find support for this *financing constraint hypothesis* based on the premise that financially constrained firms engage in aggressive tax planning to earn additional internal funds. In the context of the GFC, Richardson, Lanis, et al. (2015) and Richardson, Taylor, et al. (2015) report that US firms pursue aggressive tax avoidance strategies as the benefits of tax aggressiveness outweigh potential costs. A few studies document that managers engage in aggressive tax strategies to increase reported after-tax earnings and cash flows to mitigate the adverse impacts of uncertainty on the supply of credit and accounting performance. Examples include terrorism (Xu & Moser, 2021), political uncertainty (Li et al., 2020), policy uncertainty (Benkraiem et al., 2020), tax uncertainty (Guenther et al., 2018), and environmental uncertainty (Huang et al., 2017). COVID-19 had a severe economic impact and involved a higher degree of uncertainty than other crises (Shibata, 2021). Arguably, following the existing logic on the reaction of firms to uncertainty, the COVID-19 pandemic is accompanied by a stronger incentive for firms to engage in tax avoidance practices. Such a cushion helps the corporates from mounting problems such as layoffs, supplier payments, and bankruptcy or liquidation in the worst-case scenario. For instance, Brondolo (2009) reports that corporate taxpayers respond to economic downturns by under-reporting their tax

liability. Confirming this argument, Ţibulcă (2021) reports a decline in tax revenues in 2020 and 2021 for members of the European Union. Moreover, excessive government support during COVID-19 by using fiscal and monetary policies has to be reversed in the near future, and a hike in tax rates is anticipated.[4] Survey evidence suggests that governments will use strict monitoring to ensure tax compliance and recoup much-needed revenue to balance fiscal deficit in the future.[5] The regulatory risks will make future tax avoidance costly for the firms.[6] In addition, various relaxations in tax compliance practices, overwhelmed government machinery (Brondolo, 2009), and overburdened tax authorities due to COVID-19 enable firms to avoid tax at a lower cost.

The positive association between tax avoidance and crises hinges upon the assumption that the marginal cost of tax avoidance is constant or that an increase in marginal cost is less than the increase in marginal revenue amid the increasing uncertainty caused by COVID-19. However, such an assumption is questionable as tax avoidance involves high reputational costs (Gallemore et al., 2014). Aggressive tax strategies entail significant risks to corporate image and fame (Shulman, 2009). Firms may not tamper with their fame when the world chokes due to the spread of COVID-19 to avoid reputational costs resulting in long-term damages (Smith & Pepe, 2020). Hence, firms are more likely to behave ethically, as unethical behavior is less acceptable in a crisis (Potocan & Nedelko, 2021). Consistent with the *reputational cost hypothesis*, Baudot et al. (2020) document that increased tax aggressiveness carries high social and reputational costs. Further, the perception of corporate tax avoidance changed after the GFC. Governments across the world initiated various tax reforms (BEPS, CCCTB) in the post-GFC to minimize tax avoidance. As tax avoiders were publicly criticized, tax avoidance became a topic of frequent discussion, elevating it to an ethical level (de Colle & Bennett, 2014). Therefore, to be legitimate in their transactions, firms strive to maintain a healthy relationship with the government amid the crisis by restricting themselves from opportunistic acts. For instance, Siyi et al. (2017) document that firms engage in less aggressive tax management during typhoons to maintain good ties with the government and stakeholders, thereby benefiting from post-disaster tax cuts and exemptions. Apart from a higher reputation cost, tax management is also accompanied by implementation costs, potential enforcement costs, tax planning costs, political costs, reduced transparency, and unfavorable attention from the media (Armstrong et al., 2015). Furthermore, managers exposed to negative shocks place a

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[3] Cross-country averages suggests a reduction in sales of about 49 % during April through August 2020 compared to last year (Apedo-Amah et al., 2020).

[4] https://www.afr.com/policy/economy/tax-rises-are-inevitable-after-covid-19–20210525-p57uvi
[5] https://www.ey.com/en_gl/tax/how-the-global-financial-crisis-recovery-set-the-stage-for-covid-19-fiscal-policy
[6] https://www.dw.com/en/covid-are-tax-hikes-imminent-to-pay-for-pandemic/a-59139337

higher value on the negative outcomes associated with corporate tax avoidance, resulting in less tax avoidance (Xu & Moser, 2021). Hence, it could be possible that during COVID-19, firms are less likely to engage in tax avoidance due to higher non-tax costs and to claim future benefits in the form of exemptions from the government.

These two competing perspectives on tax management call for an empirical examination of how firms respond to COVID-19 by managing taxes. Using an international sample spanning 31 countries with significant heterogeneity, we find that firms avoid taxes amid COVID-19 to prevent liquidity crunches consistent with the financial constraints hypothesis. At the firm-level, we document that cash-constrained firms engage in higher levels of tax avoidance, and firms with high tax aggressiveness ex-ante COVID-19 exhibit less tax avoidance. Finally, our study highlights the role of country-level information and governance quality in curbing tax avoidance during extreme events like COVID-19.

Our study is significantly different from other crisis-induced tax management studies in the following aspects. Richardson, Lanis, et al. (2015) and Richardson, Taylor, et al. (2015) report that US firms avoid more taxes during the GFC. Similarly, Richardson, Lanis, et al. (2015) and Richardson, Taylor, et al. (2015b) document a higher level of tax avoidance among financially distressed Australian firms during the GFC. However, our paper differs from these studies in two aspects. First, their setting is a gradually progressing credit crisis where firms get enough time to manage their strategies on tax aggressiveness. Our study focuses on COVID-19, a health crisis that suddenly hit the economy and disrupted normal business operations all at once, hence qualifying as an exogenous shock. Second, because the tax reforms made in the wake of the GFC were intended to stop firms from engaging in aggressive tax avoidance strategies, it is uncertain ex-ante how firms will react to COVID-19. As the impact of COVID-19 and firm responses vary across countries, an international perspective is necessary to ensure the generalizability of crisis-induced tax management. For instance, as shown in Fig. 1, in contrast to the US firms, which exhibit a lower level of tax management, the firms from EU countries exhibit greater tax aggression during COVID-19.

We contribute to the literature in the following ways. First, our study contributes to the literature on the institutional influence on business decisions by allowing a cross-national comparison of governance quality and tax management during COVID-19. Prior studies have documented the role of institutional factors such as ethics, culture (Demirbag et al., 2013; Kanagaretnam et al., 2018a, 2018b), governance (Kottaridi et al., 2019; Zeng, 2019), and transparency (Kerr, 2019) in determining corporate tax management. We extend this literature by investigating the importance of information environment and country governance in deterring the tax avoidance strategies of corporates in an international business environment during COVID-19 across 31 countries with significant institutional heterogeneity in terms of country-level governance, tax rates, and access to finance. Our study responds to Ghauri et al. (2021) by providing empirical evidence on the requirement of increased taxation for governments worldwide to overcome fiscal imbalances.

Second, we respond to the call made by Cooper and Nguyen (2020) for studies in a diversified international geographic setting to understand corporate tax planning strategies across countries where different sets of tax laws and regulations are applicable. The growing literature analyzes the corporate tax management behavior in various crises, primarily focusing on the US and European countries (Li et al., 2020; Huang et al., 2017; Richardson, Lanis, et al., 2015; Richardson, Taylor, et al., 2015; Xu & Moser, 2021) and provides mixed evidence. However, as Cooper and Nguyen (2020) argue, the vast majority of studies in the tax literature have been carried out in the US context, and the uniqueness of the US tax system restricts the generalizability of findings to other international locations. Our study contributes to the tax management literature by examining the tax avoidance strategies of corporates across countries. Further, mixed evidence from previous studies could also be attributable to the potential endogeneity of the financial crises on

corporate responses.[7] Our empirical setting based on COVID-19 overcomes this limitation and qualifies as an exogenous crisis that offers better econometric identification. Our study provides the first evidence on the COVID-19-induced tax management practices of corporates based on an international sample.

Third, we contribute to the increasing literature that analyses the corporate responses to COVID-19 by investigating corporate tax management during the pandemic. To date, most COVID-19 pandemic research has concentrated on the various aspects of economic consequences (Hu & Zhang, 2021; Maliszewska et al., 2020) and external sources of corporate liquidity (Acharya & Steffen, 2020; Halling et al., 2020) but our study focuses on internal sources of funds, in particular, tax avoidance. Our findings suggest that firms avoid additional taxes to save extra cash during COVID-19, and such exogenous shocks are a strong determinant of tax avoidance (Hanlon & Heitzman, 2010).

The rest of this paper proceeds as follows. Section 2 reviews prior literature and develops the hypotheses. Section 3 describes the sample and research methodology. Section 4 provides empirical results. Section 5 details the discussion and conclusion.

2. Literature review and hypothesis development

2.1. COVID-19 and tax aggressiveness

2.1.1. Determinants of corporate tax avoidance

A value-maximizing firm manages tax as long as the benefits exceed the costs associated with such strategies (Hanlon & Heitzman, 2010). Existing literature on tax avoidance has focused on firm-level determinants that alter the equilibrium of tax avoidance. However, recent studies extend this to the external forces/shocks that influence tax avoidance practices. Xu and Moser (2021) report that terrorist attacks lead to corporate tax avoidance. Ni et al. (2021) underscore the importance of climatic risks in tax avoidance. Similarly, Richardson, Lanis, et al. (2015) and Richardson, Taylor, et al. (2015) document that firms avoid taxes during the GFC. In short, external uncertainties alter the business environment in which firms operate, changing the benefits-costs ratio of tax avoidance.

2.1.2. Consequences of COVID-19

Several studies have examined financing policies, investment decisions, and cash crunch during COVID-19. For instance, Acharya and Steffen (2020) document a higher demand for cash during COVID-19, characterized by precautionary motives. Hu and Zhang (2021) document deterioration in the firm's performance during the pandemic. De Vito and Gómez (2020) observe that ten percent of their sample firms became illiquid within six months after COVID-19. The pandemic is seen to have impacted almost all real sectors, leading to significant losses in terms of productivity (Bloom et al., 2020), employment (Verick et al., 2022), and trade (Vidya & Prabheesh, 2020). Hence firms are likely to focus on mobilizing their internal resources by avoiding taxes to save the extra dollar for financing current operations and future investments (Guenther et al., 2019).

2.1.3. Financing constraints channel

All crises majorly contain an element of uncertainty that affects the decisions of economic agents. In response, managers tend to increase budgetary slack in a turbulent environment (Dunk & Nouri, 1998). The COVID-19 disruptions led to a decline in revenues, exposing firms to bankruptcy in the face of weak cash flow from operations. The rush for cash during COVID-19 increased debt-rollover risk, swap spread, and default risk (Liu et al., 2021). Furthermore, the disruptions in business

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[7] For example the GFC originating directly from within the financial sector, which poses difficult identification challenges in studying the tax management strategies of firms.

activity reduced the value of the firm's assets, which were used as collateral against borrowings (Hasan et al., 2021). The adverse financial environment with higher borrowing costs and credit rationing amplifies firm-level financing constraints (Acharya & Steffen, 2020).

Financially constrained firms avoid taxes as the marginal benefit of tax avoidance resulting from less reliance on costly external finance exceeds the cost of avoiding taxes (Edwards et al., 2015). Unlike other cost-cutting measures, such as downsizing and CAPEX reduction, tax savings have no impact on the operational activities of firms. As cash is 'the king' during economic downturns (Joseph et al., 2020), managers use tax savings to increase their liquidity buffers (Leone, 2008). De Vito and Gómez (2020) analyze the cash crunch during COVID-19 and find that tax deferrals are modestly helpful in preventing firms from illiquidity. Increased cash shortages, higher costs of external financing, and bankruptcy risks during COVID-19 may prompt firms to consider more aggressive tax planning strategies to avoid becoming illiquid.

2.1.4. Laxity in tax enforcement

The economic ramifications of the COVID-19 outbreak necessitate immediate government intervention to support both households and firms (OECD, 2020). The tremendous focus of government machinery to reduce the spread of COVID-19 is likely to affect other monitoring activities by the government. Government resources were quickly overwhelmed, and the administrative mechanism became increasingly unmanageable, leading to chaos at the onset of the pandemic (Bowling et al., 2020). Since government responsiveness to the healthcare system, businesses, and the general public is critical in combating COVID-19 (Lalinsky & Pál, 2021; Martínez-Córdoba et al., 2021), auxiliary activities like tax collection are likely to be impacted. Moreover, during COVID-19, various governments allowed relaxations for taxpayer compliance (OECD, 2021a), tax deferrals, tax cuts, extended filing of income tax returns, and tax concessions (Mirza et al., 2020; Sadiq & Krever, 2021). In addition, the tax administration was extremely overburdened (Ibrahimaj et al., 2020) by the relief measures delivered through the tax code, the backlog of existing cases, and staff shortages (Glum, 2022).[8] Relaxations in tax compliance practices, overwhelmed government machinery, and overburdened tax authorities allow firms to avoid tax at a lower cost (Brondolo, 2009). In addition, higher tax rates are anticipated following the pandemic in order to restore fiscal balance (Kehoe, 2021). Governments are expected to use strict monitoring measures to eliminate revenue leakages (Rota-Graziosi et al., 2021), which would make future tax avoidance costly for firms. These arguments lead to the following hypothesis:-

H1. a: COVID-19 is positively associated with corporate tax aggressiveness.

2.1.5. Reputation concerns, regulatory risks, and managerial conservatism

As tax payment is a social obligation, tax avoidance is viewed as unethical (Dowling, 2014) and unjustifiable (Back, 2013). The stakeholders perceive tax avoidance as a lack of moral integrity, which damages the firm's reputation (Lee et al., 2020). For instance, the public has vilified Amazon, Google, and Starbucks for their excessive tax avoidance.[9] Unveiling aggressive tax strategies result in customer boycotts and public outcry (Hanlon & Slemrod, 2009), providing firms with a strong incentive to forgo tax avoidance opportunities (Kovermann & Velte, 2019). In a survey-based analysis, Graham et al. (2013) document that tax executives are discouraged from tax management due to reputation concerns.

Managing the COVID-19 pandemic requires enormous resources for the government. Stakeholders expect firms to meet their social obligations by paying their fair share of taxes to support the government

(Payne & Raiborn, 2018). Certain stakeholders, such as employees and customers, want firms to pay taxes, as taxes are funds that governments spend for the benefit of these stakeholders (Jacob et al., 2021). Hence, firms would tarnish their image by acting opportunistically to avoid taxes during the crisis. Therefore, firms are less likely to avoid taxes amid COVID-19.

Governments around the world began implementing numerous tax reforms after the 2008 financial crisis, termed as "epic-reforms," which were expected to have "a significant impact on the tax avoidance of firms" (Dillon, 2017). The Base Erosion and Profit Shifting (BEPS) initiative, put forth by the OECD and the G20, the discussion surrounding the adoption of the global unitary tax system and Minimum Tax, the Destination Based Cash Flow Tax, and the Residual Profit Allocation were all significant proposals to curb corporate tax avoidance (Dillon, 2017; Diniz Magalhães & Christians, 2023). The success of the above reforms, if any, has to be reflected during the pandemic, given that public scrutiny and regulatory reforms increase media attention, especially during an economic downturn that disincentivizes firms to indulge in tax avoidance (Giuliani, 2020).

Existing theories suggest that negative events like financial crises, violence, and natural disasters alter the risk preference of agents (Hanaoka et al., 2018). For instance, Reynaud and Aubert (2020) document that negative events make individuals more risk-averse. According to Xu and Moser (2021), managers exposed to negative shocks attach more weight to negative outcomes associated with corporate tax avoidance and, thus, exhibit less tax avoidance. Antoniou et al. (2015) find that corporate managers exposed to negative shocks (terrorism) adopt more conservative investment policies. As tax avoidance is risky, and COVID-19 has dampened managerial positivity and made managers more risk-averse (Ng et al., 2021), managers are less likely to avoid taxes during COVID-19. Hence, based on reputational concerns, regulatory risks, and managerial conservatism, we posit the following alternative hypothesis:

H1. b: COVID-19 is negatively associated with corporate tax aggressiveness.

2.2. Country-level heterogeneity and tax management

2.2.1. Transparency (information quality)and tax aggressiveness

Country-level heterogeneity explains more of the variation in corporate transparency than differences across firms (Doidge et al., 2007). Particularly, better transparency is associated with a greater level of accrual quality, lesser earnings management, better audit quality, reduced rent extraction, low tax aggressiveness, higher accuracy in analyst forecasts, and reduced corporate opportunism (Ahmed et al., 2013; Kerr, 2019; Ye et al., 2018). Corporate transparency is an important determinant in controlling tax management as it enhances transaction costs and the likelihood of detection (Kerr, 2019). Many studies use *International Financial Reporting Standards* (IFRS) adoption to measure corporate transparency as it strengthens financial reporting quality, regulates accounting systems, reduces income smoothing, and improves the financial information environment (Ahmed et al., 2013; DeFond et al., 2014). In addition, studies in tax management literature using IFRS as a country-level measure of information quality show that the firms incorporated in countries that adopted IFRS exhibit a lower level of tax avoidance (Kerr, 2019; Zeng, 2019).

IFRS are principle-based standards that eliminate accounting alternatives and are difficult to circumvent (Wells, 2011). IFRS promotes unique principles for recording transactions that better represent the underlying economics than domestic standards. Moreover, standardizing business transactions brings more transparency to both statutory and consolidated accounts (Kerr, 2019). IFRS adoption also enhances transparency by regulating accounting systems and improving earnings quality (Ahmed et al., 2013). Using an international sample of firms from 39 countries, Benkraiem et al. (2020) find that a better earnings

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quality and accounting information environment mitigate tax aggressiveness by reducing managerial opportunism. Better transparency increases the likelihood of detection and enhances tax-related transaction costs, making tax avoidance more costly and risky for firms (Kerr, 2019). In line with this argument, Kerr (2019) finds that countries with a greater level of transparency are associated with a lower level of tax avoidance. However, an opposing view is that unique reporting standards across the globe are not suitable for recording local business conditions, leading to a reduction in earnings quality (Bryce et al., 2015).

Brondolo (2009) reports that firms in countries with better corporate disclosure engage less in tax management during an economic crisis, hence facilitating tax administration in revenue generation. Based on the theoretical arguments, we posit the following hypothesis:

H2. (a): IFRS adoption weakens the positive association of COVID-19 with corporate tax aggressiveness.

2.2.2. Governance and tax management

International business studies require attention to the institutional traits that affect the costs and benefits of any corporate decisions (Henisz & Swaminathan, 2008). Corporate tax management practices are influenced by a country's non-economical factors, such as institutional, legal, and political climate (Slemrod, 2004). Firms could take advantage of legal loopholes in tax policies to reduce their tax obligations in an institutional setting with lower governance quality (Kottaridi et al., 2019). Recent studies on cross-country variations in tax management document the role of economic, cultural, legal, and political factors in determining corporate tax avoidance (Khlif & Amara, 2019; Zeng, 2019). Demirbag et al. (2013) find that tax management varies across countries with differing levels of governance quality. In a recent study, Zeng (2019) finds that a country's political stability, corruption control, and government efficiency are associated with a lower level of tax avoidance. A robust institutional environment leads to less tax management by controlling agency issues, reducing expropriation, controlling managerial entrenchment, and penalizing managers who engage in opportunistic activities (Picur & Riahi-Belkaoui, 2006; Zeng, 2019). In addition, better country governance involves strict monitoring making it difficult for firms to avoid tax during COVID-19. Hence the quality of institutional mechanisms has a significant role in limiting tax avoidance strategies adopted by companies. COVID-19 has stressed the need for sound policies and efficient functioning of government to manage the chaos. A good governance mechanism could manage the disruption effectively, execute strong enforcement measures to ensure compliance with the tax policies, and extend its attention to regular affairs, including collecting tax revenue during COVID-19 (OECD, 2021b). Therefore, we expect countries with higher institutional quality to manage their tax affairs better during COVID-19.

H2. (b): A higher country-level governance weakens the positive association of COVID-19 with corporate tax aggressiveness.

2.3. Firm-level heterogeneity and tax management

2.3.1. Pre-COVID-19 tax aggressiveness and tax management

The major benefits of tax avoidance are reduced cash outflow, increased after-tax profit (Badertscher et al., 2019), and increased firm value (Desai & Dharmapala, 2009). On the other hand, tax aggressiveness also has major associated costs such as implementation costs, compliance costs (Shackelford & Shevlin, 2001), agency costs (Chen et al., 2010), reputation costs (Graham et al., 2013), political costs, and information costs (Balakrishnan et al., 2019). Firms continue to manage taxes as long as the benefits exceed the costs. Considering the propensity to manage tax based on the costs and benefits, we posit that the firms with high tax aggressiveness ex-ante COVID-19 engage in less tax avoidance amid COVID-19.

Based on the existing literature, several reasons are possible. First,

we argue that the high tax-aggressive firms face a substantial *cost of reputation,* which could affect their corporate image if they further increase their tax aggressiveness amid COVID-19. Tax aggressiveness attracts unfavorable attention from the media (Kanagaretnam et al., 2018a, 2018b), and the media reports such practices more frequently during crisis times than at normal times (Chen et al., 2019). In addition to reporting the current tax management practices, the media could also dig further into the past tax activities of the firm; hence, the negative news can contain fundamental information about the firm (Ahmad et al., 2016), including the tax aggressiveness prior to the crisis. This makes the past tax-aggressive practices highly visible and causes more damage to the reputation of firms that were highly tax-aggressive ex-ante COVID-19. The media's attention to aggressive tax practices may also prompt regulatory scrutiny of the firm's current and past tax management practices, which would increase the cost of enforcement and lead to more reputational damages (Chen et al., 2019). The reputational damage leads to negative market reactions (Ahmad et al., 2016), customer boycotts (Asay et al., 2018), dilution of brand loyalty (Austin & Wilson, 2017), and changes in employee perception (Lee et al., 2020).

Second, the increase in *financing cost* stems from higher information opaqueness (Balakrishnan et al., 2019). While the benefits of tax avoidance in terms of higher cash flows and after-tax earnings accrue only to shareholders, creditors will have to face tax penalties and other risks (Kubick et al., 2020). Hasan et al. (2014) report that banks charge more interest for high tax avoidance firms due to the increased transparency risk. As COVID-19 increases the cost of external financing, tax aggressiveness ex-ante COVID-19 may make it extremely difficult for highly aggressive firms to get external funding.

Finally, tax aggressiveness varies among firms depending upon their risk-taking capacity and the flexibility of available resources to manage tax (Beuselinck & Pierk, 2019). Since highly aggressive firms are more likely to exceed their *optimum resource* usage for tax avoidance, further tax management would be costly[10] given that COVID-19 was an abrupt shock giving less time for the firms to plan a course of action. Taken together, the above discussion indicates that the marginal cost of tax aggressiveness could be higher for firms belonging to the upper quartiles of tax aggressiveness. Accordingly, we hypothesize:

H3. (a): Pre-COVID-19 tax avoidance weakens the positive association between COVID-19 and tax avoidance.

2.3.2. Tax aggressiveness and financial constraints

Empirical evidence, anecdotes,[11] and surveys (Edwards et al., 2015; Graham et al., 2013) claim that financially constrained firms attempt to minimize tax, as tax savings are an important source of additional funds. Financially constrained firms experience higher borrowing costs and low credit ratings and are unable to obtain external financing as they exhibit higher default risk (Pál & Ferrando, 2010). Financial friction incentivizes managers to depend more on tax management to save an additional dollar (Richardson, Lanis, et al., 2015; Richardson, Taylor, et al., 2015). Law and Mills (2015) document that cash tax savings are extremely important when firms face a higher degree of financial constraints.

As COVID-19-related uncertainties increase external financing costs, raising cash becomes critical for firms constrained before COVID-19. Hence, a financially constrained firm may have little choice but to become more tax aggressive despite negative reputational effects (Edwards et al., 2015). Each additional dollar of money through tax savings is more valuable to the financially constrained firms than the less constrained ones (Xu & Moser, 2021). Therefore, tax avoidance can

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[10] Resource costs include implementation, compliance, and audit costs associated with tax planning.
[11] https://www.cfo.com/accounting-tax/2008/12/theres-a-cash-machine-in-your-tax-department-8775/

serve as an alternate source of finance for financially constrained firms (Bruehne & Jacob, 2019). Accordingly, we hypothesize:

H3. (b): Pre-COVID-19 financial constraints strengthen the positive association between COVID-19 and tax avoidance.

3. Sample construction and research methodology

3.1. Sample construction and variable definition

We utilize the Refinitiv Eikon database to construct a cross-country sample of non-financial public firms throughout 2019Q1–2020Q4. We drop the firm-quarter observations with negative pre-tax income because the loss-making firms face different financial and tax-reporting incentives, and effective tax rates (ETR) with negative values lack an economic interpretation (Rego, 2003). We restrict the ETR measures between 0 and 1 (Dyreng et al., 2017). To draw more meaningful inferences from our analyses (De Vito & Gómez, 2020; Leuz et al., 2003), we require each country to have at least 15 listed firms both before and after the pandemic.[12] The final sample consists of 44009 firm-quarter observations representing 9586 unique firms across 31 countries. Panel A of Table 1 describes this sample selection process.

3.1.1. Dependent variable

We use two proxies of tax avoidance widely used in the literature: GAAP effective tax rate (GAAP ETR) and current effective tax rate (CURRENT ETR). First, following Minnick and Noga (2017), we compute GAAP ETR as the total income tax expenses scaled with pre-tax accounting income. Second, following Richardson et al. (2016), CURRENT ETR is measured by dividing the total current income tax expense by pre-tax accounting income. Lower values of ETR measures indicate a higher level of tax avoidance. A detailed description of the variables is shown in Panel A of Table 2.

3.1.2. Key variable of interest

On January 30, 2020, WHO designated COVID-19 as a public health emergency of worldwide concern, and on March 11, 2020, WHO classed COVID-19 as a pandemic. Following this chronology, we define our variable of interest, COVID-19, as a period dummy variable equal to one if the firm-quarter observation is on or after 2020 Q1, and zero otherwise.

3.1.3. Moderating variables

We measure the quality of country-level governance using the average value of all six governance dimensions developed by Kaufmann et al. (2010). We also use the individual score of *regulatory quality, government effectiveness, corruption control, voice and accountability, political stability, and the rule of law* to indicate the quality of legal enforcement, administrative efficiency, control of private interests, freedom of expression, stability of government and quality of enforcement respectively.[13] A higher value of these scores indicates better governance.

We use *IFRS* adoption as a proxy for reporting transparency/information quality (Kerr, 2019; Zeng, 2019).

We use two popular proxies of financial constraints, viz., *Cash constrained and Highly levered* (Duchin et al., 2010). Cash is king during a crisis period as it is more reliable than other sources of liquidity (Lins et al., 2010), and cash-rich firms are less impacted even when the credit market tightens (Duchin et al., 2010). High leverage is associated with

increased bankruptcy costs, which further aggravates financing costs and debt overhang issues during the crisis (Richardson et al., 2015b).

3.1.4. Firm and country-level controls

Following previous literature (Dyreng et al., 2008, 2017), we control for various firm-level variables: *leverage, tangibility, capital expenditure, R&D expense, firm size, intangibility, advertisement, loss carry-forwards, special items, and institutional holding.* We also include two major country-level controls: *statutory tax rate and tax morale,*[14] in all our regression models. The plausible association of these firm and country-level controls with ETR measures as per literature is presented in Panel B of Table 2.

3.1.5. Descriptive statistics

Panel B of Table 1 provides descriptive statistics of the key variables by country. On average, 68 % of the countries in our sample are mandatory adopters of IFRS. Country governance score averages aroud 67 % among the sample countries. Both the ETR measures show reasonable variation across countries. The average statutory tax rate of the sample is greater than ETR measures, indicating the tax management practices of corporates.

Panel C of Table 1 reports the detailed summary statistics of our final sample. The average GAAP ETR (CURRENT ETR) is about 25.2 % (23.8 %), with a median of 23.6 % (21.0 %). The average statutory tax rate is 25.3 %, while the average tax morale is 2.063 %. Firms in the sample are large and moderately levered, with a debt-to-asset ratio of 20.0 %. Fig. 2.

Panel D of Table 1 presents the correlation matrix of the variables. The GAAP ETR is positively correlated with the CURRENT ETR, as expected. The country-level governance measures are positively correlated with ETR measures.

3.2. Research methodology

3.2.1. COVID-19 and tax aggressiveness

To test H1a and H1b, we estimate the following fixed effect panel regression model after controlling for firm-specific effects.

$$
\begin{aligned}
ETR_{it} = \alpha + \beta_1 \quad COVID_t + \Upsilon Firm\_Controls_{it} \quad + \pounds Country\_Controls_{ct} \\
+ INDUSTRY\_FE + COUNTRY\_FE + \varepsilon_{i,t}
\end{aligned}
$$

(1)

where i,t, and c denote firm, year-quarter, and country, respectively. ETR is the measure of tax avoidance. *Firm_Controls and Country_Controls* include all firm and country-level controls. *INDUSTRY_FE* and *COUNTRY_FE* represent the industry[15] and country fixed effects, respectively.

3.2.2. Country-level governance, transparency, and tax aggressiveness during COVID-19

To test IFRS, COVID-19, and tax avoidance hypothesis (H2a), we estimate the following panel regression:-

$$
\begin{aligned}
ETR_{it} = \alpha + \beta_1 \quad COVID_t + \beta_2 \quad IFRS_C + \beta_3 \quad COVID_t * IFRS_C \\
+ \Upsilon Firm\_Controls_{it} \quad + \pounds Country\_Controls_{ct} \\
+ INDUSTRY\_FE + \varepsilon_{i,t}
\end{aligned}
$$

(2)

where *IFRS* is an indicator variable of transparency.

To test country-level governance, COVID-19, and tax avoidance hypothesis (H2b), we estimate the following panel regression:-

---

[12] However, our results are robust without dropping firms that belong to countries with less than 15 firm-quarter observations.

[13] Kaufmann et al. (2005) stress the significance of using a variety of metrics to evaluate governance rather than depending on a single metric to serve as a perfect substitute for governance.

[14] We thank anonymous reviewer for suggesting institutional holding and tax morale as controls of tax avoidance.

[15] Following the tax management literature, we use industry-fixed effects by including industry dummies based on their 3-digit SIC codes in all of our regressions (Bruehne & Jacob, 2019).

Table 1
Sample composition and descriptive statistics.

Panel A: Sample composition
The sample covers the period 2019 and 2020. All financial statement data are acquired from the annual fundamentals database produced by Thomson Refinitiv eikon.

Criteria	Number of firm-quarter observations	Number of firms	Number of countries
Nonfinancial firm-quarter observations with positive pre-tax income and non-missing values of the tax expense	60,963	10,888	67
Firms with ETR in between 0 and 1	53,018	10,522	66
Firms with non-missing values of control variables	45,881	10,028	65
Countries with firm-quarters > 15	44,009	9586	31

Panel B: Descriptive statistics

Country	Firm-quarter	Relative frequency (%)	GAAP ETR	CURRENT ETR	Statutory tax rate	IFRS	Country governance
Argentina	58	0.13	0.297	0.303	0.3	1	46.30
Bangladesh	408	0.93	0.218	0.258	0.25	1	20.99
Brazil	1125	2.56	0.229	0.268	0.34	1	43.57
Bulgaria	168	0.38	0.126	0.122	0.1	1	58.46
Canada	935	2.12	0.217	0.267	0.265	1	93.15
China	347	0.79	0.143	0.138	0.25	0	44.09
Colombia	110	0.25	0.268	0.299	0.326	1	46.04
Egypt	454	1.03	0.219	0.232	0.225	1	23.41
Germany	146	0.33	0.196	0.245	0.299	1	89.21
India	3889	8.84	0.235	0.26	0.3	0	47.47
Indonesia	1601	3.64	0.226	0.247	0.25	0	45.98
Italy	85	0.19	0.278	0.293	0.278	1	67.90
Japan	12015	27.3	0.31	0.323	0.297	0	87.92
Kazakhstan	59	0.13	0.242	0.228	0.2	1	42.17
Korea	2753	6.26	0.237	0.241	0.275	0	77.91
Malaysia	956	2.17	0.245	0.26	0.24	1	64.05
Mexico	449	1.02	0.289	0.306	0.3	1	36.06
Nigeria	82	0.19	0.262	0.259	0.3	1	16.67
Oman	67	0.15	0.169	0.155	0.15	0	57.00
Pakistan	302	0.69	0.279	0.281	0.29	1	21.42
Philippines	340	0.77	0.23	0.233	0.3	1	39.41
Poland	756	1.72	0.183	0.217	0.19	1	70.16
Portugal	41	0.09	0.285	0.268	0.315	1	82.96
Romania	63	0.14	0.165	0.163	0.16	1	59.35
Slovenia	54	0.12	0.152	0.168	0.19	1	79.58
Sweden	214	0.49	0.129	0.226	0.214	1	94.94
Taiwan	8201	18.63	0.206	0.215	0.2	0	84.28
Thailand	1161	2.64	0.168	0.169	0.2	0	45.32
Turkey	886	2.01	0.167	0.205	0.22	1	37.89
USA	271	0.62	0.181	0.243	0.258	0	79.29
Vietnam	6013	13.66	0.19	0.191	0.2	0	41.49
Total/Average	**44009**	**100**	**0.22**	**0.24**	**0.25**	**0.68**	**67.58**

Panel C: Descriptive statistics for the full sample

	N	Mean	SD	p25	Median	p75
GAAP ETR	44009	0.252	0.144	0.174	0.236	0.321
CURRENT ETR	44009	0.238	0.167	0.133	0.210	0.308
R&D expense	44009	0.225	0.418	0.000	0.000	0.000
Loss carry-forward	44009	0.938	0.242	1.000	1.000	1.000
Special items	44009	0.000	0.005	0.000	0.000	0.000
Firm size	44009	10.019	2.797	8.024	9.746	11.979
Tangibility	44009	0.280	0.212	0.107	0.248	0.412
Intangibility	44009	0.024	0.062	0.000	0.004	0.016
Leverage	44009	0.200	0.216	0.035	0.159	0.318

Table 1 (*continued*)

Panel C: Descriptive statistics for the full sample

	N	Mean	SD	p25	Median	p75
Capital expenditure	44009	0.022	0.033	0.001	0.009	0.029
Advertisement	44009	0.000	0.002	0.000	0.000	0.000
Institutional holding	44009	11.021	15.334	0.000	4.549	16.542
Cash_constrained	22,910	0.477	0.499	0.000	0.000	1.000
Highly levered	24,461	0.491	0.500	0.000	0.000	1.000
Tax Morale	40,423	2.063	0.637	1.412	1.748	2.518
Statutory tax rate	44009	0.253	0.048	0.200	0.265	0.297
IFRS	44009	0.175	0.380	0.000	0.000	0.000
Country governance	44009	67.581	21.624	45.146	78.058	87.372
Government effectiveness	44009	77.157	18.877	61.538	89.904	93.269
Regulatory quality	44009	71.569	21.196	48.558	82.212	89.423
Corruption control	44009	66.915	23.455	42.788	76.442	89.423
Political stability	44009	58.43	25.859	37.736	65.094	84.434
Rule of law	44009	71.717	20.341	53.365	85.096	90.385
Voice and accountability	44009	59.697	26.562	44.928	71.981	79.71

Panel D: Pair-wise correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(1) GAAP_ETR	1.00																					
(2) CURRENT_ETR	0.59	1.000																				
(3) Statutory tax rate	0.30	0.235	1.000																			
(4) R&D expense	-0.10	-0.07	-0.34	1.000																		
(5) Loss carry-forward	0.07	0.100	**-0.00**	0.025	1.000																	
(6) Special items	-0.06	-0.09	-0.00	0.027	-0.04	1.000																
(7) Firm size	0.00	0.040	-0.03	-0.15	0.007	0.135	1.000															
(8) Tangibility	-0.01	-0.03	-0.04	**0.001**	-0.03	0.037	0.082	1.000														
(9) Intangibility	0.018	0.020	0.077	-0.05	-0.06	-0.02	-0.04	-0.12	1.000													
(10) Leverage	-0.01	-0.05	-0.01	-0.07	-0.16	0.037	0.065	0.213	0.067	1.000												
(11) Capital expenditure	-0.03	0.001	-0.05	0.058	0.013	-0.01	0.020	0.327	0.080	0.063	1.000											
(12) Advertisement	0.015	0.020	0.077	0.062	0.007	-0.01	0.109	-0.00	0.043	-0.02	0.026	1.000										
(13) Institutional holding	0.109	0.080	0.267	-0.06	-0.00	**-0.03**	0.064	-0.00	0.146	-0.00	0.010	0.029	1.000									
(14) Tax_Morale	0.169	0.150	0.163	0.219	0.101	-0.03	-0.19	-0.08	-0.14	-0.12	-0.08	-0.04	0.129	1.000								
(15) IFRS	-0.01	-0.05	0.046	-0.13	-0.11	-0.03	-0.36	0.056	0.229	0.094	0.045	0.015	0.158	-0.38	1.000							
(16) Country governance	0.178	0.150	0.177	0.292	0.017	-0.01	-0.19	-0.08	-0.04	-0.09	-0.09	-0.03	0.266	0.703	-0.30	1.000						
(17) Rule of law	0.162	0.140	0.148	0.280	0.021	-0.00	-0.17	-0.08	-0.05	-0.10	-0.09	-0.03	0.250	0.708	-0.35	0.979	1.000					
(18) Political stability	0.162	0.149	0.060	0.184	0.028	-0.03	-0.01	-0.08	-0.05	-0.10	-0.11	-0.05	0.230	0.644	-0.32	0.923	0.922	1.000				
(19) Corruption control	0.185	0.152	0.208	0.277	0.018	-0.01	-0.22	-0.09	-0.04	-0.10	-0.10	-0.03	0.277	0.728	-0.27	0.991	0.973	0.909	1.000			
(20) Government Effectiveness	0.147	0.131	0.124	0.309	0.025	0.006	-0.13	-0.07	-0.07	-0.10	-0.08	-0.02	0.197	0.672	-0.43	0.962	0.953	0.870	0.952	1.000		
(21) Regulatory quality	0.151	0.127	0.101	0.338	0.014	-0.01	-0.22	-0.07	-0.02	-0.08	-0.08	-0.03	0.256	0.669	-0.24	0.979	0.944	0.880	0.964	0.951	1.000	
(22) Voice and accountability	0.200	0.149	0.342	0.301	-0.00	-0.01	-0.32	-0.05	-0.00	**-0.05**	-0.06	**0.006**	0.295	0.615	-0.13	0.896	0.827	0.704	0.884	0.812	0.880	1.000

Notes: Panel A presents the sample selection criteria. Panel B presents the descriptive statistics for the ETR measures, firm characteristics, tax rate and country for each country in the sample. Panel C presents the descriptive statistics for the ETR measures, firm characteristics, tax rate, and country-level characteristics. All the variables are defined in Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. ETR measure truncated at 0 and 1. In Panel D, all reported correlations are statistically significant at the 1 % level with the exception of the correlations in bold

Table 2

Construction of variables and predicted association.

Panel A: Variable definitions		
Variable	Description	Source
Dependent variable		
GAAP ETR	Tax expense scaled by pre-tax accounting income (Dyreng et al., 2017). The measure is restricted to falling in the interval between 0 and 1.	Refinitiv Eikon database
CURRENT ETR	Current tax expense scaled by pre-tax accounting income (Dyreng et al., 2017). The measure is restricted to falling in the interval between 0 and 1.	Refinitiv Eikon database
Variable of interest		
COVID_19	An indicator variable equal to one for post-covid period, zero otherwise	Dummy variable based on WHO's declaration of Covid-19 as a public health emergency.
Moderating variables		
Highly levered	A dummy variable that is defined as 1 for firms in the upper tercile (constrained) of leverage scaled by asset in 2019 and 0 if it belongs to the lower tercile (unconstrained).	Refinitiv Eikon database
Cash_constrained	A dummy variable that is defined as 0 for firms in the upper tercile (unconstrained) of cash scaled by asset in 2019 and 1 if it belongs to the lower tercile (constrained)	Refinitiv Eikon database
Tax_aggressive	A dummy variable that is defined as 1 for firms in the upper tercile of ETR measure in 2019 and 0 if it belongs to the lower tercile	Refinitiv Eikon database
IFRS	An indicator variable equal to one if the country adopted IFRS for domestic companies in period t, zero otherwise	IFRS Foundation
Country governance	The average value of all six governance dimensions; corruption control, political stability, government effectiveness, political accountability, regulatory capacity, and the rule of law score developed by Kaufmann et al. (2007)	(Kaufmann et al., 2007)
Government effectiveness	The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	(Kaufmann et al. 2007)
Corruption control	The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	(Kaufmann et al., 2007)
Voice and accountability	The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	(Kaufmann et al., 2007)
Political stability	The likelihood of political instability and/or politically-motivated violence, including terrorism.	(Kaufmann et al., 2007)
Rule of law	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	(Kaufmann et al., 2007)
Regulatory quality	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	(Kaufmann et al., 2007)
Firm-level controls		
R&D expense	An indicator variable equal to one if the firm-period reports research and development expense, zero otherwise	Refinitiv Eikon database
Firm size	Natural log of total assets for firm i, in period t	Refinitiv Eikon database
Tangibility	Property, plant, and equipment for firm i, in period t scaled by total assets	Refinitiv Eikon database
Intangibility	Intangible assets for firm i, in period t scaled by total assets.	Refinitiv Eikon database
Leverage	Total debt for firm i, in period t scaled by total assets.	Refinitiv Eikon database
Capital expenditure	Capital expenditure in period t for firm i scaled by total assets	Refinitiv Eikon database
Advertisement	The ratio of advertising expense for firm i, in period t to sales	Refinitiv Eikon database
Loss carry-forward	An indicator variable equal to one if the firm-period reports negative opening loss brought forward, zero otherwise	Refinitiv Eikon database
Special items	Special items in period t for firm i scaled by total assets	Refinitiv Eikon database
Institutional holding	Percentage holding of institutional investors period t for firm i	Thomson Reuters Institutional Holdings database
Country-level controls		
Statutory tax rate	Statutory maximum marginal tax rate for the relevant financial year.	KPMG's Corporate Tax Guide 2021
Tax_Morale	A country's rating of the justifiability of cheating on taxes (on a scale from 1—never justifiable to 10—always justifiable) averaged for the latest available record from World Value Surveys multiplied by − 1.	Calculated using: World survey database reported by Torgler and Schneider (2004)

Panel B: Theoretical association of firm-level controls with tax avoidance		
Variable name	Potential theoretical association with tax avoidance	Expected sign
Firm-level controls		
Leverage:	Highly levered firms could manage tax using the tax shield of interest, hence negatively associated with ETR measures (Stickney and McGee 1982)	-
Tangibility and Capital expenditure	Tangibility and Capital expenditure proxies for tax planning opportunities from depreciation and amortization of capital assets, hence are negatively associated with ETR measures (McClure et al. 2018)	-
R&D expense	R&D intensive firms enjoy investment tax shields, hence negatively associated with ETR measures (Gupta and Newberry 1997).	-
Firm size	The larger firms are well equipped to engage in corporate tax avoidance due to their sheer size and complex structures, indicating a positive association between firm size and tax avoidance. On the contrary, as firms mature in their size, they have lesser tax shields apart from good governance, suggesting a negative association between size and tax avoidance (Wang et al., 2020).	-\+
Intangibility	Intangible assets offer increased tax deduction through amortization; hence are negatively associated with ETR measures (Dyreng et al., 2017)	-
Advertisement	Advertising builds a positive reputation and a better brand image among customers; therefore, firms spend more on advertising, engage in less tax avoidance, and have a higher ETR (Mansi et al., 2020).	+
Loss carry-forward	Firms use the operating loss carry-forwards to reduce tax expenses and to claim a tax refund; hence is negatively associated with ETR (Erickson et al. 2013).	-
Special items	The taxability of special items is arguable, hence negatively associated with ETR (Mansi et al. 2020).	-
Institutional holding	Khurana and Moser (2013) find that institutional investors discourage tax aggressiveness using their control over the board. On the other hand, institutional ownership is associated with higher tax avoidance as the tax savings increase firm value (Khan et al., 2017).	-\+

Table 2 (*continued*)

| Panel B: Theoretical association of firm-level controls with tax avoidance		
Variable name	Potential theoretical association with tax avoidance	Expected sign
Country-level controls		
Statutory tax rates (STR)	Statutory tax rates impact the tax outflow of the firms and alter the benefit of tax management (Dyreng et al., 2017), therefore positively associated with ETR.	+
Tax_Morale	The morale of taxpayers is likely to vary among nations because of cultural and socio-psychological differences across countries (Alm and Torgler 2006). To control the effect of tolerance of tax avoidance, we use the rating on 'justifiability of cheating on taxes' reported by Torgler and Schneider (2004) as a proxy of tax morale.	+
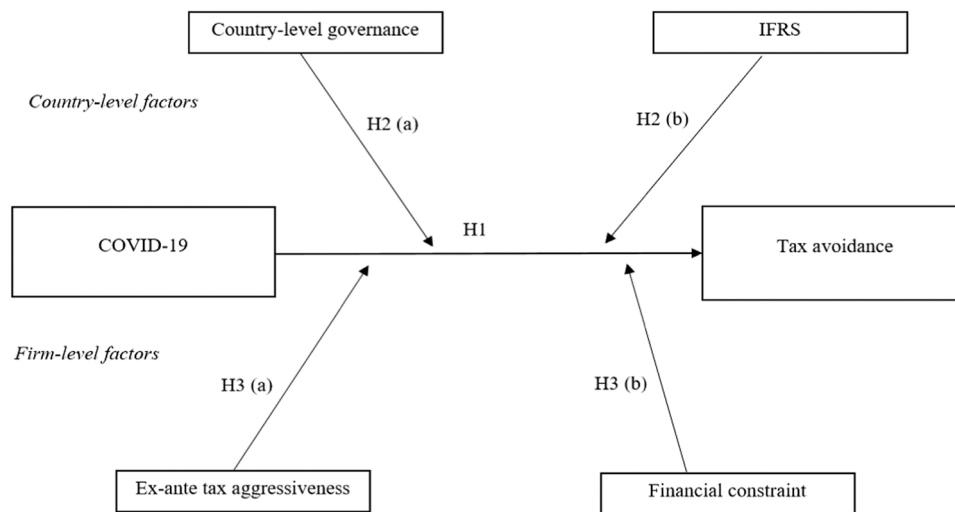
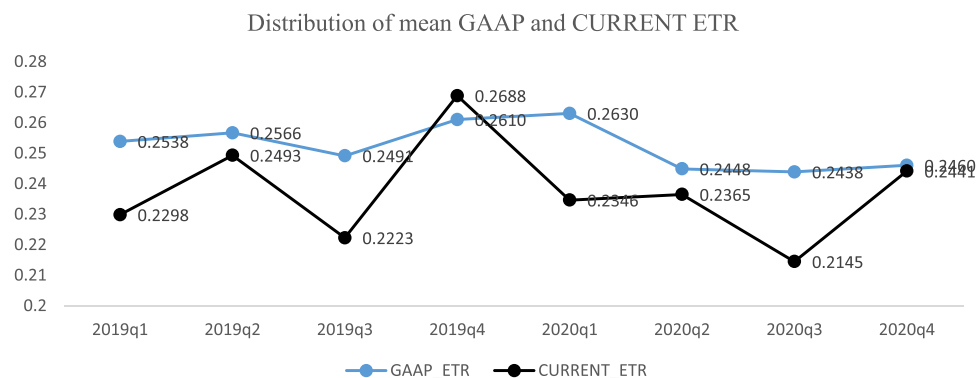**Fig. 2.** The hypothesized relationships.

Fig. 3. Displays the trend of average GAAP ETR and CURRENT ETR for eight quarters. GAAP ETR is defined as tax expense scaled by pre-tax accounting income. CURRENT ETR is defined as current tax expense scaled by pre-tax accounting income. The description of all variables is presented in Appendix A.

$$
\begin{aligned}
\text{ETR}_{it} = {}& \alpha + \beta_1 \quad \text{COVID}_t + \beta_2 \quad \text{Country governance}_{C,2019} + \beta_3 \quad \text{COVID}_t \\
& * \text{Country governance}_{C,2019} + \Upsilon \text{Firm\_Controls}_{it} + \pounds \text{Country\_Controls}_{ct} \\
& + \text{INDUSTRY\_FE} + \mathcal{E}_{i,t}
\end{aligned}
$$

$$(3)$$

where *Country governance* is the measure of country-level governance. We remove country-level fixed effects from Eqs. (2) and (3). As there is little variation in governance scores and no variation for IFRS over the sample period in most countries, it may be difficult to identify the independent effect of country-level governance and IFRS on tax management during COVID-19.[16]

3.2.3. COVID-19, tax aggressiveness, and firm characteristics

To test pre-COVID-19 tax aggressiveness, COVID-19, and tax avoidance hypothesis (H3a), we estimate the following panel regression:-

$$
\begin{aligned}
\text{ETR}_{it} = {}& \alpha + \beta_1 \quad \text{COVID}_t + \beta_2 \quad \text{Tax\_aggressive}_{i,2019} + \beta_3 \quad \text{COVID}_t \\
& * \text{Tax\_aggressive}_{i,2019} + \Upsilon \text{Firm\_Controls}_{it} + \pounds \text{Country\_Controls}_{ct} \\
& + \text{INDUSTRY\_FE} + \text{COUNTRY\_FE} + \mathcal{E}_{i,t}
\end{aligned} \quad (4)
$$

where *Tax_aggressive* is the measure of tax aggressiveness in pre-COVID-19.

To test pre-COVID-19 financial constraints, COVID-19, and tax avoidance hypothesis (H3b), we estimate the following panel regression:-

---
[16] See Mitton (2004) for detailed discussion on this.

Table 3
COVID_19 and tax aggressiveness.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR	(3) CURRENT_ETR	(4) CURRENT_ETR
COVID_19	-0.00421***	-0.00408***	-0.00752***	-0.00692***
	(0.00120)	(0.00120)	(0.00135)	(0.00135)
Firm size	0.00328***	0.00483***	0.00546***	0.00497***
	(0.000497)	(0.000503)	(0.000503)	(0.000817)
Tangibility	0.0376***	0.0306***	-0.0119*	-0.0165**
	(0.00701)	(0.00701)	(0.00670)	(0.00675)
Intangibility	0.0386*	0.0316	0.0361	0.0436*
	(0.0209)	(0.0213)	(0.0227)	(0.0232)
Leverage	-0.00481	-0.00329	-0.0169***	-0.0123***
	(0.00561)	(0.00547)	(0.00426)	(0.00430)
Capital expenditure	-0.0713***	-0.0505**	0.265***	0.290***
	(0.0243)	(0.0242)	(0.0322)	(0.0322)
Advertisement	0.0940	0.324	-0.264	0.476
	(0.561)	(0.564)	(0.643)	(0.643)
R&D expense	-0.00352	0.00953*	0.00286	0.0200***
	(0.00353)	(0.00489)	(0.00354)	(0.00480)
Loss carry-forward	0.0337***	0.0372***	0.0529***	0.0542***
	(0.00565)	(0.00573)	(0.00549)	(0.00559)
Special items	-2.374***	-2.368***	-3.841***	-3.819***
	(0.244)	(0.244)	(0.308)	(0.304)
Institutional holding	0.000305***	0.000102	0.000179**	7.09e-05
	(8.52e-05)	(9.95e-05)	(9.05e-05)	(0.000103)
Statutory tax rate	0.786***	0.360	0.722***	3.049
	(0.0284)	(2.777)	(0.0294)	(2.157)
Tax_Morale	0.0269***	0.148	0.0278***	0.376
	(0.00208)	(0.507)	(0.00230)	(0.398)
Constant	-0.0636	0.361	-0.0367	-1.622
	(0.0468)	(1.990)	(0.0724)	(1.557)
Industry FE?	YES	YES	YES	YES
Country FE?	NO	YES	NO	YES
Firm-quarter observations	40,423	40,423	40,423	40,423
No of firms	8672	8672	8672	8672
R-squared	0.147	0.188	0.154	0.188

Notes: Table 3 represents the results of the panel regression of COVID-19 on tax aggressiveness. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, within industry variation and standard errors are clustered by firm. Columns (1) and (2) present the estimation result with GAAP ETR as the dependent variable, and columns (3) and (4) present the result with the CURRENT ETR as the dependent variable. Columns (1) and (3) provide the estimation results without controlling for country-fixed effects. Columns (2) and (4) show the estimation result after controlling for various firm-level and country-level determinants and industry and country fixed effects. Standard errors are clustered by the firm (Petersen 2009). Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10 % level.

$$ETR_{it} = \alpha + \beta_1 \quad COVID_t + \beta_2 \quad Financial\ constraint_{i,2019} + \beta_3 \quad COVID_t$$
$$* \ Financial\ constraint_{i,2019} + \Upsilon Firm\_Controls_{it}$$
$$+ £Country\_Controls_{ct} + INDUSTRY\_FE + COUNTRY\_FE + \varepsilon_{i,t}$$
(5)

where *Financial constraint* is the measure of financial constraint.

4. Empirical results and test of robustness

4.1. Regression results

First, we test our hypothesis on the association between COVID-19 and tax avoidance. Fig. 3 shows the trend of mean GAAP ETR and CURRENT ETR in the pre-COVID-19 and post-COVID-19 periods. Both panels show a sharp decline in ETR during the first three-quarters of the post-COVID-19 period. This trend indicates that, on average, firms aggravate their tax avoidance during COVID-19. Further, we estimate Eq. 1 and report the result of baseline regression in Table 3. The regression coefficient for COVID-19 is negative and statistically significant ($p < 0.001$) across all regression model specifications. The coefficient of COVID-19 for GAAP ETR (CURRENT ETR) indicates the magnitude of reduction in effective tax rate during COVID-19 through tax management practices. Our findings remain unchanged even after controlling for the country dummies in columns (2) and (4). In addition, the control variables are largely in line with the existing studies.

Consistent with our hypothesis 1a, the result suggests that the firms show a higher tax aggressiveness at the onset of the COVID-19 pandemic.

Second, we test our hypotheses 2a and 2b to estimate the moderating effects of country-level factors on COVID-19-induced tax aggressiveness. Table 4 shows the estimation result of Eq.2 with IFRS as the moderating variable. IFRS is positive and significantly associated with ETR measures across all two regression model specifications. This indicates that IFRS adopters are less associated with higher tax avoidance in general. Further, the regression coefficient of the interaction term between the IFRS and COVID-19 is positive and significant ($p < 0.05$, $p < 0.001$), implying that mandatory IFRS adopters are associated with less tax aggressiveness during COVID-19. Precisely, an IFRS adopter manages 0.75 % (1.34 %) less GAAP ETR (CURRENT ETR) during COVID-19 than non-IFRS adopters. Thus, our results confirm hypothesis 2a. Fig. 4 graphically represents the moderating effect of IFRS on the association between COVID-19 and tax avoidance. As seen in the regression results of Table 4, the interaction plot shows that the firms belonging to the countries that adopted IFRS engage less in tax management during COVID-19.

Table 5 shows the estimation result of Eq.3 with governance variables as moderators. Columns (1), (2), (3), (4), (5), (6), and (7) present the estimation result with country governance, regulatory quality, government effectiveness, political stability, rule of law, corruption control and voice and accountability as the governance measures

Table 4
Tax management practices of IFRS adopters during COVID-19.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR	(3) CURRENT_ETR	(4) CURRENT_ETR
COVID_19	-0.00431***	-0.00557***	-0.00852***	-0.00983***
	(0.00124)	(0.00128)	(0.00140)	(0.00144)
IFRS	0.0135***	0.0194***	0.0296***	0.00154
	(0.00411)	(0.00448)	(0.00450)	(0.00478)
COVID_19*IFRS	0.00663**	0.00756**	0.0122***	0.0134***
	(0.00335)	(0.00350)	(0.00378)	(0.00394)
Firm size	0.000483	0.00471***	0.00195***	0.00598***
	(0.000509)	(0.000556)	(0.000506)	(0.000563)
Tangibility	0.0290***	0.0344***	-0.0119*	-0.0128*
	(0.00713)	(0.00681)	(0.00674)	(0.00674)
Intangibility	0.0374*	0.0205	0.0506**	0.0303
	(0.0217)	(0.0212)	(0.0236)	(0.0230)
Leverage	-0.00154	-0.00508	-0.0173***	-0.0171***
	(0.00577)	(0.00542)	(0.00435)	(0.00423)
Capital expenditure	-0.0738***	-0.0694***	0.217***	0.267***
	(0.0233)	(0.0243)	(0.0309)	(0.0322)
Advertisement	0.881*	-0.137	1.157**	-0.341
	(0.515)	(0.560)	(0.568)	(0.643)
R&D expense	-0.0315***	-0.00183	-0.0281***	0.00349
	(0.00286)	(0.00353)	(0.00285)	(0.00356)
Loss carry-forward	0.0373***	0.0341***	0.0583***	0.0529***
	(0.00557)	(0.00562)	(0.00535)	(0.00549)
Special items	-2.107***	-2.366***	-3.206***	-3.844***
	(0.241)	(0.245)	(0.299)	(0.309)
Institutional holding	0.000916***	0.000176**	0.000809***	0.000133
	(8.33e-05)	(8.84e-05)	(8.85e-05)	(9.33e-05)
Statutory tax rate		0.797***		0.726***
		(0.0283)		(0.0295)
Tax_Morale		0.0321***		0.0297***
		(0.00227)		(0.00240)
Constant	0.118***	-0.0868	0.136***	-0.0447
	(0.0137)	(0.0578)	(0.0306)	(0.0761)
Industry FE?	YES	YES	YES	YES
Firm-quarter observations	44,009	40,423	44,009	40,423
No of firms	9586	8672	9586	8672
R-squared	0.067	0.152	0.086	0.154

Notes: Table 4 represents the results of the ordinary least square regression of COVID-19 on IFRS and tax aggressiveness. All variables are defined in Appendix A. Columns (1) and (2) present the estimation result with GAAP ETR as the dependent variable and columns (3) and (4) present the result with the CURRENT ETR as the dependent variable. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10 % level.
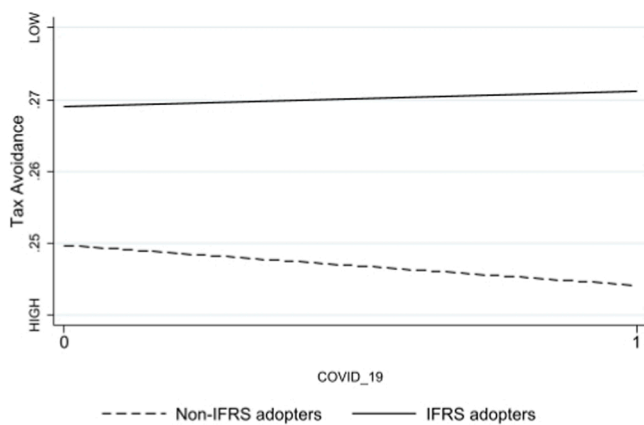
Fig. 4. The moderating effect of IFRS on the relationship between COVID_19 and tax avoidance.

respectively. All the governance variables are positively and significantly ($p < 0.001$) associated with the ETR measure implying that tax avoidance is lower in nations where the government is more effective. Further, all coefficient of the interaction term between governance measures and COVID-19 is positive and significant in our model, except

for voice and accountability (Column 7). Our empirical results confirm Hypothesis 2b. Fig. 5 graphically represents the moderating effect of country governance on COVID-19-induced tax management. The interaction plot shows that the firms belonging to the countries with a higher level of governance engage less in tax management during COVID-19.

Finally, to test our hypotheses 3a and 3b, we present the results of the estimations that analyze the firm-level determinants of tax aggressiveness during COVID-19. Table 6 shows the estimation result of Eq. (4) with Tax_aggressive as the moderating variable. The regression coefficients of COVID-19 *Tax_aggressive are positive and significant ($p < 0.001$). This implies that tax avoidance is lower among firms that maintained high-tax aggressiveness ex-ante COVID-19. High-tax aggressive firms manage 5.5 % (2.9 %) less GAAP ETR (CURRENT_ETR) during COVID-19 than the less aggressive firms. Our findings confirm hypothesis 3a that the marginal cost of tax aggressiveness could be higher for firms belonging to the upper tercile of tax aggressiveness. Consistent with our hypothesis, Fig. 6 shows that firms with a history of high tax avoidance are more likely to follow conservative tax policies during COVID-19.

Table 7 shows the estimation result of Eq.5 with Cash_constrained (columns 1 and 2) and Highly levered (columns 3 and 4) as the moderating variables. We find a negative and statistically significant ($p < 0.05$, $p < 0.10$) coefficient for COVID-19 *Cash_constrained, implying that the cash-constrained firms follow a high tax aggressiveness during COVID-19 to manage liquidity. However, the coefficient of

Table 5

Impact of country-level governance on tax management practices during COVID-19.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR	(3) GAAP_ETR	(4) GAAP_ETR	(5) GAAP_ETR	(6) GAAP_ETR	(7) GAAP_ETR
COVID_19	-0.0185***	-0.0227***	-0.0214***	-0.0163***	-0.0184***	-0.0210***	-0.00767***
	(0.00409)	(0.00440)	(0.00540)	(0.00324)	(0.00466)	(0.00382)	(0.00296)
Country governance	0.000905***						
	(8.28e-05)						
COVID_19 * Country governance	0.000198***						
	(5.51e-05)						
Regulatory quality		0.000889***					
		(8.03e-05)					
COVID_19 * Regulatory quality		0.000249***					
		(5.68e-05)					
Government effectiveness			0.000550***				
			(8.97e-05)				
COVID_19 *Government effectiveness			0.000211***				
			(6.57e-05)				
Political stability				0.000621***			
				(6.46e-05)			
COVID_19 * Political stability				0.000206***			
				(4.74e-05)			
Rule of law					0.000815***		
					(9.16e-05)		
COVID_19 * Rule of law					0.000200***		
					(6.04e-05)		
Corruption control						0.000848***	
						(7.89e-05)	
COVID_19 * Corruption control						0.000221***	
						(5.10e-05)	
Voice and accountability							0.000777***
							(6.24e-05)
COVID_19 * Voice and accountability							3.97e-05
Statutory tax rate	0.767***	0.809***	0.740***	0.834***	0.792***	0.757***	0.650***
	(0.0284)	(0.0283)	(0.0283)	(0.0283)	(0.0283)	(0.0285)	(0.0299)
Tax_Morale	0.00510*	0.00612**	0.0144***	0.00633**	0.00774***	0.00352	0.0125***
	(0.00274)	(0.00269)	(0.00267)	(0.00271)	(0.00278)	(0.00284)	(0.00232)
Constant	-0.145***	-0.157***	-0.0599**	-0.126***	-0.144***	-0.143***	-0.112***
	(0.0267)	(0.0265)	(0.0253)	(0.0317)	(0.0300)	(0.0266)	(0.0336)
Industry FE?	YES	YES	YES	YES	YES	YES	YES
Firm-level controls?	YES	YES	YES	YES	YES	YES	YES
Firm-quarter observations	40,423	40,423	40,423	40,423	40,423	40,423	40,423
No of firms	8672	8672	8672	8672	8672	8672	8672
R-squared	0.1651	0.1663	0.1509	0.1624	0.1615	0.1641	0.1652

Notes: Table 5 represents the results of the ordinary least square regression of COVID-19 on governance variables and tax aggressiveness. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10 % level.
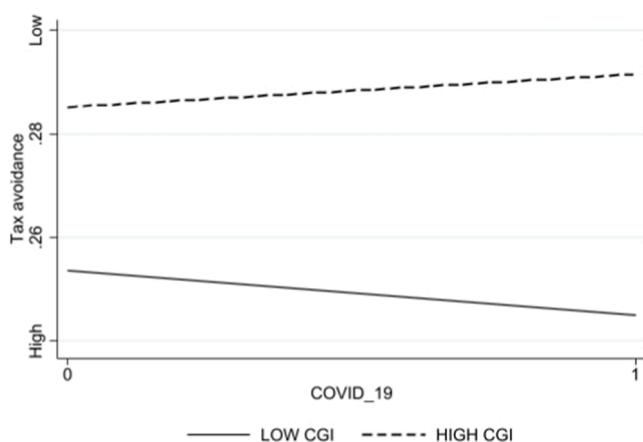

Fig. 5. The moderating effect of country governance on the relationship between COVID_19 and tax avoidance.

COVID-19 *Highly levered is not statistically significant. Therefore, our hypothesis 3b is only partially confirmed. To see the pattern of the interaction effects, we plotted the trend showing the association between COVID-19 and tax management for cash-constrained and unconstrained firms in Fig. 7. As seen in the regression results, the interaction plot shows that cash-constrained firms engage more in COVID-19-induced tax management than the low cash-constrained firms.[17]

4.2. Sensitivity analysis

This section re-estimates the baseline regression results with various additional tests. First, we test the robustness of our results using another measure of corporate tax avoidance: CASH ETR (cash tax paid scaled by pre-tax accounting income). Table 8 shows the estimation of Eq.1 using CASH ETR, which is consistent with our baseline result.

Henry and Sansing (2018) suggest that deleting the loss firms from the sample may cause truncation bias. Hence, we perform a robustness test by retaining the firms with negative pre-tax income in our sample to analyze the sensitivity of our main result to loss firms. Following Rego (2003), we control negative pre-tax income and tax expense by adding dummy variables to Eq.1. We create two variables for loss firms and tax loss firms. Loss firm (Tax loss firms) is a dummy variable that takes the value of one if a firm-quarter reports a negative pre-tax income

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[17] We do not provide the interaction plot for COVID_19 *HIGH_LEV as the interaction coefficient is insignificant.

Table 6

Tax management practices of tax aggressive firms during COVID-19.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR	(3) CURRENT_ETR	(4) CURRENT_ETR
COVID_19	-0.0318***	-0.0322***	-0.0222***	-0.0225***
	(0.00265)	(0.00266)	(0.00298)	(0.00299)
Tax_aggressive	-0.127***	-0.127***	-0.0878***	-0.0874***
	(0.00305)	(0.00298)	(0.00371)	(0.00364)
COVID_19 * Tax_aggressive	0.0554***	0.0555***	0.0291***	0.0293***
	(0.00336)	(0.00336)	(0.00383)	(0.00384)
Firm size	0.00166***	0.00391***	0.00453***	0.00542***
	(0.000633)	(0.00105)	(0.000718)	(0.00118)
Tangibility	0.0287***	0.0211**	-0.0143	-0.0230**
	(0.00867)	(0.00862)	(0.00926)	(0.00924)
Intangibility	0.102***	0.0886***	0.0936***	0.0844**
	(0.0263)	(0.0269)	(0.0325)	(0.0332)
Leverage	0.00454	0.00560	-0.0117*	-0.00800
	(0.00932)	(0.00934)	(0.00705)	(0.00707)
Capital expenditure	-0.0292	-0.0146	0.304***	0.321***
	(0.0361)	(0.0361)	(0.0466)	(0.0464)
Advertisement	0.705	0.569	-1.409*	-0.908
	(0.715)	(0.724)	(0.747)	(0.762)
R&D expense	0.00692	0.0104*	0.00849*	0.0184***
	(0.00451)	(0.00618)	(0.00499)	(0.00656)
Loss carry-forward	0.0346***	0.0308***	0.0479***	0.0463***
	(0.00772)	(0.00796)	(0.00846)	(0.00861)
Special items	-2.727***	-2.678***	-4.327***	-4.255***
	(0.366)	(0.366)	(0.456)	(0.450)
Statutory tax rate	0.862***	4.936	0.810***	7.474**
	(0.0365)	(4.757)	(0.0436)	(3.100)
Institutional holding	8.16e-05	0.000209*	3.76e-05	0.000284**
	(0.000103)	(0.000119)	(0.000125)	(0.000139)
Tax_Morale	0.0259***	0.669	0.0288***	1.145**
	(0.00270)	(0.869)	(0.00342)	(0.576)
Constant	0.0487	-2.756	0.0376	-4.607**
	(0.0528)	(3.409)	(0.0772)	(2.242)
Country FE?	NO	YES	NO	YES
Industry FE?	YES	YES	YES	YES
Firm-quarter observations	18,996	18,996	18,996	18,996
No of firms	3278	3278	3278	3278
R-squared	0.443	0.471	0.308	0.344

Notes: Table 6 represents the results of the ordinary least square regression of COVID-19 on Tax_aggressive and tax aggressiveness. All variables are defined in Appendix A. Columns (1) and (2) present the estimation result with GAAP ETR as the dependent variable and columns (3) and (4) present the result with the CURRENT ETR as the dependent variable. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * **, * *, and * denote significance at a 1, 5, and 10 % level.
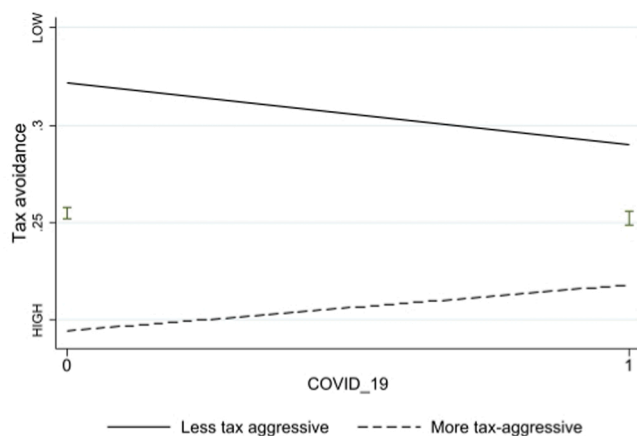
Fig. 6. The interaction effect of pre-COVID_19 tax aggressiveness on the relationship between COVID_19 and tax avoidance.

(tax-expense) and zero otherwise. The results of estimating Eq.1 without excluding loss firms and adding loss firms and tax loss firmsdummies are presented in Table 9. The coefficient of COVID-19 dummy variable changes when loss firms are included in the sample. The estimated coefficient of COVID-19 is − 0.003 for GAAP_ETR and − 0.006 for CURRENT_ETR in the baseline regression (Table 3). It changes to − 0.005 for

GAAP_ETR and − 0.008 for CURRENT_ETR in Table 9. This indicates that the loss-making firm reports negative or zero-tax expenses shows a lower ETR and inflates the coefficient of COVID-19. Even if the inclusion of loss firms change the coefficient of COVID-19, the estimated coefficient remains negative and statistically significant, which confirms the robustness of our main result.[18]

5. Discussion

The COVID-19 pandemic has re-emphasized the role of government after its interventions in minimizing the pandemic's adverse effects on health and economic spheres, making it a key stakeholder in the path to recovery. Since funds are required to fight against inequality, climatic challenges, and sluggish growth (Stiglitz, 2019), taxpayers are expected to pay their fair share of taxes to support the government. Though the government is the largest minority shareholder in firms through its claim on profits as taxes, corporations nonetheless find ways to avoid tax for various reasons. This study investigates how firms adjust their tax strategy in response to an unprecedented global health and economic crisis-COVID-19. Do firms help the government by paying taxes or take advantage of the crisis to cut back on their tax?

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[18] We thank anonymous reviewer for highlighting the need to address the potential truncation bias.

Table 7
Impact of financial constraints on tax aggressiveness during COVID-19.

VARIABLES	(1) GAAP_ETR	(2) CURRENT_ETR	(3) GAAP_ETR	(4) CURRENT_ETR
COVID_19	-0.000239	-0.00708 * **	-0.00171	-0.00612***
	(0.00197)	(0.00242)	(0.00181)	(0.00223)
Cash_constrained	-0.0189***	-0.0147***		
	(0.00439)	(0.00479)		
COVID_19 * Cash_constrained	-0.00785**	-0.00123*		
	(0.00324)	(0.00369)		
Highly levered			0.0315***	0.0167***
			(0.00459)	(0.00474)
COVID_19 * Highly levered			-0.00128	-0.00112
			(0.00307)	(0.00356)
Firm size	0.00192***	0.00564***	0.00181***	0.00532***
	(0.000631)	(0.00119)	(0.000602)	(0.00111)
Tangibility	0.0524***	0.00304	0.0209**	-0.0145
	(0.0102)	(0.00994)	(0.00854)	(0.00904)
Intangibility	0.0370	0.0286	0.0289	0.0528
	(0.0274)	(0.0342)	(0.0265)	(0.0329)
Leverage	-0.00122	-0.0102	-0.0309***	-0.0256***
	(0.00931)	(0.00668)	(0.00745)	(0.00624)
Capital expenditure	-0.0800**	0.240***	-0.0416	0.322***
	(0.0332)	(0.0435)	(0.0322)	(0.0434)
Advertisement	-0.531	-0.163	-1.151	0.601
	(0.654)	(0.884)	(0.721)	(0.957)
R&D expense	-0.00119	0.0221***	0.00904**	0.0239***
	(0.00442)	(0.00750)	(0.00405)	(0.00661)
Loss carry-forward	0.0456***	0.0557***	0.0433***	0.0557***
	(0.00702)	(0.00742)	(0.00723)	(0.00747)
Special items	-2.718***	-4.690***	-2.805***	-4.282***
	(0.308)	(0.389)	(0.296)	(0.422)
Institutional holding	0.000310***	-2.01e-05	0.000289***	-5.74e-05
	(0.000102)	(0.000138)	(0.000101)	(0.000140)
Statutory tax rate	0.844***	3.935	0.904***	3.720
	(0.0362)	(2.646)	(0.0342)	(2.691)
Tax_Morale	0.0254***	0.471	0.0210***	0.416
	(0.00270)	(0.488)	(0.00570)	(0.499)
Constant	-0.0126	-2.030	-0.0638***	-1.778
	(0.0181)	(1.906)	(0.0128)	(1.945)
Country FE?	NO	YES	NO	YES
Industry FE?	YES	YES	YES	YES
Firm-quarter observations	22,904	21,138	24,461	22,507
No of firms	4698	4268	4918	4445
R-squared	0.154	0.213	0.168	0.218

Notes: Table 7 represents the results of the ordinary least square regression of COVID-19 on financial constraints and tax aggressiveness. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10 % level.
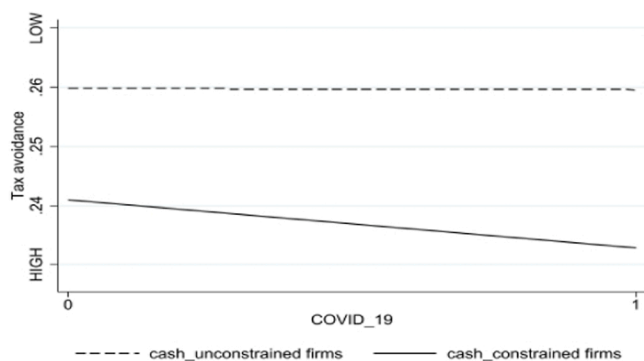
Fig. 7. The interaction effect of cash constraints on the relationship between COVID_19 and tax avoidance.

5.1. Financial constraints versus reputational and ethical concerns

We analyze the COVID-19-induced tax strategy using two broad theories. First is the *financing constraint hypothesis,* which states that lower cash flow from operations and increased risk of bankruptcy amid COVID-19 (Didier et al., 2021) incentivize firms to engage in tax avoidance to prevent liquidity crunches. Second is the *reputation cost hypothesis,* which

states that non-tax costs such as social, reputational, political, and legal costs (Armstrong et al., 2015) reduce a firm's incentive to engage in tax avoidance during COVID-19. Our baseline findings in Table 3 indicate that firms engage in aggressive tax planning strategies during COVID-19, which is consistent with the *financing constraint hypothesis.* The positive association between COVID-19 and tax avoidance is attributable to three alternative but non-mutually exclusive explanations. First, COVID-19-led financial constraints increase the marginal benefit of tax avoidance. Second, factors such as relaxations in tax compliance practices, overwhelmed government machinery, and overburdened tax authorities during COVID-19 allow firms to avoid tax at a lower cost. Finally, the expectation of a hike in tax and ensuing regulatory compliance will make future tax avoidance more costly owing to regulatory risks and, hence, firms are more likely to exploit tax-loopholes in the furthest possibility. Our baseline findings based on an international sample is an indication of the fact firms prioritize their survival or acts opportunistically during an exogenous shocks and are less likely to exhibit pro-social behavior during turbulent times.[19]

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[19] Financial constraints as a motivating factor to act opportunistically by engaging in activities like tax avoidance are documented in prior studies (Richardson, Lanis, et al., 2015; Richardson, Taylor, et al., 2015; Gul et al., 2018).

Table 8
Alternative measure: CASH_ETR.

VARIABLES	(1) CASH_ETR	(2) CASH_ETR	(3) CASH_ETR
COVID_19	-0.0164***	-0.0249***	-0.0261***
	(0.00339)	(0.00351)	(0.00352)
Firm size	0.00807***	0.0138***	0.0192***
	(0.000961)	(0.00108)	(0.00175)
Tangibility	-0.0994***	-0.0777***	-0.0935***
	(0.0140)	(0.0143)	(0.0143)
Intangibility	-0.0565	-0.0582	-0.0463
	(0.0456)	(0.0476)	(0.0489)
Leverage	-0.0952***	-0.0864***	-0.0756***
	(0.0132)	(0.0127)	(0.0125)
Capital expenditure	1.926***	1.764***	1.731***
	(0.0811)	(0.0838)	(0.0830)
Advertisement	1.627	-0.308	1.424
	(1.301)	(1.627)	(1.477)
R&D expense	-0.0823***	-0.0198***	0.000405
	(0.00557)	(0.00729)	(0.00978)
Loss carry-forward	0.130***	0.121***	0.117***
	(0.00988)	(0.0102)	(0.0102)
Special items	-4.835***	-4.477***	-4.590***
	(0.478)	(0.538)	(0.518)
Statutory tax rate		1.236***	-3.625
		(0.0636)	(8.641)
Institutional holding		0.000703***	0.000387*
		(0.000176)	(0.000199)
Tax_Morale		0.0502***	0.741
		(0.00449)	(1.574)
Constant	0.236***	-0.0555	2.953
	(0.0772)	(0.136)	(6.184)
Country FE?	NO	NO	YES
Industry FE?	YES	YES	YES
Firm-quarter observations	23,930	21,383	21,383
No of firms	7397	6614	6614
R-squared	0.116	0.209	0.243

Notes: Table 8 represents the results of the ordinary least square regression of COVID-19 on CASH ETR. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10 % level.

5.2. Role of firm-level factors

We also explore the heterogeneity of the association between COVID-19 and tax avoidance across firm-level factors. Do firm characteristics prior to the crisis moderate the association between corporate tax behavior and COVID-19? Our results in Table 6 document that firms with a history of high tax avoidance are more likely to follow conservative policies during COVID-19 to reduce public rebuke, reputational damages (Chen et al., 2019), financing costs (Hasan et al., 2014), and owing to resource constraints (Kanagaretnam et al., 2018a, 2018b). Our results in Table 7 also show that firms that entered the crisis with ample cash reserves avoid less tax compared to firms with less cash, consistent with the narrative that cash-rich firms are financially unconstrained and less affected by adverse shocks (Duchin et al., 2010). However, we do not find any significant association between firm indebtedness and tax avoidance amid rising COVID-19.[20] Our results collectively highlight the role firm-level factors play as moderators in response to COVID-19 through tax avoidance strategies.

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[20] The negative albeit insignificant effect of leverage on COVID-19 and tax avoidance could indicate an interplay of monitoring activities and bankruptcy costs (Platikanova, 2017). The statistical insignificance could be explained by the debt-related reliefs enjoyed by levered firms during COVID-19, such as debt moratoriums and delayed interest burdens (Felipe & Fullwiler, 2020).

Table 9
Without excluding loss-making firms.

VARIABLES	(1) GAAP_ETR	(2) CURRENT_ETR
COVID_19	-0.00539***	-0.00817***
	(0.00118)	(0.00129)
Firm size	0.00450***	0.00409***
	(0.000726)	(0.000706)
Tangibility	0.0245***	-0.0186***
	(0.00596)	(0.00557)
Intangibility	0.0139	0.0226
	(0.0169)	(0.0183)
Leverage	-0.00612**	-0.00797***
	(0.00260)	(0.00226)
Capital expenditure	-0.0106	0.281***
	(0.0231)	(0.0293)
Advertisement	0.496	0.663
	(0.591)	(0.592)
R&D expense	0.00629	0.0158***
	(0.00444)	(0.00425)
Loss carry-forward	0.0512***	0.0560***
	(0.00421)	(0.00401)
Special items	-0.241**	-0.800***
	(0.122)	(0.127)
Statutory tax rate	1.353	4.078*
	(2.447)	(2.131)
Loss firms	-0.157***	-0.154***
	(0.00396)	(0.00305)
Tax loss firms	-0.124***	-0.0894***
	(0.00488)	(0.00444)
Institutional holding	3.53e-05	5.99e-05
	(9.12e-05)	(9.59e-05)
Tax_Morale	-0.0211	-0.560
	(0.447)	(0.394)
Constant	-0.199	-2.248
	(1.754)	(1.538)
Industry FE?	YES	YES
Country FE?	YES	YES
Firm-quarter observations	45,598	45,598
No of firms	9407	9407
R-squared	0.320	0.364

Notes: Table 9 represents the results of the ordinary least square regression of COVID-19 on CASH ETR without excluding loss firm-quarters. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10 % level.

5.3. Role of information quality and regulatory environment

Our study also explores the role of country-level institutions in terms of quality of the information environment, regulatory environment, and political climate as the major determinants of tax avoidance. According to Slemrod (2004), tax avoidance is the reflection of a taxpayer's sense of responsibility, view of the tax system's fairness, and confidence in the political and broader governmental systems. Consistent with this, results in Tables 4 and 5 report that the firms in countries that adopted IFRS and better governance are less likely to engage in tax avoidance during COVID-19. In addition, we document that country-level transparency is an important factor in controlling tax management during a crisis, as it leads to higher tax-related transaction costs and a greater risk of detection. While existing studies focus on the quality of governance during normal times,[21] we show that better country-level transparency reduces tax avoidance during turbulent periods like COVID-19. Our results imply that the quality of county-level governance restricts firm's rent-seeking and opportunistic behavior in such countries resulting in less tax avoidance during adverse times (Johannesen et al., 2020).

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[21] See for instance Ahmed et al. (2013), Kerr (2019), Okafor et al. (2019) and Zeng (2019)

Table A1
PLACEBO.

VARIABLES	(1) GAAP_ETR	(2) CURRENT_ETR
PLACEBO	0.000789	0.00163
	(0.00125)	(0.00145)
Firm size	0.00323***	0.00445***
	(0.000788)	(0.000781)
Tangibility	0.0350***	-0.0126*
	(0.00759)	(0.00683)
Intangibility	0.0695***	0.0383*
	(0.0224)	(0.0230)
Leverage	-0.00871	-0.0287***
	(0.00695)	(0.00695)
Capital expenditure	-0.101***	0.256***
	(0.0231)	(0.0306)
Advertisement	0.0776	-0.744
	(0.834)	(0.811)
R&D expense	0.0215***	0.0195***
	(0.00500)	(0.00491)
Loss carry-forward	0.0292***	0.0454***
	(0.00632)	(0.00617)
Special items	-2.659***	-4.057***
	(0.289)	(0.341)
Statutory tax rate	0.528***	0.420***
	(0.0897)	(0.107)
Tax_Morale	0.235***	0.0791
	(0.0608)	(0.0513)
Constant	0.814***	0.357**
	(0.178)	(0.156)
Country FE?	YES	YES
Industry FE?	YES	YES
Firm-quarter observations	38,578	38,578
No of firms	7761	7761
R-squared	0.193	0.203

Notes: Table A1 represents the results of the ordinary least square regression of PLACEBO on tax aggressiveness. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10% level.

Table A2
Sample without Taiwan and Japan.

VARIABLES	(1) GAAP_ETR	(2) CURRENT_ETR
COVID_19	-0.00806***	-0.00804***
	(0.00191)	(0.00196)
Firm size	0.00559***	0.00460***
	(0.00100)	(0.00101)
Tangibility	0.0229**	-0.0102
	(0.00940)	(0.00914)
Intangibility	0.0142	0.0693***
	(0.0235)	(0.0265)
Leverage	-0.0152***	-0.0203***
	(0.00537)	(0.00440)
Capital expenditure	0.0799**	0.0293
	(0.0349)	(0.0334)
Advertisement	0.0739	0.826
	(0.630)	(0.771)
R&D expense	-0.00929	0.0210**
	(0.00843)	(0.00876)
Loss carry-forward	0.0284***	0.0491***
	(0.00682)	(0.00683)
Special items	-1.022***	-1.884***
	(0.316)	(0.358)
Statutory tax rate	-0.498	3.048
	(2.769)	(2.066)
Institutional holding	0.000230*	0.000339**
	(0.000134)	(0.000144)
Tax_Morale	0.303	-0.373
	(0.506)	(0.382)
Constant	0.927	-1.688
	(1.984)	(1.492)
Country FE?	YES	YES
Industry FE?	YES	YES
Firm-quarter observations	20,207	20,207
No of firms	5058	5058
R-squared	0.1235	0.1227

Notes: Table A2 represents the results of the ordinary least square regression of COVID-19 on tax aggressiveness. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10% level.

Post-GFC, governments across the world initiated various tax reforms known as "epic-reforms," that were predicted to have "a significant impact on the tax avoidance of firms" (Dillon, 2017). The Base Erosion and Profit Shifting (BEPS) initiative proposed by OECD and G20 nations, the discussion on the adoption of a global unitary tax system, common reporting standards, Minimum Tax, Destination Based Cash Flow Tax, and Residual Profit allocation were some major proposals to control tax aggressiveness by corporates. However, COVID-19 disrupted the new global tax initiatives, and our findings clearly illustrate the crisis has increased the propensity of firms to avoid taxes around the world at the expense of the government's ability to restore fiscal stability. Given the fact that governments cannot trust firms to pay tax as a part of their moral responsibility, our findings indicate that country-level governance plays a crucial role in tax avoidance. In other words, our research demonstrates unequivocally that in the absence of a strong country-level accounting and governance system, new reforms in the context of tax avoidance, such as BEPS 2.0 and its pillars (Avi-Yonah, 2022; Diniz Magalhães & Christians, 2023) will be less effective in reducing tax avoidance.

6. Conclusion

Two alarming facts that got reignited by COVID-19 were corporate tax avoidance and straining government budgets. From the perspective of firms, tax payments constitute major out-of-pocket expenses and are often viewed as an obstacle for doing business (Alm & McClellan, 2012; Hu et al., 2023). In contrast, corporate tax revenue is an indispensable source of revenue for the government for state building, tackling inequality, and offering support during crises. Given these contrasting views on tax compliance in the context of firm-government

relationships, we investigate how corporates reacted to COVID-19 in terms of their tax management. Our study is important due to three reasons. Firstly, post-GFC, governments across the world took various initiatives that are anticipated to have a significant impact on corporate tax avoidance. Secondly, the growing concern about reputation and a strong sense of social responsibility among corporates are likely to curtail tax avoidance. Finally, due to the detrimental impact of COVID-19 on the firm's financials, a rigorous look into how firms manage their taxes is necessary given the significance of cash tax savings. Our study fills this gap by analyzing the corporate response to COVID-19 through tax management strategies. We specifically look into whether firms reduce tax avoidance due to reputational risks and regulatory anxiety during the pandemic or increase tax avoidance to minimize financial frictions. To that end, we use quarterly data during the period 2019-Q1 to 2020-Q4 for a global sample of 9586 unique firms across 31 countries. Using Effective Tax Rates as a proxy for tax avoidance, we find that firms increase their tax avoidance amid the pandemic, and the pandemic-induced tax avoidance is more pronounced among financially constrained firms. Thus our main finding is consistent with the financial constraint motive of firms which states firms prioritize their survival amid crises. We also highlight the role of an effective country-governance system in reducing tax avoidance practices during adverse times.

Our work combines and evaluates theory from the fields of international business and finance to explain corporate tax behavior by presenting the first piece of evidence on corporate tax management during COVID-19 across countries in light of the post-GFC tax reforms. Despite the fact that the field of finance is experiencing an increase in

Table A3
Without eliminating countries' firm-quarter observations<15.

VARIABLES	(1) GAAP_ETR	(2) GAAP_ETR	(3) CURRENT_ETR	(4) CURRENT_ETR
COVID_19	-0.00399***	-0.00408***	-0.00698***	-0.00692***
	(0.00113)	(0.00120)	(0.00129)	(0.00135)
Firm size	0.00128***	0.00483***	0.00364***	0.00497***
	(0.000439)	(0.000812)	(0.000443)	(0.000817)
Tangibility	0.0318***	0.0306***	-0.0102	-0.0165**
	(0.00660)	(0.00701)	(0.00638)	(0.00675)
Intangibility	0.0234	0.0316	0.0298	0.0436*
	(0.0197)	(0.0213)	(0.0213)	(0.0232)
Leverage	-0.00602	-0.00329	-0.0211***	-0.0123***
	(0.00562)	(0.00547)	(0.00424)	(0.00430)
Capital expenditure	-0.0740***	-0.0505**	0.215***	0.290***
	(0.0230)	(0.0242)	(0.0303)	(0.0322)
Advertisement	-0.284	0.324	-0.278	0.476
	(0.497)	(0.564)	(0.559)	(0.643)
R&D expense	-0.00374	0.00953*	0.00133	0.0200***
	(0.00290)	(0.00489)	(0.00292)	(0.00480)
Loss carry-forward	0.0323***	0.0372***	0.0555***	0.0542***
	(0.00540)	(0.00573)	(0.00519)	(0.00559)
Special items	-2.187***	-2.368***	-3.289***	-3.819***
	(0.221)	(0.244)	(0.274)	(0.304)
Statutory tax rate	0.725***	0.360	0.691***	3.049
	(0.0253)	(2.777)	(0.0263)	(2.157)
Institutional holding	0.000415***	-0.000102	0.000241***	-7.09e-05
	(7.90e-05)	(9.95e-05)	(8.46e-05)	(0.000103)
Tax_Morale		0.148		-0.376
		(0.507)		(0.398)
Constant	-0.0651*	0.361	-0.0587	-1.622
	(0.0337)	(1.990)	(0.0558)	(1.557)
Industry FE?	YES	YES	YES	YES
Country FE?	NO	YES	NO	YES
Firm-quarter observations	45,881	40,423	45,881	40,423
No of firms	10,028	8672	10,028	8672
R-squared	0.1067	0.1883	0.1161	0.1882

Notes: Table A3 represents the results of the ordinary least square regression of COVID-19 on tax aggressiveness without dropping countries' firm-quarter observations< 15. All variables are defined in Appendix A. All regressions are controlled for firm-level variables, and standard errors are clustered by firm. Coefficients are presented with standard errors in parenthesis. * ** , * *, and * denote significance at a 1, 5, and 10% level.

Table B1
Sample composition by industry (NAICS 2-digit classification).

Industry classification	NAICS sector code	No. of firm years	Relative frequency (%)
Accommodation and Food Services	72	621	1.41%
Administrative and Support and Waste Management and Remediation Services	56	712	1.62%
Agriculture, Forestry, Fishing and Hunting	11	431	0.98%
Arts, Entertainment, and Recreation	71	169	0.38%
Construction	23	3691	8.39%
Educational Services	61	198	0.45%
Health Care and Social Assistance	62	518	1.18%
Information	51	2313	5.26%
Management of Companies and Enterprises	55	19	0.04%
Manufacturing	31–33	22262	50.59%
Mining, Quarrying, and Oil and Gas Extraction	21	984	2.24%
Other Services (except Public Administration)	81	180	0.41%
Professional, Scientific, and Technical Services	54	2360	5.36%
Public Administration	92	3	0.01%
Real Estate and Rental and Leasing	53	1578	3.59%
Retail Trade	44–45	1775	4.03%
Transportation and Warehousing	48–49	1833	4.17%
Utilities	22	1481	3.37%
Wholesale Trade	42	2881	6.55%
Total		**44009**	**100.00%**

studies on corporate taxes (Hanlon & Heitzman, 2010), little attention has been dedicated to empirical research on taxation in the context of international business (Cooper and Nguyen, 2020). We contribute to the tax management literature in the context of the international business environment by investigating the tax avoidance strategies of corporates during COVID-19 across countries with significant institutional heterogeneity in terms of country-level governance, tax rates, and access to finance. COVID-19 is an exogenous shock that creates competing incentives for firms to manage taxes, and we document that firms cut down on their taxes when the crisis hits. We also extend the literature on the role of country-level governance in reducing the opportunistic behavior of firms during pressing times.

Our study is subject to several limitations. First, the distribution of observations is uneven across countries, and we eliminate some countries without a minimum number of observations. This could lead to a sample selection bias. Our results should be interpreted cautiously in light of this limitation. Second, our empirical models may be incomplete. For example, the role of managerial compensation structure (Dyreng et al., 2010), the composition of the board of directors, and CEO characteristics (Lanis et al., 2019) could have an impact on firm's tax management activities. However, we could not include these variables due to data and cost constraints. Future studies with access to granular data can take this step to further our understanding of how these factors alter COVID-19-induced tax management. Finally, the literature focuses on cross-sectional variations in tax avoidance practices of firms based on different characteristics, such as corporate governance, executive characteristics, stakeholder influences, auditor quality, and institutional investors. The current study only looks at two of the factors: financial constraints and tax aggressiveness. Future research should look into how other firm-level factors affect tax management amid crises.

Our study has policy implications. Our findings indicate that the COVID-19 crisis has resulted in volatile cash flows, depressed earnings, and increased costs for raising external finance; as a result, firms avoid paying taxes to conserve funds for future needs. A higher level of tax avoidance by firms reduces the much-needed fiscal revenue for the government to combat the COVID-19 pandemic, which, in turn, slows down the recovery from this economic disruption and creates a vicious circle. As COVID-19 is still present and governments worldwide need enormous funds for efficient resource allocation, our findings advocate for immediate intervention of tax administration mechanisms by enhancing more focused enforcement measures to limit corporate tax aggressiveness.

Data availability

The authors do not have permission to share data.

Appendix A

Other tests of robustness

Placebo estimation

We conduct a placebo test to ensure that our results are not driven by other events or unobserved characteristics that might affect tax avoidance during the pandemic time. It is a widely used method in tax literature to ensure the robustness of the estimation (e.g.:- Arena et al., 2021; Joshi et al., 2020). The sample period of placebo estimation starts from 2017-Q1 to 2018-Q4. We re-estimate Eq.1 using a placebo crisis period of 2018 Q1 to 2018 Q4 and a placebo pre-crisis period of 2017 Q1-2017Q4. The placebo estimation results are reported in Table 1.1. All estimated coefficients of interest (PLACEBO) are largely statistically insignificant, suggesting that the increase in tax aggressiveness does not follow an artificially imposed pandemic period.

Subsample analysis

We repeat our estimation in Eq.1 using a sub-sample analysis. We exclude the observations from Taiwan and Japan, the two highest constituents of our sample. As reported in Panel A of Table 3, Taiwan consists of 8201 firm-period observations, and Japan consists of 12015 firm-period observations. Table 1.2 shows the estimation result of Eq.1, excluding the observations from Taiwan and Japan. The coefficient of COVID_19 based on GAAP ETR (0.81%) as the dependent variable and CURRENT ETR as the dependent variable (0.80%) is largely similar to the magnitude of the coefficient of COVID-19 (GAAP ETR: 0.42% and CURRENT ETR: 0.75%) reported in Table 4.

A large estimation period

Our main analysis holds a tight pre and post-crisis window. It is possible that the tax aggressiveness during COVID-19 could average out with a longer pre-crisis window. To rule out this possibility, we repeat our estimation in Eq.1 using a large pre-COVID-19 estimation window. The sample period of pre- estimation starts from 2017-Q1 to 2019-Q4. Untabulated results are in line with our baseline estimation.

Without dropping the firms that belong to countries with less than 15 firm-year observations

Following cross-country studies (De Vito & Gómez, 2020; Leuz et al., 2003), to draw more meaningful inferences from our analyses, we require each country to have at least 15 listed firms both before and after the pandemic. This helps us for a more meaningful comparison of the tax management practices of firms before and after COVID-19. However, for robustness, we also conduct our empirical analysis without dropping firms that belong to countries with less than 15 firm-year observations. Our results and coefficients presented in Table 1.3 are largely consistent with our baseline regression even after including those observations

which we removed from our original analysis (Tables A1-A3).

Appendix B

See Table B1.

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