

Are Financial Derivatives Related to Intra-Entities' Tax Aggressiveness?

UK Evidence

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Abstract

This study investigates the effect of hedged versus non-hedged financial derivative instruments on the intra-entities' tax aggressiveness. Our findings provide evidence that multinational enterprises manage derivatives instruments to avoid their tax expenses aggressively. Specifically, non-hedged derivatives are an excellent determinant of the tax aggressiveness practices of corporate groups. Besides, this study speaks to the central role of governance quality in mitigating this aspect of tax aggressiveness and provides practical guidance to tax authorities and regulators for establishing new policies for governing financial derivative instruments and preventing tax aggressiveness from negatively affecting firms and society.

Keywords: Financial derivative instruments, Transfer pricing aggressiveness, Governance

JEL classification: G23, G32, K34

1. Introduction

Over the last two decades, many fields of research have highlighted the dramatic growth and the acceleration in derivatives management (Graham and Rogers, 2002; Aretz and Bartram, 2010; Taylor et al., 2015; Zeng, 2014; Scholes et al., 2015) related to several reasons, including hedging risks, reducing costs related to financial constrained situations, and decreasing the volatility of pre-tax income and thus reducing tax expenses. However, only a limited part of accounting and finance literature has investigated the association between derivatives instruments and tax avoidance practices based on a sample of individual firms (Ben Khediri, 2010; Afza and Alam, 2011; Donohoe et al., 2012; Donohoe, 2015a&b; Geyer-Kingeborg et al., 2019; Chen, 2021). These studies provide evidence that companies use financial derivative instruments (FDIs) as a device to avoid tax expenses and by replicating some complex economic positions allowing them to create an appealing way to aggressively avoid taxes. In our context, we define FDIs as a sort of contract that derives from a classical form of financial instruments, like currencies, bonds, or stocks, that are evaluated in terms of the performance of their underlying assets or equity (Stulz, 2014).

Financial derivatives business is deliberated as a necessity for most multinational enterprises (MNEs) globally due to the ongoing need for business growth and the extension of exchanges inside-out of corporate groups (Donohoe, 2015a, 2015b). Additionally, derivatives prevent potential business risk and cover and ensure the regularization of transactions intra-jurisdictions or transactions realized in different currencies (Geyer-Kingeborg et al., 2019). However, empirical studies on derivatives from a tax perspective are rare (Bachiller et al., 2020). Thus, by investigating firms' tax aggressiveness behaviors regarding their use of FDIs, our study comes in response to the gap in the literature about tax aggressiveness behavior of corporate groups through FDIs management and the role of governance monitoring regarding this relationship. Our results will promote a clearer road map for regulators, tax authorities, and investors in general.

The majority of tax authorities worldwide suffer from the lack of tax provisions or specific tax rules to govern the different transactions of FDIs. In this, Tang et al., (2017) note that tax authorities have the power to monitor corporate tax avoidance practices in line with the principle that "the essence is more important than the form." Additionally, tax supervision of tax authorities means that firms have endured tax audits of their tax avoidance practices (Cheong et al., 2020; Ye

and Liu, 2011), simply put classic tax avoidance practices have risen to the notice of tax authorities (Chen, 2021). However, the use of derivatives in tax aggressiveness schemes seems to be an effective, safer, obscured, and effectively substitutional solution for tax evaders due to their complexity, their lack of identification, and the difficulty of tax authorities in identifying them. Therefore, Chen (2021) argues that derivatives are unique in accounting standards and tax regulation, operationally flexible, and complexly structured by nature.

To extract tax savings, some MNEs adopt non-compliant tax strategies. From tax experts' perspective, derivatives are considered a mechanism for tax avoidance and might be reorganized to give firms the possibility to take advantage of their tax-related provisions. In this vein, Ernst & Young (2014) has noted that not one tax authority survey during the last two years reported reduced resources and/or an agreement that worldwide taxation departments are focusing on increasing their resources for combatting aggressive transfer pricing and income shifting strategies, which practically led to promote tax revision cases. Besides, the ongoing scrutiny by tax authorities has led to a growing number of tax court cases regarding transfer pricing aggressive behaviors, carried out by MNEs (i.e., Amazon, and Google, to name a few). The results show the significant tax savings collected by MNEs, in instars of savings from tax rate differences by the incorporation of business over much different tax jurisdictions and the non-arm's-length of transaction intra-entities (Levin, 2012).

Another major factor contributing to this non-tax-compliant scenario, related to the financial crises and debt-financing difficulties, emerges from the intra-entities financing tools throughout derivative instruments management. In this context, Hanlon and Heitzman (2010) accentuate the importance of foreign financial strategic affiliates, in instars of thin capitalization practices set up for financing facilities of MNEs affiliates, and some tax aggressiveness practices of MNEs, such as treasuries incorporation in tax havens, are likely implemented for increasing their flow of capital among their affiliates and by making managers more complying (Gravelle, 2009).

From 24% to 34% have been considered the overseas subsidiaries under U.S. companies' control, with zero tax liabilities during the 1998–2005 period, where the great part is explained by the abusive transfer pricing practices that MNEs are in use (GAO, 2011). Thus, to face those practices, MNEs and tax regulators should cooperate in terms of compliance with the arm's length

principle, and it has provided some promoted measures funded by recent and actual regulations in developed nations (OECD, 2015). This has been translated into a global initiative from the OECD by the promulgation of the entitled BEPS' actions plan in October 2015. This project deals with the ongoing transfer pricing aggressiveness and ensures rules of transfer pricing.

As a response to this initiative, Chancellor George Osborne, upon delivering his 2016 budget, announced the start of the action plan in 2017 in the United Kingdom. This plan was estimated to collect approximately £1.3 billion each year. From an academic perspective, conducted principally in the U.S. and Australian contexts (Taylor et al., 2015; Donohoe, 2015a&b), and as well as government publications reported by international tax authorities (GAO, 2011; HMRC, 2016; HASGA, 2012; OECD, 2015), have wondered whether derivative instruments and tax aggressiveness are related. However, none of the prior studies have closely studied the association between the FDI's different categories and the intra-entities' tax aggressiveness and how governance mitigates these relationships.

Our study takes into account the centralization of the prior literature that has been developed under the transfer pricing umbrella and considers a sample from corporate groups listed on the London stock exchange (FTSE 350) during the 2000–2017 period. Therefore, our study allows investors, researchers, and tax regulators to take a broader perspective on tax aggressiveness in the UK context. Our main findings are consistent with the outcomes in Chen (2021), suggesting that firms utilize FDI to reduce their tax dues.

We provide an alternative, appropriate, unique, and effective proxy measure of corporate groups' tax aggressiveness practices, specifically developed for intra-entities' transactions. First, it promotes research on the tax aggressiveness strategies of corporate groups, an area not significantly considered by prior studies. Second, MNEs, the high investment level of corporate groups makes us wonder about whether their FDIs can amplify and facilitate the tax aggressiveness schemes, which would be our second contribution. Third, the distinction between the effect of hedged and non-hedged derivatives on tax aggressiveness of corporate U.K. groups adds more insights to tax literature and financialization. Last, but not least, we advance new evidence on governance's moderating effect on the use of derivatives for tax aggressiveness aims.

Our study analyzes how FDIs (non-hedging and hedging derivatives (assets and liabilities)) influence transfer pricing aggressiveness and evaluates the attitude of intra-entities on

those factors. Our sample comes from publicly listed corporate groups (FTSE 350) in the United Kingdom; these groups can enter favorable market conditions agreements that allow the decrease of tax charges.

FDIs' use in the aim of tax gains is related to the advantage-cost equilibrium principle by which firms usually make investment decisions about their gains from invested costs; in other words, their decision is always related to the firm's tax circumstances. Derivatives use provides a theoretical and analytic framework by which to explore how firms exploit the favorable tax treatment of derivatives as tax-timing options. We uncover a prominent result suggesting that FDIs utilization for tax aggressiveness amplifies the extent of intra-entities' tax aggressiveness and speculation (via non-hedging derivatives). Governance monitoring effectiveness plays an important role in how derivatives are exploited by aggressive behaviors of MNEs.

Our main structure of this study considers the exploration of prior and recent tax aggressiveness, and derivatives literature in the second section, our third section develops our hypothesis; then the fourth section provides the empirical method; and the fifth section provides outcomes of the regression models, as well as the robustness tests and findings and provides additional analysis. Section 6 concludes.

2. Literature review

Contract theory posits that economic agents' transactions suffer from incompleteness and the lack of specified information in terms of potential issues and scenarios that may seem probable (Grossman and Hart, 1986).

Because of the uncertainty surrounding some transactions, firms may suffer from additional implementation costs when clarity and transparency are required in contracts. In line with this view, different contractors may behave opportunistically (Hart and Moore, 1990). Related parties are always prepared to increase their interest to the detriment of others, and this may create another problem regarding agency and transactional costs.

Therefore, tax regulators have been considering tax legislation with specific tax provisions for the aforementioned transactional costs. In other words, tax legislators will only consider the general circumstances of such a contract's scenario in which opportunistic behavior takes place between contractors (Sari et al., 2020). In such a situation, corporate tax aggressiveness would be the best option for the majority of opportunistic parties. In this, Donohoe (2015a, 2015b) provides

evidence that financial derivative instruments may be the best generator for tax aggressiveness strategies because they are subject to complex tax rules and may allow managers to smooth earnings (or even deduct interest).

UK tax regulators implemented that, “financial assets, liabilities, and investment real estate computed by the fair value, the changes in the fair value during the holding period shall not be included in the taxable income amount,” according to the accounting standards for corporations. In that regard, any margin of profit or gain resulting from holding the underlying derivatives (the difference between the history costs and the disposal price) should be incorporated in the earnings before tax within the holding period (the of disposal or settlement). Therefore, for the settlement link only, derivatives are taken into account in taxable income. By contrast, outcomes accounted for and unsettled within holding the FDI are untaxable, a fact that can create a real potentiality for tax aggressiveness activities.

On the other hand, the BEPS action plan report published by the OECD (2015) has inspired many tax authorities to deal with transfer pricing issues, specifically tax aggressiveness practices. In particular, the United Kingdom has established many changes to its tax regulations to intentionally address those sophisticated and myopic derivatives¹ tax aggressiveness practices and to preserve the right part of taxes that corporations are compliant to pay over derivatives use. International regulators and tax authorities have prioritized the transfer pricing issue and the risks that can result from it, which has been amplified due to the strengthening of worldwide tax regulation and the provision of significantly weighted sanctions for non-compliance (Borkowski and Gaffney, 2014).

As a response to the ongoing development of tax regulations about transfer pricing, MNEs have established new, innovative risk managing approaches such as “Enterprise Risk management” (ERM), that contributed to the detection of particular risks related to industries, as well as given the ability to manage and reduce, those risks. However, nowadays, many studies have been providing insights about risk-taken management schemes, suggesting that hedge practices are relevant practices for managing short-term risks. External funds costs of financing (borrowed) provide a respectful strategy to hedge cross-border transaction volatility (Froot et al., 1993). They

¹See the online changes to part 7 of the 2007 Corporation Tax Act, specifically “Derivatives Contracts,” over the period of the study (available at <https://www.legislation.gov.uk/ukpga/2009/4/part/7/2009-04-01>).

also state that the external resources of financialization are more used than locally or internal funds and hedging practices can be considered as extreme value creation and added benefit for MNEs, precisely if hedging matches fund outflow.

A new branch of tax aggressiveness strategies has been created by the use of financial derivatives, which can offer favorable tax treatments and benefits. Therefore, MNEs frequently use FDIs for aggressive tax schemes and financial constraints (Donohoe, 2015a&b; Mayers and Smith, 1982), among other purposes. One important item in considering the use of derivatives is practices related to their complex accounting standardization (FASB, 2008), in which derivatives should be proxied at their fair value and indexed in the balance sheet if they are held for trade aims, whereas gains or losses are indexed in the comprehensive statement of income. Financial instruments identified as hedging should be considered at their fair value and indexed in the financial statement and their resulted gains or losses must be identified as “other comprehensive income” their realization.

Two axes are generally issued from tax rules: (1) the nature of the result recognized from the realized transaction (gain, loss, interest, dividend) and (2) the periodicity of recognizing them and their incomes (loss or gain) for the entity.

From a general perspective, derivatives are treated as independent transactions within the ordinary operational business cycle. However, derivatives are characterized by business income if the firm considers the derivatives to be a part of the operating business or to be income from speculation activities (i.e., financial institutions). Otherwise, derivatives issued from other transactions, such as speculation, are related to the underlying asset, including foreign exchanges, and are considered to be exchange income regarding the exchange nature. Also, capital earnings can be acquired from some FDIs if they have been used for hedging the price changes linked to related FDIs. Thus, FDIs income recognition time is tied to their nature and related generally to the transaction’s recognition, and the realization of FDIs earnings is based on maturity, disposition, exchanging, or the unrecognition of the FDI (Edgar, 2000).

The tax treatments imposed on derivatives differ from the accounting treatment principles that apply to derivatives. In line with the accounting policies, when an entity uses derivatives for hedging on its offshore transactions all their related earnings (loss or gain) recognized or not are identified in the same status of their underlying hedged. Only for taxation aims, deferring earnings

from year to year, which is the postponement of taxes, of interest, or for a firm that could favorably use or exploit the advantages of the tax-timing option (Tennant, 2005).

3. Hypothesis development

In our study, we try to accentuate how financial derivatives amplify and facilitate transfer pricing aggressiveness. During this decade, financial derivative instruments have occupied center stage as one of the major practices deployed by MNEs. At the core of our study, one major advantage that amplifies the use of derivatives is the aim of tax aggressiveness practice (JCT, 2011). In this context, Lisowsky et al., (2013) point out that tax avoidance represents a continuum and firms land somewhere on the continuum when they do or don't adopt planned tax strategies and complex schemes to avoid paying their just part of tax liabilities.

Corporate groups' tax aggressiveness could be considered as the result of hedging strategies (the *by-product Approach*). Besides, ambiguity is at forefront of myopic tax aggressiveness schemes (the *tax law literature Approach*). So, hedge fundamentals are called up for hedging risks, which decrease tax income volatility, therefore allowing MNEs to decrease their tax charges (Smith and Stulz, 1985). However, the major character that incurs FDI is their ambiguous tax provision which allows firms to provide myopic schemes.

Thus, the complexity of the tax treatment and the ambiguity arising from the use of derivatives in many MNE transactions is a synonym for their valuable usage in corporate groups' tax aggressiveness (Donohoe, 2015a). In line with this, the ERM perspective of the MNE neither promoted value regarding the market perfection nor give MNEs opportunities for new financing (Modigliani and Miller, 1958). Aretz and Bartram (2010) provide contemporary evidence on market imperfections, such as the fact that the tax history of the firm drives MNE to reallocate their resources and reduce the taxable risks. For that, the derivative instrument is devoted to monitoring those risks for its aptitude of reducing the risk exposure of the firm.

MNEs implement hedging strategies enabling them to reduce or even diminish the volatility of the taxable income-related risk. Offshore financing is more important for MNEs compared to the cost of internal financing, a finding leading to the prediction that hedging solutions are effective in resolving these issues for their allowance to increase the value of holden funds and result in decreasing the possibility for MNEs in affiliating to capital markets around the world. Some firms utilize financial derivatives as a sort of strategic tax arbitrage investment to gain an advantageous

tax position or even to take part in tax avoidance practices (Chen, 2021). Some firms can control and monitor their taxable income, despite differing taxation, with the use of financial derivative instruments (Zeng, 2014; Donohoe, 2015a&b; Wang, 2016). This is especially the case for corporate groups that have cross-border affiliates, and the different contracted parties are based inside the corporate group (for the financing and financed parties) (Desai, 2003). Also, financialization through debt between corporate group members gives one party tax exemptions and the ability to deduct interest from the other related party, but both parties will be exempt from taxes if one of them is incorporated in a low-tax jurisdiction.

Remarkably, the uncertainty of financial derivatives enables corporate groups to gain advantageous tax treatment and arbitrage contrary to economic transactions with external parties. Corporate groups could extract, by interplaying between the different categories or types of FDIs and this could be a form of debt financing, a debt interest deduction, or even with the form of equity financing. Additionally, derivatives could be used in monitoring the timing of the income realization (Edgar, 2000). An incorporated enterprise in a tax haven jurisdiction might have a low or no tax rate (Geyer-Klingeberg et al., 2019). However, controlling earning realization could be helpful for firms practicing tax aggressiveness practices, even in the case in which the holding income of a firm's assets is generated by an underlying that is untaxable (free from tax).

MNEs could structure a complex portfolio of hedged FDIs incorporating margins of profit and loss, regardless of the operating generation of incomes and losses. However, firms also have the possibility of selling the underlying part of derivatives, which may consequently probably result in a taxable income decrease due to realized losses, and this is among the recognition of the credit (expenditure underlying) side existence. Then the firm retains the profit from the financial assets, so it is not subject to tax. Lastly, after settling its tax expenses, the firm can repurchase the credit that has been retained.

Such a scheme will put the firm into a short-term price change risk situation and give it the latitude to differ its tax liabilities (Chen, 2021). In off-shore or cross-border transactions, related firms or derivative contractors could extract gains regarding the differentiation of the derivatives earnings from period to period and depending on the type of transaction. However, decrypting the taxation amount one would need to pay in each country seems very complicated to do (Bartram, 2019).

Which import is to determine the source of the realized income with the use of derivatives, the international taxation authorities would find it difficult to figure out the effective taxpayers and/or the real source of the taxable income. Therefore, if tax authorities cannot assess the residency of contractors, both parties can't be concerned about a withholding tax. By this means, tax aggressiveness could address the use of derivatives to attain its purposes. At this point, we can consider that FDIs are a significant determinant of risk management strategies that makes any change in the derivative portfolios of the firm. Many types of research have considered the issue of tax avoidance and derivatives during the last decades, but none has proclaimed the effect of derivatives' different categories on the corporate groups' tax aggressiveness, and how governance can monitor these relationships.

From the above description, the main paper estimates the significance of exposure of MNEs market values of derivative instruments and how this exposure can influence the tax aggressiveness' level of MNEs. In line with this, the exposure of FDIs proxied in two different ways. To identify this exposure, we extract the derivatives' fair value and their percentage of total assets from the consolidated annual reports of MNEs, which subsequently serve their intra-entity financialization process. Firms exposed to risk have a higher fair value of derivatives, which may affect their tax aggressiveness level.

H1.a. Holding other things constant, financial derivative instruments (total assets & liabilities of hedged and non-hedged derivatives) are positively associated with intra-entities' tax aggressiveness.

H1.b. Holding other things constant, governance quality mitigates the positive association between financial derivative instruments (total assets & liabilities of hedged and non-hedged derivatives) and intra-entities' tax aggressiveness.

H2.a. Holding other things constant, hedge fundamental derivatives (assets & liabilities) are negatively associated with intra-entities' tax aggressiveness.

H2.b. Holding other things constant, governance quality moderates the negative relationship between hedge fundamental derivatives (assets & liabilities) and intra-entities' tax aggressiveness.

H3.a. Holding other things constant, non-hedged derivatives (assets & liabilities) are positively associated with intra-entities' tax aggressiveness.

H3.b. Holding other things constant, governance quality influences the positive association between non-hedged derivatives (assets & liabilities) and intra-entities' tax aggressiveness

4. Research design

4.1 Data collection and sample design

The present study concentrates on the top first 100 capitalized firms from the FTSE 350. We target these firms for the fact that they are the most likely to incur derivatives contracts, and potential for aggressive tax strategies, and they are the most common practitioner dealer of derivatives for their cross-border businesses. The final sample is economically significant and representative of the portfolio value of the UK market stock capitalization and covers 47 firms during the 2000–2017 period (846 firm-year observations) in total and this is regarding the IFRS application in annual reports of firms during 2000-2017 period.

We exclude financial, insurance, and utility firms for their probable nature of using derivatives for trading purposes or they might be derivatives dealers and their divergence in tax and accounting reporting standards from other industry sectors. Data have been collected by a documentation analysis throughout hand-collect of information referring to derivatives and their related footnotes disclosed in each consolidated annual report; thus, we have used the keywords search method to extract a firm with a derivative position and for data-collection timing considerations.² Data has been collected from Compustat and Datastream databases and Thomson Reuters' 10-K, Exhibit 21, and 13-F filings. Although, the sample period spans from 2000 to 2017 regarding the fiscal year and the application of IFRS accounting standards for our need of collecting data referring to our intra-entities' tax aggressiveness. Financial data have been obtained from the Compustat databases from Thomson Reuters. Table 1 collects the different criteria that assisted us in fixing our final sample.

“Insert Table 1 here”

4.2 Dependent variable *TPA*

The dependent variable is presented by the intra-entities' tax aggressiveness index following the TPA index developed by Taylor et al., (2015). This TPA index comprises six

² Keywords include “derivatives,” “derivative instruments,” “financial instruments,” “hedges,” “hedging,” “risk management,” “fair value measurement,” “market risk,” “cash flow,” “forwards,” “futures,” “swaps,” and “options.”

dichotomous items (see below). Higher scores of TPA attained represent a higher level of intra-entities' strategies implemented by the corporate group. Thus, the components of the TPA index are determined regarding some criteria involving internal transactions and exchanges between the corporate group's affiliates that are not in respect to the arm's length principle. The most important reason to use this index is that classic proxy measures of tax aggressiveness are subject to many limitations and are not effective in the context of corporate groups because of the consolidation method that implies the elimination of internal transactions between related parties. Therefore, the financial proxies of tax avoidance neither would be effective nor would 100% signal tax avoidance issues.

Based on the Taylor et al. (2015) study, we examine five types of transactions involving non-commercial-related parties' behavior in the firm's annual filing reports, to which we add one more item that considers the weight of transaction between related parties. These types of arrangements are provided in the following:

1. The existence of interest-free loan accorded intra affiliates of the same corporate group;
2. The existence of debt forgiveness intra affiliates of the same corporate group;
3. The existence of impaired loans and/or debts intra affiliates of the same corporate group;
4. The exchange of assets intra affiliates of the same corporate group with any economic motives;
5. Losses carried forward or exchanged among the corporate group's entities without economic justification; and
6. Intra-entities' transaction weight.

The OECD refers to the six components of our index as identifiers of tax aggressive behavior in MNEs (Taylor et al., 2015). The transfer pricing aggressiveness items will be scored as one in case the firm discloses their engagement that identifies the component and zero otherwise. So, the TPA index is computed by the sum-score method regarding these items and would be ranged from zero to 1 for each firm.

4.3 Independent variables

Our explanatory variables are defined through FDIs proxy measures, which are considered by the fair value (FV) of each type of financial derivatives instrument (assets and liabilities of hedged and non-hedged derivatives) disclosed in the firm's annual report, specifically in the financial statements and notes related. In our study, we explore whether there is any effect produced by financial instruments' utilization and intra-entities' tax aggressiveness, which is an original perspective in tax research.

4.4 Control variables

In terms of control, we have chosen some of the control variables, regarding Donohoe (2015a&b), that monitor for firm's risk dynamic of cash flows and the probable the volatility of taxable income (*CV*); also, we use firm profitability (*ROA*), the size of the firm (*Size*), the level of the firm's long term debt (*Lev*), governance quality (*Gov*), the ratio of firm's market value to its book value (*MTB*), capital intensity (*Capint*), Cash holding level (*Cash-hold*), the level of sales (*Sales*), the firm age (*Ln-Age*), the level of discretionary accruals (*Disc-acc*), and crises (*Crisis*) as tax aggressiveness motivations. To the same extent, we add the industry (*Inds*) and year (*Year*) regarding their potential influence on the intra-entities' tax incentives and the fact that certain industry sectors actively offer greater opportunities for MNEs to engage in tax aggressiveness activities (Oyelere and Emmanuel, 1998).

It is worth noting that country-level formal and informal institutions can be very relevant to the effect of the use of financial derivatives. Yoo and Lee (2019) examine the association between tax aggressive practices of MNEs and the national culture in a cross-countries study. They find evidence that MNEs in countries with low uncertainty, low individualism, high masculinity, and low power distance are more tax aggressive. In addition, cultural features of the parent company of corporate groups have generally a high impact on the corporate groups' level of tax avoidance. Richardson (2008) and Bame-Aldred (2013) provide evidence that MNEs in civil law countries are less likely encouraged to practice tax aggressiveness rather than MNEs in common law countries and this is because civil law legal systems are more considering written statutes and other legal codes. Ma et al., (2020) examine the relationship between a country's democracy level and tax avoidance. They find that political freedom is negatively related to tax aggressive practices, as public scrutiny promotes transparency of financial statement. The authors also provide evidence

that shareholders' protection, which is pronounced mostly in common law countries, mitigates the negative association between political freedom and tax aggressiveness. Given that our study is a single country one (all are firms are based in the UK) we did not include such control variables in our model.

4.5 Regression models

To verify the influence of derivatives' use (*total financial derivative instruments, hedged derivatives, and non-hedged derivatives*) on intra-entities' tax aggressiveness (*TPA*) behavior, the main study considers a *fixed regression model* regarding the outcomes of the *Hausman* test. Also, in an extended regression model, we test the impact of the mitigator effect of governance quality on financial derivative instruments to determine whether governance monitoring could significantly adjust or modify the effect of derivatives on intra-entities' tax aggressiveness of corporate UK groups.

In this, our baseline regression model is stated as follows:

$$TPA_{i,t} = \beta_0 + \beta_1 FVDA_{i,t} + \beta_2 FVDL_{i,t} + \beta_3 FVDHA_{i,t} + \beta_4 FVDHL_{i,t} + \beta_5 FVDNHA_{i,t} + \beta_6 FVDNHL_{i,t} + \beta_{7-19} Controls + \beta_{20} INDS_{i,t} + \beta_{21} YEAR_{i,t} + \varepsilon_{i,t} \quad (1)$$

In this model, the $TPA_{i,t}$ represents the dependent variable associated with the observable sum of intra-entities' trade items. Additionally, we stand for each MNEs (from 1 to 47) and the period between 2000-2017 inclusively, besides, the ε represents the error term. For more clarity, Table 2 in the appendix defines the variables and summarizes the measurement.³

“Insert Table 2 here”

We aim to investigate the relation between the different categories of derivatives and intra-entities' tax aggressiveness. For that, we consider two categories of financial derivatives: hedged and non-hedged. First, we are motivated to investigate the relation between total FDIs and Hedged FDIs (assets & liabilities), respectively, and the TPA's level of the intra-entities' aggressiveness strategies. We initially seek to examine the association between the total FDIs (assets & liabilities) and hedged FDIs (assets & liabilities) with intra-entities' tax aggressiveness.

³ The appendix defines the variables used in the study.

$$TPA_{i,t} = \beta_0 + \beta_1 FVDA_{i,t} + \beta_2 FVDL_{i,t} + \beta_3 FVHDA_{i,t} + \beta_4 FVHDL_{i,t} + \beta_{5-17} Controls + \beta_{18} INDS_{i,t} + \beta_{19} YEAR_{i,t} + \varepsilon_{i,t} \quad (2)$$

The coefficient for *FVDA* (*FVDL*) corresponds to the overall impact of derivatives assets (liabilities) on intra-entities' tax aggressiveness. Thus, we first predict that *FVDA* and *FVDL* are positively associated with intra-entities' tax aggressiveness because transactions should increase as the use of derivatives increases. In contrast, we predict that, if the firm is using hedging derivatives that would be to secure its business and for risk management purposes, intra-entities' tax aggressiveness practices would decrease.

In a second test, we believe it would be effective to test whether the governance mechanisms have any moderating effect with derivatives utilization on intra-entities' tax aggressiveness. So, we include an interaction term of governance and derivatives (assets & liabilities) on TPA, through the next model:

$$TPA_{i,t} = \beta_0 + \beta_1 FVDA_{i,t} + \beta_2 FVDL_{i,t} + \beta_3 FVHDA_{i,t} + \beta_4 FVHDL_{i,t} + \beta_5 FVDA * GOV_{i,t} + \beta_6 FVDL * GOV_{i,t} + \beta_7 FVHDA * GOV_{i,t} + \beta_8 FVHDL * GOV_{i,t} + \beta_{9-21} Controls + \beta_{22} INDS_{i,t} + \beta_{23} YEAR_{i,t} + \varepsilon_{i,t} \quad (3)$$

where *FVDA*GOV* (*FVDL*GOV*) and *FVHDA*GOV* (*FVHDL*GOV*) are interaction terms. The coefficients for *FVDA* (*FVDL*) and *FVHDA* (*FVHDL*) represent, respectively, the effect of total derivative assets (liabilities) and hedged derivatives assets (liabilities) on tax aggressiveness of intra-entities' transactions.

In a third step, we consider the relation between non-hedged FDIs (assets & liabilities) and intra-entities' aggressiveness TPA (H3.a). So, we test those effects separately from total and hedging derivatives for the existence of a higher correlation between the fair value of total derivatives and that of non-hedging derivatives. Thus, we estimate the regression model:

$$TPA_{i,t} = \beta_0 + \beta_1 FVNHDA_{i,t} + \beta_2 FVNHDL_{i,t} + \beta_{3-15} Controls + \beta_{16} INDS_{i,t} + \beta_{17} YEAR_{i,t} + \varepsilon_{i,t} \quad (4)$$

It is important to note that we have regressed hedging and non-hedging instruments separately to mitigate concerns related to the potential times-series correlation in errors that may arise in between.

This model translates our third hypothesis considering the incremental effect between non-hedging derivatives and intra-entities' tax aggressiveness. Practically speaking, a non-hedging instrument is utilized for the extreme forms of tax aggressive practices in the tax avoidance

spectrum. Thus, we predict a positive relation between non-hedged FDIs and TPA because we believe that corporate groups are motivated to use more non-hedging derivatives if they intend to realize intra-entities' aggressive practices or transfer pricing measures. Next, we include the interaction term between *GOV* and derivative measures governance mechanisms aspects of transfer pricing aggressiveness (H3.b) and reductions in aggressive tax practices that use derivatives.

$$TPA_{i,t} = \beta_0 + \beta_1 FVNHDA_{i,t} + \beta_2 FVNHDL_{i,t} + \beta_3 FVNHDA * GOV_{i,t} + \beta_4 FVNHDL * GOV_{i,t} + \beta_{5-17} Controls + \beta_{18} INDS_{i,t} + \beta_{19} YEAR_{i,t} + \varepsilon_{i,t} \quad (5)$$

5. Empirical Results

5.1 Descriptive statistics

Table 3 reports the summarizing of descriptive statistics. The table reports the mean in terms of dollars (% to Assets total) of derivatives assets is \$41.637 million (0.975%) of total assets. The mean in terms of dollars (% of total assets) of the fair value (FV) of total derivatives liabilities is \$72.411 million (1.27%) of total assets. The mean of the fair value of hedging derivatives assets is \$27.341 million (0.666%) of total assets, and the mean of the hedging derivatives liabilities is \$21.638 million (0.776% of total assets). For non-hedging derivatives assets, the mean (% of total assets) is about \$14.866 million (0.319% of total assets) and for non-hedging derivatives liabilities is around \$52 million (0.5% of total assets), and this is to say that our sample firm on average deploys more investments in derivatives liabilities rather than in derivatives assets, specifically for non-hedged derivatives. Thus, FV amounts of hedged derivatives (assets & liabilities) are relatively similar. The mean of the natural logarithm of total derivatives assets, total derivatives liabilities, hedging assets, hedging liabilities, non-hedged assets, and non-hedged liabilities are 3.152, 3.303, 2.758, 2.745, 1.964, and 1.906, respectively, which signals the importance dedicated for derivatives uses for these firms.

“Insert Table 3 here”

5.2 Correlation results

Tables 4 and 5 in the appendix exhibit the results of the Pearson correlation matrix for the correlation coefficients and the VIF method, respectively, which confirm the presence of significant correlations between TPA and the majority of independent and control variables at the

5% level of significance. However, none of the results signals any higher level of correlation and/or multicollinearity that could restrict the use of any of our model's variables. The outcomes of the VIF method confirm the non-existence of any multicollinearity among the different variables of our regression model. To deal with the potential presence of autocorrelation between the financial derivatives categories, we have subdivided our principal model into two parts: the first part considers the total and hedged (assets & liabilities) effect on intra-entities' tax aggressiveness, and the second model emphasizes the only effect of non-hedged (assets & liabilities) derivatives on the corporate group's tax aggressiveness.

“Insert Tables 4 & 5 here”

5.3 Findings

Table 6 reports the outcomes of our overall regression. Coefficients indicate that MNEs are subject to more aggressive tax practices through the use of derivatives. Particularly, MNEs' use of derivatives is more pronounced in trade among intra-entities of corporate groups. Therefore, in using the percentages of the fair value of total, hedged, and non-hedged derivatives “FD” (asset and liabilities) to total lagged assets, we confirm our expectations.

“Insert Table 6 here”

Also, Table 6 in the appendix shows the existence of a significant positive relationship between each of FDI's total assets and liabilities and the intra-entities' tax aggressiveness, and, in contrast to hedging derivatives, there is a negative association between them and the TPA. Particularly, the coefficients for $FVDA/TA_{t-1}$ and $FVDL/TA_{t-1}$ in our regression are 10.44 and 2.771, respectively, both of which are significantly positive at the 1% level. These outcomes corroborate the ongoing literature arguing that firms use derivatives to lower their cash taxes paid through the unrealized gains from the derivatives themselves rather than classically managing total tax expenses in the income statement (see Donohoe, 2015a; Chen, 2021).

Our findings confirm the presence of a significant negative relation between hedged FDI's assets (coeff. = -10.57) & liabilities (coeff. = -5.514), which is a present-day practice since firms are utilizing hedging derivatives for principally hedging from risk management and the high volatilities of products and debts in markets. By those means, we understand that MNEs are using derivatives in general to cover their intra-entities' tax aggressiveness and to amplify their level of tax savings because derivatives use lowers the volatility of a firm's taxable income. Consequently,

if a firm has a strategic reason to amplify its intra-entities' tax aggressiveness and its transfer pricing practices, one could reasonably expect to find that the firm will increase its use of derivatives to cover and facilitate those means, especially with the fact that derivatives can offer both benefits of risk management of cross-border transactions intra-entities of the group and the reduction and stabilization of the taxable income volatility.

The main findings are consistent with those of Chen (2021) and Donohoe (2015a), suggesting that firms are utilizing FDI to reduce their tax burden, and add the specific effect of hedged and non-hedged derivatives on intra-entities' tax aggressiveness, besides the mitigator influence of good governance monitoring on the aforementioned association. Thus, firms will be willing to untraded low volatility for tax savings issues. Consequently, they do not need to use non-hedging derivatives to smooth income volatility. Non-hedging derivatives are utilized for their flexibility in other purposes (such as speculation). Consequently, firms may be more willing to accelerate or harvest losses from non-hedging derivatives to increase tax savings. As a result, MNEs would be ready to engage in a sort of acceleration or harvest losses resulting from non-hedging derivatives. Therefore, by accelerating the losses emerging from non-hedging derivatives use, firms are principally looking to amplify their tax aggressiveness level, since hedging liabilities are negatively associated with the tax aggressiveness of intra-entities' exchanges.

Tables 6 and 7 in the appendix present the findings of our predicted hypothesis and exhibit the outcomes of the examination of whether hedging and non-hedging derivatives are associated with intra-entities' tax aggressiveness, *TPA*, in addition to the moderator effect of governance monitoring among the aforementioned associations. We examine whether hedged and non-hedged FDIs are related to *TPA*. Our results provide a significant (positive) negative relation between hedged FDIs derivative (non-hedging) assets and liabilities and *TPA*. As expected, our findings confirm the significance of the positive relationship between intra-entities' tax aggressive strategies and non-hedging derivatives assets. Liabilities imply that MNEs treat derivatives in exchanges between the group's members and that would generate differentiation of gains and losses issued from non-hedging derivatives. The use of non-hedging derivatives is exploited for speculation purposes and can be favorable for their "wait and see" strategy, which is an advantageous tax treatment for MNEs and gives them the latitude to defer their recognition of gains and recognizes of losses until termination. The ambiguity surrounding derivatives allows firms to behave aggressively in terms of their tax strategy, in particular, by amplifying intra-entities' tax

aggressiveness. Interestingly, non-hedged FDIs' (assets & liabilities) are related positively and significantly to TPA.

Specifically, *FVNHDA* (*FVNHDL*) is significant and positive at the 1% level. Furthermore, outcomes confirm that firms accelerate losses from non-hedging derivatives by engaging in complex transactions intended to aggressively reduce cash taxes paid or differ them. However, governance quality seems to mitigate the effect of the different components of derivatives to the right signs. Corporate governance monitoring plays a mitigating role in adjusting the positive association of total and non-hedged derivatives and intra-entities' tax aggressiveness for the fact that the use of derivatives in tax aggressiveness purposes may incur an important reversal of negative and risky effects, otherwise, governance monitoring confirms the negative relationship between tax aggressiveness and hedging derivatives, which affirms our predictions.

5.4 Additional analysis

“Insert Table 7 here”

The findings in Table 6 are confirmed by the results in Table 7, where we examine the baseline regression using the fair value of each derivative component as the independent variable. Tables 7, 8, 9, 10, and 11 confirm our findings regarding the association between financial derivative instruments and intra-entities' tax aggressiveness, as well as the moderating effect of governance. By using alternative proxy measures of financial derivatives, including the fair value of total, hedged, and non-hedged derivatives (asset and liabilities), we confirm our expectations.

Our findings argue that tax aggressive schemes, based on FDIs management, are largely pronounced for earnings on FDIs assets rather than liabilities, which confirms that firms are encouraged most likely for the tax incentives measures to activate their tax aggressiveness practices (i.e., taxation based on a “wait-and-see” approach). Besides, the findings affirm that firms deploy non-hedged FDIs for tax aggressive purposes.

While the outcomes show that hedged FDIs-related-losses are non-significantly associated with tax aggressiveness, non-hedged FDIs losses are significantly related to transfer pricing aggressiveness. This finding suggests that firms exploit the ambiguity in non-hedging derivatives to aggressively avoid taxes; that is, firms are not benignly avoiding taxation. Our findings persist for additional analysis as well as for significant transfer pricing aggressiveness determinants.

Our baseline regression and additional robustness checks confirm that earnings (gains or losses) that emerged from hedged-FDIs management are reversibly related to the intra-entities' tax aggressiveness because they can be considered a substitute for the tax aggressiveness of intra-entities' exchanges. Meanwhile, non-hedged FDIs are significantly and positively related to the intra-entities' tax aggressiveness, a finding that highlights that MNEs utilize non-hedging derivatives as tools to facilitate their tax aggressiveness. Thus, this finding suggests that firms engage in these transactions (the use of non-hedging derivatives) for their ambiguity, complexity, and favorable tax treatments, to aggressively avoid taxes. Firms are not benignly deferring taxation. Also, we signal that UK MNEs intend to utilize hedged and non-hedged FDIs management to exploit the advantageous tax treatments of both types of derivatives.

“Insert Tables 8, 9, 10, & 11 here”

6. Conclusion

Our study provides evidence in the UK context regarding the use of derivatives for favorable tax treatment purposes over the 2000–2017 period. Our findings confirm that both hedging and non-hedging derivatives are commonly used by companies as tax aggressiveness strategies (i.e., taxation based on a “wait-and-see” approach). The study's outcomes provide evidence about the tax aggressive schemes based on FDIs utilization and how governance monitoring can influence these relations. Furthermore, engaging in complex aggressive tax planning via the use of non-hedging derivatives can be moderated by promoting governance quality.

This study points out that governance monitoring, regarding total FDIs of hedged and non-hedged derivatives management, serves to moderate the intra-entities' tax aggressiveness and risk extent. In the presence of a high-quality governance monitoring system, firms are more likely encouraged to manage the tax position regardless of the management of FDIs. Additionally, our results add to the existing literature that FDIs can serve as a determinant of the intra-entities' tax aggressiveness. However, effective governance mechanisms could strictly restrict to use FDIs only in their practical function.

Our study speaks to how firms use and exploit derivatives for aggressive tax purposes between corporate group members, as a substitute for classic deferral strategies, or even to amplify their debt capacity. Then these firms can extract interest deductions through their derivatives use.

Using hand-collected data, we establish a new way to test the relationship between financial derivative instruments and the tax aggressiveness of corporate groups. Also, when we use an alternative proxy measure for derivatives, we find similar results.

This study promotes the literature on tax aggressiveness, particularly in terms of corporate group strategies, and expands the research on tax aggressiveness in the UK context. This setting seems to be perfect for investigating tax avoidance practices, including in the arenas of BREXIT, the tax legislation of derivatives, and transfer pricing. Additionally, this study considers the moderating effect of governance, which plays a role in determining how MNEs can use derivatives for tax aggressiveness purposes. It also provides evidence of the government's weak supervision. Last, but not least, our findings promote taxation and accounting literature about the relation of tax aggressive practices of MNEs and their use and management of FDIs.

Along this line, we provide practical guidance for both tax supervisors and MNEs, as well as investors, in terms of mitigating the effects of tax aggressiveness strategies related to the use of derivatives. Our aim is a contribution to the development of an effective tax system and accounting standards that could diminish the undesirable mismanagement of FDIs for tax-favorable purposes. More importantly, we clarify the paramount role that governance monitoring plays in reducing the negative effects of tax-aggressiveness-related derivative strategies. We will be motivated in the future to use these proxy measures for a more detailed exploration of corporate groups' aggressive tax behaviors related to derivatives use. Policymakers and tax authorities can apply these findings to their work on tax regulations, and academics and the public can improve their general knowledge of this issue.

Our study advances that FDIs can be managed for tax avoidance purposes by benignly avoiding tax expenses and the fact that firms are using non-hedging FDIs to aggressively avoid taxes. Thus, if policymakers or regulators are interested in scrutinizing derivative-based tax aggressiveness, they would be well-served to focus on non-hedging derivatives. Consequently, our findings could be considered in their decision-making process in regulating MNEs' aggressive behavior. Furthermore, our study roughly provides a map for tax authorities to address the most complex cases of tax aggressive strategies. For prior research, our study could be considered a response to their call on the literature gap in this research area. However, we provide a detailed examination of the FDIs used by MNEs in different ways, besides the governance moderator effect.

The intra-entities' tax aggressiveness could also be subject to many restrictions in terms of the countries' legal systems, economic changes, governance policies, and cultural specificities. However, it could be a source of some adjustments in the governance and legislative processes. In this vein, a cross-countries study by Tang (2019) showed that tax aggressiveness enhances firms' value and this might be moderated in countries characterized by a low level of control, a weak governance quality, and a high corruption level. By this means, the study advances that tax aggressiveness can be considered as a promoter of firms' value-enhancing and the value creation of tax aggressive schemes depends on the countries' policy.

Finally, our developed index of intra-entities' tax aggressiveness can serve as a dependent or independent variable in future research on accounting and taxation aspects. As with any study, the present one is concerned with some limits, regarding the restrained sample size, which is because we have only considered the publicly listed MNEs in the United Kingdom for data collection and timing limitations. Second, the method for computing the intra-entities' tax aggressiveness index could be subject to subjectivity. Third, the decision of engaging or using derivatives is based practically on unobservable factors, so other developed approaches should be considered for potential concerns (i.e., documentation of whether tax savings from FDIs management increases with intra-entities' tax aggressiveness amplify).

For instance, targeted research could explore how different tax treatments of derivatives across countries can affect the tax aggressiveness behavior of MNEs and this regarding its association with the financing choice of groups' members. The recent transfer pricing BEPS project on OECD countries can affect firms' tax compliance, governance, and monitoring, and finally, another field could arise from the relationship between tax aggressiveness of MNEs financing methods rather than derivatives, such as intra-entities' financing through hybrid mismatching arrangements, special purpose vehicles, and thin capitalization.

References

- Afza, T. & Alam, A. (2011). Corporate derivatives and foreign exchange risk management: A case study of non-financial firms of Pakistan. *Journal of Risk Finance*, 12 (5), 409-420. Doi: [10.1108/15265941111176145](https://doi.org/10.1108/15265941111176145).
- Aretz, K. & Bartram, S. (2010). Corporate hedging and shareholder value. *Journal of financial research*, 33 (4), 317-371. DOI: [10.1111/j.1475-6803.2010.01278.x](https://doi.org/10.1111/j.1475-6803.2010.01278.x).
- Bachiller, P., Boubaker, S., & Mefteh-Wali, S. (2020). Financial derivatives and firm value: what have we learned? *Finance Research Letters*, ahead-of-print. Doi: [10.1016/j.frl.2020.101573](https://doi.org/10.1016/j.frl.2020.101573).
- Bame-Aldred, C. W., Cullen, J. B., Martin, K. D., & Parboteeah, K. P. (2013). National culture and firm-level tax evasion. *Journal of Business Research*, 66(3), 390-396.
- Bartram, S.M. (2019). Corporate hedging and speculation with derivatives. *Journal of Corporate Finance*, 57, 9-34. DOI: [10.1016/j.jcorpfin.2017.09.023](https://doi.org/10.1016/j.jcorpfin.2017.09.023).
- Ben Khediri, K. (2010). Do investors really value derivatives use? Empirical evidence from France. *Journal of Risk Finance*, 11 (1), 62-74. Doi: [10.1108/15265941011012688](https://doi.org/10.1108/15265941011012688).
- Borkowski, S.C., & Gaffney, M.A. (2014). Proactive transfer pricing risk management in Pata countries. *Journal of International Accounting Research*, 13 (2), 25-55. DOI: [10.2308/jiar-50845](https://doi.org/10.2308/jiar-50845).
- Chen, W. (2021). Are financial derivatives tax havens? Evidence from China. *International Journal of Emerging Markets*, ahead-of-print. Doi: [10.1108/IJOEM-06-2020-0655](https://doi.org/10.1108/IJOEM-06-2020-0655).
- Cheong, C.W.H., Lee, M.H. & Weissmann, M.A. (2020). Credit access, tax structure, and the performance of Malaysian manufacturing SMEs. *International Journal of Managerial Finance*, 16 (4), 433-454. DOI: [10.1108/IJMF-08-2019-0308](https://doi.org/10.1108/IJMF-08-2019-0308).
- Desai, M. (2003). The divergence between book income and tax income. *Tax Policy and the Economy*, 17, 169–206. DOI: [10.1086/tpe.17.20140508](https://doi.org/10.1086/tpe.17.20140508).
- Donohoe, M. (2015a). Financial derivatives in corporate tax avoidance: a conceptual perspective. *Journal of the American Taxation Association*, 37 (1), 37-68. DOI: [10.2308/atax-50907](https://doi.org/10.2308/atax-50907).
- Donohoe, M. (2015b). The economic effects of financial derivatives on corporate tax avoidance. *Journal of Accounting and Economics*, 59 (1), 1-24. DOI: [10.1016/j.jacceco.2014.11.001](https://doi.org/10.1016/j.jacceco.2014.11.001).
- Donohoe, M., McGill, G., & Outslay, E. (2012). Through a glass darkly: What can we learn about a U.S. multinational corporation's international operation from its financial statement disclosures? *National Tax Journal*, 65 (4), 961–984. DOI: [10.17310/ntj.2012.4.12](https://doi.org/10.17310/ntj.2012.4.12).
- Edgar, T.W. (2000). The income tax treatment of financial instruments: theory and practice. (Doctoral dissertation, Deakin University). *Canadian Tax Paper*, 105, Canadian Tax Foundation, Toronto.
- Ernst & Young (2014). Global transfer pricing tax authority survey. Available at: www.ey.com [accessed January 2016]
- Financial Accounting Standards Board (FASB), (2008). Disclosures about Derivatives Instruments and Hedging Activities. *Statement of Financial Accounting Standard*, 161. FASB, Norwalk, CT.
- Froot, K., Scharfstein, D., & Stein, J. (1993). Risk management: Coordinating corporate investment and financing policies. *The Journal of Finance*, 48, 1629–1658. DOI: [10.1111/j.1540-6261.1993.tb05123.x](https://doi.org/10.1111/j.1540-6261.1993.tb05123.x).

- Geyer-Klingeborg, J., Hang, M., & Rathgeber, A.W. (2019). What drives financial hedging? A meta-regression analysis of corporate hedging determinants. *International Review of Financial Analysis*, 61, 203-221. DOI: [10.1016/j.irfa.2018.11.006](https://doi.org/10.1016/j.irfa.2018.11.006).
- Graham, J., & Rogers, A. (2002). Do firms hedge in response to tax incentives? *The Journal of Finance*, 57 (2), 815-839. DOI: [10.1111/1540-6261.00443](https://doi.org/10.1111/1540-6261.00443).
- Gravelle, J. G. (2009). Tax havens: International tax avoidance and evasion. *National Tax Journal*, 62 (4), 727-753. DOI: [10.17310/ntj.2009.4.07](https://doi.org/10.17310/ntj.2009.4.07).
- Grossman, S.J., & Hart, O.D. (1986). The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy*, 94 (4), 691-719. DOI: [10.1086/261404](https://doi.org/10.1086/261404).
- Hanlon, M., & Heitzman, S. (2010). A review of tax research. *Journal of Accounting and Economics*, 50 (2-3), 127-178. DOI: [10.1016/j.jacceco.2010.09.002](https://doi.org/10.1016/j.jacceco.2010.09.002).
- Hart, O., and Moore, J. (1990). Property rights and nature of the firm. *Journal of Political Economy*, 98 (6), 1119-1158. DOI: [10.1086/261729](https://doi.org/10.1086/261729).
- HM Revenue & Customs (HMRC), (2016). Tackling tax evasion: legislation and guidance for a corporate offense of failure to prevent the criminal facilitation of tax evasion. London: HMRC publishing. Available at: www.gov.uk [accessed January 2017]
- Levin, C. (2012). *Statement of senator Carl Levin (d-Michigan) before U.S. Senate permanent subcommittee on investigations in offshore profit shifting and the U.S. Tax code*. Available at: www.hsgac.senate.gov [accessed February 2018]. Available at: [https://www.hsgac.senate.gov/imo/media/doc/OPENING%20-%20LEVIN-Carl%20\(September%2020%202012\)1.pdf](https://www.hsgac.senate.gov/imo/media/doc/OPENING%20-%20LEVIN-Carl%20(September%2020%202012)1.pdf).
- Lisowsky, P., Robinson, L., & Schmidt, A. (2013). Do publicly disclosed tax reserves tell us about privately disclosed tax shelter activity? *Journal of Accounting Research*, 51 (3), 583-629. DOI: [10.1111/joar.12003](https://doi.org/10.1111/joar.12003).
- Ma, J., Guo, K., & Yu, J. (2020). Democracy and tax avoidance: An international study. *Journal of Corporate Accounting & Finance*, 31(1), 18-52.
- Mayers, D., & Smith, C. W. (1982). On the corporate demand for insurance. In *Foundations of insurance economics* (pp. 190-205). Springer, Dordrecht. DOI: [10.1007/978-94-015-7957-5_9](https://doi.org/10.1007/978-94-015-7957-5_9).
- Modigliani, F., & Miller, M. (1958). The cost of capital, corporation finance, and the theory of investment. *American Economic Review*, 48 (3), 261-297. Available at: <http://www.jstor.org/stable/1809766>.
- Organization for economic co-operation (OECD), (2010). OECD transfer pricing guidelines for multinational enterprises and tax administrations, Paris: OECD publishing. Available at: https://read.oecd-ilibrary.org/taxation/oecd-transfer-pricing-guidelines-for-multinational-enterprises-and-tax-administrations-2010_tpg-2010-en.
- Organization for economic cooperation (OECD), (2015). Base erosion and profit shifting project – aligning transfer pricing outcome with value creation action 8-10, Paris: OECD publishing. Available at: https://read.oecd-ilibrary.org/taxation/aligning-transfer-pricing-outcomes-with-value-creation-actions-8-10-2015-final-reports_9789264241244-en.
- Oyelere, P.B., & Emmanuel, C.R. (1998). International transfer pricing and income shifting: evidence from the U.K. *The European accounting review*, 7 (4), 623-635. DOI: [10.1080/096381898336222](https://doi.org/10.1080/096381898336222).

- Richardson, G. (2008). The relationship between culture and tax evasion across countries: Additional evidence and extensions. *Journal of International Accounting, Auditing and Taxation*, 17(2), 67-78.
- Sari, D., Utama, S., & Rahayu, N. (2020). Transfer pricing practices and specific anti-avoidance rules in Asian developing countries. *International Journal of Emerging Markets*, ahead-of-print. Doi: [10.1108/IJOEM-10-2018-0541](https://doi.org/10.1108/IJOEM-10-2018-0541).
- Scholes, M., Wolfson, M., Erickson, M., Hanlon, M., Maydew, E., & Shevlin, T. (2015). *Taxes and Business Strategy: A Planning Approach*. 5th (eds)., Pearson, Upper Saddle River, NJ: Prentice Hall.
- Smith, C.W., & Stulz, R.M. (1985). The determinants of firms' hedging policies. *Journal of financial and quantitative analysis*, 20 (4), 391-405. DOI: [10.2307/2330757](https://doi.org/10.2307/2330757).
- Stulz, R.M. (2014). Should we fear derivatives? *Journal of Economic Perspectives*, 18 (3), 173-192. DOI: [10.1257/0895330042162359](https://doi.org/10.1257/0895330042162359).
- Tang, T. Y. (2019). The value implications of tax avoidance across countries. *Journal of Accounting, Auditing & Finance*, 34(4), 615-638.
- Tang, T., Mo, P.L.L., & Chan, K.H. (2017). Tax collector or tax avoider? An investigation of intergovernmental agency conflicts. *Accounting Review*, 92 (2), 247-270. DOI: [10.2308/accr-51526](https://doi.org/10.2308/accr-51526).
- Taylor, G., Richardson, G., & Lanis, R. (2015). Multinational, tax havens, intangible assets, and transfer pricing aggressiveness: an empirical analysis. *Journal of international accounting research*, 14 (1), 25-57. DOI: [10.2308/jiar-51019](https://doi.org/10.2308/jiar-51019).
- Tennant, J. (2005). The taxation of derivatives: the basic rules. In *Report on Proceedings of the Fifty-Seven Tax Conference*. *Canadian Annual Tax Conference Report*, Vancouver, 41, 1-17.
- Joint Committee on Taxation [JCT], (2011). Present Law and Issues Related to the Taxation of Financial Instruments and Products (JCX- 56-11), December 2. Available at: <https://www.jct.gov/publications/2011/jcx-56-11/>.
- United States Government Accountability Office [GAO], (2011). Financial derivatives: Disparate tax treatment and information gaps create uncertainty and potential abuse. Report to Congressional Requesters, September. Available at: <https://www.gao.gov/products/gao-11-750>.
- Wang, L. (2016). Capitalising or expensing research and development expenditures: a tax perspective explanation. *China Journal of Accounting Studies*, 4(1), 79-103. DOI: [10.1080/21697213.2016.1176416](https://doi.org/10.1080/21697213.2016.1176416).
- Ye, K., & Liu, X. (2011). Tax collection, income tax cost, and earnings management. *Management World*, 5, 140-148.
- Yoo, J. S., & Lee, Y. J. (2019). National culture and tax avoidance of multinational corporations. *Sustainability*, 11(24), 6946.
- Zeng, T. (2014). Derivative financial instruments, tax aggressiveness, and firm market value. *Journal of Financial Economic Policy*, 6 (4), 1-27. DOI: [10.1108/JFEP-02-2014-0013](https://doi.org/10.1108/JFEP-02-2014-0013).

Table 1. Sample Selection Criteria

This table exhibits our sample selection criteria required to assess our study's final sample firm. We have considered some exclusion criteria to consider only homogenous sample firms for our study.

Description	Selection/Exclusion criteria
London Stock Exchange: FTSE 350	350 Enterprises
Market value classification criterion during the period 2000 to 2017	The first 100 th largest Stock capitalized firms
Type of accounts	Consolidated accounts only
IFRS adoption and disclosure of Related parties' transaction	21 Enterprises
Industry Sector	Sectors excluded: <ul style="list-style-type: none"> ▪ Financial and insurance (section K – three-digit UK SIC codes 641-663); ▪ Electricity, gas, steam, and air conditioning supply (section D – three-digit UK SIC codes 351-353); ▪ Water supply, sewerage, waste management and remediation activities (section E – three-digit UK SIC codes 360-390). 13 Enterprises
Other reasons for exclusion	<ul style="list-style-type: none"> ▪ Enterprises with no overseas subsidiaries; ▪ Corporations exempt from transfer pricing rules, this is classified as small/medium-sized enterprises; and, ▪ Multinational enterprises with no derivatives instrument's disclosure in their annual reports from 2000 to 2017. 19 Enterprises
Period	2000-2017 (18 years)
Final Set (firms)	47 multinational enterprises
Final Set observations (firms-year)	846 firm-years observations

Table 2. Variables Description

This table provides the definition and computation of each of our dependent, independent, and control variables.

Dependent Variable	<i>Intra-Entities' Tax Aggressiveness</i>
TPA/TAXAGG	TPA: A developed Index for Intra-entities' tax aggressiveness.
Independent Variables	<i>Financial Derivatives Instruments</i>
FVDA (FVDL)	The fair value of total derivatives assets (liabilities).
FVHDA (FVHDL)	The fair value of hedged derivatives assets (liabilities).
FVNHDA (FVNHDL)	The fair value of non-hedged derivatives assets (liabilities).
<i>Alternatives</i> <i>Independent Variables</i>	
FVDA/TA _{t-1} (FDA)	The fair value of derivative assets is the fair value of all derivative assets scaled by lagged total assets (TA _{t-1})
FVDL/TA _{t-1} (FDL)	The fair value of derivative liabilities is the absolute fair value of all derivative liabilities scaled by lagged total assets (TA _{t-1})
FVHDA/TA _{t-1} (FDHA)	The fair value of hedging derivative assets is the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (TA _{t-1})
FVHDL/TA _{t-1} (FDHL)	The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (TA _{t-1})
FVNHDA/TA _{t-1} (FDNHA)	The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (TA _{t-1})
FVNHDL/TA _{t-1} (FDNHL)	The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (TA _{t-1}).
Control Variables	<i>Firm's Characteristics</i>
Profitability (ROA)	ROA: Pretax income divided by total assets.
Size (SIZE)	SIZE: natural logarithm of assets total.
Leverage (LEV)	LEV: long-term debt divided by the assets total.
Governance (GOV)	GOV: Index proxy measure of Governance mechanisms.
CV	An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero. Following Donohoe (2015), a firm faces a convex tax function if the firm-year marginal tax rate (before interest expense) is less than the statutory tax rate (i.e., 35%). A firm experiences a reduction in taxable income volatility if the standard deviation of taxable income over the last five years including the current year (t-4, t) is less than that of taxable income over the last five years excluding the current year (t-5, t-1).
CFV	Cash flow volatility is defined as the standard deviation of operating cash flows (OANCF) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period.

Sales	<i>SALES</i> : sales scaled by total lagged assets.
Ln-Age	The Ln of the number of years the firm has Compustat data.
Cash-Hold	Cash holdings are defined as cash and equivalents (CHE) divided by lagged total assets (TA_{t-1}).
Capint	Property, plant, and equipment scaled by lagged total assets.
Disc-Acc	The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002).
Crisis	Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0
MTB	Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity.
INDS	<i>INDS</i> : A dummy variable, coded as 1, if the UK SIC sections equal: (i) mining and quarrying (section B), (ii) manufacturing (section C), (iii) construction (section F), (iv) wholesale and retail trade (section G), (v) information and communication (section G), and (vi) professional scientific and technical services (section M).
YEAR	<i>YEAR</i> : A dummy variable, coded 1 if any specific year ranging between 2000 and 2017 has been the introduction, development, or change in transfer pricing or linked legislation, otherwise 0.

Table 3. Descriptive Statistics

This table provides the descriptive statistics for the variables deployed in the current study, respectively, the intra-entities' tax aggressiveness index proxy, derivatives proxy measures, and control variables.

Variables	N	Mean	Std	Min	Max
<i><u>Dependent Variable</u></i>					
TPA	846	0.221	0.281	0	1
<i><u>Independent Variables</u></i>					
FVDA/At _{t-1} (FDA)	846	0.00975	0.0239	0	0.253
FVDL/At _{t-1} (FDL)	846	0.0127	0.0348	0	0.387
FVHDA/At _{t-1} (FDHA)	846	0.00666	0.0221	0	0.253
FVHDL/At _{t-1} (FDHL)	846	0.00776	0.0272	0	0.308
FVNHDA/At _{t-1} (FDNHA)	846	0.00319	0.00974	0	0.109
FVNHDL/At _{t-1} (FDNHL)	846	0.00499	0.0189	0	0.226
<i><u>Alternative Independent Variables</u></i>					
FVDA	846	41,637	115,330	0	891,300
FVDL	846	72,411	429,416	0	5.636e+06
FVHDA	846	27,341	91,328	0	891,300
FVHDL	846	21,638	61,706	0	574,400
FVNHDA	846	14,866	59,422	0	702,000
FVNHDL	846	50,774	425,857	0	5.636e+06
<i><u>Control Variables</u></i>					
Gov	846	0.782	0.158	0.0357	0.979
Lev	846	0.201	0.142	0	1.389
Roa	846	0.135	0.235	-0.301	2.829
Size	846	8.463	1.701	3.093	12.93
Cv	846	0.426	0.495	0	1
Cfv	846	0.119	0.192	-0.755	2.257
Ln-Age	846	4.415	0.498	3.332	5.283
Mtb	846	6.050	49.05	-367.9	1,082
Cash-hold	846	0.172	0.171	0	1.350
Crisis	846	0.444	0.497	0	1
Capint	846	0.256	0.255	0	0.964
Sales	846	0.722	0.603	-0.0773	4.077
Disc-Acc	846	-0.229	2.365	-54.77	0.809

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; FVDA (FVDL): The fair value of total derivatives assets (liabilities); FVHDA (FVHDL): The fair value of hedged derivatives assets (liabilities); FVNHDA (FVNHDL): The fair value of non-hedged derivatives assets (liabilities); FVDA/TA_{t-1} (FDA) : The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); FVDL/TA_{t-1} (FDL): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets

(TA_{t-1}) ; $FVHDA/TA_{t-1}$ (FDHA): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (TA_{t-1}) ; $FVHDL/TA_{t-1}$ (FDHL): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (TA_{t-1}) ; $FVNHDA/TA_{t-1}$ (FDNHA): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (TA_{t-1}) ; $FVNHDL/TA_{t-1}$ (FDNHL): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (TA_{t-1}) ; ROA : Pretax income divided by total assets; $SIZE$: natural logarithm of assets total; LEV : long term debt divided the assets total; GOV : Index proxy measure of Governance mechanisms; CV : An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; CFV : Cash flow volatility is defined as the standard deviation of operating cash flows (OANCF) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; $SALES$: Sales scaled by total lagged assets; $Ln-Age$: The Ln of the number of years the firm has Compustat data; $Cash-Hold$: Cash holdings are defined as cash and equivalents (CHE) divided by lagged total assets (TA_{t-1}) ; $Capint$: Property, plant, and equipment scaled by lagged total assets; $Disc-Acc$: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); $Crisis$: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; MTB : Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity.

Table 4. Pearson Correlation Matrix

This table provides the results of the Pearson matrix for the correlation coefficients that confirm the presence of significant associations between TPA and the majority of independent and control variables, at the 5% level, but none of the results signal any higher level of correlation and/or multicollinearity.

	TPA	FDA	FDL	FDHA	FDHL	FDNHA	FDNHL	Gov	Lev	Roa
TPA	—									
FDA	0.1936*	—								
FDL	0.2059*	0.6027*	—							
FDHA	0.0867*	0.9154*	0.3767*	—						
FDHL	0.1205*	0.6561*	0.8477*	0.4624*	—					
FDNHA	0.2876*	0.4202*	0.6476*	0.0276	0.5877*	—				
FDNHL	0.2113*	0.1785*	0.6438*	0.0363	0.1399*	0.3609*	—			
Gov	0.4752*	0.1835*	0.1652*	0.1357*	0.1395*	0.1562*	0.1074*	—		
Lev	0.0801*	0.0059	-0.0318	-0.0134	-0.0366	0.0534	-0.0068	0.1395*	—	
Roa	0.0340	-0.0625	-0.0523	-0.0475	-0.0299	-0.0498	-0.0545	0.0567	-0.1273*	—
Size	0.2892*	0.0955*	0.0627	0.0589	-0.0069	0.1061*	0.1277*	0.4213*	0.1158*	-0.1610*
CV	0.4624*	0.1538*	0.1714*	0.1002*	0.1753*	0.1533*	0.0683*	0.3058*	0.0037	0.0764*
Crisis	-0.0541	0.0563	0.0034	0.0614	-0.0407	-0.0049	0.0645	0.0067	0.0182	-0.0997*
Capint	0.0448	0.1034*	0.0252	0.1057*	0.0170	0.0154	0.0221	0.0804*	0.1813*	-0.1217*
Sales	-0.0030	-0.0234	-0.0612	0.0070	-0.0628	-0.0617	-0.0234	0.0118	0.0931*	-0.1206*
Cash-hold	0.0445	-0.0084	0.0109	0.0031	-0.0011	-0.0281	0.0218	0.0829*	-0.1716*	0.2916*
Ln-Age	0.1723*	-0.0415	0.0298	-0.0754*	-0.0604	0.0662	0.1432*	0.1643*	0.0787*	-0.0194
Mtb	0.0580	-0.0201	-0.0152	-0.0138	-0.0120	-0.0194	-0.0110	0.0430	-0.1213*	0.7150*
Cfv	0.0141	-0.0530	-0.0490	-0.0395	-0.0241	-0.0442	-0.0567	0.0520	-0.1433*	0.9519*
Disc-Acc	-0.1441*	-0.0247	0.0149	-0.0340	0.0109	0.0161	0.0122	-0.0096	0.0156	-0.0168

	Size	CV	Crisis	Capint	Sales	Cash-hold	Ln-Age	Mtb	Cfv	Disc-Acc
Size	—									
CV	0.1051*	—								
Crisis	0.0870*	-0.0189	—							
Capint	0.1948*	0.0160	-0.0048	—						
Sales	0.0964*	0.0385	0.0723*	-0.0391	—					
Cash-hold	-0.0182	0.0205	-0.0553	-0.0905*	-0.0824*	—				
Ln-Age	0.2595*	0.0979*	-0.0168	-0.0995*	-0.0171	0.0117	—			
Mtb	-0.1127*	0.0842*	-0.0777*	-0.0786*	-0.0874*	0.1583*	-0.0064	—		
Cfv	-0.1386*	0.0699*	-0.0791*	-0.1038*	-0.0970*	0.2644*	-0.0418	0.6952*	—	
Disc-Acc	0.0006	-0.0636	-0.0573	0.0657	0.0353	-0.0745*	0.1009*	-0.0003	-0.0192	—

* Significance at the 5% level

Table 5. VIF Method

This table provides the results of the VIF method, that confirm the presence of significant associations between TPA and the majority of independent and control variables, at the 5% level, but none of the results signal any higher level of correlation and/or multicollinearity.

Variables	VIF	1/VIF
FDA	4.78	0.078217
Roa	4.75	0.085126
Cfv	3.95	0.091353
FDHA	3.06	0.110391
FDHL	2.29	0.232880
FDL	2.19	0.238480
FDNHA	2.11	0.335341
FDNHL	2.08	0.363441
Mtb	2.07	0.483172
Cash-hold	2.02	0.562547
Size	1.43	0.700687
Gov	1.40	0.713694
Ln-Age	1.17	0.852791
CV	1.15	0.866625
Capint	1.14	0.878808
Lev	1.10	0.907031
Sales	1.06	0.943108
Crisis	1.04	0.959852
Disc-Acc	1.03	0.968164
Mean VIF		3.68

Table 6. Regression Results

This table reports our overall regression indicating that MNEs have been employing aggressive behaviors from a transfer pricing perspective throughout the use of derivatives, given the significant coefficients obtained from the model.

Models Variables	(1) TPA	(1.1) TPA	(1.2) TPA	(1.3) TPA	(1.4) TPA	(2) TPA	(2.1) TPA	(2.2) TPA
FDA	10.44*** (1.408)	30.03*** (6.104)	14.10*** (1.501)	10.34*** (1.405)	12.21*** (1.460)	-	-	-
FDL	2.771*** (0.574)	2.604*** (0.572)	29.45*** (4.402)	2.678*** (0.574)	2.706*** (0.568)	-	-	-
FDHA	-10.57*** (1.344)	-10.67*** (1.336)	-14.25*** (1.445)	4.566 (7.092)	-12.34*** (1.399)	-	-	-
FDHL	-5.514*** (0.771)	-4.952*** (0.785)	-2.507*** (0.900)	-5.340*** (0.774)	22.46*** (6.887)	-	-	-
FDNHA	-	-	-	-	-	5.891*** (1.067)	71.30*** (13.51)	8.626*** (1.171)
FDNHL	-	-	-	-	-	2.933*** (0.583)	2.720*** (0.576)	42.11*** (7.463)
Gov	-0.0337 (0.0263)	-0.0131 (0.0268)	-0.00578 (0.0261)	-0.0248 (0.0265)	-0.0172 (0.0263)	-0.0317 (0.0267)	-0.00222 (0.0270)	-0.0170 (0.0264)
Lev	-0.0799 (0.0719)	-0.0960 (0.0716)	-0.0757 (0.0703)	-0.0888 (0.0718)	-0.0719 (0.0712)	-0.0401 (0.0728)	-0.0657 (0.0720)	-0.0482 (0.0716)
Roa	0.0662 (0.103)	0.0894 (0.102)	0.0564 (0.101)	0.0812 (0.103)	0.0727 (0.102)	0.0813 (0.105)	0.0912 (0.103)	0.0572 (0.103)
Size	-0.00528 (0.00656)	-0.00481 (0.00652)	-0.00399 (0.00642)	-0.00494 (0.00655)	-0.00430 (0.00650)	-0.00849 (0.00665)	-0.00730 (0.00656)	-0.00796 (0.00654)
Cv	0.185*** (0.0170)	0.181*** (0.0169)	0.176*** (0.0167)	0.183*** (0.0170)	0.177*** (0.0170)	0.181*** (0.0173)	0.176*** (0.0171)	0.181*** (0.0170)
Crisis	-0.0379*** (0.0124)	-0.0382*** (0.0123)	-0.0385*** (0.0121)	-0.0380*** (0.0124)	-0.0384*** (0.0123)	-0.0331*** (0.0125)	-0.0357*** (0.0124)	-0.0332*** (0.0123)
Capint	0.00153 (0.0372)	0.00747 (0.0370)	0.00319 (0.0363)	0.00622 (0.0372)	0.00445 (0.0368)	-0.00555 (0.0378)	-0.00581 (0.0372)	-0.00772 (0.0371)
Sales	0.0164 (0.0161)	0.0146 (0.0160)	0.0112 (0.0157)	0.0140 (0.0161)	0.0103 (0.0160)	0.0196 (0.0163)	0.0223 (0.0161)	0.0213 (0.0161)
Cash-hold	0.00739 (0.0477)	-0.00850 (0.0476)	-0.0110 (0.0467)	-0.000733 (0.0477)	-0.00268 (0.0473)	0.0125 (0.0485)	-0.00669 (0.0480)	0.00133 (0.0478)
Ln-Age	2.250*** (0.124)	2.152*** (0.127)	2.093*** (0.124)	2.207*** (0.125)	2.146*** (0.126)	2.187*** (0.123)	2.050*** (0.124)	2.118*** (0.121)
Mtb	0.000129 (0.000183)	0.000128 (0.000182)	0.000133 (0.000179)	0.000132 (0.000182)	0.000138 (0.000181)	0.000124 (0.000186)	0.000105 (0.000184)	0.000118 (0.000183)
Cfv	-0.126 (0.115)	-0.151 (0.114)	-0.109 (0.112)	-0.145 (0.115)	-0.132 (0.114)	-0.134 (0.117)	-0.133 (0.115)	-0.100 (0.115)
Disc-Acc	-0.00287 (0.00297)	-0.00225 (0.00296)	-0.00354 (0.00291)	-0.00222 (0.00298)	-0.00334 (0.00294)	-0.00327 (0.00302)	-0.00388 (0.00298)	-0.00350 (0.00297)

FDxGov	-	-21.61*** (6.552)	-	-	-	-	-	-
FDLxGov	-	-	-32.07*** (5.249)	-	-	-	-	-
FDHxGov	-	-	-	-16.59** (7.631)	-	-	-	-
FDHLxGov	-	-	-	-	-30.21*** (7.391)	-	-	-
FDNHxGov	-	-	-	-	-	-	-69.94*** (14.41)	-
FDNHLxGov	-	-	-	-	-	-	-	-46.99*** (8.923)
INDS YEAR	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES
Constant	-9.667*** (0.520)	-9.251*** (0.532)	-9.006*** (0.520)	-9.485*** (0.526)	-9.231*** (0.526)	-9.383*** (0.512)	-8.801*** (0.519)	-9.090*** (0.507)
Observations	846	846	846	846	846	846	846	846
R-squared	0.627	0.632	0.644	0.630	0.635	0.612	0.624	0.626
ID Nbr	47	47	47	47	47	47	47	47

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; *FVDA* (*FVDL*): The fair value of total derivatives assets (liabilities); *FVHDA* (*FVHDL*): The fair value of hedged derivatives assets (liabilities); *FVNHDA* (*FVNHDL*): The fair value of non-hedged derivatives assets (liabilities); *FVDA/TA_{t-1}* (*FDA*): The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); *FVDL/TA_{t-1}* (*FDL*): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets (*TA_{t-1}*); *FVHDA/TA_{t-1}* (*FDHA*): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVHDL/TA_{t-1}* (*FDHL*): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDA/TA_{t-1}* (*FDNHA*): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDL/TA_{t-1}* (*FDNHL*): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *ROA*: Pretax income divided by total assets; *SIZE*: natural logarithm of assets total; *LEV*: long term debt divided the assets total; *GOV*: Index proxy measure of Governance mechanisms; *CV*: An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; *CFV*: Cash flow volatility is defined as the standard deviation of operating cash flows (*OANCF*) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; *SALES*: Sales scaled by total lagged assets; *Ln-Age*: The Ln of the number of years the firm has Compustat data; *Cash-Hold*: Cash holdings are defined as cash and equivalents (*CHE*) divided by lagged total assets (*TA_{t-1}*); *Capint*: Property, plant, and equipment scaled by lagged total assets; *Disc-Acc*: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); *Crisis*: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; *MTB*: Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Robustness Check

This table presents the findings of our predicted hypothesis and exhibits the outcomes of the examination of whether hedging and non-hedging derivatives are associated with the Intra-entities' tax aggressiveness "TPA", besides the moderator effect of governance monitoring among the afro mentioned associations.

Models Variables	(1) TPA	(1.1) TPA	(1.2) TPA	(1.3) TPA	(1.4) TPA	(2) TPA	(2.1) TPA	(2.2) TPA
FVDA	9.95e-07*** (1.79e-07)	4.46e-06*** (1.39e-06)	1.01e-06*** (1.79e-07)	9.72e-07*** (1.79e-07)	1.02e-06*** (1.79e-07)	-	-	-
FVDL	1.28e-07*** (2.58e-08)	1.38e-07*** (2.60e-08)	1.43e-06** (7.08e-07)	1.37e-07*** (2.60e-08)	1.28e-07*** (2.57e-08)	-	-	-
FVHDA	-1.38e-06*** (2.35e-07)	-1.42e-06*** (2.35e-07)	-1.39e-06*** (2.35e-07)	2.86e-06 (1.87e-06)	-1.39e-06*** (2.34e-07)	-	-	-
FVHDL	6.83e-09 (2.02e-07)	9.29e-08 (2.04e-07)	-8.85e-10 (2.01e-07)	7.42e-08 (2.03e-07)	6.10e-06*** (2.34e-06)	-	-	-
FVNHDA	-	-	-	-	-	9.59e-07*** (1.79e-07)	4.89e-06* (2.94e-06)	9.63e-07*** (1.79e-07)
FVNHDL	-	-	-	-	-	1.05e-07*** (2.45e-08)	1.07e-07*** (2.45e-08)	9.82e-07 (7.79e-07)
Gov	-0.0247 (0.0273)	-0.0140 (0.0275)	-0.0197 (0.0274)	-0.0169 (0.0274)	-0.0123 (0.0276)	-0.0221 (0.0273)	-0.0169 (0.0275)	-0.0205 (0.0273)
Lev	-0.0504 (0.0748)	-0.0579 (0.0746)	-0.0507 (0.0747)	-0.0592 (0.0747)	-0.0470 (0.0746)	-0.0493 (0.0747)	-0.0504 (0.0747)	-0.0500 (0.0747)
Roa	0.0969 (0.107)	0.110 (0.107)	0.0990 (0.107)	0.113 (0.107)	0.102 (0.107)	0.108 (0.107)	0.108 (0.107)	0.108 (0.107)
Size	-0.00764 (0.00681)	-0.00810 (0.00679)	-0.00771 (0.00680)	-0.00804 (0.00679)	-0.00783 (0.00679)	-0.00776 (0.00680)	-0.00785 (0.00680)	-0.00778 (0.00680)
Cv	0.186*** (0.0177)	0.185*** (0.0177)	0.184*** (0.0177)	0.185*** (0.0177)	0.184*** (0.0177)	0.186*** (0.0177)	0.186*** (0.0177)	0.185*** (0.0177)
Crisis	-0.0233* (0.0128)	-0.0233* (0.0128)	-0.0229* (0.0128)	-0.0233* (0.0128)	-0.0228* (0.0128)	-0.0259** (0.0128)	-0.0262** (0.0128)	-0.0257** (0.0128)
Capint	0.00590 (0.0387)	0.00840 (0.0386)	0.00741 (0.0387)	0.00991 (0.0387)	0.00875 (0.0386)	0.00293 (0.0387)	0.00242 (0.0386)	0.00354 (0.0387)
Sales	0.00765 (0.0166)	0.00789 (0.0165)	0.00721 (0.0166)	0.00611 (0.0166)	0.00445 (0.0166)	0.00483 (0.0166)	0.00642 (0.0166)	0.00498 (0.0166)
Cash-hold	0.00695 (0.0496)	0.00198 (0.0494)	0.00574 (0.0495)	0.00237 (0.0495)	0.00362 (0.0494)	0.00989 (0.0496)	0.00837 (0.0496)	0.00956 (0.0496)
Ln-Age	2.250*** (0.128)	2.208*** (0.129)	2.230*** (0.128)	2.218*** (0.128)	2.194*** (0.129)	2.187*** (0.126)	2.169*** (0.126)	2.181*** (0.126)
Mtb	0.000118 (0.000190)	0.000116 (0.000189)	0.000120 (0.000190)	0.000115 (0.000189)	0.000122 (0.000189)	0.000103 (0.000190)	0.000103 (0.000190)	0.000104 (0.000190)
Cfv	-0.163 (0.119)	-0.176 (0.119)	-0.165 (0.119)	-0.180 (0.119)	-0.168 (0.119)	-0.164 (0.119)	-0.164 (0.119)	-0.165 (0.119)

Disc-Acc	0.00539 (0.00550)	0.00495 (0.00549)	0.00556 (0.00549)	0.00468 (0.00550)	0.00581 (0.00548)	0.00550 (0.00551)	0.00562 (0.00551)	0.00555 (0.00551)
FVDAxGov	-	-3.83e-06** (1.53e-06)	-	-	-	-	-	-
FVDLxGov	-	-	-1.40e-06* (7.64e-07)	-	-	-	-	-
FVHDAxGov	-	-	-	-4.69e-06** (2.05e-06)	-	-	-	-
FVHDLxGov	-	-	-	-	-6.63e-06*** (2.54e-06)	-	-	-
FVNHDAxGov	-	-	-	-	-	-	-4.33e-06 (3.23e-06)	-
FVNHDLxGov	-	-	-	-	-	-	-	-9.47e-07 (8.41e-07)
INDS YEAR	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES
Constant	-9.658*** (0.536)	-9.475*** (0.539)	-9.572*** (0.537)	-9.515*** (0.538)	-9.418*** (0.542)	-9.382*** (0.525)	-9.304*** (0.527)	-9.357*** (0.525)
Observations	846	846	846	846	846	846	846	846
R-squared	0.599	0.602	0.600	0.601	0.602	0.595	0.596	0.596
ID Nbr	47	47	47	47	47	47	47	47

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; *FVDA* (*FVDL*): The fair value of total derivatives assets (liabilities); *FVHDA* (*FVHDL*): The fair value of hedged derivatives assets (liabilities); *FVNHDA* (*FVNHDL*): The fair value of non-hedged derivatives assets (liabilities); *FVDA/TA_{t-1}* (*FDA*): The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); *FVDL/TA_{t-1}* (*FDL*): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets (*TA_{t-1}*); *FVHDA/TA_{t-1}* (*FDHA*): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVHDL/TA_{t-1}* (*FDHL*): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDA/TA_{t-1}* (*FDNHA*): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDL/TA_{t-1}* (*FDNHL*): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *ROA*: Pretax income divided by total assets; *SIZE*: natural logarithm of assets total; *LEV*: long term debt divided the assets total; *GOV*: Index proxy measure of Governance mechanisms; *CV*: An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; *CFV*: Cash flow volatility is defined as the standard deviation of operating cash flows (OANCF) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; *SALES*: Sales scaled by total lagged assets; *Ln-Age*: The Ln of the number of years the firm has Compustat data; *Cash-Hold*: Cash holdings are defined as cash and equivalents (CHE) divided by lagged total assets (*TA_{t-1}*); *Capint*: Property, plant, and equipment scaled by lagged total assets; *Disc-Acc*: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); *Crisis*: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; *MTB*: Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8. PCSE Method with FV/AT_{t-1}: FD proxies

This table provides our additional analysis to confirm our findings regarding the association between derivatives financial instruments and the intra-entities' tax aggressiveness, moderator effect of governance, throughout using the PCSE method, and the use of the % of Derivatives to total lagged assets of different categories of financial derivatives (hedged and non-hedged) (asset and liabilities), we find out paramount results that confirm our expectations.

Models Variables	(1) TPA	(1.1) TPA	(1.2) TPA	(1.3) TPA	(1.4) TPA	(2) TPA	(2.1) TPA	(2.2) TPA
FDA	10.73*** (1.735)	52.79*** (9.900)	15.40*** (1.827)	10.46*** (1.673)	13.45*** (1.947)	-	-	-
FDL	1.620* (0.867)	1.326* (0.792)	39.52*** (6.072)	1.437* (0.834)	1.525* (0.888)	-	-	-
FDHA	-9.106*** (1.512)	-9.289*** (1.401)	-14.28*** (1.699)	26.64*** (9.547)	-12.20*** (1.817)	-	-	-
FDHL	-4.278*** (1.027)	-3.033*** (0.906)	0.207 (0.979)	-3.859*** (0.966)	41.49*** (9.315)	-	-	-
FDNHA	-	-	-	-	-	6.277*** (1.430)	107.7*** (18.44)	9.609*** (1.447)
FDNHL	-	-	-	-	-	1.945** (0.777)	1.579** (0.749)	53.08*** (10.36)
Gov	0.244*** (0.0902)	0.268*** (0.0891)	0.261*** (0.0863)	0.256*** (0.0896)	0.253*** (0.0873)	0.239*** (0.0910)	0.265*** (0.0888)	0.249*** (0.0892)
Lev	0.0217 (0.0490)	0.00621 (0.0458)	0.0161 (0.0457)	0.00842 (0.0483)	0.0148 (0.0478)	0.0342 (0.0500)	0.0261 (0.0453)	0.0331 (0.0469)
Roa	0.185 (0.123)	0.204* (0.118)	0.190* (0.116)	0.192 (0.118)	0.211* (0.118)	0.187 (0.126)	0.208* (0.123)	0.162 (0.124)
Size	0.0111** (0.00493)	0.00766 (0.00481)	0.00879* (0.00459)	0.00933* (0.00493)	0.00986** (0.00488)	0.0128** (0.00516)	0.00867* (0.00468)	0.0111** (0.00476)
Cv	0.232*** (0.0549)	0.220*** (0.0514)	0.219*** (0.0511)	0.227*** (0.0531)	0.218*** (0.0514)	0.227*** (0.0553)	0.217*** (0.0518)	0.227*** (0.0543)
Cfv	-0.262* (0.149)	-0.283** (0.143)	-0.257* (0.139)	-0.273* (0.143)	-0.285** (0.142)	-0.263* (0.152)	-0.282* (0.150)	-0.229 (0.148)
Capint	0.000421 (0.0298)	0.00754 (0.0287)	-0.00471 (0.0288)	0.0103 (0.0297)	0.00415 (0.0299)	0.00773 (0.0299)	-0.00674 (0.0289)	-0.00418 (0.0286)
Crisis	-0.0438** (0.0172)	-0.0430*** (0.0163)	-0.0435** (0.0169)	-0.0436*** (0.0168)	-0.0437*** (0.0165)	-0.0373** (0.0169)	-0.0394** (0.0165)	-0.0372** (0.0176)
Sales	-0.00159 (0.00766)	-0.00376 (0.00766)	-0.00298 (0.00728)	-0.00316 (0.00761)	-0.00455 (0.00721)	-0.00120 (0.00814)	-0.00257 (0.00818)	5.68e-05 (0.00819)
Cash-hold	0.00526 (0.0417)	-0.0208 (0.0419)	-0.00869 (0.0413)	-0.0135 (0.0416)	-0.00755 (0.0411)	0.00411 (0.0418)	-0.00410 (0.0421)	0.00123 (0.0418)
Ln-Age	0.0252** (0.0120)	0.0278** (0.0126)	0.0162 (0.0102)	0.0291** (0.0127)	0.0204* (0.0109)	0.0297** (0.0128)	0.0222* (0.0116)	0.0234** (0.0117)
Mtb	0.000244	0.000241	0.000224	0.000251	0.000233	0.000263	0.000224	0.000246

	(0.000202)	(0.000195)	(0.000196)	(0.000199)	(0.000198)	(0.000202)	(0.000194)	(0.000199)
Disc-Acc	-0.0155***	-0.0133***	-0.0157***	-0.0135***	-0.0158***	-0.0161***	-0.0161***	-0.0159***
	(0.00407)	(0.00395)	(0.00404)	(0.00401)	(0.00405)	(0.00417)	(0.00416)	(0.00414)
FDAXGov	-	-46.75***	-	-	-	-	-	-
		(10.19)						
FDLxGov	-	-	-45.52***	-	-	-	-	-
			(7.071)					
FDHAXGov	-	-	-	-39.24***	-	-	-	-
				(10.95)				
FDHLxGov	-	-	-	-	-49.26***	-	-	-
					(10.29)			
FDNHAXGov	-	-	-	-	-	-	-108.9***	-
							(19.70)	
FDNHLxGov	-	-	-	-	-	-	-	-61.30***
								(12.29)
Constant	-0.175**	-0.172***	-0.131**	-0.184***	-0.152**	-0.212***	-0.158**	-0.179**
	(0.0683)	(0.0663)	(0.0612)	(0.0687)	(0.0626)	(0.0740)	(0.0642)	(0.0704)
INDS	YES	YES	YES	YES	YES	YES	YES	YES
YEAR	YES	YES	YES	YES	YES	YES	YES	YES
Observations	846	846	846	846	846	846	846	846
R-squared	0.427	0.454	0.464	0.440	0.450	0.414	0.446	0.437
ID Nbr	47	47	47	47	47	47	47	47

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; *FVDA* (FVDL): The fair value of total derivatives assets (liabilities); *FVHDA* (FVHDL): The fair value of hedged derivatives assets (liabilities); *FVNHDA* (FVNHDL): The fair value of non-hedged derivatives assets (liabilities); *FVDA/TA_{t-1}* (FDA) : The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); *FVDL/TA_{t-1}* (FDL): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets (*TA_{t-1}*); *FVHDA/TA_{t-1}* (FDHA): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVHDL/TA_{t-1}* (FDHL): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDA/TA_{t-1}* (FDNHA): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDL/TA_{t-1}* (FDNHL): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *ROA*: Pretax income divided by total assets; *SIZE*: natural logarithm of assets total; *LEV*: long term debt divided the assets total; *GOV*: Index proxy measure of Governance mechanisms; *CV*: An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; *CFV*: Cash flow volatility is defined as the standard deviation of operating cash flows (OANCF) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; *SALES*: Sales scaled by total lagged assets; *Ln-Age*: The Ln of the number of years the firm has Compustat data; *Cash-Hold*: Cash holdings are defined as cash and equivalents (CHE) divided by lagged total assets (*TA_{t-1}*); *Capint*: Property, plant, and equipment scaled by lagged total assets; *Disc-Acc*: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); *Crisis*: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; *MTB*: Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity. *** p<0.01, ** p<0.05, * p<0.1

Table 9. GLS Method with FV/AT_{t-1}: FD proxies

This table presents our additional analysis to confirm our findings regarding the association between derivatives financial instruments and the intra-entities' tax aggressiveness, moderator effect of governance, throughout using the GLS method, and the use of the % of derivatives to total lagged assets of different categories of financial derivatives (hedged and non-hedged) (asset and liabilities), we find out paramount results that confirm our expectations.

Models Variables	(1) TPA	(1.1) TPA	(1.2) TPA	(1.3) TPA	(1.4) TPA	(2) TPA	(2.1) TPA	(2.2) TPA
FDA	10.73*** (1.576)	52.79*** (6.678)	15.40*** (1.640)	10.46*** (1.558)	13.45*** (1.610)	-	-	-
FDL	1.620*** (0.625)	1.326** (0.612)	39.52*** (4.958)	1.437** (0.619)	1.525** (0.613)	-	-	-
FDHA	-9.106*** (1.462)	-9.289*** (1.428)	-14.28*** (1.565)	26.64*** (7.947)	-12.20*** (1.523)	-	-	-
FDHL	-4.278*** (0.818)	-3.033*** (0.822)	0.207 (0.982)	-3.859*** (0.814)	41.49*** (7.709)	-	-	-
FDNHA	-	-	-	-	-	6.277*** (1.213)	107.7*** (14.48)	9.609*** (1.317)
FDNHL	-	-	-	-	-	1.945*** (0.628)	1.579*** (0.612)	53.08*** (8.709)
Gov	0.244*** (0.0256)	0.268*** (0.0252)	0.261*** (0.0248)	0.256*** (0.0254)	0.253*** (0.0251)	0.239*** (0.0257)	0.265*** (0.0252)	0.249*** (0.0252)
Lev	0.0217 (0.0540)	0.00621 (0.0527)	0.0161 (0.0522)	0.00842 (0.0534)	0.0148 (0.0529)	0.0342 (0.0544)	0.0261 (0.0529)	0.0331 (0.0533)
Roa	0.185* (0.109)	0.204* (0.107)	0.190* (0.106)	0.192* (0.108)	0.211** (0.107)	0.187* (0.110)	0.208* (0.107)	0.162 (0.108)
Size	0.0111*** (0.00394)	0.00766** (0.00388)	0.00879** (0.00382)	0.00933** (0.00391)	0.00986** (0.00386)	0.0128*** (0.00396)	0.00867** (0.00389)	0.0111*** (0.00389)
Cv	0.232*** (0.0201)	0.220*** (0.0197)	0.219*** (0.0195)	0.227*** (0.0199)	0.218*** (0.0198)	0.227*** (0.0202)	0.217*** (0.0197)	0.227*** (0.0198)
Cfv	-0.262** (0.127)	-0.283** (0.124)	-0.257** (0.122)	-0.273** (0.125)	-0.285** (0.124)	-0.263** (0.128)	-0.282** (0.124)	-0.229* (0.126)
Capint	0.000421 (0.0306)	0.00754 (0.0299)	-0.00471 (0.0296)	0.0103 (0.0303)	0.00415 (0.0300)	0.00773 (0.0308)	-0.00674 (0.0300)	-0.00418 (0.0303)
Crisis	-0.0438*** (0.0150)	-0.0430*** (0.0147)	-0.0435*** (0.0145)	-0.0436*** (0.0149)	-0.0437*** (0.0147)	-0.0373** (0.0151)	-0.0394*** (0.0147)	-0.0372** (0.0148)
Sales	-0.00159 (0.0125)	-0.00376 (0.0122)	-0.00298 (0.0121)	-0.00316 (0.0124)	-0.00455 (0.0123)	-0.00120 (0.0126)	-0.00257 (0.0123)	5.68e-05 (0.0124)
Cash-hold	0.00526 (0.0458)	-0.0208 (0.0449)	-0.00869 (0.0443)	-0.0135 (0.0454)	-0.00755 (0.0449)	0.00411 (0.0463)	-0.00410 (0.0450)	0.00123 (0.0454)
Ln-Age	0.0252 (0.0159)	0.0278* (0.0156)	0.0162 (0.0154)	0.0291* (0.0158)	0.0204 (0.0156)	0.0297* (0.0160)	0.0222 (0.0156)	0.0234 (0.0157)
Mtb	0.000244 (0.000215)	0.000241 (0.000210)	0.000224 (0.000208)	0.000251 (0.000213)	0.000233 (0.000211)	0.000263 (0.000218)	0.000224 (0.000212)	0.000246 (0.000213)

Disc-Acc	-0.0155*** (0.00315)	-0.0133*** (0.00310)	-0.0157*** (0.00305)	-0.0135*** (0.00315)	-0.0158*** (0.00309)	-0.0161*** (0.00319)	-0.0161*** (0.00310)	-0.0159*** (0.00312)
FDAxGov	-	-46.75*** (7.223)	-	-	-	-	-	-
FDLxGov	-	-	-45.52*** (5.910)	-	-	-	-	-
FDHxGov	-	-	-	-39.24*** (8.580)	-	-	-	-
FDHLxGov	-	-	-	-	-49.26*** (8.252)	-	-	-
FDNHxGov	-	-	-	-	-	-	-108.9*** (15.51)	-
FDNHLxGov	-	-	-	-	-	-	-	-61.30*** (10.42)
INDS	YES	YES	YES	YES	YES	YES	YES	YES
YEAR	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-0.175** (0.0715)	-0.172** (0.0698)	-0.131* (0.0694)	-0.184*** (0.0707)	-0.152** (0.0702)	-0.212*** (0.0716)	-0.158** (0.0700)	-0.179** (0.0704)
Observations	846	846	846	846	846	846	846	846
ID Nbr	47	47	47	47	47	47	47	47

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; *FVDA* (*FVDL*): The fair value of total derivatives assets (liabilities); *FVHDA* (*FVHDL*): The fair value of hedged derivatives assets (liabilities); *FVNHDA* (*FVNHDL*): The fair value of non-hedged derivatives assets (liabilities); *FVDA/TA_{t-1}* (*FDA*): The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); *FVDL/TA_{t-1}* (*FDL*): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets (*TA_{t-1}*); *FVHDA/TA_{t-1}* (*FDHA*): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVHDL/TA_{t-1}* (*FDHL*): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDA/TA_{t-1}* (*FDNHA*): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDL/TA_{t-1}* (*FDNHL*): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *ROA*: Pretax income divided by total assets; *SIZE*: natural logarithm of assets total; *LEV*: long term debt divided the assets total; *GOV*: Index proxy measure of Governance mechanisms; *CV*: An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; *CFV*: Cash flow volatility is defined as the standard deviation of operating cash flows (*OANCF*) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; *SALES*: Sales scaled by total lagged assets; *Ln-Age*: The Ln of the number of years the firm has Compustat data; *Cash-Hold*: Cash holdings are defined as cash and equivalents (*CHE*) divided by lagged total assets (*TA_{t-1}*); *Capint*: Property, plant, and equipment scaled by lagged total assets; *Disc-Acc*: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); *Crisis*: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; *MTB*: Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10. PCSE method with FVD proxies

This table provides our additional analysis to confirm our findings regarding the association between derivatives financial instruments and the intra-entities' tax aggressiveness, the moderator effect of governance, throughout using the PCSE method, and the use of the Fair value of Derivatives to proxy for the different categories of financial derivatives (hedged and non-hedged) (asset and liabilities), we find out paramount results that confirm our predictions.

Models Variables	(1) TPA	(1.1) TPA	(1.2) TPA	(1.3) TPA	(1.4) TPA	(2) TPA	(2.1) TPA	(2.2) TPA
FVDA	7.83e-07*** (1.94e-07)	7.49e-06*** (2.02e-06)	7.81e-07*** (2.13e-07)	7.27e-07*** (1.89e-07)	8.28e-07*** (1.99e-07)	-	-	-
FVDL	7.74e-08*** (2.71e-08)	9.61e-08*** (2.82e-08)	2.12e-06* (1.11e-06)	9.48e-08*** (2.66e-08)	7.93e-08*** (2.69e-08)	-	-	-
FVHDA	-9.50e-07*** (2.47e-07)	-1.03e-06*** (2.56e-07)	-9.56e-07*** (2.56e-07)	7.47e-06*** (2.37e-06)	-1.01e-06*** (2.60e-07)	-	-	-
FVHDL	2.75e-07 (2.16e-07)	4.39e-07** (2.23e-07)	2.62e-07 (2.20e-07)	4.09e-07* (2.22e-07)	1.16e-05*** (3.00e-06)	-	-	-
FVNHDA	-	-	-	-	-	7.86e-07*** (2.00e-07)	9.02e-06** (4.16e-06)	7.81e-07*** (2.05e-07)
FVNHDL	-	-	-	-	-	6.73e-08** (2.99e-08)	6.96e-08** (3.16e-08)	1.10e-06 (1.11e-06)
Gov	0.248** (0.0980)	0.258*** (0.0974)	0.252*** (0.0976)	0.255*** (0.0973)	0.258*** (0.0967)	0.251*** (0.0939)	0.257*** (0.0941)	0.252*** (0.0939)
Lev	0.0517 (0.0545)	0.0423 (0.0522)	0.0525 (0.0534)	0.0396 (0.0529)	0.0511 (0.0528)	0.0439 (0.0519)	0.0438 (0.0507)	0.0444 (0.0514)
Roa	0.170 (0.131)	0.190 (0.125)	0.175 (0.129)	0.188 (0.125)	0.189 (0.124)	0.169 (0.127)	0.176 (0.126)	0.170 (0.127)
Size	0.0118** (0.00537)	0.0111** (0.00538)	0.0114** (0.00541)	0.0113** (0.00542)	0.0112** (0.00546)	0.0114** (0.00528)	0.0110** (0.00526)	0.0113** (0.00530)
Cfv	-0.262 (0.162)	-0.283* (0.155)	-0.269* (0.159)	-0.279* (0.155)	-0.280* (0.154)	-0.265* (0.156)	-0.275* (0.155)	-0.267* (0.156)
Cv	0.230*** (0.0584)	0.226*** (0.0567)	0.227*** (0.0577)	0.226*** (0.0569)	0.225*** (0.0563)	0.233*** (0.0574)	0.232*** (0.0567)	0.232*** (0.0572)
Crisis	-0.0300** (0.0144)	-0.0295** (0.0136)	-0.0293** (0.0140)	-0.0297** (0.0137)	-0.0289** (0.0131)	-0.0314** (0.0145)	-0.0317** (0.0142)	-0.0311** (0.0144)
Capint	0.00154 (0.0297)	0.00562 (0.0292)	0.00194 (0.0296)	0.00895 (0.0293)	0.00500 (0.0297)	0.00320 (0.0292)	0.000768 (0.0293)	0.00308 (0.0291)
Sales	-0.0111 (0.00768)	-0.0106 (0.00756)	-0.0116 (0.00765)	-0.0112 (0.00737)	-0.0125* (0.00734)	-0.0121 (0.00777)	-0.0113 (0.00794)	-0.0122 (0.00778)
Cash-hold	0.0178 (0.0417)	0.00634 (0.0415)	0.0169 (0.0417)	0.00500 (0.0416)	0.00748 (0.0409)	0.0189 (0.0403)	0.0177 (0.0405)	0.0194 (0.0404)
Ln-Age	0.0339** (0.0136)	0.0335** (0.0137)	0.0320** (0.0134)	0.0350** (0.0138)	0.0291** (0.0130)	0.0335** (0.0139)	0.0320** (0.0138)	0.0329** (0.0138)
Mtb	0.000282 (0.000209)	0.000277 (0.000205)	0.000283 (0.000207)	0.000273 (0.000205)	0.000274 (0.000205)	0.000283 (0.000206)	0.000284 (0.000206)	0.000284 (0.000206)

Disc-Acc	-0.0159*** (0.00422)	-0.0144*** (0.00403)	-0.0159*** (0.00421)	-0.0140*** (0.00399)	-0.0159*** (0.00420)	-0.0156*** (0.00408)	-0.0156*** (0.00408)	-0.0156*** (0.00407)
FVDAxGov	-	-7.45e-06*** (2.19e-06)	-	-	-	-	-	-
FVDLxGov	-	-	-2.20e-06* (1.19e-06)	-	-	-	-	-
FVHDAxGov	-	-	-	-9.32e-06*** (2.67e-06)	-	-	-	-
FVHDLxGov	-	-	-	-	-1.24e-05*** (3.23e-06)	-	-	-
FVNHDAxGov	-	-	-	-	-	-	-9.08e-06** (4.56e-06)	-
FVNHDLxGov	-	-	-	-	-	-	-	-1.12e-06 (1.20e-06)
INDS YEAR	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES
Constant	-0.222*** (0.0734)	-0.221*** (0.0737)	-0.214*** (0.0732)	-0.227*** (0.0744)	-0.205*** (0.0705)	-0.216*** (0.0757)	-0.209*** (0.0746)	-0.213*** (0.0757)
Observations	846	846	846	846	846	846	846	846
R-squared	0.396	0.408	0.400	0.407	0.409	0.394	0.398	0.395
ID Nbr	47	47	47	47	47	47	47	47

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; *FVDA* (*FVDL*): The fair value of total derivatives assets (liabilities); *FVHDA* (*FVHDL*): The fair value of hedged derivatives assets (liabilities); *FVNHDA* (*FVNHDL*): The fair value of non-hedged derivatives assets (liabilities); *FVDA/TA_{t-1}* (*FDA*): The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); *FVDL/TA_{t-1}* (*FDL*): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets (*TA_{t-1}*); *FVHDA/TA_{t-1}* (*FDHA*): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVHDL/TA_{t-1}* (*FDHL*): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDA/TA_{t-1}* (*FDNHA*): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDL/TA_{t-1}* (*FDNHL*): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *ROA*: Pretax income divided by total assets; *SIZE*: natural logarithm of assets total; *LEV*: long term debt divided the assets total; *GOV*: Index proxy measure of Governance mechanisms; *CV*: An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; *CFV*: Cash flow volatility is defined as the standard deviation of operating cash flows (*OANCF*) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; *SALES*: Sales scaled by total lagged assets; *Ln-Age*: The Ln of the number of years the firm has Compustat data; *Cash-Hold*: Cash holdings are defined as cash and equivalents (*CHE*) divided by lagged total assets (*TA_{t-1}*); *Capint*: Property, plant, and equipment scaled by lagged total assets; *Disc-Acc*: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); *Crisis*: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; *MTB*: Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11. GLS method with FVD proxies

This table exhibits our additional analysis to confirm our findings regarding the association between derivatives financial instruments and the intra-entities' tax aggressiveness, moderator effect of governance, throughout using the GLS method, and the use of the Fair value of Derivatives to proxy for the different categories of financial derivatives (hedged and non-hedged) (asset and liabilities), we find out paramount results that confirm our expectations.

Models Variables	(1) TPA	(1.1) TPA	(1.2) TPA	(1.3) TPA	(1.4) TPA	(2) TPA	(2.1) TPA	(2.2) TPA
FVDA	7.83e-07*** (1.94e-07)	7.49e-06*** (1.62e-06)	7.81e-07*** (1.93e-07)	7.27e-07*** (1.93e-07)	8.28e-07*** (1.92e-07)	-	-	-
FVDL	7.74e-08*** (2.87e-08)	9.61e-08*** (2.87e-08)	2.12e-06** (8.46e-07)	9.48e-08*** (2.87e-08)	7.93e-08*** (2.83e-08)	-	-	-
FVHDA	-9.50e-07*** (2.60e-07)	-1.03e-06*** (2.58e-07)	-9.56e-07*** (2.59e-07)	7.47e-06*** (2.16e-06)	-1.01e-06*** (2.57e-07)	-	-	-
FVHDL	2.75e-07 (2.18e-07)	4.39e-07** (2.19e-07)	2.62e-07 (2.17e-07)	4.09e-07* (2.19e-07)	1.16e-05*** (2.59e-06)	-	-	-
FVNHDA	-	-	-	-	-	7.86e-07*** (1.93e-07)	9.02e-06*** (3.49e-06)	7.81e-07*** (1.93e-07)
FVNHDL	-	-	-	-	-	6.73e-08** (2.71e-08)	6.96e-08*** (2.70e-08)	1.10e-06 (9.41e-07)
Gov	0.248*** (0.0264)	0.258*** (0.0263)	0.252*** (0.0264)	0.255*** (0.0262)	0.258*** (0.0262)	0.251*** (0.0260)	0.257*** (0.0261)	0.252*** (0.0260)
Lev	0.0517 (0.0558)	0.0423 (0.0553)	0.0525 (0.0556)	0.0396 (0.0554)	0.0511 (0.0552)	0.0439 (0.0552)	0.0438 (0.0550)	0.0444 (0.0552)
Roa	0.170 (0.112)	0.190* (0.111)	0.175 (0.112)	0.188* (0.111)	0.189* (0.111)	0.169 (0.112)	0.176 (0.112)	0.170 (0.112)
Size	0.0118*** (0.00407)	0.0111*** (0.00403)	0.0114*** (0.00406)	0.0113*** (0.00404)	0.0112*** (0.00403)	0.0114*** (0.00406)	0.0110*** (0.00405)	0.0113*** (0.00406)
Cfv	-0.262** (0.130)	-0.283** (0.129)	-0.269** (0.130)	-0.279** (0.129)	-0.280** (0.129)	-0.265** (0.130)	-0.275** (0.130)	-0.267** (0.130)
Cv	0.230*** (0.0207)	0.226*** (0.0205)	0.227*** (0.0206)	0.226*** (0.0205)	0.225*** (0.0205)	0.233*** (0.0205)	0.232*** (0.0205)	0.232*** (0.0205)
Crisis	-0.0300* (0.0154)	-0.0295* (0.0153)	-0.0293* (0.0154)	-0.0297* (0.0153)	-0.0289* (0.0153)	-0.0314** (0.0154)	-0.0317** (0.0153)	-0.0311** (0.0154)
Capint	0.00154 (0.0313)	0.00562 (0.0310)	0.00194 (0.0312)	0.00895 (0.0311)	0.00500 (0.0310)	0.00320 (0.0313)	0.000768 (0.0312)	0.00308 (0.0313)
Sales	-0.0111 (0.0128)	-0.0106 (0.0127)	-0.0116 (0.0128)	-0.0112 (0.0127)	-0.0125 (0.0127)	-0.0121 (0.0128)	-0.0113 (0.0128)	-0.0122 (0.0128)
Cash-hold	0.0178 (0.0472)	0.00634 (0.0468)	0.0169 (0.0471)	0.00500 (0.0469)	0.00748 (0.0468)	0.0189 (0.0471)	0.0177 (0.0470)	0.0194 (0.0471)
Ln-Age	0.0339** (0.0162)	0.0335** (0.0161)	0.0320** (0.0162)	0.0350** (0.0161)	0.0291* (0.0161)	0.0335** (0.0162)	0.0320** (0.0162)	0.0329** (0.0162)
Mtb	0.000282	0.000277	0.000283	0.000273	0.000274	0.000283	0.000284	0.000284

Disc-Acc	(0.000221) -0.0159*** (0.00324)	(0.000219) -0.0144*** (0.00323)	(0.000221) -0.0159*** (0.00323)	(0.000219) -0.0140*** (0.00325)	(0.000219) -0.0159*** (0.00320)	(0.000221) -0.0156*** (0.00324)	(0.000220) -0.0156*** (0.00323)	(0.000221) -0.0156*** (0.00324)
FVDAxGov	-	-7.45e-06*** (1.78e-06)	-	-	-	-	-	-
FVDLxGov	-	-	-2.20e-06** (9.14e-07)	-	-	-	-	-
FVHDAxGov	-	-	-	-9.32e-06*** (2.38e-06)	-	-	-	-
FVHDLxGov	-	-	-	-	-1.24e-05*** (2.82e-06)	-	-	-
FVNHDAxGov	-	-	-	-	-	-	-9.08e-06** (3.84e-06)	-
FVNHDLxGov	-	-	-	-	-	-	-	-1.12e-06 (1.02e-06)
INDS YEAR	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES	YES YES
Constant	-0.222*** (0.0728)	-0.221*** (0.0721)	-0.214*** (0.0727)	-0.227*** (0.0722)	-0.205*** (0.0721)	-0.216*** (0.0726)	-0.209*** (0.0724)	-0.213*** (0.0726)
Observations	846	846	846	846	846	846	846	846
ID Nbr	47	47	47	47	47	47	47	47

Were, *TPA*: A developed Index for Intra-entities' tax aggressiveness; *FVDA* (*FVDL*): The fair value of total derivatives assets (liabilities); *FVHDA* (*FVHDL*): The fair value of hedged derivatives assets (liabilities); *FVNHDA* (*FVNHDL*): The fair value of non-hedged derivatives assets (liabilities); *FVDA/TA_{t-1}* (*FDA*): The fair value of derivative assets as the fair value of all derivative assets scaled by lagged total assets (*TA_{t-1}*); *FVDL/TA_{t-1}* (*FDL*): The fair value of derivative liabilities as of the absolute fair value of all derivative liabilities scaled by lagged total assets (*TA_{t-1}*); *FVHDA/TA_{t-1}* (*FDHA*): The fair value of hedging derivative assets as the fair value of derivative assets that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVHDL/TA_{t-1}* (*FDHL*): The fair value of hedging derivative liabilities as of the absolute fair value of derivative liabilities that are designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDA/TA_{t-1}* (*FDNHA*): The fair value of non-hedging derivative assets as the fair value of derivative assets that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *FVNHDL/TA_{t-1}* (*FDNHL*): The fair value of non-hedging derivative liabilities as of the absolute fair value of derivative liabilities that are not designated as hedging instruments scaled by lagged total assets (*TA_{t-1}*); *ROA*: Pretax income divided by total assets; *SIZE*: natural logarithm of assets total; *LEV*: long term debt divided the assets total; *GOV*: Index proxy measure of Governance mechanisms; *CV*: An indicator variable equal to 1 if a firm faces a convex function and a reduction in taxable income volatility; otherwise, zero; *CFV*: Cash flow volatility is defined as the standard deviation of operating cash flows (*OANCF*) during the most recent five years scaled by the absolute value of the mean of operating cash flows over the same five-year period; *SALES*: Sales scaled by total lagged assets; *Ln-Age*: The Ln of the number of years the firm has Compustat data; *Cash-Hold*: Cash holdings are defined as cash and equivalents (*CHE*) divided by lagged total assets (*TA_{t-1}*); *Capint*: Property, plant, and equipment scaled by lagged total assets; *Disc-Acc*: The financial reporting quality proxy: the value of the residuals from the Dechow and Dichev (2002); *Crisis*: Period dummy variable, coded 1 if the observation is for the 2008 year, otherwise 0; *MTB*: Market-to-book ratio at the beginning of the year, measured as the market value of equity scaled by the book value of equity. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1