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# Transfer pricing aggressiveness and financial derivatives practices: Empirical evidences from United Kingdom

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**TRANSFER PRICING AGGRESSIVENESS AND FINANCIAL  
DERIVATIVES PRACTICES: EMPIRICAL EVIDENCES FROM  
UNITED KINGDOM**

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## ABSTRACT

Multinational corporations (MNCs) have long taking consideration into transfer pricing as a critical aspect of their tax management policies. The present study aims to identify the influence of intra-group financing using derivatives instruments on transfer pricing aggressiveness. Based on a selective sample of 117 publicly listed U.K. multinational enterprises over 2006 and 2014 (1053 firms years observations), the regression model indicates derivatives to be significantly associated with transfer pricing aggressiveness behaviors. More specifically, interest rates and foreign exchange rates volatility have a positive contribution on magnifying international transfer pricing aggressiveness. Additionally, the multinationality of MNCs also exhibits a significant impact on entities tax governance. The overall empirical findings present reasonable results augmented by an additional analysis with recourse to effective tax measures.

**Keywords:** Transfer Pricing, Derivative Instruments, Multinationality, Aggressiveness and Tax Avoidance

## **ABBREVIATIONS**

BEPS – Based Erosion Profit Shifting

EC – European Commission

ERM – Enterprise Risk Management Practices

FASB – Financial Accounting Standard Board

GAO – Government Accountability Office

HMRC – HM Revenue & Customs

HSGA – Homeland Security and Governmental Affairs

ICTA – Income and Corporation Tax Act

JCT – Joint Committee on Taxation

MNCs’ – Multinational Companies

OECD – Organization for Economic Co-Operation

TIOPA – Taxation (International and other provisions) Act

# 1 INTRODUCTION

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Nowadays the use of financial derivative instruments is the foremost reason for corporate tax noncompliance practiced by MNCs to avoid or evade tax obligations. (United States Government Accountability Office [GAO], 2011), (Organization for Economic Co-Operation [OECD], 2010), and (HM Revenue & Customs [HMRC], 2016). Tax experts have identified the ease which derivatives can be restructured to allow taxpayers to take advantages of country tax rules on financial derivatives (GAO, 2011).

Under this context, governmental departments such as, the HRMC and the Senate Committee on Homeland Security and Governmental Affairs (HSGA) claim the transfer pricing legislation addressing derivatives instruments to be on the top of the priorities on the international tax enforcement challenge for governmental tax offices. Moreover, a recent survey demonstrates that tax authorities are continuing to increase their transfer pricing resources, which in turn are leading to a general increase in the number of inquiries and audits. No individual tax authority surveyed has reduced its resources over the last two years (Ernst & Young, 2014). This increased scrutiny from tax departments have resulted in many court cases on aggressive transfer pricing arrangements carried out by well-known MNCs (*i.e.*, Shell, Starbucks, Apple Inc.) showing the provision of substantial tax benefits and advantages that these MNCs take over the law, tax rates differences between jurisdictions, and the non-arm's length principle of services, goods and funds transferred amongst the intra-group companies (Levin, 2012).

Another important factor contributing for such scenarios relates the financial crisis and credit restriction from external lenders which increased the flow and dimension of intragroup financing throughout the application of derivatives, loans, guarantees and hybrid instruments arrangements (Van der Breggen, 2007). Hanlon and Heitzman (2010), call up attention for offshore financial centers, strategically set up for ease the flow of capital amongst different tax jurisdictions and finance business activities that are intensely driven by the cost of capital. Moreover, Dyreng and Lindsey (2009) and Gravelle (2013), stated about the incorporation of MNCs treasuries in favorable tax jurisdictions which likely

increases the flow of capital amongst MNCs associates and still manages to comply with narrowed regulation and enforcements procedures about information disclosure on capital management requirements. An economic analysis presented by the GAO detected that 34% and 24% of overseas and U.S.A. controlled companies, respectively, have reported no tax liabilities over the period of 1998-2005, where the major explanation for such evidence relates for the abuse of transfer pricing rules. (GAO, 2011).

In order to attempt these inconsistencies, as well as, to further assist MNCs and tax authorities with the compliance of the arm's length principle<sup>1</sup>, the OECD has developed a number of extensive guidelines that are at the core of the modern transfer pricing regulation in the most of the developed nations. The latest OECD initiative, the so called *Based Erosion Profit Shifting* (BEPS), published in October 2015, attempts to ensure that transfer pricing rules are not misused and the results are accordingly aligned with value creation. For example, George Osborne upon the delivery of his budget for 2016 announced the first introduction of BEPS measures to be implemented in the U.K. from 2017, where the estimation is to raise about £1.3 billion a year by limiting tax deductions for interest and finance costs.

Despite some academic studies (Richardson and Taylor, 2015; Donohoe, 2015; Hanlon and Heitzam, 2010; and Taylor et al., 2015) and governmental reports (GAO, 2011; HMRC, 2013, HASGA, 2012) make clear that derivatives practices have an impact on tax avoidance, none of these, from the best of my knowledge, have looked closely how the association between financial derivatives and transfer pricing aggressiveness is determined. Under this context, this study aims to evaluate how derivative instruments, frequently used for hedging practices, determine the level of transfer pricing aggressiveness for publicly

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<sup>1</sup> The OECD Transfer Pricing Guidelines makes reference in section B.1 to the arm's length principle as: *[Where] conditions are made or imposed between the two [associated] enterprises in their commercial or financial relations which h differ from those which would be made between independent enterprises, then any profits which would, but for those conditions, have accrued to one of the enterprises, but, by reason of those conditions, have not so accrued, may be included in the profits of that enterprise and taxed accordingly.*

listed multinational companies in the United Kingdom, bearing in mind these companies can get into favorable market conditions agreements which allows a reduction on their corporate tax liabilities.

This study main contribution concerns the development of a transfer pricing aggressiveness dependent variable which comprises, simultaneously, the HRMC transfer pricing risk assessment regulation and thin capitalization rules. According to Hanlon and Heitzman (2010), past transfer pricing indexes tend to consider inappropriate measurement rules, which may distort the overall research. By having this into consideration, the present study adds to modern literature an alternative, appropriate and effective measure of transfer pricing by providing both conceptual and methodological improvement and developing a case for the measurement of thin capitalization rules and transfer pricing aggressiveness for British incorporated multinational enterprises. Since the United Kingdom does not practice “safe harbors”<sup>2</sup> measures, the development of this proxy becomes more relevant, once it assures reliability and comparability on determining the allowed interest deduction according to the arm’s length principle stated by the OECD.

Secondly, this research contributes to the extent of important literature on transfer pricing aggressiveness and tax avoidance (Taylor et al., 2015; Richardson and Taylor, 2015; and Taylor and Richardson, 2011; Hanlon and Heitzman, 2010; and Donohoe, 2015). Further to prior studies that identified intangibles and tax havens to have a significant impact on transfer pricing aggressiveness and tax avoidance, this study, sizes and complements such research articles by identifying how derivatives instruments (includes exposures to interest rate and foreign exchange rate) promote tax aggressive behaviors from the transfer pricing perspective.

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<sup>2</sup> The HRMC dismisses the idea of having ‘safe harbors’ ratios as this measure offers a simplistic method of determining tax consequences by reference to publicly-stated formulae, rather than by a precise application of the OECD principles.

Thirdly, and from the conceptual and methodological perspective this research paper includes important recommendations, practices and methodologies suggested by the most recent literature issued by OECD/G20 on *Limiting Base Erosion Involving Interest Deductions and Other Financial Payments*, 2015, (BEPS: action 4), which from the best of my knowledge have been scarcely applied and considered in most recent transfer pricing scientific papers.

Fourthly, this study decentralizes the majority of the scientific researches being developed under the transfer pricing umbrella of the United States of America and Australia, and comprises a sample of multinational companies publicly listed in the London Stock Exchange, which allows investors, researches and student community in general to have a broader perspective and an additional comparable factor on how European multinational entities, more specifically in the U.K., (i) comply with the OECD transfer pricing legislation, and (ii) structure their capital intensity.

The structure of this research study is organized in the following manner, section 2 examines the background literature on transfer pricing aggressiveness, financial derivative instruments and risk management strategies combining both concepts (transfer pricing and derivatives), section 3 develops the hypotheses, section 4 explores the research design and presents the base regression model, section 5 reports the empirical results, as well as, identifies robustness checks on the model and develops additional analysis on the dependent variable, section 6 concludes.

## **2 BACKGROUND LITERATURE**

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The Transfer Pricing regulation in the United Kingdom has well established procedures and was intentionally developed to be consistent with the OECD Guidelines practices. Over the past year, the UK Transfer Pricing rules/guidance have remained unchanged, although the recent reports published by the OECD regarding the BEPS actions plans have caught the UK Government attention for a reflexive position on tackling aggressive tax planning strategies in the global economy.

### **2.1 Transfer Pricing Aggressiveness Background**

The most of the OECD countries have harmonized Transfer Pricing regulation which is designed to assure that prices in operations taken by related parties have the appropriate allocation of profits across jurisdictions (Joint Committee on Taxation [JCT], 2010). However, the UK considers the current transfer pricing legislation to simplify the allocation of certain level of profits to low-tax jurisdictions in an inappropriate manner.

Under the international context the perception of transfer pricing aggressiveness refers to the downward management of tax paid by transferring profits or losses amongst group associates incorporated in different tax jurisdictions through deliberate manipulation of intercompany transfer prices. Bartelsman and Beetsma (2003), present different ways of profits shifting, such as the financing of new subsidiaries in high tax jurisdictions with debt instead equity. Furthermore, transfer pricing aggressiveness can be characterized by the raise of tax benefits for MNCs, as a whole, resulting from mispricing of services, products, interest, loan, and royalties among related parties. It thus considers transfer pricing behaviors falling into the gray area of tax compliance, as well as, activities that are clearly illegal (Hanlon and Heitzman, 2010).

Eden and Smith (2011), considers the transfer pricing aggressiveness to be a tax or financial advantage successfully taken by MNCs resulting from financial, economic or legislative arbitrage differences between jurisdictions. On the top of these jurisdictions are tax havens, which according to Drucker (2011)<sup>3</sup> represented to be a common denominator presented on the largest tax audits undertaken or completed in the U.S.A., concerning transfer pricing aggressive operations.

Usmen (2012) and the OECD (2013) public consultation draft on *Transfer Pricing Risk Assessment* argues that the use of tax havens jurisdictions by MNCs does not have in mind only its transfer pricing aggressive strategies, additionally it aims to engage in financial arbitrage procedures in order to manage their foreign currency cash flows as well as regulatory risk exposure.

Levin (2012) compares the profits to be artificially inflated in low tax jurisdictions and deflated in high tax jurisdictions as a result of aggressive transfer pricing techniques carried out by related parties with no consideration of the arm's length principle. The author further states that transfer pricing aggressiveness infers from the lack of assurance, with particular relevance for the arm's length nature on intercompany prices of goods or services, transfer funds (i.e., dividends, royalties, interest), and the all methodology on the application of the appropriate transfer pricing method.

## **2.2 Financial Derivatives Instruments Background**

A financial instrument or derivative is the result of any contractual terms agreed by at least two parties giving rise to financial asset of one entity and financial liability or equity instruments of another entity. In other words, a derivative instrument can be defined as a

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<sup>3</sup> Please see the “double Irish Dutch Sandwich” for evidence on these transfer pricing activities resulting from arrangements of U.S.A. groups (Facebook and Google) where the tax haven incorporated subsidiary plays an important role on the group structure (Drucker, 2011; Smyth, 2013).

contract which its value derives from its relation with something else, commonly referred as the “underlying” (Stulz, 2004).

The underlying term under a derivative contract can be almost anything, however very often this is identified as other financial instrument or economic good.<sup>4</sup>

Bodnar et al., (2003) and Bartram et al., (2009), considers the uses of derivatives by MNCs to be often motivated by the insulation effect that it provides to earnings and cash flow risk exposure resulting from changes in interest rates, foreign exchange rates and commodity prices. Such example is given on Maynard (2008), which refers to Southwest Airlines as a well-known enterprise for using derivatives instruments to lock in jet fuel prices. Despite this common use of derivatives, MNCs very frequently adopt derivatives strategies for many other reasons, such as tax avoidance (Donohoe, 2015), earnings management (Barton, 2001), financial distress mitigation (Mayers and Smith, 1982), amongst others.

Another important element to take into account under the financial derivate instruments practices relates to its accounting standards and MNCs reporting measurements. According to the Financial Accounting Standard Board (FASB, 2016), a worldwide institution responsible for the monitoring and standardize of financial accounting policies, derivatives instruments held for trading purposes shall be measured at their fair value in the balance sheet, while the unrealized holding gain/loss should be recognized in the statement of comprehensive income. On other hand, derivatives held for hedging purposes, should be measured at the fair value in the financial statement, while the unrealized holding gain/loss available for hedging strategies (including those classified as current assets) should not be considered in the earnings, instead it should be reported in other comprehensive income until realized.

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<sup>4</sup> In the majority of the times derivatives tend to follow three kinds of instruments: (i) options, (ii) futures and forwards, and (iii) swaps. Options involve the right, but not the obligation, to buy or sell an underlying at a set price within a specified period. A futures or forward contract involves an obligation to exchange an underlying at a future date for a specific price, and swaps are agreements to exchange a stream of payments based on an underlying over a predefined period.

### **2.3 Risk Management Background**

After the financial downturn in 2007/2008 the global economy, in overall, has focused its attention on how MNCs can more effectively increase their management policies for risk exposures reduction. On the top priorities of governments and tax authorities is transfer pricing risk, which according to Borkowski and Gaffney (2014) have increased as more tax authorities worldwide implement or strengthen transfer pricing regulations and impose harsher penalties for infractions.

In this context, managers and CEOs' of multinational enterprises have put into practice innovative forms of risk management tools, such as enterprise risk management practices (ERM), which allows MNCs to identify specific risks exposures on their industry and economic environment, as well as, implement on time strategies to manage and reduce any form of external or uncontrollable management risk.

On other hand, many of theories being published nowadays regarding risk management strategies suggest that hedging activities are becoming the most common practice of manage short term risk. In addition, some of those theories, for instance, Froot et al. (1993), highlight the cost of external financial borrow as the main aspect to put into practice a decent plan for hedging any volatility in foreign exchange volatility. Moreover, the authors further states that, if the cost of financing abroad is likely to be higher than internal financing, the recourse to hedging activities can represent an extreme value added benefit for MNCs, especially if it matches fund inflows with outflows, which consequently allows for lowering the chances that an MNC needs to access capital markets.

Additionally, Smith and Stulz (1985), claim attention for the probability of potential tax motivations to hedge the volatility of cash flows and income. Furtherly, the author's present evidence on the reduction of taxes for MNCs with a U-shaped tax function as a result of an effective monitoring and reduction in taxable income volatility. In addition, Stulz (1996) and Leland (1998) call up researcher's attention for the reduction in cash-flow volatility through hedging to potentially increase debt capacity and produce greater tax advantages for MNCs.

### 3 HYPOTHESES DEVELOPMENT

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This section considers the development of hypotheses regarding the impact of derivatives instruments and multinationality on MNCs transfer pricing aggressiveness. According to important literature, as previously presented, these variables argued to be relevant on the transfer pricing aggressiveness behaviors.

#### 3.1 Financial Derivatives

The question to be imposed from this study perspective is “Why derivatives are so valuable for corporate tax aggressiveness?”

In the spotlight for derivatives practices nowadays is MNCs tax avoidance (JCT, 2011), in other words, the reduction of their tax liability. According to Lisowsky et al., (2013), and from a wide perspective, tax avoidance represents the continuum use of planned tax strategies to extremely and aggressively avoid tax responsibilities. Some of the literature addressing this subject, in one hand, documents tax aggressiveness to be the result of hedging strategies (*byproduct* perspective), while the other hand, reports the ambiguity in derivative taxation to be at the forefront for tax aggressiveness behaviors (*tax law literature* perspective). The figure below addresses both perspectives (*byproduct vs tax law literature*) by describing the useful of derivatives for corporate tax aggressiveness.

**Table 1 - The valuable usage of derivatives for MNCs tax aggressiveness**

<b>The complexity of derivatives instruments and transactions</b>	
<i>Byproduct</i>	<i>Tax Law</i>
<p><b>Hedge Fundamentals</b></p> <p>Hedging risk reduces taxable income volatility, which allows MNCs to lower its expected tax expense (Simth and Stulz 1985).</p>	<p><b>Ambiguity in Derivatives Taxation</b></p> <p>The ambiguity on derivatives taxation procedures allows MNCs to harmonize the timing and source of taxable income/deduction via transactional form and tax reporting choices. Some of these behaviors are legally valid, while others push the envelope of tax law.</p>

Adapted from Donohoe (2014)

## **Hedge Fundamentals**

According to Modigliani and Miller (1958), risk management strategies developed by MNCs do not increase their value in perfect capital markets. On the other hand of the spectrum, Aretz and Bartram (2010), explained why imperfections presented in the market, such as taxes, drive MNCs to a devoted allocation of resources, in order to reduce their financial risk. The main characteristic of a derivative instrument relates to his aptitude to reduce risk exposure. Thus, bearing in mind that the most tax legislations across OECD countries are relatively harmonized, successful hedge positions able MNCs to reduce the volatility risk of their taxable income (Keyes, 2008). Additionally, Froot et al., (1993) identified the cost of external financing to be more costly when compared to intra-group financing, which predicts that hedging practices represent a fair solution and a value-increasing activity if it matches the inflow and outflow of funds, and consequently lowers the probability of MNCs needs to access capital markets. At the same hand, Smith and Stulz (1985) stated that cash flows and earnings stability *via* an accurate monitoring for volatility constitutes an extra motivation for hedging activities.

## **Ambiguity in Derivatives Taxation**

The transactional form reflects tax aggressiveness to be closely attributable to ambiguity in derivative transactions, mainly concerning (i) fragmented reporting treatments rules, (ii) provision of minimal guidance for determine accurate tax treatments on complex instruments, Weisbach (2005) and, (iii) the complexity of derivatives represents another advantage for MNCs, once, finance and economist professionals, in somehow, may struggle to accurately interpret derivatives, then considering the ambiguous derivative taxation treatments, it is not surprising the tax authorities to struggle as well (Raghavan 2007, 2008).

In conclusion, if derivatives instruments represent an important factor of risk management strategies as stated in the literature above, any prospective changes in multinational enterprises derivatives portfolio position may be economically significant when compared

to potential hedging objectives such as, MNCs underlying risk exposure. Under this context, the present study estimates the exposure of MNCs market values to interest rates and currency exchange rates and the extent to which MNCs derivatives instruments potentially aim to hedge these exposures. By this means, the exposure is measured by estimating the effects of interest rate and exchange rates using exposure coefficients from MNCs monthly stock returns regression on changes in interest rates and exchange rates. To assess market exposure, the study assumes derivatives contracts to be held by the holding company (MNC) which subsequently serves its controlled companies according to the intragroup financing policies. Thus MNCs with significant exposure to interest rates and exchange rates have higher market value sensibility which subsequently increases their likelihood for aggressive transfer pricing behaviors.

**H1: All else remaining constant, derivatives instruments practices are significantly associated with transfer pricing aggressiveness.**

### **3.2 Multinationality**

Nowadays the success of MNCs international globalization and market diversification axes on the parent company abilities to manage and monitor the wider spectrum of economic, cultural and political risks across countries. As a result of these events, it is not surprising for MNCs to developed complex organizational structures that very frequently lack for transparency.

Jacob's (1996), one of the first transfer pricing studies, examined that MNCs sited in different tax jurisdictions have greater tax opportunities and resources not only to shift income (*i.e.*, royalty income, interest and dividend) to favorable tax jurisdictions, but as well to assign important allowable tax expenses (for instance, debt interest paid) to high tax jurisdictions.

At the same hand, various research papers (Clausing, 2009; and Klassen and Laplante, 2012a) reported the existence of income shifting, as well as, predicted the high possibility of income shifting between related party companies located in different tax jurisdictions, to be preferably developed via (i) strategic debt location, (ii) transfer pricing transactions and (iii) preferential cost allocation.

Rego (2003) and Dyreng et al. (2008) concluded that MNCs tend to be more capable and have higher chances to reduce their corporate tax liability when compared against those corporations operating purely in the internal market. The author's further identified that MNCs relying intensively in foreign transactions or deriving higher income from external sources have greater reasons and scope to engage in income shifting behaviors.

Desai et al., (2006a) further concluded that higher international MNCs exposure, extensive intercompany operations and greater R&D expenditure, preferred the use of tax haven vehicles to avoid their liabilities. The authors additionally found that MNCs effective tax rates (ETRs) usually reflect a combination of transactions in either higher or lower tax regimes which reflects this way their aggressiveness in exploring tax havens jurisdictions to support their income shifting schemes.

**H2: All else remaining constant, the multinationality of MNCs is significantly associated with transfer pricing aggressiveness.**

## 4 RESEARCH DESIGN

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### 4.1 Data selection and sample design

The present study considers the largest 200 stock enterprises (highest stock capitalization) publicly listed at the London Stock Exchange for the period of 2006-2014. I have focused on the largest stocks enterprises because previous studies (Nance et al., 1993; Graham and Rogers, 2002; and Hentschel and Kothari, 2001) have provided strong evidence that large enterprises are more likely to incur in derivative instruments contracts, as well as, the largest 200 enterprises economically represent a significant fraction of the portfolio value of the U.K. market stock capitalization. In this context, the sample size was reduced to 117 enterprises, after exclude, (i) enterprises falling into finance and insurance sector (section K – three digit UK SIC codes 641-663), (ii) enterprises operating in the electricity, gas, steam and air conditioning supply (section D – three digit UK SIC codes 351-353), (iii) firms with activities in water supply, sewerage, waste management and remediation activities (section E – three digit UK SIC codes 360-390), (iv) enterprises with no overseas subsidiaries, (v) corporations exempt from transfer pricing rules, this is classified as small/medium sized enterprises<sup>5</sup>, and (vi) multinational enterprises with no derivatives instruments in their annual reports from 2006 to 2014. Regarding the enterprises falling into a specific industry category (K, D and E), their exclusion concerns not only the significant differences in accounting policies and derivation in accounting estimates, additionally, it considers particularities in legislation and regulatory constraints on reporting which certain industries, e.g., utilities, are subject for. The full sample consists in 1053 firm-year observations over the period of 9 years. Financial information was obtained from recognized database sources such as, Amadeus from Bureau Van Dijk and Eikon Datastream from Thomson Reuters.

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<sup>5</sup> The HRMC, based on the European Commission (2003/361/EC), defines micro, small and medium sized enterprises as “an entity that qualifies as either small or medium if it meets the staff headcount ceiling (less than 250 employees) for that class and one (or both) of the financial limits (annual turnover less than €50 million and/or balance sheet less than €43 million). Where the entity is a member of a group, or has an associated entity, these limits apply to the whole group and not the specific entity”.

The following table presents the criteria's adopted on the exclusion of some enterprises sectors in the study sample.

**Table 2 - Sample descriptive criteria's**

Description	Selection/Exclusion criteria
London Stock Exchange	200 <sup>th</sup> largest Stock Capitalized Enterprises;
Time Period	2006-2014;
Type of accounts	Consolidated accounts only;
Sector Industry	Sectors excluded: <ul style="list-style-type: none"> <li>▪ financial and insurance (section K – three digit UK SIC codes 641-663);</li> <li>▪ electricity, gas, steam and air conditioning supply (section D – three digit UK SIC codes 351-353);</li> <li>▪ water supply, sewerage, waste management and remediation activities (section E – three digit UK SIC codes 360-390).</li> </ul>
Other reason for exclusion	<ul style="list-style-type: none"> <li>▪ enterprises with no overseas subsidiaries;</li> <li>▪ corporations exempt from transfer pricing rules, this is classified as small/medium sized enterprises; and,</li> <li>▪ multinational enterprises with no derivatives instruments in their annual reports from 2006 to 2014.</li> </ul>
Final Set (firms)	117 multinational enterprises
Final Set observations (firms-year)	1053 firm-years observations

## 4.2 Dependent variable

The BEPS (2015) initiatives and the OECD thin capitalization legislation (2012) defines the profit shifting through interest as one of the preferred practices used by MNCs to structure their financing arrangements and maximize their tax benefits (increased deduction in interest paid and reduction in taxable profit, consequently). The U.K. thin-capitalization and intra-group funding legislation<sup>6</sup> defines the procedures which enterprises shall follow

<sup>6</sup> The thin-capitalization and intra-group funding legislation is considered in the Act 2010 (TIOPA10), previously in Schedule 28AA ICTA 1988, commits HMRC to interpreting transfer-pricing transactions in accordance with the principles set down by the OECD. This commitment centers on Article 9 of the OECD Model Tax Convention and the OECD Transfer Pricing Guidelines. The legislation, applies the arm's length

when assessing the maximum interest-bearing debt that can give rise for interest deductions for each tax year. Specifically, the section INTM 515010 of HMRC internal manual, defines that covenants<sup>7</sup> applied at intervals allows for identification of whether or not the enterprises maintain the ability to service and repay the borrowing debt. The breach of this terms and conditions by the borrower usually triggers attention from the lender and signals for an aggressive tax behavior, and perhaps avoidance.

Since the U.K does not operate “safe harbors”<sup>8</sup>, the British tax legislation applies the OECD guidance by taking debt and earnings ratios as the appropriate measure of the arm’s length principle to calculate the allowed interest deduction. Based on the conceptual thin capitalization approach<sup>9</sup> presented in Richardson and Taylor (2015), the present study contributes for the extent transfer pricing literature by developing a new proxy measure based on the disallowed interest expense defined by the British tax authorities’, *i.e.*, the HMRC thin capitalization manual for U.K. entities<sup>10</sup>. Since the U.K. legislation does not applied static thin capitalization measures, in other words, “safe harbors”, the development of this new transfer pricing proxy presents relevance and a unique contribution for the transfer pricing literature, since it addresses complexity and accuracy on defining a more reliable arm’s length principle.

To determine whether a MNC uses excessive interest deduction, the dependent variable was measured through the ratios EBITDA/interest paid and debt/EBITDA, and thereafter matched against a benchmarking inter-quartile range (IQR), specifically designed for each

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principle to lending and borrowing transactions - treating parties to a transaction as if they were independent of each other.

7 A loan covenant commonly includes a maximum ratio of debt to earnings and a minimum ratio of earnings to interest costs. The latter ratio is known as ‘interest cover’. Interest cover covenants are common in third party loan agreements and are a mainstay of thin capitalization agreements. Thus a borrower’s interest cover is a measure of its ability to service its debt - to pay the interest and other regular costs of borrowing - rather than of its ability to repay the principal.

8 According to HMRC “a safe harbor in this context is a legislative limit on interest deduction by reference to fixed ratios, such as a debt:equity ratio of 3:1 applicable to all company funding.”

9 The thin capitalization proxy developed in Richardson and Taylor (2015) considers the U.S tax legislation, as well as, all the terms and conditions framed in the US thin capitalization legislation, largely different from the U.K. framework.

10 According to the HMRC the “interest cover covenants have been adopted for use in Advance Thin Cap Agreements to measure arm’s length interest for each year of the agreement. In the event of a breach of covenant, enough interest is disallowed to restore the ratio”.

UK Standard Industry Classification (SIC) code section. The transfer pricing aggressiveness variable (TPAGG) is measured as a dummy variable, code as 1 if a MNC EBITDA/interest paid is below its UK SIC benchmarking IQR or debt/EBITDA is above its UK SIC benchmarking IQR, and 0 otherwise.

### **4.3 Independent variables**

The independent variables are comprised by financial derivatives instruments (*FDI*) and multinationality (*MULTI*). In order to gain additional clearance and perspective on firms risk management practices and transfer pricing aggressiveness, the present study extends and sizes the present transfer pricing literature by including the *FDI* variables as a measure for risk management incentive (hedging risk) that influences the use of financial derivatives instruments and consequently the transfer pricing aggressiveness. Thus, financial derivative instruments (*FDI*) is defined by two sub-variables, the interest rate (*IR*) which stands for entities with interest rates derivatives, and the foreign exchange rate (*FER*) which represents multinational enterprises with exchange rate derivatives. Both measures (*IR* and *FER*) represent the market value exposure to financial prices and aim to estimate accurately the transfer pricing aptitudes for aggressive behaviors.

Having this into context, the *IR* variable is calculated as the estimated coefficient from a regression of a MNC monthly holding period stock returns on the monthly percentage change in the 6 months London Interbank Offered Rate (LIBOR), (Guay, 1999; Zhang, 2009).

The *FER* is measured as the foreign currency exchange rate, defined as the estimated coefficient from a regression monthly holding period stock returns on the monthly percentage change in the sterling ERI trade weighted index (Guay, 1999; Zhang, 2009).

On other hand, the *MULTI* variable takes into consideration relevant literature findings from Harris et al., (1993), Rego (2003), Mills and Newberry (2004), which states that MNCs with a substantial number of foreign business subsidiaries are likely to behave more aggressively than MNCs operating domestically. By having this results into context the

*MULTI* is calculated as a dummy variable, coded as 1 for firms reporting current or deferred foreign income taxes, and 0 otherwise.

#### **4.4 Control variables**

The control variables included in the present study are represented by profitability (*PROFIT*), MNCs size (*SIZE*), leverage (*LEV*), cash flow from operating activities (*CFOA*), year effects (*YEAR*) and industry (*INDS*).

According to Jacob (1996), profitable (*PROFIT*) MNCs have greater reasons to engage in aggressive transfer pricing behaviors to finally avoid significant corporate taxes. Nowadays many MNCs, for instance, Microsoft, Google and Apple, have been able to practice aggressive tax strategies by favorably locating their profits in low tax jurisdictions and increase their taxable deductible expenditure in high tax jurisdictions in order to significantly reduce their taxable profits (Duhigg et al., 2012; Womack et al., 2011; Mutti et al., 2009). The *PROFIT* control variable is measured via pretax income divided by total assets as defined in Gupta and Newberry (1997).

The size variable (*SIZE*) takes into consideration both resources and incentives that MNCs have in hand to efficiently apply planned and aggressive transfer pricing behaviors across the group subsidiaries. MNCs with multiple foreign entities have greater opportunities to exploit tax legislations in different countries which able them to plan tax strategies and shift income from high to low tax jurisdictions by locating their operations in these favorable locations (Slemrod, 2001; Rego, 2003). *SIZE* is measured by the natural logarithm of total assets as presented in Stickney and McGee (1982).

The leverage variable (*LEV*), according to Hines (1996), Newberry and Dhaliwal (2001), and Rego (2003), has a great potential to identify high leveraged MNCs exploiting tax deductions opportunities resulting from interest payments and loan fees and shifting debt amongst low tax jurisdictions. Additionally, many other studies on tax avoidance presented evidence on how MNCs with high debt to equity ratios tend to behave in a more aggressive manner than highly capitalized MNCs, Bernard et al., 2006, Dyreng et al., 2008, and Blouin

et al., 2013. The *LEV* control variable is measured according to Gupta and Newberry (1997), by dividing long term debt from the total assets.

The *CFOA* variable will be considered in the regression model to control and monitor for the flow of funds occurring from operations and MNCs performances (Dechow et al., 1998). Further, Hanlon (2005) states that some of the tax favorable jurisdictions, *e.g.*, tax shelters, frequently provide information on the persistence of underlying cash flow streams and earning persistence of MNCs. At the same hand, Kim et al., 2011, presents evidence that *CFOA* has a significant association with tax avoidance. Under this context, the *CFOA* variable is measured by the cash flow from operating activities scaled by total assets.

On other hand, the industry (*INDS*) which MNCs operate is very likely to positively affect their transfer pricing aggressiveness behaviors, with certain sectors of activity offering greater propensity to this final end (Oyelere, 1998; Bernard et al., 2006). Thus, the *INDS*<sup>11</sup> control variable is defined as a dummy, coded as 1, as it controls for the UK Standard Industry Classification (UK SIC) sections, such as: (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).

The *YEAR* variable controls for time fixed effects of any change, development or initiative in transfer pricing or linked legislation between the periods of 2006-2014. As a natural reaction, each of the years comprehended between 2006 and 2014 have had their own specificities, which directly or indirectly may influence MNCs to put into practice aggressive tax planning strategies and incentives. Thus, *YEAR* is classified as a dummy variable, coded as 1, if any specific year ranged between 2006 and 2014 have seen the introduction, development or change in transfer pricing or linked legislation, otherwise is 0.

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<sup>11</sup> Consistent with the HRMC (2014) “tax planning structures and arrangements which result in BEPS are generic and can be utilized by multinational groups in all sectors”. Thus, the UK Standard Industry Classification code (UK SIC) identified under the *INDS* variable considers the six most aggressive transfer pricing sectors as defined in the *TPAGG* variable (excludes transportation and storage).

## 4.5 Base Regression Model

In order to verify the influence of financial derivatives practices (*IR* and *FER*) and multinationality (*MULTI*) on transfer pricing aggressiveness (*TPAGG*) behaviors, the present study considers a *logistic regression model* since the dependent variable is classified as a dichotomous variable, and the independent and control variables assume, simultaneously, quantitative and qualitative values in the model. According to Marôco (2014), this method provides the most effective way to identify and estimate the significance of the independent variables in the model, when compared to other statistical methods such as, for example, the discriminant analysis. The *logistic regression model* presents a broader field for application since (i) it accepts qualitative and quantitative predictors, (ii) does not assume the dependent variable and independent variables to be linear correlated, (iii) does not require the independent variables to be normal distributed, and (iv) is less sensitive to outliers.

In this context, the logistic regression model is stated as follows:

$$\text{TPAGG}^*_{it} = \alpha_{it} + \beta_1 \text{IR}_{it} + \beta_2 \text{FER}_{it} + \beta_3 \text{MULTI}_{it} + \beta_4 \text{PROFIT}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{LEV}_{it} + \beta_7 \text{CFOA}_{it} + \beta_8 \text{INDS}_{it} + \beta_9 \text{YEAR}_{it} + \varepsilon_{it} \quad (4.1)$$

where,  $\text{TPAGG}^*_{it}$ , represents the latent variable associated to the observable variable, being *TPAGG* equal to 1 (one) when  $\text{TPAGG}^* > 0$ , otherwise, *TPAGG* equals 0 (zero) when  $\text{TPAGG}^* \leq 0$ , additionally  $i$  = stands for each MNCs ranged from 1 to 117, and  $t$  = represents the financial period considered in present study ranging from 2006 to 2014, inclusive,  $\varepsilon$  stands for the error term.

In order to clarify the base regression model (4.1), the following table provides a summary description on the measurement of the dependent, independent and controls variables in the study.

**Table 3 - Variables Description**

<b>Dependent Variable</b>	<b>Description</b>
Transfer Pricing Aggressiveness ( <i>TPAGG</i> )	Dummy variable, code as 1 if: <ul style="list-style-type: none"> <li>▪ EBITDA/interest paid &lt; UK SIC benchmarking IQR; or</li> <li>▪ Debt/EBITDA &gt; UK SIC benchmarking IQR, 0 otherwise.</li> </ul>
<b>Independent Variables</b>	
Financial Derivatives Instruments	
▪ Interest Rate Exposure ( <i>IR</i> )	<i>IR</i> : the estimated coefficient from a regression of a MNCs monthly holding period stock returns on the monthly percentage change in the 6M Libor.
▪ Foreign Exchange Rate ( <i>FER</i> )	<i>FER</i> : the estimated coefficient from a regression of monthly holding period stock returns on the monthly percentage change in ERI trade weighted index.
Multinationality ( <i>MULTI</i> )	<i>MULTI</i> : dummy variable, coded as 1 for firms reporting current or deferred foreign income taxes, and 0 otherwise.
<b>Control Variables</b>	
Profitability ( <i>PROFIT</i> )	<i>PROFIT</i> : Pretax income divided by total assets.
Size ( <i>SIZE</i> )	<i>SIZE</i> : natural logarithm of total assets.
Leverage ( <i>LEV</i> )	<i>LEV</i> : long term debt divided the total assets.
Cash Flow from Activities ( <i>CFOA</i> )	<i>CFOA</i> : cash flow from operating activities divided by total assets.
Industry ( <i>INDUS</i> )	<i>INDS</i> : dummy variable, coded as 1, if the UK SIC sections equals: (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> )	<i>YEAR</i> : a dummy variable, coded as 1, if any specific year ranged between 2006 and 2014 have seen the introduction, development or change in transfer pricing or linked legislation, otherwise is 0.

## 5 EMPIRICAL RESULTS

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### 5.1 Descriptive Statistics

Table 4, present's important descriptive statistics for the different variables considered in the present study, i.e., the dependent variable (*TPAGG*), independent variables (*IR*, *FER*, and *MULTI*) and the control variables (*PROFIT*, *SIZE*, *LEV*, *CFOA*, *INDS*, and *YEAR*).

As the results show in table 4, the *TPAGG* mean (0,701) indicates that approximately 70% of MNCs are above the allowed interest deduction legibility for income tax purposes in the UK. On other hand, regarding the financial derivatives instruments, the *IR* mean (0,533) indicates that MNCs have, approximately, 53% of their market value of equity exposed to interest rate changes in financial markets. At the same time, despite the *FER* variable (0,014) present less sensitivity of MNCs (1,4%) market value exposure to exchange rates, is still reasonable to argue that there is a positive sign and motivation to risk-averse CEO's and tax managers to reduce/mitigate the stock price exposure to volatile exchange rates and subsequently ease the volatility in MNCs stock base portfolio wealth.

In addition, another important result links the incorporation of subsidiaries in abroad jurisdictions as shown by the *MULTI* variable mean (0,872). Representing about 87% of the MNCs in the sample, the *MULTI* indicates that at least 1 subsidiary runs a business in a non-domestic jurisdictions, which definitely increases the probability of tax aggressive behaviors of MNCs.

Finally, the statistics presented for skewness and kurtosis allow to conclude a data set reasonably normally distributed. More specifically, from the skewness results we can verify that all variables, except the *MULTI* variable, present modest symmetry distribution to mean, as coefficients registered results close to 0, this is, between ] -0,5 and +0,5 [, as defined by Runyon et al. (1996, cited in Marôco, 2014, pp.22). Regarding the kurtosis, the overall distribution results coefficients remain within the range of ] -0,5 and +0,5 [, exception made to *TPAGG*, *FER* and *MULTI* that show slightly higher values, indicating a sharper peak. Despite these higher kurtosis coefficients registered, Westfall (2014) argues

that *higher kurtosis means more of the variance is the result of infrequent extreme deviations, as opposed to frequent modestly sized deviations.*

**Table 4 - Descriptive statistics - Variables Summary**

<b>Variable Summary</b>				
<b>Variables</b>	<b>Mean</b>	<b>STD.DEV</b>	<b>Skewness</b>	<b>Kurtosis</b>
TPAGG	0,701	0,458	-0,879	-1,230
IR	0,533	1,790	0,396	0,634
FER	0,014	6,337	-0,038	1,438
MULTI	0,872	0,334	-2,227	2,967
LEV	0,210	0,137	0,348	-0,414
PROFIT	0,080	0,061	0,424	-0,114
CFOA	0,098	0,060	0,318	-0,080
SIZE	15,218	1,292	0,308	-0,171
Valid N (listwise)	1053			

Table 5, reports industry summary descriptive statistics according to UK SIC codes. Considering the sample distribution (1053 firm-years), we verify that manufacturing industry counts with the greater fraction of MNCs included in the present study (25,641%), wholesale and retail trade counts with (14,530%), construction and information & communication (11,966%) and (10,256%), respectively. Professional, scientific and technical activities (9,402%) and mining and quarrying (7,692%) close the top six UK SIC codes industries with the highest contribution for the present sample data set.

Moreover, table 5 reports descriptive statistics on MNCs with transfer pricing aggressiveness behaviors only, per UK SIC codes. Consistent with the observations in the sample distribution, the *TPAGG* per industry classification presents the manufacturing (22,493%), wholesale and retail trade (12,195%) and construction (11,653%) as the industries in the UK with the highest number of MNCs frequently concurring with disallowed interest expenses for tax purposes, according to HMRC thin capitalization rules. In addition, information & communication (10,705%), professional, scientific and technical activities (10,569%), and mining and quarrying (7,182%) follow the tendency, although

with less frequency. Standard deviation for the majority of the variables shows a central tendency with the median results.

**Table 5 - Descriptive statistics - Industry Summary**

<b>Industry summary statistics</b>				
<b>UK Standard Industry Classification (SIC) Codes</b>	<b>Sample distribution</b>		<b>TPAGG per industry classification</b>	
	<b>No. of MNCs -Years</b>	<b>Relative Frequency (%)</b>	<b>No. of MNCs -Years</b>	<b>Relative Frequency (%)</b>
Section B - Mining and Quarrying	81	7,692%	53	7,182%
Section C - Manufacturing	270	25,641%	166	22,493%
Section F - Construction	126	11,966%	86	11,653%
Section G - Wholesale and retail trade	153	14,530%	90	12,195%
Section H - Transportation and storage	63	5,983%	61	8,266%
Section I - Accommodation and food service activities	36	3,419%	27	3,659%
Section J - Information and communication	108	10,256%	79	10,705%
Section L - Real estate activities	9	0,855%	5	0,678%
Section M - Professional, scientific and technical activities	99	9,402%	78	10,569%
Section N - Administrative and support service activities	54	5,128%	43	5,827%
Section O - Public administration and defence; compulsory social security	27	2,564%	24	3,252%
Section R - Arts, entertainment and recreation	18	1,709%	18	2,439%
Section S - Other service activities	9	0,855%	8	1,084%
<b>Total</b>	<b>1053</b>	<b>100%</b>	<b>738</b>	<b>100%</b>

Another important set of results is shown in table 6, by comparing all the 315 non-aggressive MNCs against 315 aggressive MNCs (includes 35 firms randomly picked for each period between 2006 and 2014). As we can verify, in average non-aggressive MNCs (0,630) are likely to present a slightly higher interest rate risk exposure (*IR*) when compared to aggressive MNCs (0,487) since non-aggressive MNCs behavior doesn't assume the practice of hedging activities to mitigate their market value risk exposure. Identical results are presented in the *FER* variable.

On other hand, the *MULTI* variable shows that aggressive MNCs (0,844) and non-aggressive MNCs (0,863) have similar structures concerning the number of foreign subsidiaries operating abroad. Further, consistent with Newberry and Dhaliwal (2001) and Rego (2003), the *LEV* variable also proves further evidence that aggressive MNCs (0,244) have great potential to exploiting tax deductions opportunities resulting from interest payments, loan fees and shifting debt amongst low tax jurisdictions when compared with non-aggressive MNCs (0,147). Overall results are in accordance with relevant literature presented above.

**Table 6 - Descriptive Statistics – Non -TPAGG vs TPAGG**

NON-TPAGG & TPAGG								
Variables	Mean		STD.DEV		Skewness		Kurtosis	
	NON TPAGG	TPAGG	NON TPAGG	TPAGG	NON TPAGG	TPAGG	NON TPAGG	TPAGG
IR	0,630	0,487	1,948	1,705	-0,046	0,733	1,417	0,079
FER	0,751	0,232	6,245	6,187	0,661	-0,178	1,166	0,907
MULTI	0,863	0,844	0,344	0,363	-2,128	-1,910	2,543	1,658
LEV	0,147	0,265	0,103	0,137	0,731	-0,008	0,519	-0,504
PROFIT	0,103	0,068	0,060	0,056	0,092	0,747	-0,436	0,820
CFOA	0,109	0,088	0,064	0,056	0,032	0,385	-0,376	0,322
SIZE	15,141	15,286	1,372	1,277	0,573	0,143	-0,208	-0,134
Total	630							

## 5.2 Correlation results

Table 7 summarizes the Spearman matrix results for the correlation coefficients. We find the presence of significant correlations between *TPAGG* and *LEV*, *PROFIT*, *CFOA*, at the 1% level, and *SIZE* at the 5% level of significance. Additionally, the study finds *TPAGG* to have a negative association with *IR* (-0,045) and *FER* (-0,039), in other words, as the aggressiveness in *TPAGG* behaviors increases, the sensibility of MNCs market value of equity to interest rates and foreign exchange rates volatility tends to decrease. These types of multinationals frequently recur to hedging contracts in order to reduce the risk exposure of their subsidiaries, increasing this way their appetite for aggressive behaviors amongst the group transactions. Other important conclusion to be made from the Spearman matrix relates the significant association between *TPAGG* and *LEV* (0,312;  $P > 0,01$ ), presenting further evidence on how MNCs with high debt to equity ratios tend to behave more aggressively compared to high capitalized MNCs.

Further, significant association between *TPAGG*, *PROFIT* and *CFOA* at (-0,253;  $P > 0,01$ ) and (-0,126;  $P > 0,01$ ), respectively, comply with the great potential that MNCs have to explore tax opportunities in high tax jurisdictions in order to reduce their taxable profits in the home country. Multicollinearity between exogenous variables is moderate, representing mid-low levels, in fact the highest correlation coefficients occurred between *PROFIT* and *CFOA* (0,403;  $P > 0,01$ ), which for the sake of the present study does not affect the legitimacy of the model results.

**Table 7 - Spearman/Kendall's Matrix Correlation**

	TPAGG	IR	FER	MULTI	LEV	PROFIT	CFOA	SIZE
TPAGG	-			0,16				
IR	- 0,045	-		0,000				
FER	- 0,039	0,059	-	0,035				
MULTI	-	-	-	-				
LEV	0,312***	0,023	0,041	- 0,062**	-			
PROFIT	- 0,253***	- 0,017	0,002	- 0,025	-0,107***	-		
CFOA	- 0,126***	0,047	- 0,014	0,001	0,044	0,403***	-	
SIZE	0,067**	0,041	- 0,033	0,086***	0,140***	- 0,077**	-0,121***	-

\*\*\* indicates significance at 0,01 level and \*\* indicates significance at 0,05 level.

The p-values are 2-tailed, once it aims to test for the possibility of the relationship in both directions.

### 5.3 Regression results

The logistic regression results presented in table 8 shows the probability of the exogenous variables influence transfer pricing aggressiveness behaviors at different significance levels of association. The *IR* coefficient ( $X^2Wald = 2,921$ ;  $p = 0,087$ ) shows significant evidence ( $p < 0,10$ ) that exposure to interest rates volatility boosts aggressive transfer pricing behaviors to be adopted by MNCs, thus supports H1. Consistent with Guay et al., (2003) and Keyes (2008) equity value exposure to interest rate volatility increases the usage of hedging instruments by MNCs, which consequently reflects their appetite to incur in aggressive transfer pricing behaviors across group transactions. Regarding the *FER* coefficient ( $X^2Wald = 7,725$ ;  $p = 0,005$ ), the results keep the *IR* variable tendency, this is, a significant coefficient at 1% level ( $p < 0,01$ ), which fully supports H1. Consistent with Zhang (2009) and Donohoe (2015) foreign exchange risk exposure incurred by MNCs subsidiaries enhances the MNCs likelihood for tax aggressiveness, since the high volume of daily transactions in different currencies may result in a loss, economically significant for the firm financial results.

On other hand, the *MULTI* variable coefficient ( $X^2Wald = 1,883$ ;  $p = 0,170$ ) in the model presents a result slightly above the level of significance of 10%, which does not supports H2. Despite this result, is reasonable to say that multinational corporations are still likely to

behave aggressively from the transfer pricing perspective. In other words, as supported by other important research articles (Hanlon et al., 2007 and Rego, 2003), the greater the level of MNCs multinational operations the greater the likelihood of those MNCs incur in transfer pricing aggressiveness transactions.

Regarding the control variables in the model, the coefficients results for *LEV* and *PROFIT* are significantly associated to aggressive transfer pricing behaviors at 1 % level. The *LEV* ( $X^2$ Wald = 78,454;  $p = 0,000$ ), and *PROFIT* ( $X^2$ Wald = 28,056;  $p = 0,000$ ), are statically significant at 1% level, which shows a strong linkage to transfer pricing aggressive behaviors as stated in Richardson and Taylor (2015) and Taylor et al., (2015). On other hand, regardless the *CFOA* variable does not present a statically significant result ( $X^2$ Wald = 1,679;  $p = 0,195$ ), seems appropriate to make reference for this variable significance due to its capacity to monitor the flow of funds to favorable tax jurisdictions (Dechow et al., 1998; and Hanlon, 2005).

Another important set of results to be considered in this study relates the *odds ratio*<sup>12</sup> (*OR*) as given by *Exp (B)*. The *OR* predicts the chances of non-aggressive (group 1) vs aggressive (group 2) transfer pricing behaviors occur given its exposure to each independent variable unit at a 95% confidence interval. As shown in table 8, the *IR* variable conditions ( $\text{Exp (B)} = 0,932 < 1$ ) presents a lower probability to occur in non-aggressive MNCs compared to aggressive MNCs, whom frequently recur to derivative instruments to reduce their interest rate exposure. In addition, the results for *FER* and *MULTI* variables, ( $\text{Exp (B)} = 0,968 < 1$ ) and ( $\text{Exp (B)} = 0,737 < 1$ ), respectively, present similar results, in other words, the conditions imposed in these two variables are more likely to occur in aggressive transfer pricing MNCs when compared to non-transfer pricing aggressive MNCs. Regarding the control variables (*PROFIT*, *CFOA* and *SIZE*) the results remains

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12 According to Szumilas (2010), “an odds ratio (*OR*) is a measure of association between an exposure and an outcome. The *OR* represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. Odds ratios are most commonly used in case-control studies, however they can also be used in cross-sectional and cohort study designs as well (with some modifications and/or assumptions). An odds ratio of 1(one) indicates that the condition or event under study is likely to occur in both groups, at the same hand, a ratio greater than 1 (one) indicates the likelihood that the condition or event is more likely to occur in the first group. Finally, an odd ratio lesser than 1 (one) indicates that the probability is lower in the first group than in the second “.

consistent with the independent variables *odds ratio* predictions, exception made to *LEV* variable ( $\text{Exp}(B) = 267,658 > 1$ ), which presents an *OR* above 1, indicating that leverage MNCs have higher chances to occur in non-aggressive MNCs. The McFadden pseudo  $R^2$  (0,141) shows a reasonable result, consistent with Richardson and Taylor (2011 and 2015) and Taylor et al., (2015).

To conclude, the overall regression indicates that MNCs have been employing aggressive behaviors from the transfer pricing perspective, given the significant coefficients obtained from the model. More specifically, MNCs with high market value exposure to interest rates and exchange rates tend to practice derivatives contracts to hedge intragroup volatility amongst controlled companies' activities. Multinationality also presents empirical evidence that higher number of related parties spread across favorable debt locations enhances transfer pricing aggressiveness.

**Table 8 - Logistic regression results - TPAGG**

	B	S.E.	X <sup>2</sup> Wald	Exp(B)	95% C.I.for EXP(B)	
					Lower	Upper
IR	-0,070	0,041	2,921*	0,932	0,860	1,010
FER	-0,032	0,012	7,725***	0,968	0,947	0,991
MULTI	-0,305	0,222	1,883	0,737	0,477	1,140
LEV	5,590	0,631	78,454***	266,658	77,697	922,049
PROFIT	-6,965	1,315	28,056***	0,001	0,000	0,012
CFOA	-1,744	1,346	1,679	0,175	0,013	2,445
SIZE	-0,020	0,059	0,119	0,980	0,873	1,100
YEAR				Yes		
INDUS				Yes		
Constant	0,583	0,937	0,386	1,791	-	-
Pseudo R <sup>2</sup> McFadden				0,140		
N				1053		

\*\*\* indicates significance at the 0,01 level, \*\* indicates significance at 0,05 level and \* indicates significance at the 0,10 level;

The p-values are 2-tailed, once it aims to test for the possibility of the relationship in both directions.

## 5.4 Robustness checks

In order to assess the regression model reliability and consistency, several robustness checks were performed to regression results in table 8. Firstly, it was executed a diagnostic to detect the presence of outliers and influent observations in the model, whereby a diagram for studentized residuals of the estimated probabilities and the analog of *Cook's* influence statistics were performed. The results obtained, present a reduced number of outliers above the reference, *i.e.*,  $|r_j| > 2$  (appendix 1), with no significant influence values over the regression coefficient. In addition, the analog of *Cook's* influences presents a few observations above the reference value, *i.e.*,  $DX2 > 4$  (appendix 2)<sup>13</sup>, however none of the *Cook's* distance points are above 1, which denotes the absence of influent observations on the model coefficients.

Secondly, it was developed an efficiency classification table which defines the sensibility and the specificity of the model. As shown in appendix 3, the model sensibility (0,897) classifies accurately in approximately 90% the MNCs with transfer pricing aggressiveness behaviors. Regarding the model specificity (0,286), it indicates that about 29% of MNCs securely present no transfer pricing aggressiveness behaviors. Globally, the model includes robust observations by properly classifying 71,4% firm-year observations, approximately.

Thirdly, it was performed robustness checks in the regression model capacity to discriminate *TP Aggressive MNCs vs TP Non-Aggressive MNCs*, using for this purpose the ROC curve analysis. As registered in appendix 4, the area under the curve ( $AUC = 0,775$ ) is considerable above the reference value of 0.5 ( $p < 0.01$ ), which represents a significant capacity of the logistic regression model to discriminate firms with aggressive transfer pricing behaviors from those with no aggressive transfer pricing practices.

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<sup>13</sup> DX2 represents the Hosmer and Lemeshow (2000) information about the influente observations in the model in function of the estimated probabilities given by  $\Delta\chi^2_1$ .

## 5.5 Additional analysis

In order to assess consistency on the dependent variable, the study considered the inclusion of alternative aggressive tax measures existent in the literature (Dyreng et al., 2008; Manzon and Plesko, 2002; Shevlin, 2010; and Lisowsky et al., 2013.,) denoted by ETRs, such as, the cash effective tax rate (*CASHETR*), the accounting effective tax rate (*ACCETR*), as well as, the book tax gap (*BTGETR*) from Manzon and Plesko, 2002. In fact, Dharmapala (2008) and Desai and Hines (2002) make reference for the intensity to which MNCs increase their international tax avoidance through transfer pricing activities. Moreover, very frequently these intragroup transactions take the form of financing schemes settled between MNCs treasury centers and its controlled subsidiaries where the main purpose is to explore, for instance, derivatives taxation inconsistency across jurisdictions since different tax treatments is a common practice. By having this into context I have extent the empirical analysis by considering relevant tax avoidance measures in the present literature denoted as follows:

(2) *ACCETR*: a dummy variable coded as 1 if the income tax expense registered (current and deferred taxes) divided by the pretax accounting income indicates a tax value below its market reference, and 0 otherwise;

(3) *CASHETR*: a dummy variable coded as 1 if the cash tax paid divided by the pretax accounting income is below to its reference and 0 otherwise;

(4) *BTGETR*: a dummy variable coded as 1 if the pretax accounting income less taxable income, divided by the total assets indicates a tax difference below to its reference, and 0 otherwise.

All three MNCs effective tax rates measures are classified as a dummy variable, which takes into consideration a benchmarking reference. Thus, MNCs presenting effective tax rates below the eligible reference are classified as aggressive tax players. The base logistic regression for the model is designed to include all three ETR's, separately, and is estimated as follows:

$$\text{ETR's}_{it} = \alpha_{it} + \beta_1 \text{IR}_{it} + \beta_2 \text{FER}_{it} + \beta_3 \text{MULTI}_{it} + \beta_4 \text{PROFIT}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{LEV}_{it} + \beta_7 \text{CFOA}_{it} + \beta_8 \text{INDS}_{it} + \beta_9 \text{YEAR}_{it} + \varepsilon_{it} \quad (5.2; 5.3; \text{ or } 5.4, \text{ respectively})$$

Table 9 presents the additional regression  $X^2$ Wald coefficient results. In general I found consistency and evidence amongst the tax avoidance ETR's (ACCETR, CASHETR and BTGETR) and the transfer pricing aggressive measure as presented in model one (1). By considering the ACCETR, the relevant conclusion to be made against the results obtained from table 8 concerns the MULTI variable, which shows a positive and significant coefficient ( $X^2$ Wald = 3,316;  $p = 0,069$ ) at 10% level. Additionally, I found the IR coefficient ( $X^2$ Wald = 3,038;  $p = 0,081$ ) and FER coefficient ( $X^2$ Wald = 12,147;  $p = 0,000$ ) to have a significant association to ACCETR at 10% and 1% levels, respectively, which denotes reliability and robustness for the result obtained in model (1). Similar conclusions applied to LEV coefficient ( $X^2$ Wald = 15,002;  $p = 0,000$ ) and PROFIT coefficient ( $X^2$ Wald = 15,226;  $p = 0,000$ ).

Regarding the CASHETR, the results presented less significant coefficients for the generality of the variables, however, the IR, FER and LEV variables, ( $X^2$ Wald = 3,514;  $p = 0,061$ ), ( $X^2$ Wald = 8,977;  $p = 0,003$ ) and ( $X^2$ Wald = 3,954;  $p = 0,047$ ) respectively, remain a significant tendency association between tax aggressiveness/avoidance behaviors, interest rates, foreign exchange rates and high leveraged MNCs..

Finally, the BTETR measure reinforces the significance association registered between tax avoidance and the IR variable ( $X^2$ Wald = 2,933;  $p = 0,087$ ) at 10% level. Additionally it brings evidence that sizable, i.e., SIZE ( $X^2$ Wald = 8,212;  $p = 0,004$ ), MNCs are has significant influence on tax aggressiveness/avoidance behaviors since their robust structure is more capable to raise capital at lower costs and distribute across related parties in favorable circumstances.

**Table 9 - Logistic regression results – ETR's**

	ACCETR (LOGIT)	CASHETR (LOGIT)	BTETR (LOGIT)
	X <sup>2</sup> Wald	X <sup>2</sup> Wald	X <sup>2</sup> Wald
IR	3,038*	3,514*	2,933*
FER	12,147***	8,977***	0,469
MULTI	3,316*	0,081	1,697
LEV	15,002***	3,954**	9,539***
PROFIT	15,266***	0,527	1,925
CFOA	1,214	0,016	0,135
SIZE	0,773	0,041	8,212***
YEAR	Yes	Yes	Yes
INDUS	Yes	Yes	Yes
Constant	5,085	3,153	12,850
Pseudo R <sup>2</sup> McFadden	0,078	0,019	0,061
N		1053	

ETR's variables definition: *ACCETR* is defined as the income tax expense (current and deferred taxes) divided by the pretax accounting income. *CASHETR* is measured by the cash tax paid divided by the pretax accounting income. *BTETR* is calculated as a pretax accounting income less taxable income, divided by the total assets.

\*\*\* indicates significance at the 0,01 level, \*\* indicates significance at 0,05 level and \* indicates significance at the 0,10 level;

The p-values are 2-tailed, once it aims to test for the possibility of the relationship in both directions.

## 6 CONCLUSION

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The present study identifies the influence of derivatives instruments on transfer pricing aggressiveness behaviors of public listed multinational firms in the U.K. In line with relevant literature, I found empirical evidence on derivative instruments practices to be significantly associated with transfer pricing aggressiveness, contributing this way for one of the leading source of corporate tax noncompliance. By this means, having the previous results into context, is appropriate to certify the *TPAGG* proxy contribution for future research projects, since it revealed significance and reliance on the logistic regression of derivatives instruments on transfer pricing aggressiveness. Moreover, additional contribution is given by including important practices and methodologies as suggested in BEPS action plans.

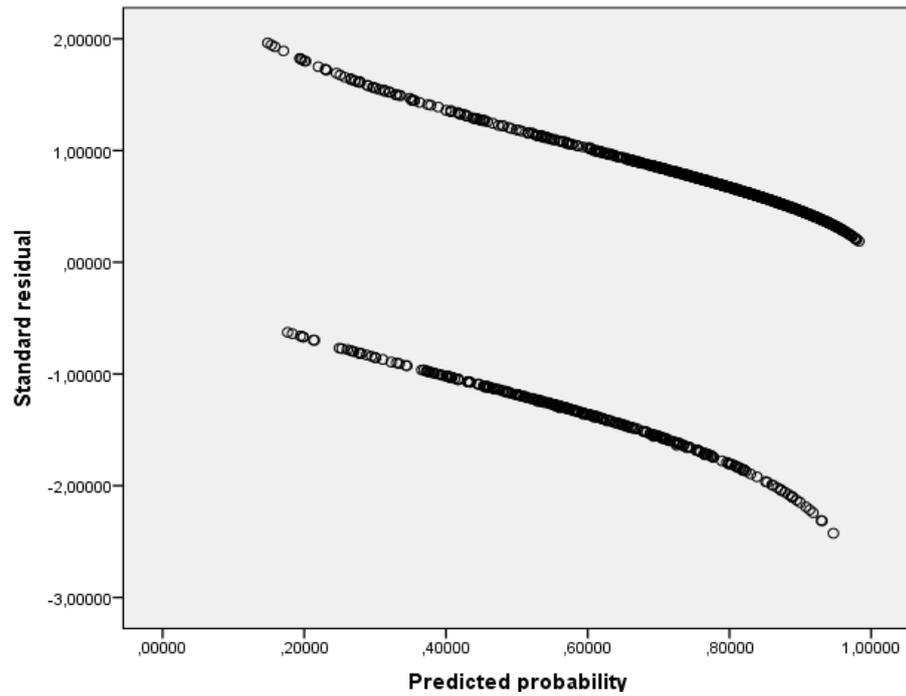
Despite the reliable results achieved in regression model one (4.1), consistent with the additional analysis models (5.2, 5.3 and 5.4), the study is subject to several limitations such as, (i) the sample considers only publicly listed MNCs in the UK since data for private MNCs are not available for consultation, (ii) the transfer pricing aggressiveness variable takes into account aggregated financial information at the group level, not individually by treasury center, (iii) an MNCs decision to use derivatives is, in the majority, defined by unobservable factors, so further approaches should be considered in order to mitigate potential concerns, *e.g.*, document whether tax savings increases with aggressive transfer pricing behaviors.

In the future, transfer pricing aggressiveness researches could take into consideration different aspects, capable to contribute for the extent and sophistication of the theme. For instance, (i) explore how the different accounting treatment on derivatives across countries influence the MNCs tax behaviors on financing subsidiaries, (ii) measure the impact of the recent transfer pricing BEPS initiatives on countries (OECD and non-OECD) tax compliance and governance, and (iii) extent literature on corporate tax avoidance and financial instruments, other than derivatives, such as, special purpose vehicles and hybrid mismatch arrangements on intragroup financing.

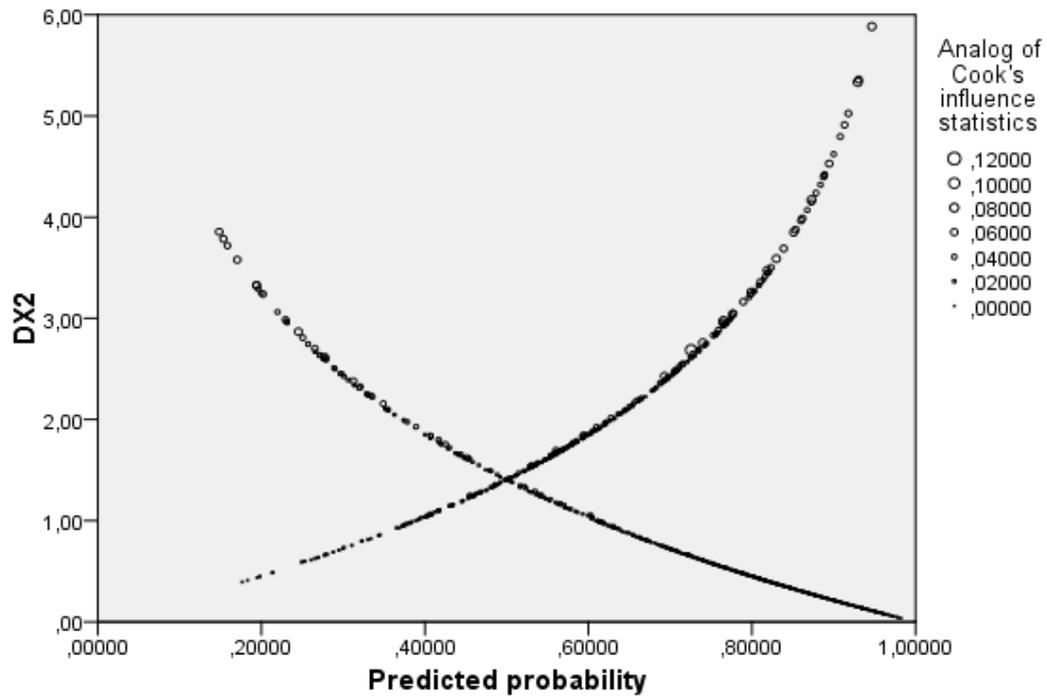
## APPENDICES

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### Appendix 1 - Diagram for studentized residuals



## Appendix 2 - Analog of Cook's influence statistics



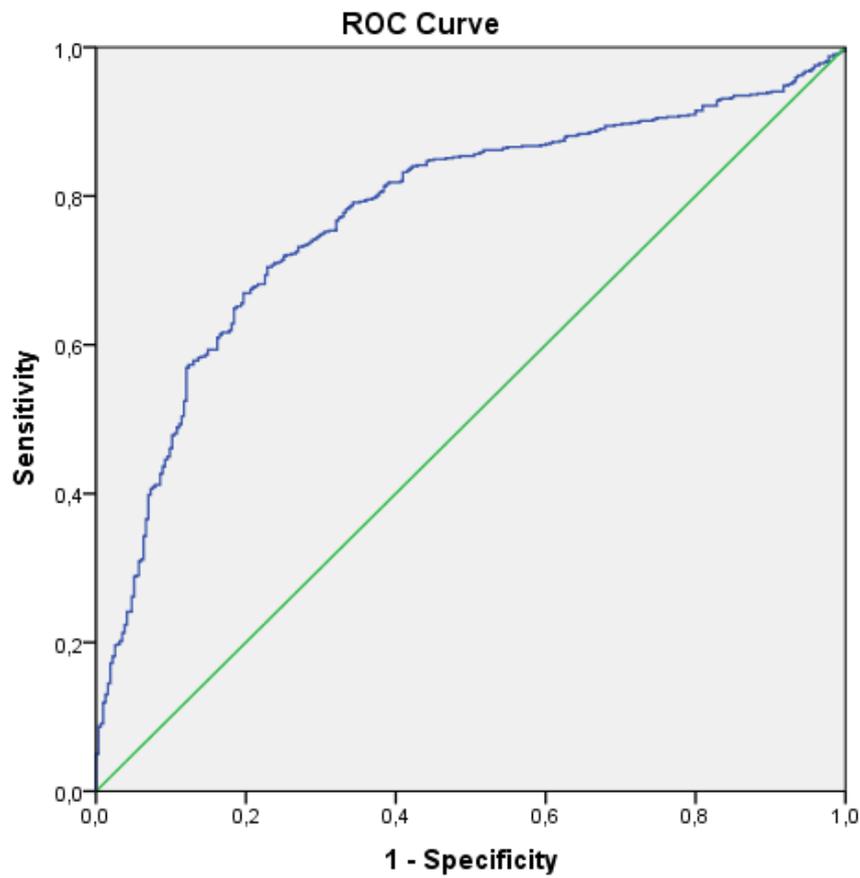
### Appendix 3 - Efficiency classification table

Classification Table<sup>a</sup>

Observed			Predicted		
			TPAGG		Percentage Correct
			TP NON AGRESSIVE	TP AGGRESSIVE	
Step 1	TPAGG	TP NON AGRESSIVE	90	225	28,6
		TP AGGRESSIVE	76	662	89,7
	Overall Percentage				71,4

a. The cut value is ,500

## Appendix 4 - ROC curve analysis



**Area Under the Curve**

Test Result Variable(s): Predicted probability

Area	Std. Error <sup>a</sup>	Asymptotic Sig. <sup>b</sup>	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
,775	,015	,000	,745	,805

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

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