GLOBAL TAX TRANSPARENCY AND TAX BEHAVIOUR: EMPIRICAL EVIDENCE FOR THE EFFECTS OF COUNTRY-BY-COUNTRY REPORTING ON TAX AVOIDANCE AND INCOME SHIFTING

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Abstract

Tax transparency and exchange of information are at the heart of a global effort to tackle aggressive tax planning of multinational corporations (MNCs). Policymakers worldwide, including within the Organisation for Economic Co-operation and Development, the G20 nations, the European Union, the Financial Accounting Standard Board, and the United Nations, have strived to enhance tax disclosures. Even with this push for global tax transparency, evidence is lacking about whether regulations achieve the desired effects. This dissertation examines the corporate tax avoidance and income shifting of European Union MNCs following the adoption of two transparency rules: private country-by-country reporting under Action Item 13 of OECD's base-erosion and profit-shifting project and public country-by-country reporting under Capital Requirements Directive IV.

In examining response to private country by country reporting, I document no significant difference in tax-motivated income shifting in the three-year post-adoption period. However, starting in 2018, I find that affiliates of European Union MNCs engaged in significantly less profit shifting. I also find robust evidence of an increase in effective tax rates of European Union MNCs subject to private country by country reporting. Overall these results suggest that, while the introduction of private country by country reporting led to a significant decline in firm-level tax avoidance, the impact on affiliate-level income shifting has been limited. In examining the effects of public country-by-country reporting, I document a significant decrease in the income shifting by the industrial affiliates of European multinational banks subject to the disclosure requirements.

The findings of this study have important policy implications for the global implementation of country-by-country reporting and extend the debate on public versus private disclosure of tax information.

This dissertation consists of three chapters. The first contains the introduction, background, and literature review. The second examines the effects of private country by country reporting, and the third examines the impact of public country by country reporting.

Dedication

This dissertation is dedicated to my husband Rahul. He motivated me to pursue my doctoral degree and supported me at each and every step.

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List of Acronyms and Abbreviations

BEPS	Base erosion and profit shifting
BTE	Book tax expense
CAR	Cumulative abnormal return
CbCr	Private Country-by-country reporting
CbCR	Public Country-by-country reporting
CETR	Cash effective tax rates
CRD IV	Capital Requirements Directive IV
DID	Difference-in-difference
ETR	Effective tax rates
EU	European Union
FASB	Financial Accounting Standard Board
GUO	Global ultimate owners
IPW	Inverse probability weighting
LogTA	Log of total assets
MNC	Multinational corporations
MNB	Multinational banks
OECD	Organisation for Economic Co-operation and Development
PTI	Pre-tax income
RD	Regression discontinuity
RDD	Regression discontinuity design
ROA	Return on assets
STR	Statutory tax rate

Chapter One:
Introduction, Background, and Literature Review

1.0 INTRODUCTION

Disclosure regulations are increasingly used as public policy instruments to discourage certain corporate behaviours and business practices (Leuz and Wysocki [2016]). Consistent with this view, to tackle aggressive tax planning by MNCs, several tax transparency initiatives have been introduced worldwide. For example, prior to the introduction of Statement of Financial Accounting Standards No. 131 (SFAS 131) in the United States, MNCs were required to disclose geographically segmented earnings along with information on geographically segmented sales and assets.[1] Furthermore, SEC regulations require that MNCs disclose the location of significant subsidiaries in Exhibit 21. In the United Kingdom, the Company Act of 2006 requires firms to disclose the name and location of all subsidiaries owned by a British multinational corporation. Australia, Norway, Sweden, Finland, and Japan (until it was abolished in 2005) all require public disclosure of some tax information for companies incorporated or operating in these countries.

In 2013, the Organisation for Economic Co-operation and Development (OECD) introduced private country-by-country reporting requiring firms to provide a geographic breakdown of several key financial, operational, and tax metrics to each tax jurisdiction in which they do business. Similarly, the European Union introduced public country-by-country reporting in 2013 under Capital Requirements Directive IV (CRD IV) for the banking sector. Despite the transformation in the global landscape of tax transparency, little is known about the effectiveness of such initiatives in combatting aggressive tax planning. This dissertation examines corporate tax avoidance and profit shifting of European Union (EU) firms following the introduction of private and public country-by-country reporting.

[1] After SFAS 131, disclosure of geographic earnings is now voluntary for most firms.

2.0 BACKGROUND

In this section, I review the various country-by-country reporting (CbCr) mandates that are central to my dissertation. The first part of the review (section 2.1) provides a discussion of the opacity in existing accounting and tax reporting requirements which leads to the introduction of transparency initiatives like country-by-country reporting. In section 2.2, I discuss the difference between public and private country-by-country reporting. Sections 2.3 to 2.5 provide a discussion of the three major country-by-country reporting mandates that have been introduced in the last five years. Finally, in section 2.6, I provide a synopsis of a potential country-by-country reporting mandate that is being proposed by the European Commission.

2.1 Country-by-Country Reporting

Tax avoidance is facilitated by a lack of transparency in MNCs' financial and tax accounts (Murphy [2009]). The financial statement disclosure of MNCs is aggregated at a consolidated level with no requirement for the MNCs to publish a geographic breakdown of their operations or financial results under current international accounting standards. As a result, most of them provide segmented information only along product or division lines. Even though financial results are published on consolidated bases, each member company of these groups is taxed individually in the country of operation.

To better understand the disconnect between accounting and tax filing obligation, consider the example of the following corporate group.

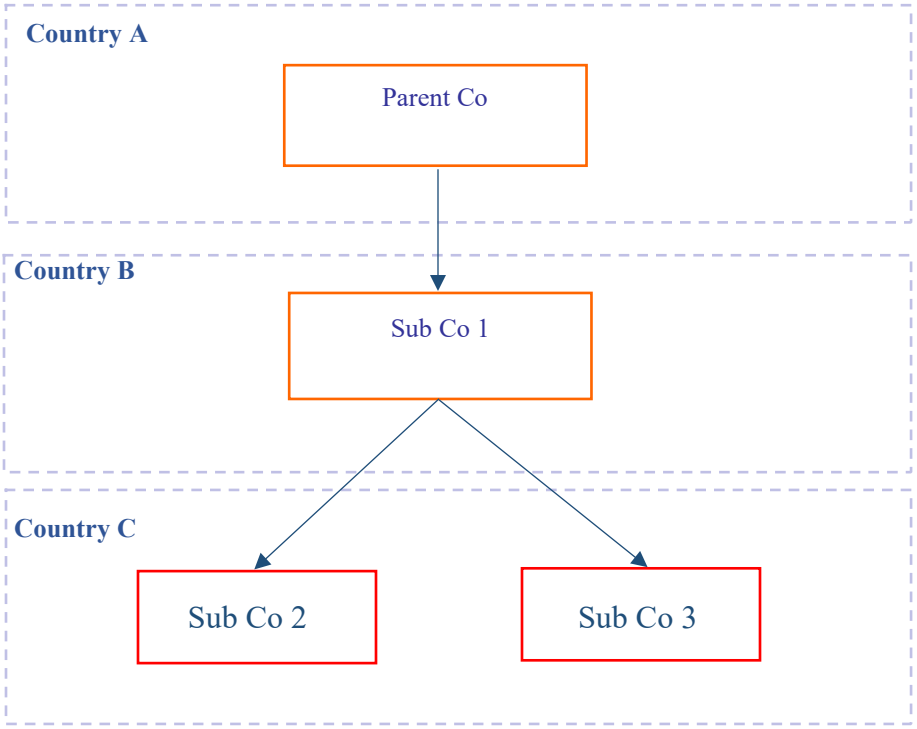

Illustration: Disconnect between accounting and tax filing obligations.

For accounting purposes, this group will prepare consolidated financial statements that capture the financial results of all underlying entities. This disclosure will, however, not provide any information on country-level profitability, activity level, or tax liability. For tax purposes, a separate tax return will be filed for each entity in the respective jurisdictions, and the filing obligation will be governed by the domestic tax rules in each jurisdiction. In Country A, for example, Parent Co. will file a comprehensive tax return. In Country B, Sub-Co. 1 will make its tax filings. In Country C, Sub-Co. 2 and Sub-Co. 3 will file either a joint or individual tax returns. The most comprehensive set of tax disclosures will be made in the resident jurisdiction (Country A). In Countries B and C, tax disclosures will be limited to income earned and taxes paid in the

respective jurisdictions. Such fragmented disclosures impede tax authorities from detecting aggressive tax planning strategies used by MNCs.

To eliminate the discrepancy in information disclosed by the same MNCs in different jurisdictions and to enhance tax transparency on a global scale, a new type of annual report, *Country-by-Country Reporting*, has been introduced. Writing on behalf of the Association for Accountancy and Business Affairs, Richard Murphy [2003] first proposed the concept of country-by-country reporting as an International Accounting Standard in 2003. Country-by-country disclosures provide governments and other interested parties with information that allows them to appraise a transnational corporation with regard to its corporate social responsibility, investment risk, tax risk, contribution by way of value added to the societies in which it operates, and contribution to national well-being by way of tax payments within those locations (Murphy [2003]).

2.2 Public vs. Private Country-by-Country Reporting

Two types of country-by-country reporting frameworks have been recently introduced: private and public. In the former, country-level information is disclosed directly to the tax authorities; in the latter, this information is published in the public domain, similar to financial statement disclosures. Another difference between these two types of transparency frameworks is that private disclosures are more detailed than public ones. For example, under BEPS Action Item 13, firms must provide a geographic breakdown of their related-party and third-party revenue.

The oldest CbCr regime was introduced as a public disclosure for the extractive industries under the Extractive Industries Transparency Initiatives (EITI) in 2013. The European Union next mandated public CbCr for the financial sector. The most recent (and the most widely implemented)

initiative is private CbCr under the OECD's Base Erosion and Profit Shifting project (BEPS Action Item 13).

2.3 Extractive Industries Transparency Initiatives

The EITI is considered the global standard for the good governance of oil, gas, and mineral resources industries (EITI [2017]).[2] Its primary objective is to improve tax compliance in developing countries, where taxation of natural resources is often a significant source of government revenue (UNCTAD [2015]) and where concerns about corporate tax evasion are widespread (e.g., Oxfam [2014]). The EITI Standard has been implemented in 52 countries around the world. It requires the disclosure of information all along the extractive industry value chain: from the point of extraction, to how the revenue makes its way through the government, to how it contributes to the economy. The standard also requires disclosure of the allocation and registration of licenses and contracts, the payments for them, their beneficial owners, the fiscal and legal arrangements, the amount of production, the location where revenues are allocated, and the contribution to the economy, including employment. Each of the 52 countries is required to publish to an annual EITI report disclosing information on contracts and licenses, production, revenue collection, revenue allocation, and social and economic spending (Wikipedia [2019]).

[2] The first report under EITI was published in 2013. For more information, see EITI [n.d.].

2.4 Capital Requirement Directive (CRD) IV

Following the financial crisis of 2008,[3] the Basel Committee on Banking Supervision[4] issued a new framework of "global regulatory reforms" that were intended to strengthen global capital and liquidity rules with the goal of promoting a more resilient banking sector. The objective of the reforms was to "improve the banking sector's ability to absorb shocks arising from financial and economic stress, whatever the source, thus reducing the risk of spillover from the financial sector to the real economy" (Bank for International Settlements [2011], p.1). These reforms also aimed to improve risk management and governance as well as strengthen banks' transparency and disclosure (Bank for International Settlements [2011]).

The European Union implemented most of the changes recommended in Basel III in Directive 2013/36/EU (otherwise known as Capital Requirements Directive IV), which was published on June 26, 2013. The focus of CRD IV is to improve the quality and quantity of banks' regulatory capital, to improve their liquidity and leverage, and to enhance the risk coverage of their capital base. EU member states were required to implement CRD IV by January 1, 2014, with the first reporting from June 30, 2014. In addition to the changes recommended by Basel III, the EU Commission introduced further changes, one of which was "enhanced governance." The commission stated that the proposal "will introduce clear principles and standards applicable to corporate governance arrangements and mechanisms within institutions" (European Commission

[3] The International Monetary Fund estimated that crisis-related losses incurred by European banks between 2007 and 2010 approximated €1 billion or 8 percent of the European Union's total GDP (European Commission [2011]).

[4] The committee included representatives of Belgium, France, Germany, Italy, Luxembourg, Netherlands, Sweden, Spain, Switzerland, and the United Kingdom.

[2011]). The Commission did not target specific risk-taking activities, such as aggressive tax planning.

Consistent with the commission's goal of increasing accountability in the financial sector, in February 2013, members of the European Parliament introduced a proposal that would require each institution subject to CRD IV to disclose specific information publicly on a "country-by-country" basis, beginning from January 1, 2015. This proposal, adopted as Article 89 to CRD IV, requires institutions to disclose on a consolidated basis the (a) name(s), nature of activities, and location; (b) turnover; (c) number of employees on a full-time equivalent basis; (d) profit or loss before tax; (e) tax on profit or loss; and (f) public subsidies received. EU MNBs were required to disclose (a), (b), and (c) by July 1, 2014, but the rest of the items did not have to be made public until 2015. The additional data requirements—items (d), (e) and (f)—only applied to EU Global Systemically Important Institutions (G-SIIs) starting in 2014, and these data are required to be submitted to the European Commission confidentially. Institutions must publish the required information as an extension to their annual reports.

2.5 BEPS Action Item 13

MNCs employ numerous strategies that exploit the gaps and mismatches in international tax rules and to artificially shift profit from high-tax to low-tax counties. To combat the use of such aggressive and complex tax-planning schemes, the OECD, in collaboration with the G20 nations, introduced a comprehensive, coherent, and coordinated reform of the international tax system in 2013. This reform gave rise to the Base Erosion and Profit Shifting Project (BEPS). The BEPS was motivated by concern that MNCs were exploiting the "boundaries of acceptable tax planning" (OECD [2013b], p. 8), thus depriving governments of substantial tax revenue. The BEPS has three

fundamental pillars: coherence in the domestic tax rules, alignment in international tax systems, and enhancement of global tax transparency.

The BEPS consists of 15 distinct action items, including Action Item 13. This item aims to enhance global tax transparency. It focuses on providing tax administrations with adequate information to assess high-level transfer pricing and other BEPS-related issues, by requiring MNCs (in participating countries) with at least €750 million in annual revenue to prepare and disclose to the tax authorities a master file, a local file, and specific country-level information (OECD [2015]). The master file contains details on the overall operations of the multinational group as well as on the group transfer-pricing policy. The local file provides information on transactions between the reporting entity and other affiliates and offers an overview of transfer pricing used in intercompany dealings. The third and most significant feature of Action Item 13 is CbCr. The OECD intends CbCr to be used by governments for "high level transfer pricing risk assessment, the assessment of other BEPS-related risks, and economic and statistical analysis" (OECD [2015]).

Rules on CbCr were approved by the EU member states on March 8, 2016, and formally adopted on May 25, 2016, with an effective date of January 1, 2016 (European Commission [2017]). In the European Union, a primary reporting obligation under CbCr arises when there is a multinational group, and either the ultimate parent or a member of the group resides in an EU member state.[5] If the ultimate parent of the group is tax-resident in an EU member state, then that company needs to file the report. If the ultimate parent resides outside the European Union, EU subsidiaries must report (via "secondary reporting") if certain conditions are met. A secondary

[5] A multinational group is defined as a group of enterprises resident in more than one tax jurisdiction that prepares consolidated financial statements (or would be required to do so if any members were publicly traded).

reporting obligation arises under following circumstances: the parent is not required to file a report in its jurisdiction of residence, there is no effective automatic exchange of reports between the parent's jurisdiction and that of the EU subsidiaries, or the parent's jurisdiction does not in practice exchange ("systemic failure").

Under CbCr, the following information needs to be disclosed for every jurisdiction where the group operates: revenue (split between related and unrelated entities), profit or loss before income tax, income tax paid and accrued, stated capital, retained earnings, and the number of employees and tangible assets.[6] Note that the reporting requirements under CbCr are more detailed than other public CbCr regimes, like CRD IV and EITI. For example, under CbCr, the revenue disclosed has to be broken down between related- and unrelated-party revenues. Moreover, the information disclosed under CbCr is based on tax results, whereas other CbCr regimes report financial results for the most part (except cash taxes paid, which is a tax number). As of 2017, more than 100 countries around the world have ratified and have either already implemented or are in the process of implementing Action Item 13, making it the most widely implemented transparency initiative ever to be introduced.

CbCr can also aid tax authorities in enforcing "formula apportionment". Under formulary apportionment, a multinational corporation would allocate its taxable income across countries based on a measure (or measures) of its economic activity (i.e., sales, payroll cost, and employment) in each location. Because firms would no longer have to allocate income or expenses across countries for tax purposes, formula apportionment can reduce the tax system's complexity and the administrative burden for firms. Moreover, under formulary apportionment, intra-firm

[6] All technical guidance on BEPS Action Item 13 in EU is obtained from the EU Directive & EY Summary of Country by Country Reporting in Europe.

transactions would not affect the measure of domestic profits, and there would be no need for transfer-pricing rules, which would remove a major source of dispute between corporations and tax authorities.[7]

Though formula apportionment has received increased attention recently, it is still not used widely, due to the disconnect in international tax rules and limited sharing and exchange of information across jurisdictions. Because CbCr provides tax authorities with a detailed geographic breakdown of MNCs activities and profitability, it can be used to implement formula apportionment.

2.5.1 Automatic Exchange of Country-by-Country Report

To further enhance global tax transparency, the OECD introduced the automatic exchange of country-by-country reports for private use by tax authorities only. Under Action Item 13, CbCr forms are annually submitted by the parent company for the entire group in the resident jurisdiction.[8] This report is then shared with tax authorities with which the resident jurisdiction has established a bilateral exchange relationship[9] (OECD [2015]). For example, MNC A, headquartered in the United Kingdom with operations in Canada, Barbados, and France, will submit a report in the United Kingdom, which will be shared with tax authorities in the other countries. To secure an efficient and consistent implementation of the automatic exchange of CbCr, the OECD developed the Multilateral Competent Authority Agreement on the Exchange of Country by Country Reports.

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[7] https://www.taxpolicycenter.org/briefing-book/how-would-formulary-apportionment-work

[8] Resident jurisdiction refers to the jurisdiction in which the parent entity is resident.

[9] Exchange relationship refers to whether a jurisdiction has adopted the Multilateral Competent Authority Agreement on the Exchange of Country by Country Reports.

The primary advantage of the automatic exchange of information is that tax authorities in all jurisdictions get access to the same disclosures, irrespective of the extent of activities in that jurisdiction or the local tax disclosure requirements. The exchange of information is, however, limited to country-level disclosures; other disclosures under Action Item 13 (e.g., master file and local file) are submitted to the local tax authority and are not shared with other jurisdictions.

As of 2017, more than 2,000 relationships for the exchange of CbC reports have been activated. These include relationships between the G20 nations and OECD members, between the 28 EU member states under European Council Directive, and between jurisdictions that have bilateral qualifying competent agreements in effect (including bilateral arrangements between the U.S. and over 35 jurisdictions (OECD [2017]).

2.6 Proposed Public Country-by-Country Reporting in the European Union

In 2016, the European Commission proposed a directive requiring large MNCs to publish key information about where they make their profits and where they pay their tax in the European Union, on a country-by-country basis. If implemented, the initiative will also require MNCs to disclose how much tax they pay outside the union. These additional transparency requirements will apply to all MNCs that operate in any EU member state and have consolidated revenue in excess of €750 million. The proposal builds on the European Commission's work to tackle corporate tax avoidance in Europe.

In response to the European Commission's proposal, EU member states issued an initial informal position, according to which the scope of the disclosure requirements would be restricted. For instance, for member states, reporting requirements should only cover corporations that are "operating"in the union. The European Commission, in turn, has indicated that the proposed change would allow shell companies, which often play a central role in the tax avoidance of large

multinationals, to be excluded from the reporting obligation (Eurodad [2017]). Given the lack of consensus regarding the scope of the proposed directive, public CbCr in the European Union has not been implemented. It awaits a final vote in the European Commission.

3.0 LITERATURE REVIEW

In this section, I review the extant research relevant to my dissertation. In section 3.1, I provide a high-level synopsis of a long line of literature on tax avoidance. Section 3.2 discusses the literature that studies the impact of disclosure of tax information on a firm's tax behaviour, with subsection 3.2.1 focusing on private disclosure and subsection 3.2.1 focusing on public tax disclosures. Section 3.2.2 is relevant for part three of the dissertation, where I study the different consequences of public CbCr directives. As the public CbCr directive I use in part three (CRD IV) only applies to financial firms, I also provide a discussion of papers that have studied tax avoidance and income shifting in the financial sector (sections 3.1.1 and 3.3.2). In section 3.3, I discuss the literature on income shifting and conclude with a discussion of the impact of increased tax transparency on a firm's tax behaviour. Finally, in section 3.4, I introduce the emerging literature on CbCr and discuss a few concurrent working papers that have used different CbCr directives to examine various research questions. I conclude the literature review with a discussion on why CbCr under Action Item 13 provides a unique setting to examine the impact of global tax transparency on a firm's tax behaviour.

3.1 Tax Avoidance

Interest in corporate tax planning has accelerated in recent years as a combination of political, economic, and technological factors have fuelled the public's focus on corporate decisions, including corporate tax behaviour (Wilde and Wilson [2018]). The literature on tax planning is,

however, well established, and the initial papers can be traced back to the 1970s. In one of the earliest reviews of the tax accounting literature, Shackelford and Shevlin [2001] noted that, up to the mid-1980s, legal studies and policy analysis dominated tax research. The introduction of the Scholes-Wolfson [1992] framework led to a significant increase in positive tax-accounting research. In the traditional Scholes and Wolfson [1992] framework, effective tax planning is defined as steps taken by a firm to minimize its explicit tax burden. Scholes and Wolfson's [1992] model emphasized the importance of considering all parties, all taxes, and all costs in evaluating tax management decisions. Consistent with this view, in one of the seminal papers in this literature, Dyreng et al. [2008] show that effective tax rates (a common measure of tax avoidance) are a choice variable, suggesting that firms can strategically avoid taxes over the long run.

Over the last two decades, a number of papers have focused on defining and measuring different forms of tax avoidance (Desai and Dharmapala [2006], [2009]; Hanlon [2003]; Frank, Lynch, and Rego [2009]; McGill and Outlay [2004]). Another dominant theme in this literature was the examination of the association between firm attributes and corporate tax outcomes. Papers in this subset of the literature have found that firm attributes, such as size (Zimmerman [1983]), planning costs (Mills, Erickson, and Maydew [1998]), international operations (Rego [2003]), its information environment (Gallemore and Labro [2015]), internal control mechanisms (Bauer [2016], De Simone, Ege, and Stomberg [2015]), business strategy (Higgins, Omer, and Phillips [2015]), financial constraints (Edwards, Schwab, and Shevlin [2016b], Law and Mills [2015], Dyreng and Markle [2016]), and tax havens (Dyreng and Lindsey [2009], Dyreng, Lindsey, Markle, Shackelford [2015]), facilitate tax planning.

A number of papers have also examined the association between agency costs and tax avoidance, with a focus on ownership structure. In this stream of work, research highlights the

effect of ownership structure incentives (S. Chen, X. Chen, Cheng, and Shevlin [2010]), dual-class ownership structure (McGuire, Wang, and Wilson [2014b]), and private versus public firm ownership (Badertscher, Katz, and Rego [2013], Mills and Newberry [2001]) on tax outcomes.

3.1.1 Tax Avoidance in the Financial Industry

As discussed in section 3.1, academic research on corporate tax avoidance has grown, benefiting from new data sources, developments in tax avoidance measures, and improved econometric techniques (Donohoe, McGill, and Outslay [2014]). However, current research has focused primarily on the corporate tax behaviour of industrial firms; as a result, empirical evidence on the tax avoidance of financial institutions is still limited.

Although banks appear to be able to pass on a significant portion of their tax burden to their customers (Demirgüç-Kunt and Huizinga [1999], Cardoso [2003], Albertazzi and Gambacorta [2010]), there is evidence that they still avoid corporate taxation. Wilson and Wolfson [1990] examine whether changes in tax rules can explain banks' financing and investment policies and document a significant shift in bank holdings of municipal bonds attributable to changes in the tax deductibility of interest expense. Subsequently, Hemmelgarn and Teichmann [2014] analyze the effect of corporate income tax reforms on banks' leverage, dividend policies, and earnings management and find that taxation influences all three decisions. In a more recent paper, Andries et al. (2017) document that the use of loan-loss provisions increases with the tax rates in countries that allow general provision tax deductibility. These studies suggest that the corporate tax rate helps determine banks' financial reporting, investment, and capital structure decisions, and that, similar to industrial firms, banks attempt to reduce their overall tax liability, albeit through different means.

These findings also are supported by anecdotal evidence. For example, in 2003, the SEC exposed at least 10 major U.S. banks that were responsible for sheltering hundreds of millions of dollars from federal and state income taxes through private investment funds that paid tax-exempt dividends (Simpson [2003]). In the United Kingdom, a study by an independent tax group research in 2005 reported that five of the world's largest investment banks paid no UK corporate tax, even though they earned billions of dollars of profit there (Austin [2015]).

3.2 Tax Disclosures and Tax Avoidance

To curb the significant tax benefits derived by MNCs from tax planning (e.g., Blouin, Krull, and Robinson [2012], Klassen and Laplante [2012], Markle [2016]), regulators and policymakers worldwide have introduced reforms of the domestic and international tax systems (e.g., the BEPS Project). Tax authorities have also pushed for greater disclosure of firms' tax activities, ranging from uncertain tax position disclosures in the United States (Towery [2017]) to CbCr standards. In addition, public outcry against corporate tax planning from activist groups (Dyreng, Hoopes, and Wilde [2016]) and the media have placed a spotlight on corporate tax decisions. As such, over the last five years, the focus in the tax avoidance literature has shifted to evaluating the impact of policies and initiatives that have been designed to combat tax avoidance by MNCs.

3.2.1 Private Tax Disclosures

Private tax disclosures can provide the transparency necessary for tax authorities to detect aggressive tax planning. The theory of tax evasion also predicts that compliance and enforcement will increase with higher detection risk (Allingham and Sandmo [1972]). If disclosures to tax authorities increase the detection risk, then there should be a corresponding increase in the costs

associated with implementing aggressive tax planning, which should, in turn, reduce the level of tax avoidance.

Empirical research on the association between disclosure to tax authorities, detection risk, and tax enforcement is limited due to data constraints.[10] In one of the first papers that studied this issue, Mills (1998) documented that an increase in geographic and tax-related disclosures can aid tax authorities with their decisions to allocate enforcement resources. Consistent with the findings of Mills [1998], Hoopes, Mescall, and Pitman [2012] also find that U.S. public firms undertake less aggressive tax positions when tax enforcement is stricter. Hasegawa et al. [2017), however, document no evidence of a change in tax outcomes following a reduction in disclosure requirements in Japan.

Similarly, Towery [2017] finds that US firms did not change their tax behaviour after being required to report new information to IRS regarding uncertain tax provisions (UTP). Honaker and Sharma [2017] evaluate the long-term impact of Schedule UTP and find no evidence of a change in long-term tax planning. The inconsistency in the findings discussed above can be attributed to the fact that studies that directly evaluate the link between tax disclosures and tax avoidance (i.e., Honaker et al. [2017], Towery [2017]) do not account for the informativeness of the disclosure under study.

In a recent paper, Bozanic, Hoopes, Thornock, and Williams [2016] examine how public and private disclosure requirements interact to influence tax enforcement in the United States. The authors use IRS acquisition of a firm's public financial disclosures as a proxy for IRS attention and find that attention increased following an increase in the public tax disclosure requirements

[10] To evaluate whether disclosures to tax authorities lead to an increase in tax enforcement, information on tax audits and assessments in the pre- and post-implementation periods is required. As this information is not publicly available, research on the topic is limited.

(e.g., FASB Interpretation No. 48, Accounting for Uncertainty in Income Taxes) but decreased following an increase in private tax disclosure requirements (e.g., uncertain tax benefits). Bozanic et al. [2016] explain their result in terms of informative content of disclosures. Specifically, the authors argue that private disclosures will only be useful to tax authorities if they provide new information regarding an entity's tax affairs.

3.2.2 Public Tax Disclosure

Public tax disclosures would deter tax avoidance, if firms and their executives had to bear reputational costs for avoiding taxes. Prior literature has posited that reputational costs can partially explain why so many firms forgo the benefits of tax avoidance, the so-called "under-sheltering puzzle" (Gallemore, Maydew and Thornock [2014]). Hope, Ma, and Thomas [2013] were the first authors to study the relationship between public disclosures and tax behaviour. Hope et al. [2013] find that, after the adoption of Statement of Financial Accounting Standards No.131 in the United States, firms that chose to discontinue disclosure of geographic earnings in their financial statements had lower worldwide effective tax rates. Dyreng, Hoopes, and Wilde [2016] were next to study the association between public tax disclosures and tax behaviour. These authors use a shock to the public scrutiny of firm subsidiary locations to investigate whether that scrutiny leads to changes in firms' disclosure and corporate tax avoidance. The evidence from Dyreng et al. [2016] suggests that public pressure from outside activist groups can exert a significant influence on the behaviour of large publicly traded firms. In a related paper, Hoopes, Robinson, and Slemrod [2018] investigate the consequences of public disclosure of information from company income-tax returns filed in Australia. They detect a small increase (decrease) in tax payments for private (public) firms subject to disclosure, suggesting differential costs of disclosure across firms.

3.3 Tax-Motivated Income Shifting

Theory on income shifting predicts that mobile taxable income will flow toward low-tax jurisdictions either through the transfer of real operations (i.e., real income shifting) or manipulation of transfer pricing (i.e., paper income shifting; see Markle, Mills, and Williams [2016]). An extensive literature on multinational tax planning provides evidence that MNCs shift income in response to tax incentives (Hines and Hubbar [1990], Altshuler and Newlon [1993], Desai, Foley, and Hines [2001], [2007]); one of the primary benefits of income shifting is the tax savings realized from reporting income in low-tax jurisdictions.

In one of the first papers in this literature, Klassen, Lang, and Wolfson [1993] provided evidence of geographical income shifting in response to tax rate changes in the United States, Canada, and Europe. The authors examined 191 U.S. MNCs and found that firms shifted income from higher-tax to lower-tax jurisdictions. In a concurrent study, Harris [1993] provided evidence that such firm characteristics as interest, R&D, advertising, and rent expenses or intangible assets were associated with income shifting. Other work in this literature addresses the effect of accounting standards, the profitability of affiliates, the use of e-commerce, financial constraints, the tax regime of the parent country, internal information quality, political connections, and firm-level information asymmetry as contributors to income shifting (Chen, Hepfer, Quinn, and Wilson [2018], De Simone [2016], De Simone et al. [2017b], Dyreng and Markle [2016], Klassen, Laplante, and Carnaghan [2014], Markle [2016], McGuire, Rane, and Weaver [2018]).

3.3.1 Tax-Motivated Income Shifting in the Financial Sector

Similar to MNCs, subsidiaries of a multinational bank are subject to corporate income tax in their country of residence. The gaps and mismatches in international tax laws provide banks with the opportunity to shift profit from high-tax to low-tax subsidiaries (Merz and Overesch, [2016]).

Whereas profit-shifting by industrial firms often relates to intangible assets and manipulation of transfer prices, banks rely on other strategies to shift profits. For example, they can allocate intrafirm financial transactions (e.g., interest margins and service fees) or highly mobile segments (e.g., trading and asset management) to a low-tax country. Banks also can distribute credit risk to a high-tax country by contracting out the liability of a loan (Merz and Overesch [2016]).

The academic literature documents significant income shifting by financial institutions. In the U.S. context, Petroni and Shackelford [1995] provide evidence consistent with property-casualty insurers structuring their expansion across U.S. states, through licensing or subsidiaries, in a manner that mitigates both state taxes and regulatory costs. In an international context, Merz and Overesch [2016] use subsidiary-level data and find that banks seem to have more flexibility in shifting their profits, compared to nonfinancial firms. The tax response coefficient estimated in their study is approximately three times the estimate for nonfinancial MNCs in previous studies.

The presence of tax-motivated income shifting in banks is also consistent with anecdotal evidence. In a recent study, Oxfam International noted that large banks in the European Union disproportionally use tax havens to benefit from their favorable tax and regulatory rules. They estimated that Europe's most prominent banks funneled as much as €27 billion through overseas tax havens in 2015 (Aubry and Dauphin [2017]).

Banks also can shift income among their industrial affiliates to reduce the total tax liability at the consolidated level. Banks' ownership in industrial firms is permitted with some restrictions (Arping and Rochetrau [2000]). In Europe, for example, the Second Banking Directive requires that each 10-percent-or-more ownership in industrial firms cannot exceed 15 percent of the bank's total funds, and such ownership on an aggregate basis cannot exceed 60 percent of its own funds.

A few countries impose additional regulations.[11] Banks own industrial firms for several reasons, including (a) acquisitions related to the classical banking business, (b) acquisitions as part of special financial services, and (c) strategic and other reasons (Baums [1992]).[12]

The literature has focused soley on income-shifting activities among the financial affiliates of multinational banks (i.e., Demirgüc-Kunt and Huizinga [1999], [2001]; Huizinga et al. [2014]; Merz and Overesch [2016]). To my knowledge, there has not been any evidence of income shifting among the industrial affiliates. My study contributes to this stream of literature by investigating income shifting within both groups of affiliates in the same bank.

3.4 Research Using CbCr Data

3.4.1 Extractive Industry Transparency Initiative

A number of studies have evaluated the impact of EITI through qualitative methods, such as conducting expert interviews with key stakeholders responsible for the implementation of, or directly benefiting from, this initiative (Rainbow Insight [2009], BIC and Global Witness [2008], Mainhardt-Gibbs [2010]). These studies tend to provide direct or indirect evidence of the positive effect of EITI on improved governance outcomes, generally reflected in improvements of governance processes, such as increased participation of stakeholders or greater disclosure of data (Acosta [2013]).

[11] For instance, in Canada, banks cannot hold more than 10 percent in a firm, and, in the United States, bank holding companies can hold up to 5 percent of the voting shares and up to 25 percent of the voting and nonvoting shares in a firm.

[12] Bank ownership in industrial affiliates, albeit common, is not without controversy. Critics of the practice argue that it can lead to severe conflicts of interest for banks and can have anti-competitive effects on product markets, as it fosters product-market collusion and concentration (Arping and Rochetrau [2000]).

Corrigan [2017] wrote one of the few papers that has used the EITI database empirically. Corrigan [2017] uses panel data from 1997/1998 to 2014 to evaluate the impact of joining the EITI on changes in economic and corruption indicators and finds that the EITI has had a significant and positive effect on economic development in member states since its inception but that these effects have not yet been translated to observable and significant improvements in control of corruption.[13] In another related study, Johannsen and Larsen [2016] study the impact of EITI on firm value. The authors find that CbCr under EITI is associated with a significant decrease in firm value in extractive industries; they associate this effect of disclosure rules with a reduction of rents derived by firms from governments.

3.4.2 Capital Requirements Directive IV

To date, there have been few studies investigating the implementation of CbCr requirements under CRD IV. Existing studies primarily focus on evaluating either the use of tax havens or the misalignment of the location of profits and turnover in European banks. Murphy [2015], for example, used the published CBCR data on the 26 biggest EU banks to study the presence of EU banks in offshore centres. More recently, Jelinkova [2016] used CbCr data from 32 EU banks and found that banks reported their profits disproportionately to their activities. Similarly, Jansky [2017] discovers a significant misalignment of the location of profit and the location of turnovers/employees, implying that some countries have proportionally more profits reported in them than the turnover or number of employees would suggest.

In a concurrent working paper, Joshi et al. [2018] examine the adoption of CRD IV and find no significant change in consolidated bank-level tax avoidance while documenting a decline

[13] The effects of increased revenue transparency in the extractives sector: The case of the Extractive Industries Transparency Initiative.

in the income shifting at the affiliate level. In a related paper, Dutt et al. [2018] investigate the stock price reaction around the day of the decision, including CbCr in CRD IV, and document a lack of noticeable market response to the implementation decision of public CbCr under CRD IV. Such a finding is consistent with the authors' interpretation that investors do not view this disclosure as increasing the net costs of a firm's tax avoidance. Brown [2018] and Overesch and Wolff [2018] examine the effect of public CbCr under CRD IV on overall tax avoidance by European banks and find contradictory evidence. Whereas Overesch and Wolff document a reduction in the banks' book-effective tax rates, Brown finds a lack of such effect using cash-effective tax rates.

3.4.3 BEPS Action Item 13

Several recent studies provide a detailed discussion and critique of the objective, scope, and effectiveness of CbCr under BEPS Action Item 13. However, given the recent implementation and adoption of this initiative, there is little or no empirical evidence on how these disclosures affect a firm's tax behaviour. The objective of this dissertation is to address this gap by providing a detailed evaluation of the effectiveness of CbCr under Action Item 13 in curbing tax avoidance and income shifting in MNCs.

In a realted paper, DeSimone and Olbert [2019] examine the effects of CbCr on economic activity and find a significant change in investment and employment level in low-tax countries after the introduction of CbCr. This dissertation differs from their work in several ways. First, I examine whether CbCr meets its stated objective—reduction in tax avoidance—by discouraging firms from shifting income to low-tax jurisdictions. Unlike De Simone and Olbert [2019] and Joshi [2019], I also examine the channel through which these disclosures change tax behaviour (e.g.,

enforcement risk, detection risk, and risk of public exposure) and document investor reaction to the introduction of CbCr.

Chapter Two:
Private Country-by-Country Reporting

1.0 INTRODUCTION

Tax transparency initiatives aim to either increase the amount of information available to taxing authorities (private disclosures) or improve accountability and compliance via mandatory tax disclosure to the public (public disclosures; Hoopes, Robinson, and Slemrod [2018]). Despite ample research on regulations that improve accountability and compliance via mandatory tax disclosure to the public (Hope, Ma, and Thomas [2013], Dyreng, Hoopes, and Wilde [2016], Hoopes et al. [2018]), research on how firms respond to private disclosures that could allow increased scrutiny of MNC tax affairs by tax authorities is limited and, as Hanlon [2019] states, "not always on point". Furthermore, these studies provide mixed evidence (Hoopes, Mescall, and Pitman [2012], Towery [2017]). This gap in extant literature is one of the main motivations for my study. Understanding the impact of private tax disclosures is crucial because the most widely adopted global transparency initiative is private (CbCr under Action Item 13).

The OECD's Action Item 13 aims at closing ambiguities in tax laws legally exploited by MNCs to reduce their global tax burdens. Under Action Item 13, MNCs increase disclosures to tax administrations by submitting an annual CbC report to each tax jurisdiction in which they do business. The report must include revenue (split between related and nonrelated entities), profit or loss before income tax, income tax paid and accrued, stated capital, retained earnings, the number of employees, and tangible assets (OECD [2013a]). To ensure that all tax authorities receive the same disclosures, the OECD developed an agreement to facilitate the secure and confidential exchange of CbC reports between tax authorities across jurisdictions. The OECD intended this kind of reporting to enhance tax enforcement, and thus to deter aggressive tax planning (OECD [2016]).

CbCr can change MNC tax behaviour by altering the actual or perceived net benefit of tax planning. First, country-level disclosures can increase enforcement by providing useful new information to tax authorities on a firm's global activities and the associated tax costs, especially in nonresident jurisdictions.[1] For example, CbCr provides the local tax authority with new and consistently calculated information, such as a geographic breakdown of cash taxes paid. Moreover, CbCr provides this information to all relevant tax authorities, whereas such information sharing between tax authorities was limited before the implementation of Action Item 13. Second, CbCr can increase the perceived cost of reporting income in low-tax countries, due to the risk that this information may be leaked and published.[2] However, it is uncertain whether CbCr provides additional insights to tax authorities because the disclosures are unrelated to the specific transfer-pricing methodologies used by firms to substantiate their tax-motivated income shifting (Hanlon [2019]).[3] The efficacy of this regulation is, therefore, an open question.

A common issue in empirically testing the effects of disclosure regulations is identifying counterfactuals, unaffected control groups, and natural experiments that allow clean identification of the effects (Leuz and Wysocki [2016). To overcome these limitations, I employ a regression-discontinuity and difference-in-differences design that leverages the implementation of CbCr only for firms with consolidated revenue higher than €750 million.

[1] In the rest of the paper, "resident or local jurisdiction" refers to the jurisdiction in which the parent entity is headquartered, and "non-resident or other jurisdiction" refers to other countries where the entity has business operations.

[2] For example, in the Luxembourg tax leaks (2014), private tax rulings between taxpayers and Luxembourg tax authorities were leaked to media outlets, which resulted in an outcry and criticism from numerous stakeholders.

[3] Transfer pricing is based on the arm's length principle, under which the amount charged by related parties should be comparable to the price of the transaction on the open market.

My main measure of tax avoidance is the consolidated GAAP effective tax rate (ETR).[4] Firm-level regression discontinuity estimation reveals a sharp, positive, and significant discontinuity in tax avoidance at the cutoff: firms above the CbCr threshold report higher ETRs, indicating a decline in tax avoidance. To mitigate concerns about low power and lack of generalizability associated with regression discontinuity models, I also use a difference-in-differences model. Results suggest a 1%–2% increase in the ETRs (€4 million–€8 million increase in tax expense) of reporting MNCs (treatment group) after the implementation of CbCr, relative to non-reporting firms (control group). Together, these results indicate that the introduction of CbCr led to a significant decline in corporate tax avoidance.

In contrast, I do not find robust evidence of a widespread decrease in income shifting. Using affiliate-level data, I document no significant difference in the level of income shifting in the three-year post-adoption period. However, starting in 2018, I find that affiliates of EU MNCs engaged in significantly less profit shifting. These results suggest that it took firms one to two years to change their practices, consistent with prior work indicating it can take upwards of 18 months for firms to respond to new regulations (Khan, Srinivasan, and Tan [2017]; Kim, McGuire, Savoy and Wilson[2019]). Thus, although my findings suggest that there has been little impact on income shifting (so far), I conclude increased transparency can deter tax avoidance. The increase in GAAP ETRs is perhaps due to a decline in other types of tax avoidance by MNCs.[5]

[4] For all firm level tests, I use GAAP effective tax rate, cash effective tax rate (CETR), and the difference between GAAP effective tax rate and statutory tax rate (TaxDiff) to measure tax avoidance.

[5] For example, De Simone and Olbert [2019] find that firms affected by the CbCr disclosure reduce ownership in tax haven subsidiaries. Closure of tax haven subsidiaries can explain the decline in tax avoidance that I document.

To better understand whether CbCr primarily affects tax behaviour through enforcement or public pressure, I conduct a series of cross-sectional analyses. To measure tax enforcement, I use country-level tax spending scaled by gross domestic product. To measure public pressure, I use Google Trends data and Factiva hits. I fail to find robust evidence to support the notion that firms respond to CbCr due to the risk of their disclosures being leaked and published. Instead, results suggest that tax enforcement is the primary channel through which CbCr deters tax avoidance.

This study makes several contributions. First, it answers the call by Dyreng and Maydew [2017] to explore how disclosure of tax information affects real tax behaviour. Studies in this literature have examined the impact of publicly disclosing geographic earnings in the United States (Hope et al. [2013]), subsidiary locations in the United Kingdom (Dyreng et al. [2016]), tax return information in Australia (Hoopes et al. [2018]), and country-level information in the EU banking industry (Joshi, Outslay & Persson. [2019], Overesch and Wolff [2017]). I add to this literature by providing initial empirical evidence on the economic consequences of a recently introduced private disclosure regulation that applies across all industries and has been implemented in over 90 countries.

De Simone and Olbert [2019] and Joshi [2019] examine the effects of CbCr on economic activity, finding a significant change in investment and employment levels in low-tax countries after its introduction. My paper differs from these in several ways. First, I examine whether CbCr meets its objective—a reduction in tax avoidance—by discouraging firms from shifting income to low-tax jurisdictions. Unlike De Simone and Olbert [2019] and Joshi [2019], I also examine the channel through which these disclosures change tax behaviour (i.e., enforcement risk, detection risk, and risk of public exposure).

Second, this study helps resolve the inconsistency in the literature regarding monitoring provided by tax authorities. Hoopes et al. [2012], for example, find that public U.S. firms take less aggressive tax positions when enforcement is stricter. Towery [2017], however, finds that firms did not change their behaviour after being required to report new information to the U.S. Internal Revenue Service. My findings are consistent with those of Hoopes et al. [2012] in suggesting that private disclosure regulations can deter tax avoidance.

Finally, this study contributes evidence to the debate regarding public versus private disclosure of country-level information. Proponents of public CbCr, such as the EU and the FASB, claim that public country level disclosure makes MNCs accountable to local communities. However, supporters of private CbCr, such as the OECD, argue that requiring firms to publicly disclose a detailed geographic breakdown of their results can have unintended consequences, such as misuse by tax authorities and an increase in proprietary costs for the firm. The question at the heart of this debate is whether private country level disclosures can achieve the intended reduction in tax avoidance. My paper addresses this question by providing initial evidence that private tax disclosures can reduce corporate tax avoidance .

This study is not without limitations. First, because it uses a local randomized research design, the findings might not be fully generalizable. I address this concern by using an alternate empirical strategy in the form of difference-in-differences analysis as well as a series of robustness tests, but the estimates might still be local average treatment effects (Leuz and Wysocki [2016]). Second, with a short window of data, this study's ability to speak to longer-term effects is limited. Finally, although cross-sectional tests point to increased enforcement as the channel through which CbCr deters tax avoidance, there is an inherent risk that these disclosures will become publicly available, and thus that reputational risk also plays a role.

The rest of the article proceeds as follows. Section 2 provides the background and hypothesis development. Section 3 describes the sample and research design. Sections 4 through 6 present the primary results and robustness tests. Sections 7 and 8 discuss affiliate-level income-shifting tests, additional analysis, and the cross-sectional analysis, respectively. Section 9 concludes the article.

2.0 BACKGROUND, LITERATURE REVIEW, AND HYPOTHESIS

2.1 Country-by-Country Reporting

The goal of CbCr is to provide governments and other interested parties with information to appraise a transnational corporation with regard to its corporate social responsibility, investment risk, tax risk, and its contribution to national well-being by way of tax payments to those locations (Murphy [2003]).

The only mandate that requires private CbCr is the OECD's (2013a) BEPS framework. The BEPS project was motivated by concern that MNCs were exploiting the boundaries of acceptable tax planning, thus depriving governments of substantial tax revenue (OECD [2013a]). Action Item 13 of the BEPS mandate requires MNCs to prepare and disclose to the tax authorities a master file, local file, and specific country-level information (OECD [2015b]). The master file requires details on the overall operations of the multinational group as well as on the group transfer-pricing policy. The local file must provide information on transactions between the reporting entity and other affiliates, and offer an overview of transfer pricing used in intercompany dealings. The third and the most significant feature of Action Item 13 is CbCr, and unlike the master file and local file, the CbCr requirements only apply to MNCs with at least €750 million in annual revenue.

CbC reports are submitted annually by the parent company for the entire group in the resident jurisdiction. To further enhance transparency, OECD developed the Multilateral Competent Authority Agreement on the Exchange of CbC reports (OECD [2015c]). An essential feature of this exchange is that tax authorities in all jurisdictions get access to the same disclosures irrespective of the extent of activities in that jurisdiction or the local tax disclosure requirements. For example, an MNC headquartered in the UK with operations in Canada, Barbados, and France would submit a report in the UK, which would be shared with tax authorities in Canada, Barbados, and France. As of February 2019, there were over two thousand bilateral exchange relationships activated by jurisdictions, including tax haven countries. (OECD [2019]).

2.2 Hypothesis Development

CbCr can change tax behaviour by altering the actual or perceived net benefits of tax avoidance. Increased enforcement by tax authorities is the primary channel through which CbCr can increase the actual costs associated with tax avoidance. However, Bozanic, Hoopes, Thornock and Wiiliams [2017] examine how tax disclosure requirements influence tax enforcement and find that private disclosures would increase enforcement only if they provided new information to tax authorities. Althought it is well documented that MNCs employ several strategies to generate tax savings, such as profit shifting (Klassen and Laplante [2012]), financial derivatives (Donohoe [2015]), tax havens (Dyreng and Lindsey [2009]), and state tax planning (Dyreng, Lindsey, and Thornock [2013], Gupta and Mills [2002], Klassen and Shackelford [1998]), CbCr reports contain information on only certain types of tax strategies (i.e., profit shifting and tax havens). It is therefore unclear ex ante whether CbCr disclosures are informative enough to increase enforcement and deter MNC tax avoidance.

On the one hand, CbCr could provide insights to tax authorities about firms' profit shifting strategies for several reasons. Although profit shifting is not illegal, much ambiguity is involved in the application and interpretation of tax laws in different countries. CbCr can help resolve this ambiguity by providing information that would not have been previously available to all tax authorities, such as cash taxes paid in other countries. Foreign operations of MNCs are subject to extensive tax disclosure requirements only in their home jurisdictions, and, elsewhere, tax-filing requirements are restricted to activities in a particular country. Though all tax authorities can obtain access to financial statements filed by a firm's global subsidiaries, these statements may be prepared based on accounting standards that lack conformity.[6] The discrepancy in tax and accounting disclosure requirements across countries led to a fragmented depiction of a firm's global activities and the associated tax costs (Joshi et al. [2019]).[7]

Under CbCr, firms must provide a detailed breakdown of key operating, financial and tax metrics for all countries in which the firm has operations. CbCr can therefore provide geographic information with more precision and conformity to tax authorities. Additionally, before the implementation of Action Item 13, there was limited sharing of information among tax authorities. For example, in the EU, a member state can request information only if its tax authority already has a tax enforcement action underway. In contrast, CbCr mandates the automatic exchange of detailed geographic disclosures among all participating countries.

[6] Though large MNCs would be subject to IFRS, their individual subsidiaries can prepare financial statements using local accounting standards.

[7] Prior to CbCr, a geographic breakdown of cash taxes was not available to all tax authorities because MNCs were only required to report local cash taxes to the local tax authority. Cash taxes paid is also not a required financial statement disclosure under all accounting standards (e.g., local GAAP in the United Kingdom).

It is, however, unclear whether these disclosures offer additional insights to tax authorities on firms' use of profit shifting strategies. There is an inconsistency in the information disclosed under CbCr and the transfer-pricing methodology used by MNCs to set intercompany prices (Hanlon [2019]). Transfer-pricing rules govern the amount of income reported in a given jurisdiction and are based on an arms-length principle—the price charged in related party transactions should be comparable to the price of similar transactions on the open market. Geographic breakdown of income and activities therefore does not inform tax authorities whether the income reported in a jurisdiction is based on transfer prices that comply with the arm's length standard. Because of this, the OECD has also emphasized that CbCr disclosures should not be used as a replacement for detailed transfer-pricing analysis. Misuse of CbC reports (e.g., using these reports as the sole basis of a tax audit) can result in loss of exchange privileges (OECD [2016]). Based on the competing arguments discussed above, it is unclear whether CbCr can facilitate the detection of profit shifting by tax authorities.

CbCr disclosures can also increase the reputational costs associated with shifting income to low tax jurisdictions. Studies that examine the implementation of transparency initiatives generally document that firms perceive significant costs associated with public disclosure of tax information (Hasegawa et al. [2013], Hoopes et al. [2018], Hope et al. [2013] and Rauter [2018]). Although CbCr is not publicly available, it is not uncommon for privately disclosed information to be leaked to the public (e.g., the Luxembourg Leaks, Panama Papers, and Paradise Papers). The risk of public exposure is especially high for CbCr, because these reports are shared across jurisdictions. Such leaks could change the behaviour of affected firms, due to fear of backlash from the public, governments, and investors (EY [2014]). Consistent with this notion, Hanlon (2018) notes that a benefit of public CbCR "might be found in a potential behavioural response on the

part of companies to curb income shifting once they have to disclose activities and income on a country-by-country basis." Studies examining the effects of publicly disclosing a geographic breakdown of economic activity, however, provide mixed evidence (Dyreng et al. [2016], Joshi et al. [2019]).

To summarize, theoretical arguments and empirical findings provide competing predictions regarding whether CbCr would help deter tax-motivated income shifting or tax avoidance. I therefore do not make a prediction and state the hypothesis in the null form. Formally:

> *Hypothesis 1 (H1): Tax-motivated income shifting, and tax avoidance will not decrease following the implementation of CbCr.*

3.0 DATA AND METHODOLOGY

3.1 Data and Sample

The primary sample consists of EU MNCs. I restrict the sample to EU MNCs because CbCr was effective in EU member states on the same date (January 1, 2016). In addition, the tax and legal environments in EU nations are comparable across jurisdictions, and there is better availability of affiliate-level data through databases compiled by Bureau van Dijk. I obtain annual financial statement and ownership data for the years 2010 to 2018 from the Orbis database (Bureau van Dijk). Information on cash effective tax rates (CETR) and data for the market reaction test is from Compustat and data for statutory tax rates (STR) is from the OECD tax database. To match observations between Orbis and Compustat, I use the ISIN number. To ensure accurate matching, I reconcile the pre-tax income and total assets from Compustat to Orbis.

CbCr was first introduced by OECD in 2013, and the guidelines (including the €750 million threshold) were finalized by 2015. Though the EU formally adopted these rules in 2016, firms were aware of the reporting requirements by 2015. I therefore consider the post-implementation

period to be from 2016 onward. Because it can take firms some time to adjust their tax planning, I also estimate the tax avoidance and income shifting models by year (sections 6.2 and 7.0). Additionally, in section 8.3, I test for the spillover effect by including 2015 in the post-implementation period.

In the EU, a primary reporting obligation under CbCr arises when, in a multinational group, either the ultimate parent or a member of the group is resident in a member state. CbCr requirements for nonresident EU firms depend on whether the parent jurisdiction has adopted the rules and on the exchange relationship between parent home country and EU member states. I therefore restrict my primary sample to EU headquartered firms and, in an additional analysis (section 8.3), include nonresident EU firms. I start with EU-headquartered firms that are identified as global ultimate owners in the Orbis database and that have at least one foreign subsidiary. I exclude financial institutions and firms in the extractive industries because they are subject to additional CbCr requirements.[8] After excluding firms with missing data required to calculate the regression variables, the final sample consists of 5,312 EU-headquartered multinationals (47,808 firm year-ends).

For the income-shifting test, the subjects of interest are all industrial affiliates of the firms included in the primary sample. I restrict the sample to majority-owned affiliates (i.e., ≥ 50% owned by the EU MNCs) within the first two unfolding levels of the group's ownership structure.[9]

[8] The Extractive Industries Transparency Initiatives is the oldest (public) CbCr regime (EITI [2017]). In Europe, country-level reporting was first introduced in 2013 as a public-disclosure requirement in the financial sector under the CRD IV directive.

[9] To match the affiliates to the global ultimate owners, I use both the database matching as well as a manual construction, whereby I download a historic version of the database. This approach is similar to recent studies (Beuselinck, Cascino, Deloof and Vanstraelen [2018], De Simone and Olbert [2019], Beaver, Cascino, Correia, and McNichols [2019]).

This step helps me exclude affiliates that are indirectly owned or may not be part of the firms' tax planning.[10] After excluding firms with missing data, the final sample for the income shifting tests consists of 14,530 affiliates (117,258 affiliate year-ends). Table 1 provides an overview of the sample selection.

<Insert Table 1 here>

3.2 Measures of Tax Avoidance

Drawing from the literature, I proxy for tax avoidance using ETR. ETRs have extensively used in previous studies that examine tax avoidance of large US and EU MNCs and is therefore appropriate for my sample (Hanlon and Heitzman [2010]).[11] As an alternative measure of tax avoidance, I also use the CETR, which provides an estimate of cash tax savings. Because cash tax expense reporting is not mandatory across jurisdictions, my CETR sample is smaller compared to the ETR sample.[12] CETR is therefore not used as the primary measure of tax avoidance in this study. I believe this is an appropriate choice because previous research provides evidence that managers focus primarily on tax-planning strategies that reduce both cash taxes and financial-

[10] The results from the income-shifting tests are robust to the inclusion of affiliates in up to 10 folding levels as well as affiliates with 25% ownership interest. The income-shifting tests are also robust to restricting the sample to affiliates that are active at least two years before and two years after the implementation of CbCr. This step helps exclude affiliates that were wound up after the introduction of CbCr.

[11] Existing studies on international tax avoidance tend to focus on specific tax avoidance strategies (like profit shifting) with very few studies examining overall tax avoidance. ETR has therefore not been widely used to measure tax avoidance in an international context. In a recent study, Kanagaretnam, Lee, Lim and Lobo [2018] examine the association between societal trust and corporate tax avoidance in 25 countries and use ETR as a measure of tax avoidance.

[12] The sample for CETR consists of 1,809 firms and the sample for ETR consists of 5,312 firms.

statement income tax expense and have a secondary focus on strategies that only produce a cash flow benefit (Edwards, Schwab, and Shevlin [2016]).

Despite the popularity of ETRs as a measure of tax avoidance, there are potential measurement issues with ETRs. For example, ETRs cannot be used for loss firms which have negative pre-tax income. Additionally, because ETRs are based on STRs, a change in STRs can cause ETRs to vary over the years. As such, there is an increasing call for researchers for better construct operationalization beyond ETRs (Bruhne and Jacob [2020]). I therefore use a third alternate measure of tax avoidance: the difference between ETRs and STRs (TaxDiff). A higher (positive) TaxDiff implies a lower tax avoidance, and a lower (negative) TaxDiff suggests a higher tax avoidance. Therefore, an increase in TaxDiff would be interpreted similarly—an increase in ETR, with both indicating a reduction in tax avoidance

ETR (CETR) is calculated as the book (cash) tax expense divided by pre-tax income (PTI). I reset ETR and CETR at 0 and 1, to limit the influence of outliers and to be able to better interpret the results. Though it is common for studies in this literature to use long-run ETR measures (see Dyreng, Hanlon, and Maydew [2008]), I use one-year measures to capture timely responses to CbCr (Edwards et al. [2016]).

3.3 Empirical Identification Strategy

I use a regression discontinuity design (RDD) as the primary empirical strategy to estimate the treatment effect of being subject to CbCr. The RDD is characterized by a treatment assignment based on whether a firm falls above or below a cut-off point on a rating variable, generating a discontinuity in the outcome variable at that point. The rating variable in this study is the consolidated revenue, the cut-off point is €750M in the preceding year, and the outcome variable is tax avoidance. In the language of RDD, consolidated revenue is expected to be locally smooth

across the threshold, but tax avoidance is expected to jump discontinuously at the threshold (Khan, Srinivasan, and Tan [2017], Beuselinck et al. [2018], Beaver, Cascino, et al., [2019]).

Since RDD is a nonexperimental approach, some conditions needed to be met to obtain unbiased estimates (Hahn, Todd, and Van Der Klaauw [2001]). First, the cut-off point should be determined independently of the rating variable (that is, it has to be exogenous), and assignment to treatment should be entirely based on the threshold (Khan et al. [2017]). CbCr was first introduced in 2013, and the disclosure rules were finalized by 2015. Since OECD's guidelines and thresholds on CbCr were well known by 2016 (the first year of implementation), MNCs had an incentive to manage their consolidated revenue to fall under the threshold. Manipulation of revenue, though possible, is not common since it involves changing the timing of sales recognition, which can attract unwanted scrutiny, especially for large multinational firms (Sellami and Adjaoud [2010]).

Nevertheless, to mitigate concerns regarding the independence of the rating variable, I test for manipulation of consolidated revenue (see section 5.4). Second, other than the treatment status, no other firm characteristic should be discontinuous. In section 5.5, I provide graphical representation and empirical evidence to support the lack of discontinuity around the CbCr threshold in the primary tax-avoidance determinants.

Last and most important, for an unbiased estimate of the treatment impact, functional form representing the relationship between the rating variable and the outcome must be specified correctly. For this I use a non-parametric RDD, as it does not rely on assuming a specific functional form for how tax avoidance varies with the distance from the threshold, and it fits the function to the data (Hahn et al. [2001], Lee and Lemieux [2010], Tan [2013], Gao, Khan, and Tan [2016] and

Khan et al. [2017]). Using this process, I report the bias-corrected RD treatment coefficient estimates along with *Z* statistics for the statistical tests for significance.

Consistent with previous studies in this literature, I use the optimal bandwidth selection procedure of Calonico, Cattaneo, and Titiunik [2014]. I also use a triangular kernel, since it controls the weight placed on observations, with more weight on observations close to the threshold (Lee and Lemieux [2010]). Though the rule-of-thumb estimation should produce the most efficient bandwidth for the analysis, I also test the sensitivity of the results to the selected bandwidth by re-estimating the bias-corrected RD treatment coefficient for three other fixed bandwidths (± 250, 450, and 500).

4.0 SUMMARY AND DESCRIPTIVE RESULTS

4.1 Summary Statistics

Panel A of Table 2 provides a breakdown of firms by industry. Firms engaged in the provision of professional, scientific, and technological services, make up 25% of the sample, followed by information and communication companies that make up 18% of the sample. Panels B and C of Table 2 provide a breakdown of the statutory tax rate (STR) and firm-year observations by country.

Panel A of Table 3 reports descriptive statistics separately for firms above (*treatment*) and below (*control*) the €750M threshold. As expected, firms above the threshold are bigger and more profitable. The mean revenue of treatment (control) firms is €6,773M (€134M) while the mean PTI is €445M (€8M). The treatment firms are also larger with mean assets of €9,388M. The mean ETR of the treatment (control) group is 26.5% (23.9%) while both groups face similar STRs (26.9% vs 26%). Panel B of Table 3 reports the descriptive statistics for the affiliates of the two

groups of firms. Once again, consistent with expectations, I find the affiliates of treatment firms to be bigger and more profitable, relative to the affiliates of the control firms.

In panel C of Table 3, I compare firm characteristics in the two groups of firms in the pre-implementation period. I find that specific firm characteristics (e.g., revenue, PTI, net income, and total assets) are significantly different in firms on either side of the threshold. Given the various bandwidths tested, some random significant differences are expected (Khan et al. [2017]). Finally, STR, ETR, and CETR are not significantly different in majority of the bandwidths, indicating no difference in tax avoidance in the two groups of firms before the implementation of CbCr. The descriptive statistics in Table 3 are consistent with expectations and support the validity of a using regression discontinuity design to tests the effects of CbCr on tax avoidance.

5.0 PRIMARY RESULTS

5.1 Graphical Presentation

I begin my analysis with a graphical analysis as it provides visual evidence of any discontinuity in the outcome variable at the cutoff. For comparison, I start by plotting ETR around the €750 million threshold in the pre-implementation period.

Figure 1: Regression Discontinuity Plot of Tax Avoidance (Pre-Implementation Period)

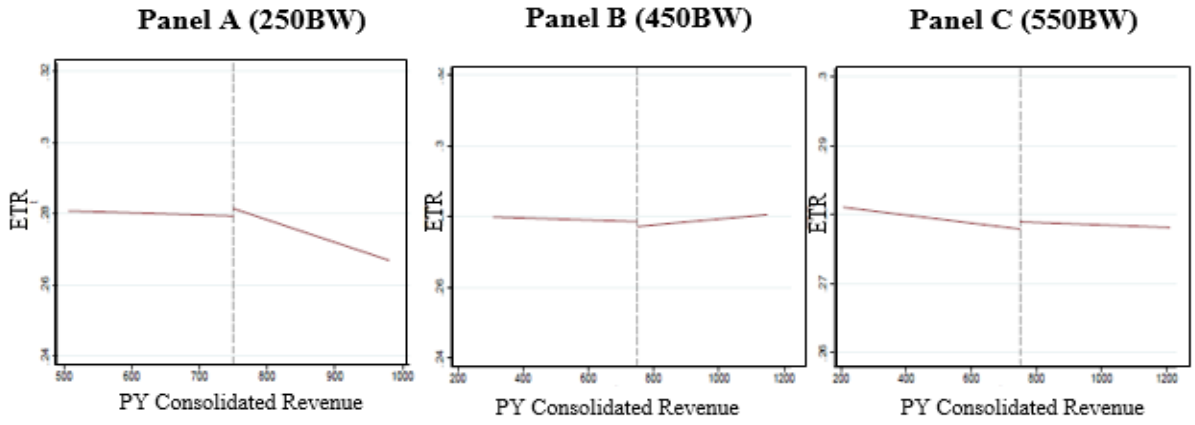


Figure 1 plots ETRs against consolidated revenue around the €750M cut-off, in the pre-implementation period (2010-2015), The vertical line is centered on €750M. Panels A, B & C provide the graphs for 250, 450 and 550 bandwidths, respectively.

Panels A–C of Figure 1 illustrate that, before the implementation of CbCr, firms above the €750 million threshold report lower ETRs (higher tax avoidance). This is consistent with expectations because firms to the right of the threshold are larger and thus are expected to have higher levels of tax avoidance (Rego [2003]).

I next plot ETR around the €750 million threshold in the post-implementation period in panels D-F (below). In contrast to panels A-C, the post-implementation period graphs in panels D-F exhibit a positive discontinuity in the ETRs at the €750 million cutoff. These graphs provide initial visual evidence suggesting lower tax avoidance in firms subject to CbCr following disclosure.

Figure 1: Regression Discontinuity Plot of Tax Avoidance (Post-Implementation Period)

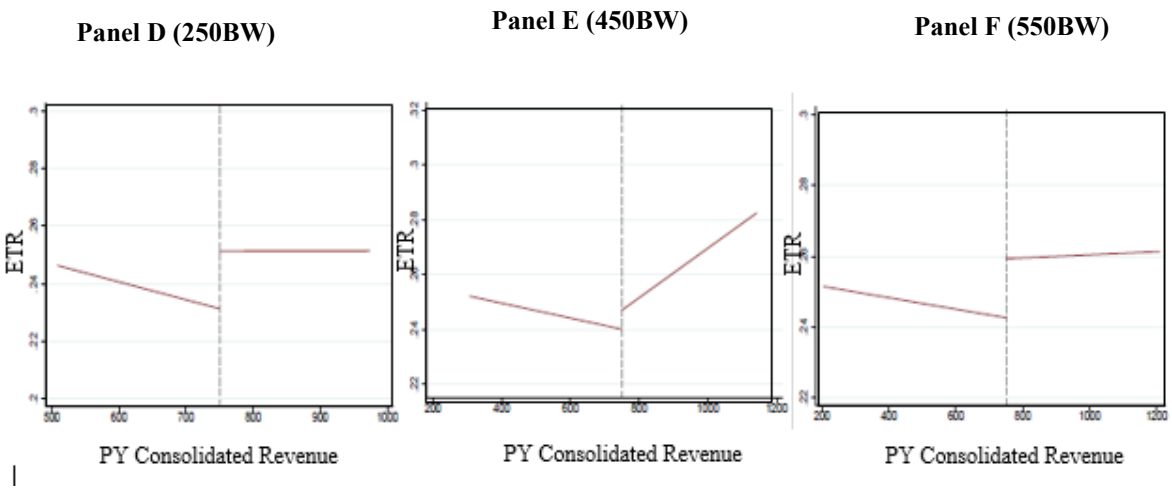
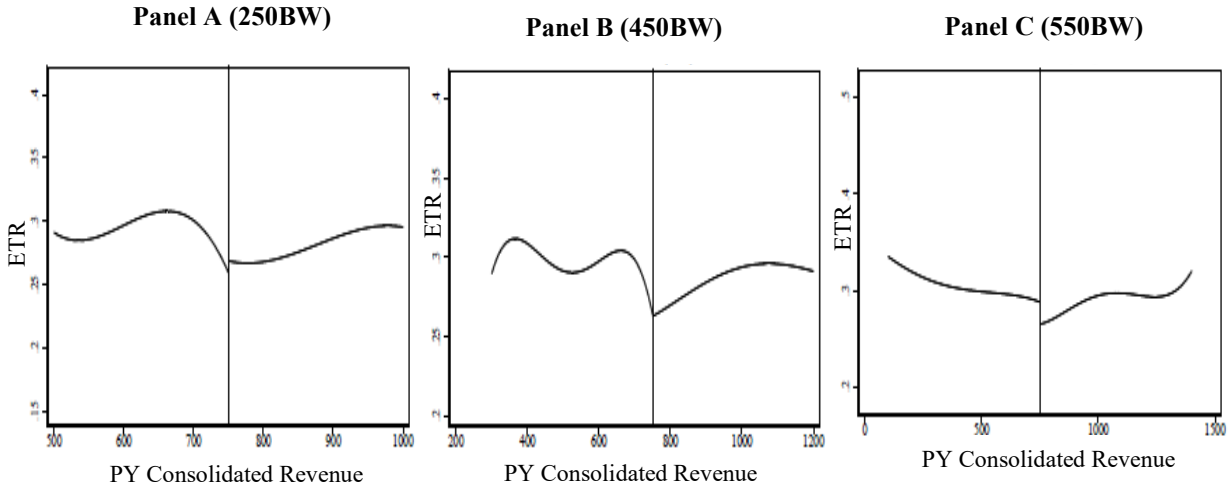


Figure 2 plots ETRs against consolidated revenue around the €750M cut-off, in the post-implementation period (2016-2018), The vertical line is centered on €750M. Panels D, E & F provide the graphs for 250, 450 and 550 bandwidths, respectively.

Taken together, the panels of Figure 1 depict tax behaviour consistent with expectations in the pre-implementation period and provide initial evidence of a decline in tax avoidance by treatment firms in the he post-implementation per ɔd.

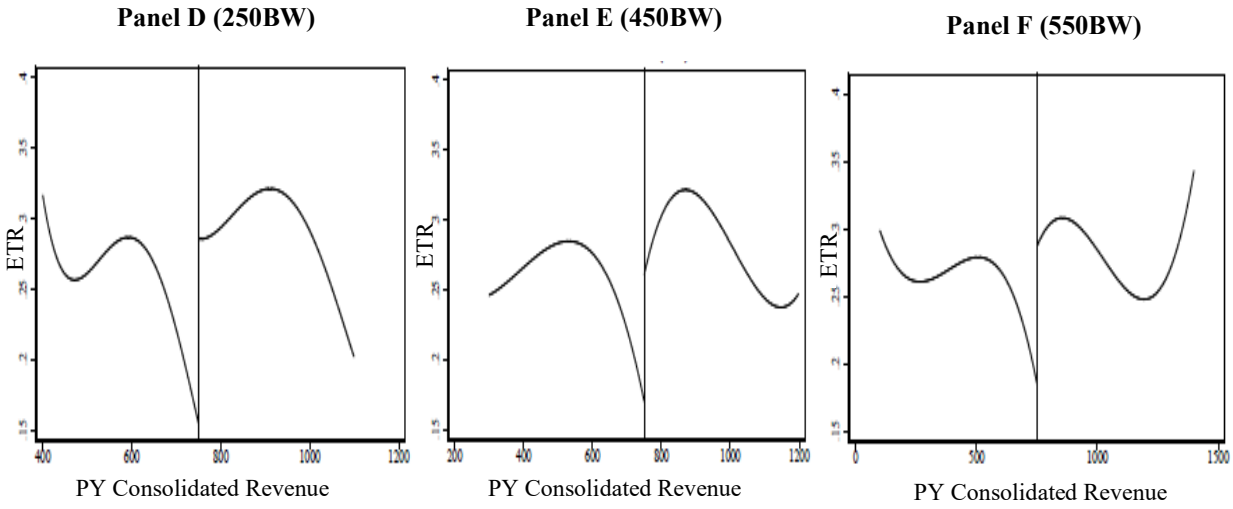
The gaphs in panels A-F of Figure 1 have been plotted using using binned scatter method (Chetty, Friedman, and Rockoff [2014]). I also plot the traditional regression discontinuity plots in panels A-F of Figure 2 below. Both sets of graphs are comparable and provide similar inference.

Figure2: Regression Discontinuity Plot of Tax Avoidance (Pre-Implementation Period)



Panels A-C provide a plot of ETRs against consolidated revenue around the €750M cut-off, in the pre-implementation period (Year<=2015), The vertical line is centered on €750M. Panels A, B & C provide the graphs for 250, 450 and 550 bandwidths, respectively.

Figure 2: Regression Discontinuity Plot of Tax Avoidance (Post-Implementation Period)



Panels D-F provide a plot of ETRs against consolidated revenue around the €750M cut-off, in the post-implementation period (Year>=2016), The vertical line is centered on €750M. Panels D, E & F provide the graphs for 250, 450 and 550 bandwidths, respectively.

5.2 Univariate Analysis

I next use nonparametric methods to examine the effect of CbCr on tax avoidance. I first compare the post-implementation mean tax avoidance for the two groups of firms, as a comparison of means

is the most straightforward nonparametric approach. I present results in Table 4. ETRs of the treatment firms in the 250 (450) [550] bandwidths are 26.3% (26.2%) [26.1%] vs 25.5% (25.2%) [25.3%] for the control firms and the difference is statistically significant in the 450 bandwidth. CETRs of the treatment firms in the 250 (450) [550] bandwidths are 25.2% (25.3%) [25.3%] vs 23.4% (23.5%) [23.4%] for the control firms and the difference is statistically significant in the 550 bandwidth. Finally, TaxDiff of the treatment firms in the 250 (450) [550] bandwidths is 0.006 (0.004) [0.001] vs -0.007 (-0.008) [-0.007] for the control firms and the difference is statistically significant in all bandwidths. We can therefore say that the ETR (CETR) of the treatment firms in the 450 (550) bandwidthis significantly higher compared to the control firms. TaxDiff of the treatment firms is significantly higher in all bandwidths. The comparison of means thus suggests that CbCr reduces tax avoidance.

5.3 Nonparametric Results

Even though a comparison of means is the most straightforward non-parametric approach, the approach is biased around the cut-off point (Chen, Huang, and Shevlin [2015]). To reduce this boundary bias, I use a non-parametric RDD the results of which are reported in Table 5. CBCR is 1 for 2016 and subsequent years if consolidated revenue in the preceding taxation year was at least €750M, and zero otherwise. Bias-corrected standard errors are clustered at the firm level, and p-value (determined based on the *Z* statistics) is reported in parentheses.

The panels of Table 5 vary based on the implementation period. Panel A estimates the regression discontinuity test in the pre-implementation period when there should be no discontinuity in tax avoidance around the €750 million threshold. This test therefore serves as a falsification or placebo test to validate the regression discontinuity design in this setting. Consistent with expectations, all columns in panel A report an insignificant coefficient on CBCR.

Panel B estimates the regression discontinuity test in the post-implementation period. The coefficients on CBCR are positive and statistically significant in most bandwidths, consistent with higher ETRs (CETRs) of treatment firms relative to control firms and thus lower tax avoidance. The magnitude of the discontinuity ranges from 0.051 to 0.062 for ETR, 0.078 to 0.099 for CETRand 0.040 to 0.074 for TaxDiff. Because cash taxes paid reporting is not mandatory across jurisdictions, the sample for CETR is smaller than the ETR sample. Therefore, to evaluate whether the discrepancy in the coefficients for ETR and CETR is driven by sample attrition, I re-estimate the nonparametric model for ETR using the CETR samples. The results of this estimation (last row of panel B) resemble the base ETR results (first row of panel B) and the discontinuity ranges from 0.051 to 0.059, helping rule out that sample attrition drives the difference in the estimate effect size across these two measures of tax avoidance.

To improve precision and for completeness, I also re-estimate the nonparametric model by adding known determinants of tax avoidance, such as total assets, profitability, leverage, return on equity, foreign operations and R&D (Wilde and Wilson [2018]).[13] These results are reported in the last four columns of panel B and the magnitude of the discontinuity ranges from 0.061 to 0.062 for ETR, 0.078 for CETRand 0.040 to 0.080 for TaxDiff. The coefficients on CBCR are similar in magnitude and sign to the estimates in the base model (columns 1 to 4).

The results in this section suggest that the ETRs (CETRs) of firms above the €750 million threshold are 5%–6% (8%–9%) higher than those of firms below the threshold. Collectively, figures 1, 2 and Table 5 provide strong evidence of a decline in tax avoidance by treatment firms after the implementation of CbCr.

[13] Covariates can be added to the regression discontinuity model, but they are not required for unbiased or consistent estimates (Lee and Lemieux [2010]).

5.4 Manipulation of Consolidated Revenue

In my research setting, selection bias would be a problem if firms were able to manipulate the consolidated revenue to fall below the €750M threshold. To address this concern, I implement a manipulation test of consolidated revenue. Figure 3 provides a density plot of consolidated revenue at the €750M cut-off and there is no visual evidence of discontinuity at the threshold. [14]

Figure 3: RD Density Plot of Consolidated Revenue

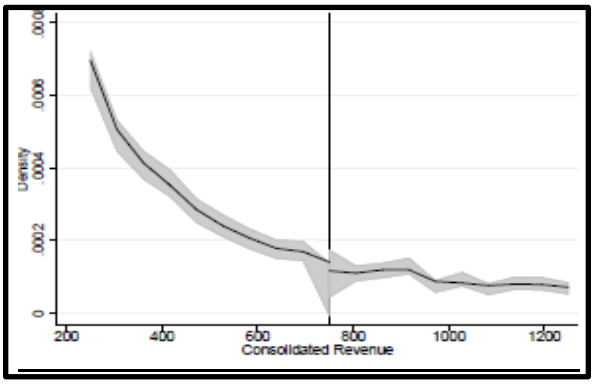


Figure 3 plots the consolidated revenue density around the €750M threshold. The vertical line is centered on €750M. All variables are as defined in Appendix A.

Panel C of Table 5 reports the result of the manipulation test and the regression discontinuity coefficient is not significant in any of the columns. Taken together, Figure 3 and panel C (table 5) indicate a lack of systematic manipulation of consolidated revenue at the cut-off point.

[14] The density estimate must be constructed not only at the cut-off point but also at nearby evaluation points, which may also be affected by boundary bias. Thus, to construct this plot, I use a local polynomial-based density estimation method (Cattaneo, Jansson, and Ma [2017]).

5.5 Discontinuity in Other Determinants of Tax Avoidance

For RD to provide unbiased estimates of the treatment effect, the treatment should not induce a discontinuity in the bivariate relationship between the outcome variable and its other determinants at the cut-off points. Therefore, to corroborate my results in section 5, I establish that there is no discontinuity in other firm characteristics around the €750M cut-off. Figure 4 provides a plot of various firm characteristics (e.g., profitability, size, and leverage) around the cut-off and the graphs below show little evidence of discontinuity.

Figure 4: RD Plot of Other Firm Characteristics

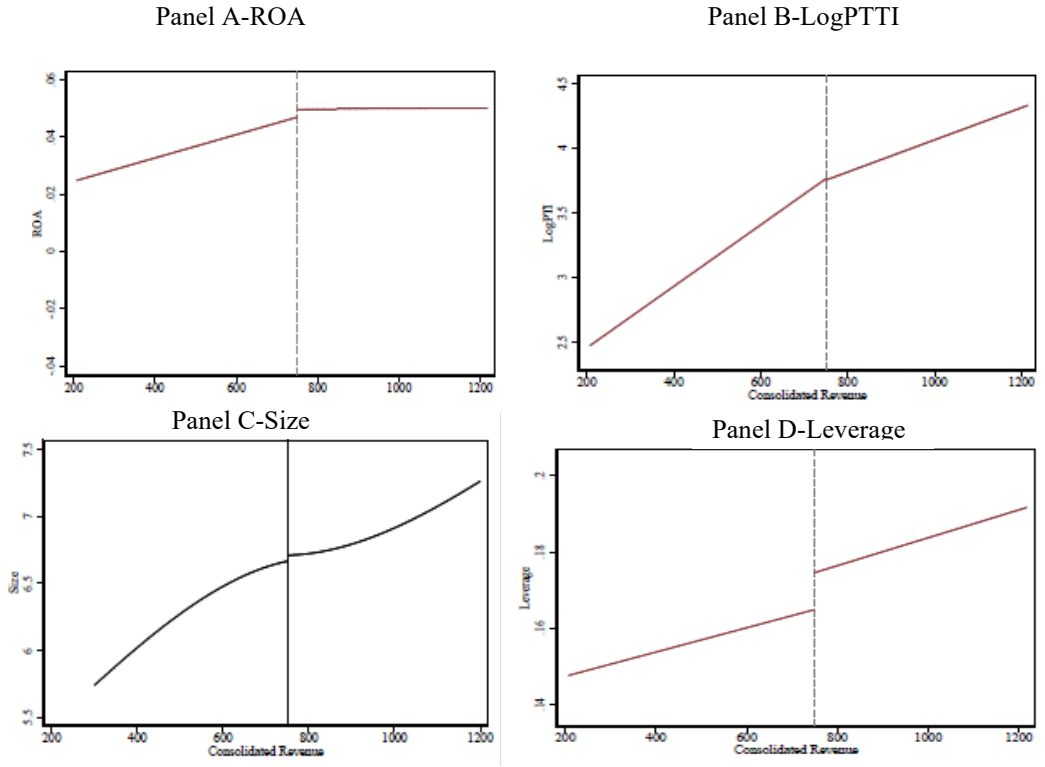


Figure 4 plots firm characteristics (return on assets [ROA], size and leverage) in the post-implementation period (Year>2015) around the Action Item 13 cut-off (€750M). The vertical line is centered on €750M. All variables are as defined in Appendix A.

To support the findings in Figure 3, I empirically tested for discontinuity in several firm characteristics and find that the RD coefficients to be statistically insignificant. These results

(panel D of Table 5) do not imply that the other firm characteristics are not different for firms above and below the threshold. Instead, these results suggest that other firm characteristics change smoothly and not discontinuously at the €750M cut-off. The results of panel D suggest a random sorting of units into control and treatment groups and help validate the results in panel B.

6.0 DIFFERENCE-IN-DIFFERENCE ANALYSIS

6.1 Model and Empirical Results

In RD, there is a trade-off between precision and bias. A non-parametric RDD employs a smaller bandwidth and can provide unbiased estimates of the treatment effect. Such estimation is generally associated with lower power (Roberts and Whited [2013]). Also, though RD estimates have strong internal validity, the external validity of these results is weak. To improve the precision of the estimates and to provide more generalizable results, I use a DID design. In the DID estimation, the treatment (control) group consists of all EU-headquartered MNCs with consolidated revenue of at least (less than) €750M in the preceding taxation year starting in 2016. To implement a true DID design, I need to compare the pre- and post-tax avoidance in treatment and control groups. I classify firms with consolidated revenue of more than €750M in the preceding taxation year (starting in 2016) as treatment firms for all time periods (pre and post). Thus, I compare tax avoidance in firms above and below the €750M cut-off, before and after the implementation of CbCr under Action Item 13. I estimate the following baseline model to test for the impact of CbCr on tax avoidance using DID:

$$TA_{it} = \alpha + \beta_1 CBCR_{it} + \beta_2 POST_t + \beta_3 POST * CBCR_{it} + \beta X_{it} + \varepsilon_{it} \quad (2)$$

All variables are as defined in Appendix A.

TA is measured using one of the tax avoidance proxies (ETR, TaxDiff, and CETR). *CBCR* is an indicator variable equal to (0) 1 in 2010-2018 if the firm is (not) subject to CbCr rules in 2016-2018. [15] *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements were in effect (2016-2018) and 0 otherwise (2010-2015). X_{it} is a vector of control variables. Control variables are often included in a difference-in-differences model for efficiency and as a check for randomization (Roberts and Whited [2013]). Following (Dyreng et al. [2008]; Hoopes et al. [2012]; Chen et al. [2015]; Donhoe [2015]; Chen [2016]; Edwards et al. [2016]), I include the following determinants of tax avoidance in my model: profitability (ROA), size (LogTA), debt level (Leverage), intangible assets (LogIntang) and R&D. Because multinational operations are associated with higher levels of tax avoidance (Klassen and Laplante [2012]), I also control for the geographic footprint of a firm (Avg_STR^{Aff} and N_Country).[16]

Table 6 reports the results of estimating equation 2, using OLS estimation with robust standard errors. The coefficient of interest in Table 6 is β_3, because it provides an estimate of the impact of CbCr on tax avoidance in the treatment group, relative to the control group, in the post-implementation period. All columns of Table 6 include firm and year fixed effect, and standard errors are clustered at the firm level. [17] β_3 is positive and statistically significant in most specifications of Table 6 when ETR and TaxDiff are used as the dependent variables, indicating

[15] To implement a true difference-in-differences design, I need to compare the pre- and post-tax avoidance in treatment and control groups. I classify firms with consolidated revenue of more than €750M in the preceding taxation year (starting in 2016) as treatment firms for all periods (pre and post). Thus I compare tax avoidance in firms above and below the €750M cutoff before and after the implementation of CbCr under Action Item 13.

[16] Avg_STR^{Aff} is the average STR faced by the MNCs and is calculated by calculating the annual mean STR in all affiliate and parent home countries.

[17] Due to the inclusion of firm and year fixed effects, the POST term drops and is not reported in the Table.

that treatment firms have higher ETR and TaxDiff, and thus lower tax avoidance, following CbCr implementation relative to control firms. However, β_3 is insignificant when CETR is used as the dependent variable.[18] Coefficient estimates range from 0.014 to 0.07 (0.013) for ETR (TaxDiff) suggesting that in the post-implementation period, the ETRs of treatment firms are 1%–2% higher than those of the control firms, which indicates a decline in tax avoidance.

To minimize the impact of potential bias on the results in Table 6, due to nonrandom treatment assignment, I use two multivariate reweighting techniques to enhance the covariate balance between the treatment and the control groups: inverse probability weighting and entropy balancing.[19] In my first method, I use a weighted regression model, where observations are weighted to ensure similarity on some observed characteristics. This approach is similar to the inverse probability of treatment weighting and the ‘‘groups’’ to be weighted reflect both treatment status as well as time (pre vs. post) (Stuart, Huskamp, Duckworth, Simmons, Song, Chernew & Barry [2014]). Specifically, I follow Stuart et al. (2014)’s weighting strategy that reweights the four groups (treatment pre, treatment post, comparison pre, comparison post) to be similar on a set of main covariates, which are leverage, size, total assets, intangible assets, and profitability.

The second method I use is entropy balancing which is based on a maximum entropy reweighting scheme that enables users to fit weights that satisfy a potentially large set of balance constraints that involve exact balance on the first, second, and possibly higher moments of the covariate distributions in the treatment and the reweighted control group (Hainmueller &

[18] To verify that sample attrition is not responsible for the change in the main coefficient of interest in Table 6, I re-estimated the models in columns (1), (5), and (9), using the sample from columns (2), (6), and (10), respectively. The results of these estimations are consistent with the results reported in Table 6. For brevity, these results have not been tabulated.

[19] Appendix B provides a detailed discussion of how I implement these techniques.

Xu 2013). Instead of checking for covariate balance after the preprocessing, the user starts by specifying the desired level of covariate balance using a set of balance conditions. In my analysis, I set the balancing constraints to the second order of moment (i.e., the variance) since the balancing is not achieved with the third moment (skewness).

Panel B of Table 6 reports the results from estimating equation 2 using inverse probability weighting (columns 1–2) and entropy balancing (columns 3–4). The coefficient estimates are similar to the ones reported in panel A of Table 6. Thus, these results are robust to nonrandom treatment assignment.

The estimates in tables 5 and 6 (respectively) provide evidence of an increase in GAAP ETRs (or a reduction in tax avoidance) in the treatment firms, relative to the control firms, after the introduction of CbCr. Because the difference-in-differences results are more generalizable, I use these estimates to quantify the economic magnitude of CbCr. Using the mean PTI of the treatment group of €424 million, the coefficient estimates in Table 6 (panel A) translate into an increase in annual accounting tax expense of €4 million to €8 million for an average treatment firm or €14 billion to €28 billion for all treatment firms in the three year post-implementation period . The effect of CbCr on tax avoidance of EUMNCs is therefore statistically and economically significant.

6.2 Robustness of DID Model

For the difference-in-differences model to provide robust estimates, the outcome variable in the treatment and control groups should follow the same trend. Because a graphical representation is a good starting point to evaluate the parallel trends assumption, I plot the movement in annual average ETRs of the treatment group, relative to the control group, between 2010–2018 (figure 5).

Figure 5: Difference-in-differences Plot of Tax Avoidance

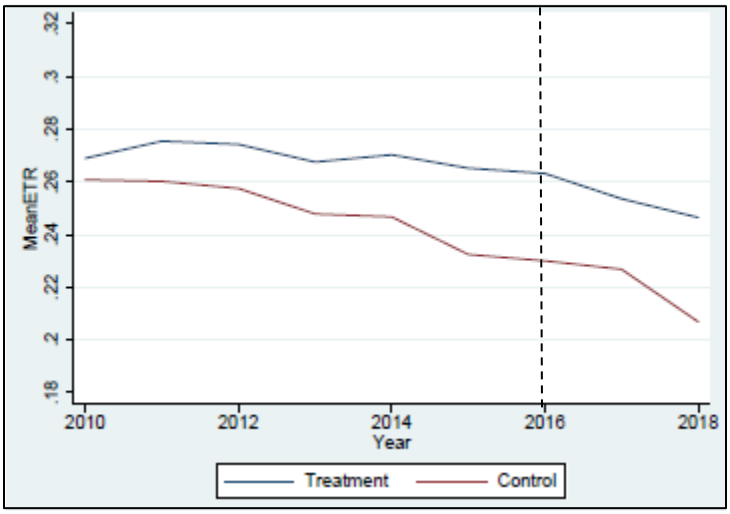
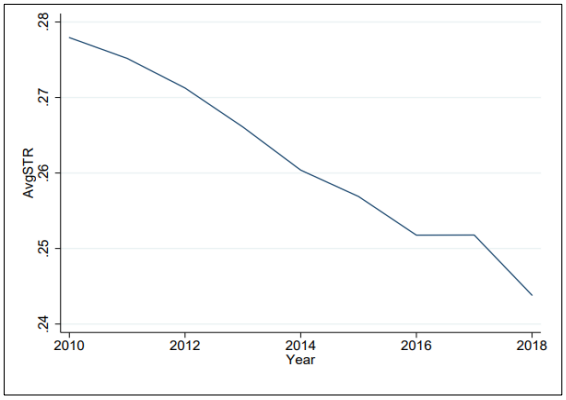


Figure 5 shows that except for 2014, in the pre-implementation period, the ETRs of the treatment and control firms follow a similar declining trend. There is however a divergence in the ETR trends in 2014 with the control firms experiencing a sharp decline. To mitigate concerns that control firms have significantly different ETRs in the pre-implementation period and to understand the timing of the changes in tax avoidance, I re-estimate the model in equation 2 by including separate year indicators and interaction variables for three years before and three years after the introduction of CbCr. The results of this estimation (table 7, panel A) suggest that there was no significant difference in tax avoidance in the two groups of firms before 2015. But starting in 2015, there is an increase in the ETRs of the treatment firms, relative to the control firms and this effect increases over time. Furthermore, a positive and significant coefficient on the interaction between 2015 and

CBCR indicates that there were some spillover effects of CbCr with EU MNCs responding before the official adoption of these rules.[20]

Figure 5 also depicts a slight decrease in ETRs of the treatment group post-2016. The control group, on the other hand, experiences a sharper decline in ETRs particularly in 2018. To further understand the ETR trends, I conduct a pre/post analysis of tax avoidance separately for the two groups. The results of this estimation are reported in panel B of table 7 (columns 1 to 6). The coefficient on the POST term (β_1) is negative and significant for both groups of firms and the estimates range from -0.008 to -0.014 for treatment firms and -0.007 to -0.031 for control firms, and the difference is statistically significant between the two groups (z-stats=2.145, 3.023, and -0.119). These results suggest that, compared to the pre-implementation period, there is a decline in ETRs in both groups, but the decline is more significant for the control firms. To help explain this result, I plot the movement in average STRs in the EU member countries between 2010–2018.

Figure 6: Plot of STR Trends



[20] I also re-estimate the difference-in-differences model by including 2015 in the post-implementation period. Though the results of this estimation are consistent with the results reported in panel A of table 6, I find the coefficient estimates to be higher (2 to 3 percentage point). These results provide further evidence that EU MNCs responded to CbCr before the rules were adopted (in 2016). For brevity, these results have not been tabulated.

Figure 6 illustrates a declining trend in STRs pre-2016, little to no change between 2016 and 2017 followed by a sharp decline in 2018. This is similar to the ETR trends depicted in figure 5 (i.e., declining trend pre-2016, slight decrease between 2016 and 2017 followed by a dip in 2018). Because an EU MNC will likely have operations outside member states, their ETRs will be impacted by STRs outside Europe. The trends in figure 6 are however comparable to the STR trends in most OECD countries. For example, the STR in the US declined from 35% to 21% in 2018, and because most EU MNCs have significant operations in the US, the decline in US STRs could also explain the ETR trends in figure 5. I, therefore, interpret the results of the pre/post analysis as follows: due to a decrease in STRs in EU and other countries, the ETRs in the post-implementation period are declining in both groups, relative to the pre-implementation period. These results, however, do not indicate an increase in tax avoidance in either group. [21]

Because TaxDiff is calculated as the difference between ETR and STR, changes in STRs should not impact the results of a pre/post analysis estimated with TaxDiff as the dependent variable. I therefore re-estimate the pre/post analysis of tax avoidance using TaxDiff (columns 7 to 12 of panel B) and find β_1 to be positive and significant for the treatment firms and insignificant

[21] There are two additional explanations for the sharp dip in ETRs in 2018 in the control group. First, this trend could be attributed to a high proportion of missing observations in 2018. Second, majority of the firms with revenue less than €100 M have negative ETRs (which are reset to 0) in 2018. I therefore re-estimate the difference-in-differences model using two alternate samples: firms with at least €100M revenue and sample year restricted to 2010-2017. The results of these estimations are consistent with the primary difference in differences results reported in table 6. For brevity, these results have been reported in online appendix A6.

for the control firms, in most specifications. Once again, the difference between the coefficients is significant across most columns (z-stats=2.209, 3.364, and -1.144).

Taken together, the findings in this section suggest that the primary results documented in table 6 (i.e., the introduction of CbCr led to a significant decline in tax avoidance) are not driven by an increase in tax avoidance in the control firms and can be attributed to the change in tax behaviour of the treatment firms.

7.0 AFFILIATE LEVEL RESPONSE TO COUNTRY-BY-COUNTRY REPORTING

7.1 Tax Motivated Income Shifting

The main goal of CbCr is to dissuade MNCs from artificially shifting profits from high-tax to low-tax jurisdictions, by providing tax authorities with visibility into the global tax affairs of these firms. An evaluation of how CbCr has impacted tax-motivated income shifting is therefore essential.

To test for income shifting among the affiliates, I adopt a quasi-experimental design using the difference in difference (DID) setup. To empirically examine profit-shifting, I start by extending the original model of income shifting developed by Hines and Rice [1994] and later expanded by Huizinga and Laeven [2008]. The main idea underlying the Huizinga and Laeven [2008] model is that reported earnings before taxes (PBT) of a subsidiary in period *t* is equal to the sum of true earnings before taxes and those profits that are shifted. Because the true profit of the affiliate in the absence of income shifting is not observable, Huizinga *et al.* [2008] use return on capital to estimate true earnings where return on capital (K), labor (L), and productivity function (A) are jointly employed by a firm to produce output Q.

I modify this model for the purpose of the difference-in-difference research design by adding the interaction term between the tax incentive variable (π_{it}), an indicator variable for the treatment group (CBCR), and an indicator variable for the post-adoption period (POST). Specifically, I estimate the following regression model:

$$LOGPTI_{it} = \alpha + \beta_1\pi_{it} + \beta_2 POST_t + \beta_3 CBCR + \beta_4\pi_{it} * POST_t + \beta_5 POST_t * CBCR + \beta_6\pi_{it} * CBCR + \beta_7\pi_{it} * CBCR * POST + \beta_8 LOGTA_{it} + \beta_9 LComp_{it} + \beta_{10} LOGGDP_{it} + FE_{it} + \varepsilon_{it} \quad (3)$$

π_{it} is the tax incentive variables and is measured using C_{it}. The calculation of C_{it} is provided in the equation below:

$$C_{i,t} = \frac{1}{1-\tau_{i,t}} \frac{\sum_{k\neq i}^{n} \frac{\beta_{k,t}(\tau_{i,t}-\tau_{k,t})}{1-\tau_{k,t}}}{\sum_{k}^{n} \frac{\beta_{k,t}}{1-\tau_{k,t}}} \quad (4)$$

C_{it} is the revenue-weighted differential statutory tax rate faced by each affiliate calculated following equation (2). Consistent with previous studies (DeSimone [2016], Markle [2016]), I use affiliate revenue to measure the scale of affiliate operations. However, since revenue can be affected by income shifting activities, I use total assets as an alternate measure of affiliate operation (Alt_C_{it}).

CBCR is an indicator variable for the affiliate-years whose ultimate global parent are subject to disclosure under CbCr. In other words, CBCR equals one for affiliates of European MNCs within the scope of CbCr and equals zero for affiliates of European MNCs outside the scope of CbCr. The POST is an indicator variable equal to one for 2016 and subsequent years, and zero for 2010-2015.

$LOGPTI_{it}$ is the natural log of profit before tax of subsidiary i of firm r in year t. $LogAssets_{it}$ is the log of affiliates' total assets, and $LogComp_{it}$ is the log of affiliates' total compensation

expense. $LogGDP_{it}$ is the log of the affiliates' home country GDP and is a proxy for productivity. Appendix A provides definitions and detailed calculations for the variables in equation (3) and (4).

I estimate the above regression using both year and parent fixed effects to control for both time trends and unobserved time-invariant characteristics among firms. With the inclusion of these fixed effects in a DID design, the individual terms are automatically dropped from the estimation. The coefficient β_7 on the interaction term between POST, CBCR, and π is the primary variable of interest in equation (3). A negative coefficient on β_7 suggests that all things being equal, EU MNC subject to CbCr, engaged in more tax-motivated income shifting to low tax affiliates.

Panel A of Table 8 reports the primary results of the income-shifting tests. Columns (1) to (4) are estimated using the full affiliate sample, and columns (5) to (7) are estimated using affiliates with at least €1M in revenue. The columns of Table 8 also vary based on the percentage of missing affiliate data. All columns include parent and year fixed effects and standard errors are clustered at the parent level.[22] Consistent with previous income shifting studies, the coefficient on the effect of tax incentives (β_1) on pre-tax income is negative and significant in column 1.

The main coefficient of interest in panel A is β_7 as it provides an estimate of the effect of tax incentives on pre-tax income in the treatment group relative to the control group, in the post-implementation period. In the full sample, β_7 is positive and statistically significant only when groups with no missing affiliate data are included in the estimation (column 4). In the restricted sample, β_7 is positive and statistically significant when groups with less than 10% missing affiliate data are included in the regression (columns 6 and 7). A positive coefficient on β_7 suggests that in the *POST* period, affiliates of treatment firms shift less income to low-tax affiliates, relative to the

[22] The income-shifting results are robust to firm and year fixed effects and to clustering of standard error at the firm level.

affiliates of firms not subject to any CbCr requirement. Though panel A of Table 8 provides some evidence of a decrease in tax-motivated income shifting after the introduction of CbCr, these results are not very robust since β_7 is statistically insignificant across most columns.

To further understand the timing of the changes in income shifting activities, I re-estimate the model in equation 3 by including separate year indicators and interaction variables for the three post-implementation years (2016–2018) in Table 8, panel B. The coefficient on the interaction between tax incentive, CBCR and 2018, is positive and statistically significant across most specifications in panel B. Thus, the results of this estimation provide robust evidence of a decline in income shifting in the treatment group, starting in 2018. Regarding economic magnitude, the estimate of 2.393 in column 1 (panel B) indicates that an interquartile increase in C_{it} (0.042) is associated with a 10.05% increase (0.042*2.393) in the reported profit of affiliates of EU MNCs in the post-implementation period. With the median pre-tax income of €8.886 million (Table 3), this translates into an incremental increase in the reported income of €0.893 million per affiliate of an EU MNC.

From the findings in this section, I infer that, in the overall post-implementation period, CbCr did not deter profit shifting. The decline in tax avoidance that I document over the same time period can be attributed to a change in other types of tax planning. For example, De Simone and Olbert [2019] find a reduction in ownership of tax haven subsidiaries by EU MNCs subject to CbCr. Consistent with the notion that it can take firms 12 to 18 months to adjust tax planning strategies (Khan et al. [2017], Kim et al. [2019]) I document robust evidence of a decline in income shifting in the treatment group, starting in 2018. I also document a simultaneous decline in tax avoidance at the firm level in 2018. Further research is, however, needed to establish the true long-term effects of CbCr. This research will only be possible once additional data becomes available.

7.2 Misalignment Between Activity Level and Income

As previously discussed, it is unclear whether CbCr provides incremental information to tax authorities regarding a firm's transfer pricing rules. Nevertheless, these disclosures provide visibility over how an MNCs activity, income, and tax liability are broken down by jurisdiction. This should allow tax authorities to detect misalignment between activity and income by jurisdictions.[23] Firms that report high levels of profit in low tax-low activity jurisdictions are more likely to be scrutinized by tax authorities and may face increased reputational cost or increased transfer pricing audits. Such firms can respond to CbCr in one of two ways. First, these firms may reduce the amount of income reported in low tax-low activity affiliates. Alternatively, these firms can also increase the activity level in low tax -low activity affiliates. I test both these predictions empirically and investigate whether there is a decrease in the misalignment between activity level and reported income after the implementation of CbCr.

To evaluate whether there is a reduction in the level of income reported in low tax-low activity affiliates, I estimate the model in equation 3 separately for high activity and low activity groups. I measure activity using employment (number of employees and compensation cost), tangible assets and intangible assets and I split the sample at the median values. Panels A to D of Table 9 report the results of these estimations. In panels A & C, I find that β_7 is positive and significant in the high-activity group indicating a decrease in income shifting for high activity-low tax affiliates. In panel B, I find that β_7 is positive and significant in both groups. Finally, in panel D, when tangible assets are used to measure activity, I find β_7 to be insignificant in both groups. The results in panels B and D suggest a lack of significant difference between the pre-tax earnings

[23] Consistent with previous studies (De Simone & Olbert [2019]), I use employment and asset level to measure activity level.

in the two groups. Taken together, the results on table 10 indicate that there was a decline in pre-tax profits reported by affiliates located in low tax countries, with a high level of employment and intangible assets. This finding is not consistent with the expectation that CbCr will decrease the misalignment between activity and income.

As previously discussed, misalignment between income and activity level can also be reduced by increasing the activity level in low tax -low activity affiliates. To empirically examine whether there is a change in the activity level in low tax-low activity affiliates, I estimate the following regression equation:

$$Activity_{it} = \alpha + \beta_1 \pi_{it} + \beta_2 POST_t + \beta_3 CBCR + \beta_4 \pi_{it} * CBCR * POST + FE_{it} + \varepsilon_{it} \quad (5)$$

β_4 is the coefficient of interest in this model as it provides an estimate of the impact of tax incentives on the activity level in affiliates of firms' subject to CbCr relative to affiliates of firms not subject to CbCr. The results of estimating equation 5 is reported in panels A to D of Table 10. In panels A-C, β_4 is negative and significant when employees and intangibles are used to measure the activity level, suggesting that in the POST implementation period, affiliates in the treatment group report higher levels of employment and intangibles in low tax countries, relative to affiliates in the control group.[24] β_4, however, is positive and significant in panel D, implying that in the POST implementation period, affiliates in the treatment group report a lower level of tangible assets in low tax countries, relative to affiliates in the control group. These results are robust to the inclusion of fixed effects and additional controls.

I interpret the results in tables 9 and 10 as follows. To reduce the misalignment between activity level and reported income, firms subject to CbCr increase investment in employment and

[24] Even though intangible assets are not disclosed in the CbC reports, I use intangible assets as one of the measures of activities because intangible assets are more mobile compared to tangible assets.

intangibles in low tax affiliates. There is, however, no change in real investment (i.e., tangible assets) or the amount of pre-tax income reported in low tax-low activity affiliates.

8.0 ADDITIONAL ANALYSIS

8.1 Cross-Sectional Variation in Response to Country-by-Country-Reporting

8.1.1 Tax Enforcement

The usefulness of CbCr disclosures in deterring income shifting will partially depend upon the strength of tax enforcement in the non-resident jurisdictions. Countries with strong tax administration will be able to use the CbCr disclosures more efficiently to detect aggressive and sophisticated tax planning structures. As such, there should be a more significant decline in the level of income shifted to subsidiaries in low tax rate jurisdictions. To measure the strength of tax enforcement, I use the total spending on tax enforcement (scaled by the gross domestic product) from the OECD's Tax Administration Comparative Information Series to measure tax enforcement and split the sample using the median and 25th/75th percentile value. Table 11 reports the results of cross-sectional tests.

Since the income-shifting model in Eq (3) already includes a triple interaction term (C_POST_CBCR) to conduct cross-sectional income-shifting tests, I estimate Eq (3) separately for high and low-tax enforcement groups. I then calculate the F statistics to determine if the coefficient of interest (β_7) is significantly different in the two regressions. For the cross-sectional tax avoidance test, I include a three-way interaction term (CBCR*POST*TE) to capture the impact of tax enforcement on ETR in the treatment firms relative to the control firms in the post-implementation period. With the inclusion of firm and year fixed effects in a DID, the individual terms (CBCR//POST/TaxEnforcement/Treament_TaxEnforcement) are automatically dropped

from the estimation. As such, these terms are not reported in Table 11, even though the terms were included in the estimation. A similar approach is followed for the cross-sectional test of public pressure, detection risk, and political cost.The main coefficient of interest in panel A is β_7 as it provides an estimate of the effect of tax incentives on pre-tax income in the treatment group relative to the control group, in the post-implementation period.

In panel A, β_7 is positive and statistically significant in the high-tax-expenditure group and negative and insignificant in the low-tax expenditure group. The difference between β_7 is statistically significant across all columns (z-stats = 2.105, 1.822, and 1.989), suggesting that the decline in income shifting is driven by affiliates located in countries with stronger tax enforcement. Contrary to the results in panel A, the results in panel B indicate that tax enforcement strength in the home country does not seem to have any impact on the tax behaviour of treatment firms in the post-implementation period. This result is consistent with expectation since MNCs are already subject to extensive disclosure requirements in their home country.

8.1.2 Detection Risk

The primary channel through which CbCr is expected to affect ETR is by increasing the risk of detection and unfavorable assessment of tax planning strategies by tax authorities. I predict a more significant decline in tax avoidance in firms that have aggressively avoided tax in the pre-implementation period. To measure detection risk, I use the long-term average ETR (ETR_5) (Dyreng, Hanlon, and Maydew [2010]), and split the sample using the median and 25th/75th percentile value. Table 12 reports the results of cross-sectional tests. In panel A, I find β_7 to be statistically insignificant in most specifications. Contrary to the results in panel A, the results in panel B indicate a greater decline in tax avoidance in the high detection risk group (β_7 is positive and significant across most columns).

8.1.3 Public Pressure

A secondary channel through which CbCr is expected to deter tax avoidance is by increasing the reputational cost associated with tax planning activities. All firms will however not respond to the risk of public exposure of CbCr. Firms that are more sensitive to public pressure are more likely to have a behavioural response to CbCr. I, therefore, predict that the decline in tax avoidance in the post-implementation period increases in a firm's sensitivity to public pressure. To measure public pressure, I construct a public interest index using the Google Trends database which is an unbiased sample of the Google search data. Google Trends database is anonymized, categorized and aggregated and can be used to measure public interest in a particular firm over various time frames and geographic locations.[25] Prior research has shown that investor and consumer' attention can be reliably proxied for by using the frequency of Google searches (Penna and Huang, 2009; Da, Engelberg, and Gao, 2011; Drake, Roulstone, and Thornock, 2012).

Using the Google Trends database, I download the total number of normalized google searches[26] for each firm subject to CbCr in the pre-implementation period (e.g., 2012-2015). Firms with a higher number of google searches[27] are included in the high public pressure group. The basic premise used in the construction of the public interest index is that firms with higher extant

[25] https://medium.com/google-news-lab/what-is-google-trends-data-and-what-does-it-mean-b48f07342ee8.

[26] Normalization of google searches means that searches are adjusted to account for all searches on all topics on Google at that time and location. Normalization of google searches is important for comparability as the number of people searching on Google changes constantly and raw search numbers are not comparable over time.

[27] In Panel A of Table 12, PublicInterest is an indicator variable equal to 1(0) if the total Google searches for the firm are greater (lower) than the median value of the google search results. In Panel B, the 25th & 75th percentile of google search results are used to divide the sample into high and low public interest groups.

public interest (as captured by normalized google searches) will be more sensitive to the public exposure of their country-level disclosures, and therefore more likely to respond by reducing the level of tax avoidance in the post-implementation period.

Since the average number of Google searches can be correlated to firms' size, I also use the total number of Factiva hits as an alternate measure of public pressure. This approach is consistent with Dyreng, Hoopes, et al. [2016]. Table 13 reports the results of cross-sectional tests. In panels A & B of Table 13, the main coefficients of interest are insignificant indicating that public pressure does not seem to have any impact on the tax behaviour of treatment firms in the post-implementation period. Overall, the results from the public pressure test do not provide strong evidence to support the notion that public pressure is a channel through which CbCr impacts tax behaviour.

8.1.4 Political Cost

The risk of public exposure of CbCr can also increase the political cost associated with reporting high levels of income in low tax countries. Recent empirical studies suggest that tax-related disclosures can damage government contracting relationships thereby imposing a political cost on the firms (Dyreng et al. [2016]). In a recent working paper, Wang, Wilson, Zhang & Zou (2018) provide evidence that firms with high political cost engage in lower levels of tax planning. Therefore, firms that are more sensitive to political pressure are more likely to respond to the risk of public exposure of CbCr by reducing their level of tax avoidance. Following Dyreng et al. [2016], I use the political sensitive industry designation from Julio and Yook [2012] and classify firms in tobacco products, pharmaceuticals, healthcare services, defense, petroleum and natural gas, telecommunications, and transportation industries as politically sensitive.

Table 14 reports the results of the cross-sectional tests. In panels A & B of Table 14, the main coefficients of interest are insignificant indicating that political cost does not seem to have any impact on the tax behaviour of treatment firms in the post-implementation period.

8.2 Investor Response to CbCr

In this section I examine investor reaction to CbCr. Investor response will depend upon the net cost/benefits of private county-level disclosures as anticipated by the shareholders. Investors can be concerned that CbCr may impose additional costs on firms due to increased detection risk or due to the risk of public exposure. On the other hand, investors may anticipate a reduction in aggressive tax strategies after the implementation of CbCr. This could benefit investors by reducing the level of information asymmetry and improving financial reporting quality (Chen 2017).

Previous papers that have studied the market reaction to increases in tax disclosures have focused on public disclosure of tax information, and these studies provide inconclusive evidence (Chen 2017; Dutt, Ludwig, Nicolay, Vay, and Voget 2018; Hoopes et al. 2017;). In one of the few papers that have evaluated the market reaction to private disclosure requirements, Abernathy, Davenport and Rapley (2013) examine investor response to the inrtoduction of Schedule UTP which provides information to IRS on tax-planning strategies. Abernathy et al. (2013) find that stock returns were negative around the development of Schedule UTP but positive around the release of the final draft of Schedule UTP.

To the best of my knowledge, there is still a lack of broad-based and consistent empirical evidence on how investors respond to increases in the private disclosure of tax information. Considering the widespread implementation of CbCr, it is nevertheless important to understand how shareholders view such disclosure requirements. Using two key dates leading up to the

implementation of CbCr, I use an event study methodology to examine whether investors anticipated net costs related to CbCr. Appendix 2 provides a timeline for the introduction and adoption of CbCr.

OECD first introduced CbCr as part of the BEPS framework in a draft memo on October 4, 2013. On February 6, 2015, the first CbCr implementation package was published which clarified the disclosures requirements and the scope of CbCr. I, therefore, use February 6 , 2015 as the first date in the event study.[28] As the primary sample in this paper consists of EU MNCs, I include the date the EU Commission approved the CbCr rules and finalized its formal adoption in member states (March 8, 2016) as the second date in the event study.

Consistent with Hanlon and Slemrod (2009), I use the market model based on a value-weighted index to estimate the abnormal returns for a three-day window centered on the two key event dates. Appendix C provides an overview of the timeline for the introduction and adoption of CbCr. Figure 7 provides a binscatter plot of the three-day CAR for the two key event dates. In both panels of Figure 7, there is a negative discontinuity in the CAR, suggesting that the treated firms report lower CAR.

Figure 7: RD Plot of Market Reaction

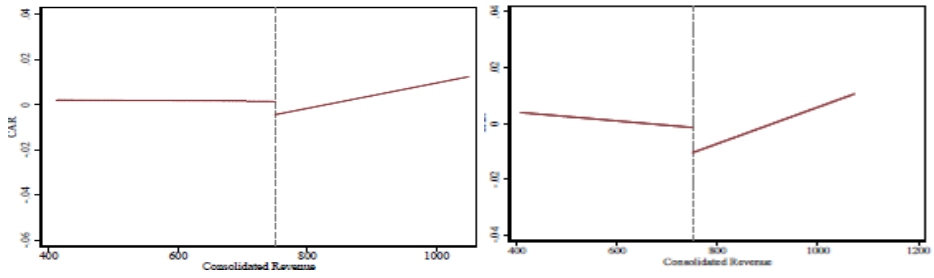


Figure 5 plots CAR for two key event dates around the Action Item 13 cut-off (€750M). The vertical line is centered on €750M. All variables are as defined in Appendix A.

[28] On October 4, 2014 it was not clear whether AI13 would apply to all MNCs or only to certain firms. On February 6, 2015, in the implementation package, OECD clarified that CbCr would only apply to MNCs with consolidated revenue more than 750M.

To test the significance of the discontinuity depicted in Figure 7, I first compare the mean CAR in the two groups of firms (panel A of Table 15) and find a significant difference only for event 2. As a comparison of the mean can be biased in the boundary of the cut-off, I also use a non-parametric regression discontinuity model. The results of this estimation are reported in panel B of Table 15, and consistent with the results in panel A, I find that for event 2, the CAR of the treated firms is significantly lower than the CAR of the control firms. The coefficient estimates translate into a negative CAR of 2% for firms subject to CbCr. From the results in this section, I infer that investors anticipated CbCr to impose additional costs on firms.

8.3 Spillover of Information

Next, I test for any spillover effect related to the implementation of CbCr. EU formally adopted CbCr in 2016, but the reporting requirements were finalized and known publicly as early as 2015. It is, therefore, possible that European MNCs responded to CbCr before its formal adoption. In my current research design, I compare tax avoidance in European MNCs on either side of the threshold starting in 2016. To test for the leakage effect, I re-estimate a non-parametric regression discontinuity model by including 2015 in the post-implementation period. Next, I only include 2015 observations (i.e., CBCR is equal to one if consolidated revenue was at least 750M in 2014) in the post-implementation period. The results of these estimations are reported in panel A of Table 16. The coefficient on CBCR is not statistically significant in any of the specifications in panel A, suggesting that firms responded to CbCr only after it was officially adopted in Europe, i.e., starting in 2016.

8.4 Confounding Effect of Other Tax Changes

A primary challenge with trying to study the impact of CbCr is that in addition to Action Item-13, some additional tax and political initiatives were introduced in the EU over the same period. For example, the EU Parent Subsidiary Directive was implemented in all EU member states in 2015. Moreover, in addition to Action Item-13, several other BEPS Action Items (i.e. Action Item-1, Action Item-5) were implemented either before or in the same year as Action Item 13. Brexit is another major event that took place in the EU during the sample period and is also expected to have a significant impact on the operations of European MNCs. It is therefore essential to establish that the results in this study are not driven by the confounding impact of these other changes.

A unique feature of CbCr is that the reporting requirement only applies to firms with consolidated revenue in the preceding taxation year of at least €750M. A critical distinction between CbCr and the concurrent tax changes is that unlike CbCr, these other initiatives apply to all firms in the EU (e.g., there is no threshold implementation). Appendix E provides an overview of these changes and highlights that even though EU member states adopted other tax-related changes around the same time as CbCr, none of these policies were implemented based on a threshold.

For example, BEPS Action Item-5 which was adopted by individual EU member states in 2015 changed the patent box regime. A change in the preferential treatment of patent income can affect tax avoidance (Bornemann, Lapalante & Osswald 2017). Action Item-5, however, should not impact firms to the left and right of the €750M cut-off differently. Similar to Action Item-5, there is no reason to expect that there will be any variation in the impact of other initiatives in the treatment and control groups. The identification strategy in this paper (RDD and DID) compares tax avoidance in firms around the 750M threshold. Even if these firms are subject to other tax

changes, as long as both the treatment and control groups are exposed to the same policies, my identification strategy should still provide unbiased treatment estimates. Nevertheless, to provide results that are robust to the confounding impact of other policies and initiatives, I parse the data and construct an alternate sample that controls for major tax or political reforms during the sample period.

Though all EU member states adopted CbCr on the same date, there was variation in the country-level implementation of other policies (EG). I exploit this variation and identify a subset of EU countries that adopted the same set of tax changes, and I use firms to the left and right of the €750M cut-off in these countries to form an alternate treatment and control group. Appendix E provides an overview of the identification strategy used to construct this alternative treatment and control group.[29]

Using the firms in the alternate treatment and control group, I estimate a non-parametric regression discontinuity model. I also re-estimate Eq (2) with the parsed sample the alternate sample (discussed above). The results of all these estimations are reported in panels B and C of table 16 and the results are similar to the primary results reported in this paper suggesting that the findings of this paper are not biased by the confounding impact of other policies and initiatives.

8.5 Sensitivity Analysis

In this section, I conduct several sensitivity checks. First, I re-estimate tax-avoidance and income-shifting models by including all European firms (even those headquartered outside EU). This sample selection procedure is similar to De Simone and Olbert [2019]. In the EU, a primary

[29] Appendix E highlights that a number of tax changes were implemented in EU between 2014 and 2017. If I exclude all countries which introduced other polices, I am left with a very small sample size. Instead I identify countries which implemented the same set of changes over the same time period. As these changes affect firms to the left and right of the threshold equally, this strategy should help control for the confounding effect of other policies.

reporting obligation under CbCr arises when, in a multinational group, either the ultimate parent or a member of the group is resident in an EU member state. CbCr requirements for non-resident EU firms depends on whether the parent jurisdiction has adopted the rules and on the exchange relationship between parent home country and EU member states. I, therefore, restrict my primary sample to EU headquartered firms and, in additional analysis, I include non-resident EU firms. The results with this expanded sample (panels A-C of Table 17) provide weak evidence of a decline in tax avoidance and income shifting, suggesting that the results documented in this study are driven by EU-headquartered firms and their affiliates. I attribute this result to the fact that not all firms operating in the EU may be within the scope of CbCr during my sample period.

I also re-estimate the income-shifting model by using total assets and fixed assets to measure the scale of affiliate operations. The results of the income shifting tests are robust to this alternate calculation of the tax incentive variable.

8.6 Falsification Tests

Finally, I conduct a series of falsification tests. First, I choose two hypothetical cut-offs (€1,500M and €2,500M) and examine whether there is a discontinuity in tax avoidance around these cut-offs in the same period as this primary analysis (i.e., in 2016 and 2018). Next, I use €750M, but change the implementation period to 2012 and examine whether there is a discontinuity in tax avoidance around the €750M cut-off between 2012 and 2014. Panels A and B of Table 18 report the results from these estimations. I document no significant change in tax avoidance in firms on either side of the hypothetical cut-off using the optimal bandwidth.

9.0 CONCLUSION

Introduction of CbCr has increased the quantity as well as the uniformity of geographic tax disclosures made by some of the largest MNCs to tax authorities. These disclosures are expected to provide tax administrations (especially in non-resident jurisdictions) with greater visibility over the global tax affairs of the firms that are at the heart of the BEPS debate.

Additionally, the risk of public exposure of their reports may cause firms to treat these disclosures as de facto public disclosures. There is, however, a well-acknowledged disconnect between CbCr and the transfer-pricing rules used by MNCs to report income in different jurisdictions. Transfer pricing rules are based on "arms length principle" and are not related to the level of activity reported in a jurisdiction. Furthermore, previous studies (Hasegawa et al. [2013], Bozanic et al. [2017], Towery [2017]) provide limited and inconclusive evidence on the effects of private tax disclosure regulations on tax avoidance. As such, there is a lack of consensus amongst policymakers, practitioners, and academics regarding the effectiveness of CbCr in increasing ETRs. This study aims to offer early empirical evidence on the economic consequences of CbCr.

Using the €750M cut-off for the application of CbCr and employing an RD and DID design, I find that private country-level disclosures are associated with higher ETRs, though there is little impact on the income-shifting activities. The change in ETRs is perhaps due to a change in other types of tax avoidance activities carried out by MNCs. To better understand the channels through which increased private disclosures influence tax behaviour, I conduct several cross-sectional tests and find a more significant increase in ETRs in firms with higher detection risk and enforcement strength in the affiliate home country. I also evaluate market reaction and document a negative CAR for firms subject to CbCr around the date the CbCr was legislated.

Because CbCr is the first initiative providing detailed country-level disclosures to tax authorities and is also one of the initial disclosures to be shared under OECD's automatic exchange of information, this study offers early empirical evidence about the effects of private disclosure of country-level information on tax behaviour. The findings of this study also contribute to the ongoing debate on public versus private CbCr, as they inform policymakers that public disclosure of CbCr is not necessary to deter tax avoidance—private disclosure of this information may be sufficient.

Table 1: Sample Selection of EU-Multinational Firms

Panel A: Sample Selection of EU MNCs

All European Global Ultimate Owners	319,279
Exclude all companies in financial and extractive industries	(156,532)
Exclude all companies with headquarters outside EU	(154,197)
Number of European MNCs	9,388
Less firms missing required data	(4,076)
Final Sample for ETR tests	**5,312**
Less firms not matched to Compustat	(3,503)
Final Sample for CETR tests	**1,809**

Panel B: Sample Selection of Affiliates of EU MNCs

Majority owned affiliates of the 5,312 EU MNCs	52,250
Less firms missing required data	(37,720)
Final Sample for income shifting tests	**14,530**

This Table provides an overview of the sample selection process. All financial statement data is from the Orbis database. GUO refers to the Global Ultimate Owner.

Table 2: Summary & Descriptive Statistics

Panel A: Industry Classification

Major Industry Sector	Freq.	Percent
Chemicals, rubber, plastics, non-metals	535	6
Construction	360	4
Education, health	99	1
Food, beverages, tobacco	207	2
Hotels & restaurants	79	1
Machinery, equipment, furniture	892	10
Metals & metal products	250	3
Information and communication	1,796	19
Professional, scientific and technological	2,327	25
Administrative and support services	389	4
Post & telecommunications	108	1
Publishing, printing	180	2
Textiles, wearing apparel, leather	124	1
Transport	288	3
Wholesale & retail trade	906	10
Other service	848	9
Total	9,388	100

This Table provides a breakdown of the primary sample by major industry sector.

Table 2: Summary Statistics (cont'd.)

Panel B: Statutory Tax Rates

Country	2013	2014	2015	2016	2017	2018
Austria	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Belgium	33.99%	33.99%	33.99%	33.99%	33.99%	29.00%
Bulgaria	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Croatia	20.00%	20.00%	20.00%	20.00%	20.00%	18.00%
Cyprus	12.50%	12.50%	12.50%	12.50%	12.50%	12.50%
Czech Republic	19.00%	19.00%	19.00%	19.00%	19.00%	19.00%
Denmark	25.00%	24.50%	22.00%	22.00%	22.00%	22.00%
Estonia	21.00%	21.00%	20.00%	20.00%	20.00%	20.00%
Finland	24.50%	20.00%	20.00%	20.00%	20.00%	20.00%
France	33.33%	33.33%	33.33%	33.30%	33.33%	33.00%
Germany	29.55%	29.58%	29.72%	29.72%	29.79%	30.00%
Greece	26.00%	26.00%	29.00%	29.00%	29.00%	29.00%
Hungary	19.00%	19.00%	19.00%	19.00%	9.00%	9.00%
Isle of Man	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Italy	31.40%	31.40%	31.40%	31.40%	24.00%	24.00%
Jersey	0.00%	0.00%	20.00%	20.00%	20.00%	20.00%
Lithuania	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
Luxembourg	29.22%	29.22%	29.22%	29.22%	27.08%	26.01%
Malta	35.00%	35.00%	35.00%	35.00%	35.00%	35.00%
Netherlands	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Poland	19.00%	19.00%	19.00%	19.00%	19.00%	19.00%
Portugal	25.00%	23.00%	21.00%	21.00%	21.00%	21.00%
Romania	16.00%	16.00%	16.00%	16.00%	16.00%	16.00%
Slovakia	23.00%	22.00%	22.00%	22.00%	21.00%	21.00%
Slovenia	17.00%	17.00%	17.00%	17.00%	19.00%	19.00%
Spain	30.00%	30.00%	28.00%	25.00%	25.00%	25.00%
Sweden	22.00%	22.00%	22.00%	22.00%	22.00%	22.00%
United Kingdom	23.00%	21.00%	20.00%	20.00%	19.00%	19.00%

This Table provides the statutory tax rate (STR) for the European Union Member states between 2012 and 2018.

Table 2: Summary Statistics (cont'd.)

Panel C: Breakdown by Country

Country	Control Firms		Treatment Firms	
	No	%	No	%
Austria	728	1.83	135	1.67
Belgium	1,811	4.56	265	3.28
Bulgaria	66	0.17		
Canary Islands (Spain)	43	0.11	8	0.1
Croatia	166	0.42		
Cyprus	150	0.38	28	0.35
Czech Republic	9	0.02	7	0.09
Denmark	1,347	3.39	298	3.69
Estonia	49	0.12	9	0.11
Faroe Islands (Denmark)	14	0.04		
Finland	2,314	5.82	278	3.44
France	2,546	6.41	801	9.91
Germany	5,353	13.47	1,346	16.65
Greece	636	1.6	82	1.01
Greenland (Denmark)	5	0.01		
Guernsey (UK)	69	0.17	44	0.54
Hungary	190	0.48	9	0.11
Ireland	122	0.31	264	3.27
Isle Of Man (UK)	67	0.17	13	0.16
Italy	5,730	14.42	627	7.76
Jersey (UK)	132	0.33	55	0.68
Latvia	130	0.33		
Lithuania	78	0.20	6	0.07
Luxembourg	207	0.52	130	1.61
Malta	44	0.11		
Netherlands	3,005	7.56	1,160	14.35
Poland	896	2.26	93	1.15
Portugal	641	1.61	51	0.63
Romania	33	0.08		
Slovakia	49	0.12		
Slovenia	50	0.13	9	0.11
Spain	3,439	8.66	514	6.36
Sweden	6,329	15.93	539	6.67
United Kingdom	3,283	8.26	1,313	16.24
Total	**39,731**	**100**	**8,084**	**100**

This Table provides a breakdown of firm-year observations by year and country.

Table 3: Descriptive Statistics

Panel A: Descriptive Statistics for EU MNCs

	Treatment Group - EU MNCs with Consolidated Revenue >=€750M						Control Group - EU MNCs with Consolidated Revenue <€750M					
Variable	**N**	**Mean**	**SD**	**P25**	**P50**	**P75**	**N**	**Mean**	**SD**	**P25**	**P50**	**P75**
Revenue	8,713	6,773	18,347	1,017	1,846	4,676	48,418	134.184	391.720	25.313	62.416	149.407
PTI	8,713	445.556	1,616	26.347	97.045	312.475	48,418	8.091	58.355	0.089	2.046	7.581
Net Income	8,713	333.729	1,482	16.066	71.733	237.090	48,418	6.232	60.478	0.004	1.462	5.685
Total Assets	8,713	9,388	25,114	865	1975	6,236	48,418	196.322	878.999	22.871	59.204	153.580
Size	8,713	7.802	1.505	6.751	7.571	8.721	48,418	4.077	1.475	3.149	4.092	5.039
ROA	8,713	0.058	0.121	0.023	0.044	0.0713	48,418	0.077	0.423	0.024	0.050	0.090
Leverage	8,713	0.633	0.223	0.513	0.635	0.748	48,418	0.614	2.082	0.408	0.576	0.733
ETR	8,713	0.265	0.202	0.157	0.247	0.324	48,418	0.239	0.227	0.128	0.221	0.322
TaxDiff	8,713	-0.005	0.202	-0.112	-0.013	0.051	48,418	-0.020	0.225	-0.190	-0.026	0.050
CETR	4,567	0.255	0.219	0.117	0.228	0.321	11,716	0.194	0.235	0.102	0.135	0.276
STR	8,713	0.269	0.058	0.230	0.278	0.295	48,418	0.260	0.054	0.220	0.250	0.298

This table reports descriptive statistics for the primary sample. All continuous variables are in millions of Euros. *Revenue* refers to the consolidated revenue for the corporate group*; PTI* refers to pre-tax earnings; *Size* refers to the natural log of total assets; *ROA* is the return on assets and is calculated as net income divided by total assets; *Leverage* is long-term debt divided by total assets; *ETR* is calculated as total tax expenses divided by *PTI*; *TaxDiff* is calculated as the difference between *STR* and *ETR; CETR* is calculated as total cash taxes paid divided by *PTI* and *STR* is the statutory tax rate; All continuous variables have been winsorized at 1 and 99. *ETR* & *CETR* have been reset at 1 and 0. All variables are as defined in Appendix A.

Table 3: Descriptive Statistics (cont'd.)

Panel B: Descriptive Statistics for Affiliates of EU MNCs

	Treatment Group – Affiliates of EU MNCs with Consolidated Revenue >=€750M						Control Group - Affiliates of EU MNCs with Consolidated Revenue <€750M					
Variable	**N**	**Mean**	**SD**	**P25**	**P50**	**P75**	**N**	**Mean**	**SD**	**P25**	**P50**	**P75**
PTI	76,003	15.426	32.134	1.952	4.015	11.367	41,255	5.180	8.337	1.581	2.664	5.440
LogPTI	76,003	1.690	1.285	0.669	1.390	2.431	41,255	1.161	0.870	0.458	0.980	1.694
LogFA	76,003	1.074	2.553	-0.634	1.257	2.912	41,255	0.646	2.385	-0.888	1.070	2.334
LogTA	76,003	4.003	1.525	2.861	3.794	4.936	41,255	3.342	1.149	2.548	3.313	4.118
LogComp	76,003	2.087	1.591	1.142	2.096	3.071	41,255	1.436	1.358	0.700	1.520	2.310
LogGDP	76,003	6.958	1.132	6.155	7.268	7.896	41,255	6.930	1.055	6.172	7.268	7.731
C	76,003	-0.007	0.042	-0.022	0.000	0.013	41,255	-0.002	0.030	-0.003	0.000	0.001
C^{Assets}	76,003	0.001	0.044	-0.014	0.002	0.022	41,255	0.001	0.032	-0.002	0.000	0.005
STR	76,003	0.294	0.068	0.250	0.298	0.344	41,255	0.289	0.063	0.250	0.299	0.315

This Table reports descriptive statistics for the primary affilate sample. All continuous variables are in millions of Euros *PTI* is to pre-tax earnings; *LogPTI* is the natural log of pre-tax earnings; *LogFA* is the natural log of fixed assets; *LogTA* is the natural log of total assets;*LogComp* is the natural log of employee compensation; *LogGDP* is the natural log of gross domestic profuct; C & C^{Assets} are the tax incentive variables and are calculated using Eq (4) and *STR* is the statutory tax rate. All continuous variables have been winsorized at 1 and 99.

Table 3: Descriptive Statistics (cont'd.)

Panel C: Comparison of Mean in the Pre-Implementation Period

Variables	250 <€750M	250 >€750M	450 <€750M	450 >€750M	550 <€750M	550 >€750M
Revenue	586.472	850.100*	420.322	919.465***	267.508	966.758***
PTI	28.717	51.849*	23.217	79.449***	25.789	83.125***
Net Income	23.490	35.241*	17.553	57.668***	11.205	60.694***
Total Assets	646.502	868.255	540.613	1,253.85**	371.511	1,378.212*
ROA	0.056	0.060	0.070	0.059	0.067	0.059
Leverage	0.622	0.635	0.621	0.642**	0.619	0.641***
STR	0.280	0.278	0.281	0.278*	0.289	0.279*
ETR	0.282	0.277	0.281	0.278	0.283	0.279
TaxDiff	0.003	0.001	0.002	0.001	0.003	0.003
CETR	0.256	0.269	0.254	0.265	0.245	0.269***

This table reports the mean of firm characteristics around the €750M threshold in the pre-implementation period (2010-2015). *Revenue* is the consolidated revenue for the corporate group*; PTI* is the pre-tax earnings; *ROA* is the return on assets and is calculated as net income divided by total assets; *Leverage* is long-term debt divided by total assets; *ETR* is calculated as total tax expenses divided by *PTI*; *TaxDiff* is calculated as the difference between *STR* and *ETR; CETR* is calculated as total cash taxes paid divided by *PTI* and *STR* is the statutory tax rate. All continuous variables have been winsorized at 1 and 99. *ETR* & *CETR* have been reset at 1 and 0. *, **, *** indicate significance at 0.10, 0.05 and 0.01. All variables are as defined in Appendix A.

Table 4: Univariate Analysis of Tax Avoidance

Variables	250 <€750M	250 >€750M	450 <€750M	450 >€750M	550 <€750M	550 >€750M
ETR	0.255	0.263	0.252	0.262*	0.253	0.261
CETR	0.234	0.252	0.235	0.253	0.234	0.253*
TaxDiff	-0.007	0.006*	-0.008	0.004**	-0.007	0.003*

This table reports the mean tax avoidance around the €750M threshold in the post-implementation period (2016-2018). *ETR* is calculated as total tax expenses divided by pre-tax income; *TaxDiff* is calculated as the difference between *STR* and *ETR; CETR* is calculated as total cash taxes paid divided by pre-tax income and *STR* is the statutory tax rate. All continuous variables have been winsorized at 1 and 99. *ETR* & *CETR* have been reset at 1 and 0. **, *** indicate significance at 0.10, 0.05 and 0.01. All variables are as defined in Appendix A.

Table 5: Regression Discontinuity Analysis of Tax Avoidance

Panel A: Pre-Implementation Period

BW	Optimal	250	450	550	Optimal	250	450	550
	No Controls				Controls			
CBCR	0.009	-0.013	0.008	0.003	-0.017	-0.029	-0.017	-0.007
(ETR)	(0.738)	(0.673)	(0.704)	(0.862)	(0.470)	(0.279)	(0.383)	(0.661)
CBCR	-0.005	-0.027	-0.006	-0.008	-0.030	-0.043	-0.032*	-0.020
(TaxDiff)	(0.827)	(0.380)	(0.783)	(0.671)	(0.178)	(0.101)	(0.092)	(0.230)
CBCR	-0.025	0.003	-0.023	-0.023	-0.049	-0.053	-0.026	-0.037*
(CETR)	(0.485)	(0.917)	(0.378)	(0.331)	(0.181)	(0.110)	(0.291)	(0.099)
CBCR	0.009	-0.013	0.008	0.003	-0.017	-0.029	-0.017	-0.007
(ETR_C)	(0.788)	(0.778)	(0.802)	(0.909)	(0.470)	(0.279)	(0.383)	(0.661)

Panel B: Post-Implementation Period

BW	Optimal	250	450	550	Optimal	250	450	550
	No Controls				Controls			
CBCR	**0.061***	**0.052***	**0.059****	**0.025**	**0.031**	**0.062****	**0.062*****	**0.017**
(ETR)	(0.078)	(0.072)	(0.018)	(0.203)	(0.200)	(0.016)	(0.006)	(0.314)
CBCR	**0.074****	**0.066****	**0.040***	**0.026**	**0.032**	**0.080*****	**0.037***	**0.018**
(TaxDiff)	(0.045)	(0.032)	(0.087)	(0.197)	(0.227)	(0.005)	(0.085)	(0.341)
CBCR	**0.082****	**0.104*****	**0.065****	**0.042**	**0.017**	**0.078***	**0.024**	**-0.020**
(CETR)	(0.032)	(0.003)	(0.019)	(0.102)	(0.668)	(0.072)	(0.514)	(0.530)
CBCR	**0.059****	**0.051***	**0.025**	**0.019**	**0.062****	**0.061****	**0.009**	**0.001**
(ETR_C)	(0.051)	(0.065)	(0.300)	(0.385)	(0.030)	(0.011)	(0.622)	(0.973)

This table reports the results of estimating a nonparametric local linear regression on either side of €750M cut-off using a triangle kernel. Panel A reports the results for the pre-implementation period (2010-2015) and Panel B reports the result for the post-implementation period (2016-2018). *CBCR* is an indicator variable equal to 1 (0) in 2016-2018, if consolidated revenue in the preceding year is at least (less than) €750M. The first column is estimated using the optimal bandwidth selection algorithm following Calonical, Cattaneo & Titiuuik (2014). 250, 450, and 550 bandwidths are used to estimate the nonparametric regression in other columns. The outcome variable in the first and fourth rows is *ETR*, in the second row is *TaxDiff* and in the third row is *CETR*. *ETR* is calculated as the total annual tax expense divided by the pre-tax income. *CETR* is calculated as cash taxes paid divided by the pre-tax income. *TaxDiff* is calculated as the difference between *ETR* and *STR*. *ETR* and *CETR* are reset at 1 & 0, and the reset *ETR* is used to calculate *TaxDiff*. The last row is estimated using *ETR* as the dependent variable but with the *CETR* sample. The first four columns report the results without any covariates, and in the last four columns, additional covariates (*Leverage, Size & ROA*) are included. Standard error is clustered at the firm level and p-values calculated using the Z score are reported in the parenthesis. *, **, *** indicate statistical significance at 0.10, 0.05 and 0.01 respectively. All variables are as defined in Appendix A.

Table 5: Regression Discontinuity Analysis of Tax Avoidance (cont'd.)

Panel C: Consolidated Revenue Manipulation Test at the Cut-Off

BW	Optimal	250	450	550
Revenue	0.899	-1.034	-1.266	-2.064
	(0.368)	(0.301)	(0.205)	(0.120)

This Table reports the result of manipulation testing in the rating variable (Revenue) around the €750M cut-off point in the post-Implementation period (Year>=2016) using a local-polynomial density estimation developed by Cattaneo, Jansson, and Ma (2017).

Table 5: Regression Discontinuity Analysis of Tax (cont'd.)

Panel D: Discontinuity in other firm level variables

BW	Optimal	250	450	550
ROA	0.001	0.006	0.001	0.002
	(0.020)	*(0.024)*	*(0.018)*	*(0.017)*
LogTA	0.011	0.095	0.804	0.834
	(0.794)	*(0.824)*	*(0.691)*	*(0.655)*
LogPTI	-0.008	0.013	-0.022	-0.036
	(0.045)	*(0.033)*	*(0.029)*	*(0.028)*
Leverage	0.050	0.041	0.011	0.012
	(0.193)	*(0.165)*	*(0.132)*	*(0.124)*

This Table reports the results of estimating non-parametric local linear regression on either side of €750M cut-off using a triangle kernel. The first column is estimated using the optimal bandwidth selection algorithm following Calonical, Cattaneo & Titiuuik (2014). 250, 450 and 550 bandwidths are used to estimate the non-parametric regression in other columns. The outcome variables are *ROA, LogTA, LogPTI and Leverage. ROA* is the return on assets and is calculated as net income divided by total assets; *LogTA* is the natural log of total assets; *LogPTI* is the natural log of pre-tax earnings *Leverage* is long-term debt divided by total assets. Standard error is clustered at the firm level and p-values calculated using the Z score are reported in the parenthesis.

Table 6: Difference in Difference Analysis of Tax Avoidance

Panel A: Without Multivariate Reweighting Techniques

	ETR				TaxDiff				CETR			
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
CBCR*POST (β_3)	**0.014****	**0.017****	**0.015****	**-0.011**	**0.010**	**0.013****	**0.003**	**0.003**		**-0.009**	**-0.008**	**0.003**
	(0.006)	(0.004)	(0.005)	(0.013)	(0.005	(0.005)	(0.007)	(0.004)	(0.00	(0.009)	(0.010)	(0.013)
ROA		-0.029	-0.009	-0.369**		-0.029	-	-0.430**		-0.580**	-0.604**	-0.485**
		(0.023)	(0.008)	(0.148)		(0.022)	(0.128)	(0.133)		(0.134)	(0.167)	(0.167)
Size		0.020**	0.011	-0.013		0.022**	-0.012	-0.009		0.021*	0.030**	0.034*
		(0.004)	(0.007)	(0.012)		(0.004)	(0.009)	(0.003)		(0.012)	(0.014)	(0.018)
Leverage		0.115**	0.061**	0.039		0.115**	0.025*	0.023*		0.073	0.035	0.053
		(0.027)	(0.031)	(0.033)		(0.026)	(0.015)	(0.014)		(0.047)	(0.035)	(0.041)
Innovation			0.002	0.057			0.043**	0.046***			0.028	0.071
			(0.017)	(0.039)			(0.013)	(0.014)			(0.054)	(0.064)
R&D			-0.001	-0.014			0.007	-0.001			-0.006	0.063
			(0.003)	(0.033)			(0.576)	(0.001)			(0.035)	(0.066)
AvgSTR				0.527***				-0.136				0.437
				(0.151)				(0.190)				(0.265)
N_AffCountry				-0.003**				-0.004**				-0.005*
				(0.007)				(0.001)				(0.003)
Firm & Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
N	57,131	44,206	13,814	4,157	57,13	44,206	7,029	6,054	10,709	9,439	7,901	4,819
adj. R-sq.	0.263	0.340	0.363	0.369	0.242	0.310	0.362	0.370	0.263	0.296	0.300	0.300

This table reports OLS estimates of the following equation: $TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 CBCR_{it} * POST + \beta X_{it} + FE_{it} + \varepsilon_{it}$
Where TA is the tax avoidance variable and is measured using *ETR, TaxDiff & CETR. CBCR* is an indicator variable equal to (0) 1 in 2010-2018 if the firm is (not) subject to CbCr rules in 2016-2018. *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements were in effect (2016-2018) and 0 otherwise (2010-2015). X_{it} is a vector of control variables. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, CBCR and *POST* terms drops from the estimation and as such are not reported in this column. White (1980) heteroscedasticity-consistent standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 6: Difference in Difference Analysis of Tax Avoidance (Cont.)

Panel B: With Multivariate Reweighting Techniques

	ETR				TaxDiff				CETR			
	IPW		Entropy		IPW		Entropy		IPW		Entropy	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
CBCR* POST (β_3)	**0.013*** **	**0.009** **	**0.009** **	**0.009** **	**0.006** **	**0.003**	**0.001**	**0.001**	**-0.004**	**-0.014**	**-0.011**	**-0.005**
	(0.005)	(0.004)	(0.004)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.615)	(0.131)	(0.295	(0.592)
ROA		-0.084**		-0.094		-0.082*		-0.093		-0.039		-0.190**
		(0.040)		(0.066)		(0.040)		(0.066)		(0.799)		(0.049)
Size		0.005		0.007		0.008*		0.010*		0.038**		-0.025**
		(0.005)		(0.005)		(0.004)		(0.005)		(0.000)		(0.02)
Leverage		0.075***		0.087**		0.075*		0.086**		0.103**		0.044
		(0.025)		(0.035)		(0.024)		(0.033)		(0.000)		(0.131)
Firm & Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
N	43,062	41,199	37,971	37,632	43,062	41,199	37,971	37,632	10,213	9,504	7,788	7,559
adj. R-sq.	0.389	0.442	0.492	0.494	0.355	0.406	0.476	0.475	0.513	0.568	0.294	0.299

This table reports OLS estimates of the following equation adjusted for the weights resulted from inverse probability weighting and entropy balancing exercises (see online Appendix A4):

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 CBCR_{it} * POST + \beta X_{it} + FE_{it} + \varepsilon_{it}$

Columns (1) to (2) are estimated using inverse probability weighting (IPW) and columns (3) to (4) are estimated using Entropy balancing. To calculate the IPWs, I follow Stuart et al. (2014)'s weighting strategy that reweights the four groups (treatment pre, treatment post, comparison pre, comparison post) to be similar on *ROA*, *Size*, *Leverage*, *LogPTI* & *Intangibles.* To calculate the weight using entropy balancing, I set the balancing constraint to be the second moment (variance). *TA* is the dependent variable and is measured using *ETR, TaxDiff & CETR.* X_{it} is a vector of control variables. All columns are estimated with firm and year fixed effects. Due to the inclusion of the year fixed effect, *CBCR* and *POST* terms drops from the estimation and as such these terms are not reported in this table. White (1980) heteroscedasticity-consistent standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 7: Robustness of Difference in Difference Model

Panel A: Yearly Analysis

	ETR			TaxDiff		
	(1)	(2)	(3)	(1)	(2)	(3)
CBCR_2013	0.005	0.014**	0.008	0.001	0.011	0.002
	(0.007)	(0.006)	(0.012)	(0.008)	(0.006)	(0.013)
CBCR_2014	0.011	0.013**	0.010	0.004	0.007	0.005
	(0.008)	(0.006)	(0.013)	(0.008)	(0.006)	(0.013)
CBCR_2015	0.019**	0.021***	0.017	0.017**	0.019***	0.015
	(0.008)	(0.006)	(0.011)	(0.008)	(0.006)	(0.011)
CBCR_2016	**0.017****	**0.0201*****	**0.020***	**0.013***	**0.017*****	**0.019**
	(0.007)	(0.006)	(0.012)	(0.007)	(0.006)	(0.012)
CBCR_2017	**0.011**	**0.013***	**-0.011**	**0.002**	**0.001**	**-0.011**
	(0.008)	(0.006)	(0.013)	(0.008)	(0.006)	(0.013)
CBCR_2018	**0.034*****	**0.048*****	**0.028****	**0.021****	**0.033*****	**0.044*****
	(0.008)	(0.007)	(0.011)	(0.010)	(0.010)	(0.013)
Firm & Year	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm
N	57,131	44,206	7,029	53,752	40,988	6,942
adj. R-sq.	0.263	0.341	0.353	0.335	0.421	0.531

This table reports OLS estimates of the following equation:

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 2013 + \beta_3 2014 + \beta_4 2015 + \beta_5 2016 + \beta_6 2017 + \beta_7 2018 + \beta_8 CBCR_{it} * 2013 + \beta_9 CBCR_{it} * 2014 + \beta_{10} CBCR_{it} * 2015 + \beta_{11} CBCR_{it} * 2016 + \beta_{12} CBCR_{it} * 2017 + \beta_{13} CBCR_{it} * 2018 + \beta X_{it} + FE_{it} + \varepsilon_{it}$

Where *TA* is the tax avoidance variable and is measured using *ETR* and *TaxDiff*. *CBCR* is an indicator variable equal to (0) 1 in 2010-2018 if the firm is (not) subject to CbCr rules in 2016-2018. 2013-2018 are indicator variables equal to 1 for the year 2013-2018 (respectively) and 0 otherwise. X_{it} is a vector of control variables and the coefficients on the these term are omitted for brevity. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, the following terms drop from the estimation and as such are not reported: CBCR & 2013–2018. Columns (1) to (3) correspond to the model estimated in columns (1) to (3), respectively, in panel A of table 6. White (1980) heteroscedasticity-consistent standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 7: Robustness of Difference in Difference Model (Cont.)

Panel B: Pre/Post Analysis

	ETR						TaxDiff					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
CBCR=	1	0	1	0	1	0	1	0	1	0	1	0
POST(β_1)	**-0.010****	**-0.022****	**-0.014****	**-0.031****	**-0.008**	**-0.007**	**0.008****	**-0.001**	**0.006***	**-0.008****	**0.004**	**0.007**
	(0.005)	(0.002)	(0.004)	(0.002)	(0.005)	(0.008)	(0.007)	(0.002)	(0.003)	(0.002)	(0.005)	(0.008)
Size			0.007	0.012**	-0.013	-0.021**			0.014	0.019***	-0.002	-0.015*
			(0.009)	(0.004)	(0.011)	(0.008)			(0.009)	(0.004)	(0.011)	(0.008)
Leverage			0.138***	0.120***	0.085**	0.009			0.138***	0.112***	0.092**	0.009
			(0.034)	(0.031)	(0.035)	(0.007)			(0.032)	(0.027)	(0.036)	(0.007)
ROA			-0.402**	-0.028	-0.352**	-0.791***			-0.396**	-0.027	-0.346**	-0.789**
			(0.120)	(0.021)	(0.129)	(0.123)			(0.120)	(0.021)	(0.129)	(0.122)
Innovation					-0.008	0.037***					0.012	0.037**
					(0.020)	(0.012)					(0.021)	(0.014)
R&D					-0.080	-0.001					0.003	-0.001
					(0.001)	(0.003)					(0.001)	(0.007)
Z	**2.145**		**3.022**		**-0.119**		**2.209**		**3.364**		**-1.144**	
N	7,913	49,218	6,957	37,249	4,204	1,850	7,913	49,218	6,957	37,249	4,204	1,850
adj. R-sq.	0.217	0.265	0.363	0.335	0.323	0.387	0.209	0.244	0.345	0.305	0.329	0.396
SE	Firm	Firm	Firm	Firm	Firm	Firm	SE	Firm	Firm	Firm	Firm	Firm
FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

This table reports OLS estimates of the following equation estimated separately for the treatment and control groups:
$TA_{it} = \beta_0 + \beta_1 POST + \beta X_{it} + FE_{it} + \varepsilon_{it}$
Where *TA* is the tax avoidance variable and is measured using *ETR* and *TaxDiff*. *CBCR* is an indicator variable equal to (0) 1 in 2010-2018 if the firm is (not) subject to CbCr rules in 2016-2018. *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements were in effect (2016-2018) and 0 otherwise (2010-2015). X_{it} is a vector of control variables. All columns are estimated with firm fixed effects. White (1980) heteroscedasticity-consistent standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 8: Difference in Difference Analysis of Income Shifting

Panel A: Income Shifting Activities of Affiliates

		Full Sample				Restricted Sample		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
π	β_1	-0.582*	-0.888**	-0.985**	-1.243**	-0.445	-0.336	-0.372
		(0.000)	(0.423)	(0.430)	(0.497)	(0.530)	(0.543)	(0.678)
CBCR	β_3		-0.024	-0.027	-0.034	-0.002	-0.003	0.016
			(0.021)	(0.022)	(0.024)	(0.021)	(0.021)	(0.023)
π _POST	β_4		0.349	0.468	0.727	0.217	0.177	0.511
			(0.492)	(0.500)	(0.613)	(0.578)	(0.593)	(0.757)
π _CBCR	β_5		0.513	0.640	0.694	0.717	0.482	0.763
			(0.448)	(0.460)	(0.549)	(0.508)	(0.513)	(0.612)
POST_CBC	β_6		-0.078**	-0.079**	-0.075**	-0.061**	-	-
			(0.017)	(0.018)	(0.022)	(0.016)	(0.016)	(0.019)
π	**β_7**		**-0.140**	**-0.202**	**0.290**	**0.0417**	**0.586***	**-0.249**
			(0.512)	(0.527)	(0.679)	(0.162)	(0.271)	(0.725)
LogFA	β_8	0.218*	0.186**	0.187**	0.188**	0.0961*	0.0969*	0.0946*
		(0.000)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
LogComp	β_9	0.565*	0.547**	0.545**	0.532**	0.298**	0.295**	0.271**
		(0.000)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.012)
LogGDP	β_{10}	0.024*	0.058**	0.057**	0.046**	0.033**	0.031**	0.006
		(0.001)	(0.010)	(0.010)	(0.013)	(0.012)	(0.012)	(0.015)
N		166,16	123,920	119749	86665	55773	53699	35680
adj. R-sq.		0.492	0.586	0.582	0.572	0.449	0.447	0.456
FE		✓	✓	✓	✓	✓	✓	✓
SE		Parent	Parent	Parent	Parent	Parent	Parent	Parent
% of Missing Aff		N/A	N/A	N/A	<30%	<10%	N/A	<30%

This Table reports OLS estimates of the profit shifting equation:

$$LogPTI^{r}_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. Columns (1) to (4) are estimated using the full sample and columns (5) to (7) are estimated using affiliates with at least €1M in revenue. Columns (3), (4), (6) & (7) are restricted to affiliate groups with less than 10% or 0% missing affiliate data. All columns are estimated with parent and year fixed effects. With the inclusion of year fixed effects, the *POST* term drops from estimation. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 8: Income Shifting Activities of Affiliates (cont'd.)
Panel B: Yearly Analysis

	Full Sample			Restricted Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
π	-0.101	-0.004	-0.157	-0.297	-0.175	-0.237
	(0.483)	(0.510)	(0.543)	(0.545)	(0.575)	(0.620)
CBCR	-0.009	-0.014	-0.023	0.0108	0.013	0.018
	(0.021)	(0.021)	(0.022)	(0.0207)	(0.020)	(0.021)
π _CBCR	0.507	0.327	0.571	0.109	-0.038	-0.035
	(0.532)	(0.558)	(0.609)	(0.574)	(0.602)	(0.656)
π _CBCR_2016	0.222	-0.033	-0.010	0.864	0.993*	0.709
	(0.584)	(0.605)	(0.669)	(0.546)	(0.558)	(0.607)
π _CBCR_2017	-0.266	-0.398	-0.781	1.057	1.412**	1.448**
	(0.544)	(0.563)	(0.610)	(0.565)	(0.581)	(0.643)
π _CBCR_2018	2.393*	2.945	2.253	4.489***	4.492***	3.990**
	(1.027)	(1.986)	(2.130)	(1.609)	(1.656)	(1.658)
LogFA	0.0542***	0.052***	0.053***	0.044***	0.043***	0.044***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
LogComp	0.384***	0.388***	0.392***	0.183***	0.183***	0.187***
	(0.017)	(0.017)	(0.018)	(0.015)	(0.015)	(0.016)
LogGDP	0.312***	0.294***	0.316***	0.087	0.090	0.043
	(0.109)	(0.111)	(0.119)	(0.104)	(0.106)	(0.114)
N	111,513	107,367	97,058	51,177	49,114	43,439
adj. R-sq.	0.832	0.832	0.828	0.839	0.840	0.838
Parent & Year FE	✓	✓	✓	✓	✓	✓
SE Clustered	Parent	Parent	Parent	Parent	Parent	Parent
% Missing Aff	N/A	<30%	<10%	N/A	<30%	<10%

This Table reports OLS estimates of the profit shifting equation:

$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 \text{CBCR}_{it} + \beta_3 2016 + \beta_4 2017 + \beta_5 2018 + \beta_6 \pi * \text{CBCR}_{it} + \sum_{k=2016}^{2018} \beta_{7\text{-}9} \text{CBCR}_{it} * k + \sum_{k=2016}^{2018} \beta_{10\text{-}12} \pi * k + \sum_{k=2016}^{2018} \beta_{13\text{-}15} CBCR_{it} * \pi * k + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. 2016-2018 are indicator variables equal to 1 for the year 2016-2018 (respectively) and 0 otherwise. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. Columns (1) to (3) are estimated using the full sample and columns (4) to (6) are estimated using affiliates with at least €1M in revenue. All columns are estimated with parent and year fixed effects. With the inclusion of year fixed effects 2016, 2017 and 2018 terms drop from estimation. For brevity, the following terms have been untabulated: $\sum_{k=2016}^{2018} \beta_{7\text{-}9} \text{CBCR}_{it} * k$ and $\sum_{k=2016}^{2018} \beta_{10\text{-}12} \pi * k$ White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 9: Cross-Sectional Test of Income Shifting Based on Activity Level

Panel A: Employee Compensation

Variables	High-Activity			Low-Activity		
π_{it}	-2.059***	-2.059***	-1.207	-0.106	-0.106	-0.835
	(0.422)	(0.422)	(1.501)	(0.402)	(0.402)	(1.731)
π_{it}_CBCR_POST	**1.644***	**1.644***	**1.276**	**-1.136**	**-1.136**	**-0.963**
	(0.890)	**(0.890)**	**(0.813)**	**(0.710)**	**(0.710)**	**(0.683)**
LogFA	0.345***	0.345***	0.281***	0.313***	0.313***	0.288***
	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)	(0.008)
LogComp	0.436***	0.436***	0.540***	0.093***	0.093***	0.0438**
	(0.014)	(0.014)	(0.020)	(0.015)	(0.015)	(0.019)
LogGDP	0.041***	0.041***	0.138	0.073***	0.073***	0.247
	(0.014)	(0.014)	(0.482)	(0.013)	(0.013)	(0.482)
N	9,475	9,475	9,460	9,653	9,653	9,643
adj. R-sq.	0.471	0.471	0.569	0.246	0.246	0.373
Year	✓	✓	✓	✓	✓	✓
Firm	✓	✓		✓	✓	
Country		✓	✓		✓	✓
Parent			✓			✓

This Table reports OLS estimates of the profit shifting equation separately for high activity and low activity affiliates:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST * CBCR_{it} * \pi + \beta_3 LogTA_{it} + \beta_4 LogComp_{it} + \beta_5 LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. HighActivity is an indicator variable equal to 1 if CBCR is 1 and LogComp of affiliate i in year t is greater than the mean LogComp of all affiliates in the related group in year t and 0 if CBCR is 0. LowActivity is an indicator variable equal to 1 if CBCR is 1 and if LogComp of affiliate i in year t is lower than the mean LogComp, of all affiliates in the related group in year t and 0 if CBCR is 0 White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 9: Cross-Sectional Test of Income Shifting Based on Activity Level (cont'd.)

Panel B: Number of Employees

Variables	High-Activity			Low-Activity		
π_{it}	-0.724*	-0.724*	-0.346	-0.673	-0.673	-0.162
	(0.721)	(0.721)	(0.673)	(0.833)	(0.833)	(0.808)
π_{it}_CBCR_POST	**0.380*** **	**0.380*** **	**0.349*** **	**0.311*** **	**0.311*** **	**0.281*** **
	(0.009)	**(0.009)**	**(0.0111)**	**(0.008)**	**(0.008)**	**(0.009)**
LogFA	0.318***	0.318***	0.308***	0.161***	0.161***	0.130***
	(0.016)	(0.016)	(0.0223)	(0.017)	(0.017)	(0.022)
LogComp	0.036***	0.036***	0.437	0.099***	0.0995***	-0.372
	(0.014)	(0.014)	(0.423)	(0.014)	(0.014)	(0.573)
LogGDP	-0.724*	-0.724*	-0.346	-0.673	-0.673	-0.162
	(0.014)	(0.014)	(0.482)	(0.013)	(0.013)	(0.482)
N	10,686	10,686	10,673	8,441	8,441	8,428
adj. R-sq.	0.476	0.476	0.568	0.270	0.270	0.403
Year	✓	✓	✓	✓	✓	✓
Firm		✓			✓	
Country			✓			✓
Parent			✓			v

This Table reports OLS estimates of the profit shifting equation separately for high activity and low activity affiliates:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST * CBCR_{it} * \pi + \beta_3 LogTA_{it} + \beta_4 LogComp_{it} + \beta_5 LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. High (Low)Activity is an indicator variable equal to 1 if CBCR is 1 and total number of employees of affiliate i in year t is greater (less) than the mean employee number of all affiliates in the related group in year t and 0 if CBCR is 0. of all affiliates in the related group in year t and 0 if CBCR is 0 White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 9: Cross-Sectional Text of Income Shifting Based on Activity Level (cont'd.)

Panel C: Intangible Assets

Variables	High-Activity			Low-Activity		
π_{it}	1.286	1.286	-4.538	-0.902***	-0.902***	-0.264
	(3.231)	(3.231)	(10.05)	(0.297)	(0.297)	(1.152)
π_{it}_CBCR_POST	**12.08***	**12.08***	**8.581**	**-0.115**	**-0.115**	**-0.275**
	(7.221)	**(7.221)**	**(7.227)**	**(0.551)**	**(0.551)**	**(0.530)**
LogFA	0.560***	0.560***	0.431***	0.348***	0.348***	0.325***
	(0.069)	(0.069)	(0.145)	(0.006)	(0.006)	(0.006)
LogComp	0.162***	0.162***	0.103	0.288***	0.288***	0.278***
	(0.053)	(0.053)	(0.105)	(0.010)	(0.010)	(0.011)
LogGDP	-0.071	-0.071	-0.027	0.065***	0.065***	-0.014
	(0.115)	(0.115)	(8.377)	(0.010)	(0.010)	(0.355)
N	10,686	10,686	10,673	8,441	8,441	8,428
adj. R-sq.	0.615	0.615	0.802	0.448	0.448	0.527
Year	✓	✓	✓	✓	✓	✓
Firm	✓	✓	✓	✓	✓	
Country			✓			✓
Parent			✓			✓

This Table reports OLS estimates of the profit shifting equation separately for high activity and low activity affiliates:

$$LogPTI^{r}_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST * CBCR_{it} * \pi + \beta_3 LogTA_{it} + \beta_4 LogComp_{it} + \beta_5 LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. High (Low)Activity is an indicator variable equal to 1 if CBCR is 1 and the natural log of intangible assets of affiliate i in year t is greater (less) than the mean value of all affiliates in the related group in year t and 0 if CBCR is 0. of all affiliates in the related group in year t and 0 if CBCR is 0 White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 9: Cross-Sectional Test of Income Shifting Based on Activity Level (cont'd.)

Panel D: Tangible Assets

Variables	High-Activity			Low-Activity		
π_{it}	0.146	0.146	-0.388	-2.146***	-2.146***	-1.027
	(0.429)	(0.429)	(1.665)	(0.384)	(0.384)	(1.491)
π_{it}_CBCR_POST	**0.724**	**0.724**	**0.652**	**0.007**	**0.007**	**-0.355**
	(0.829)	**(0.829)**	**(0.738)**	**(0.702)**	**(0.702)**	**(0.675)**
LogFA	0.512***	0.512***	0.531***	0.353***	0.353***	0.335***
	(0.011)	(0.011)	(0.017)	(0.006)	(0.006)	(0.007)
LogComp	0.292***	0.292***	0.309***	0.243***	0.243***	0.219***
	(0.016)	(0.016)	(0.020)	(0.012)	(0.012)	(0.013)
LogGDP	0.010	0.010	0.882*	0.081***	0.081***	-0.627
	(0.014)	(0.014)	(0.454)	(0.012)	(0.012)	(0.472)
N	7,006	7,006	6,991	12,149	12,149	12,137
adj. R-sq.	0.523	0.523	0.624	0.451	0.451	0.544
Year	✓	✓	✓	✓	✓	✓
Firm	✓	✓			✓	
Country			✓			✓
Parent			✓			✓

This Table reports OLS estimates of the profit shifting equation separately for high activity and low activity affiliates:

$$LogPTI^{r}_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST * CBCR_{it} * \pi + \beta_3 LogTA_{it} + \beta_4 LogComp_{it} + \beta_5 LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. High (Low)Activity is an indicator variable equal to 1 if CBCR is 1 and the natural log of tangible assets of affiliate i in year t is greater (less) than the mean value for all affiliates in the related group in year t and 0 if CBCR is 0. of all affiliates in the related group in year t and 0 if CBCR is 0. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 10: Cross-Sectional Test of Change in Activity

Panel A: Compensation Cost

Variables	(1)	(2)	(3)	(4)	(5)	(6)
π_{it}	4.510***	0.098	6.222***	2.772***	0.476***	3.384***
	(0.173)	(0.199)	(0.147)	(0.124)	(0.162)	(0.114)
π_{it} _CBCR_POST	**-2.106*** **	**-0.221**	**-1.326*** **	**-0.336**	**0.0642**	**-0.504**
	(0.512)	**(0.160)**	**(0.446)**	**(0.413)**	**(0.142)**	**(0.370)**
ROA				0.09***	0.033***	0.047***
				(0.025)	(0.006)	(0.010)
Leverage				-0.145***	-0.022***	-0.052***
				(0.040)	(0.008)	(0.019)
LogTA				0.688***	0.530***	0.651***
				(0.003)	(0.013)	(0.004)
N	64,190	63,698	64,157	64,190	63,698	64,157
adj. R-sq.	0.493	0.953	0.684	0.493	0.953	0.684
Country		✓			✓	
Firm		✓			✓	
Parent			✓			✓
Year		✓	✓		✓	✓
Industry			✓			✓

This Table reports OLS estimates of the following equation:

$Activity_{it} = \beta_0 + \beta_1 \pi_{it} + \beta_2 \pi^* CBCR^* POST + \beta_3 ROA_{it} + \beta_4 Leverage_{it} + \beta_5 LogTA_{it} + FE_{it} + \varepsilon_{it}$

The dependent variable is $Activity_{it}$ which is measured using *LogEmp*. *LogEmp* is the log of total employee compensation of affiliate *i* in year *t*. *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. The first three columns are estimated without control variables and the last three columns include control variables. *ROA* is net income scaled by total assets. *Leverage* is total affiliate liabilities scaled by total assets. *LogTA* is the log of affiliate's total assets. I estimate. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 10: Cross-Sectional Test of Change in Activity (cont'd.)

Panel B: Number of Employees

Variables	(1)	(2)	(3)	(4)	(5)	(6)
π_{it}	1.178***	0.275	2.453***	2.650***	0.367**	3.345***
	(0.0808)	(0.171)	(0.0854)	(0.116)	(0.152)	(0.112)
π_{it} _CBCR_POST	**0.648*** **	**-0.102*** **	**-0.113**	**-0.770** **	**0.0232**	**-0.613***
	(0.0634)	**(0.0301)**	**(0.0706)**	**(0.369)**	**(0.132)**	**(0.329)**
ROA				0.0289	-0.00337	0.00152
				(0.0217)	(0.0111)	(0.0145)
Leverage				-0.0640	0.0230	0.000902
				(0.0527)	(0.0147)	(0.0276)
LogTA				0.685***	0.534***	0.649***
				(0.00391)	(0.0146)	(0.00467)
N	64,575	64,091	64,545	64,575	64,091	64,545
adj. R-sq.	0.490	0.951	0.681	0.491	0.951	0.682
Country		✓			✓	
Firm		✓			✓	
Parent			✓			✓
Year		✓	✓		✓	✓
Industry			✓			✓

This Table reports OLS estimates of the following equation:

$Activity_{it} = \beta_0 + \beta_1 \pi_{it} + \beta_2 \pi^* CBCR^* POST + \beta_3 ROA_{it} + \beta_4 Leverage_{it} + \beta_5 LogTA_{it} + FE_{it} + \varepsilon_{it}$

The dependent variable is $Activity_{it}$ which is measured using *LogEmp*. *LogEmp* is the log of total number of employees of affiliate *i* in year *t*. *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. The first three columns are estimated without control variables and the last three columns include control variables. *ROA* is net income scaled by total assets. *Leverage* is total affiliate liabilities scaled by total assets. *LogTA* is the log of affiliate's total assets. I estimate. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 10: Cross-Sectional Test of Change in Activity (cont'd.)

Panel C: Intangible Assets

Variables	(1)	(2)	(3)	(4)	(5)	(6)
π_{it}	0.159***	-0.0619***	0.165***	0.138***	-0.0626***	0.115***
	(0.0104)	(0.0166)	(0.0105)	(0.0109)	(0.0173)	(0.0115)
π_{it} _CBCR_POST	**-0.0407**	**-0.0280***	**-0.0187**	**0.00288**	**-0.0278***	**0.00963**
	(0.0333)	**(0.0163)**	**(0.0319)**	**(0.0328)**	**(0.0161)**	**(0.0314)**
ROA				-0.00313	0.00475	-0.00220
				(0.00469)	(0.00506)	(0.00488)
Leverage				0.0117**	-0.00450	0.00998*
				(0.00561)	(0.00601)	(0.00562)
LogTA				0.00848***	0.00582***	0.00997***
				(0.000284)	(0.00188)	(0.000381)
N	82,095	81,608	82,081	73,742	73,119	73,710
adj. R-sq.	0.003	0.839	0.216	0.023	0.848	0.245
Country		✓			✓	
Firm		✓			✓	
Parent			✓			✓
Year		✓	✓		✓	✓
Industry			✓			✓

This Table reports OLS estimates of the following equation:

$$Activity_{it} = \beta_0 + \beta_1 \pi_{it} + \beta_2 \pi^* CBCR^* POST + \beta_3 ROA_{it} + \beta_4 Leverage_{it} + \beta_5 LogTA_{it} + FE_{it} + \varepsilon_{it}$$

The dependent variable is $Activity_{it}$ which is measured using *LogIntag*. *LogIntag* is the natural log of intangible assets of affiliate *i* in year *t*. CBCR is an indicator variable for the affiliate whose ultimate global parent are subject to disclosure under CBCR. In other words, CBCR equals one for affiliates of European MNCs with revenue greater than €750M. The POST is an indicator variable equal to 1 for all years in which the full CBCR requirements under CBCR were in effect (2016 and 2017) and 0 otherwise (2011-2015). π is the tax incentive variable calculated as per equation (6) using affiliate's total revenue. The first three columns are estimated without control variables and the last three columns include control variables. ROA is net income scaled by total assets. Leverage is total affiliate liabilities scaled by total assets. LogTA is the log of affiliate's total assets. I estimate White (1980) heteroscedasticity-consistent standard errors, which are reported in the parenthesis. *, **, *** indicate one-tailed statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 10: Cross-Sectional Test of Change in Activity (cont'd.)

Panel D: Tangible Assets

Variables	(1)	(2)	(3)	(4)	(5)	(6)
π_{it}	-0.589***	0.0485**	-0.571***	-0.653***	0.0813**	-0.584***
	(0.0240)	(0.0236)	(0.0376)	(0.0535)	(0.0389)	(0.0892)
π_{it} _CBCR_POST	0.394***	0.0554*	0.227***	0.403***	0.0650*	0.219***
	(0.0625)	(0.0301)	(0.0521)	(0.0669)	(0.0366)	(0.0590)
ROA				0.0885	0.129	0.103
				(0.106)	(0.130)	(0.116)
Leverage				-0.0612	-0.145	-0.0920
				(0.104)	(0.151)	(0.116)
LogTA				0.00604***	-0.0447	-0.00253
				(0.000742)	(0.0367)	(0.00284)
N	82,953	82,522	82,939	74,258	73,651	74,224
adj. R-sq.	0.003	0.293	0.139	0.031	0.319	0.164
Country		X			X	
Firm		X			X	
Parent			X			X
Year		X	X		X	X
Industry			X			X

This Table reports OLS estimates of the following equation:

$$Activity_{it} = \beta_0 + \beta_1\ \pi_{it} + \beta_2\ \pi^{*}\ CBCR^{*}\ POST + \beta_3\ ROA_{it} + \beta_4\ Leverage_{it} + \beta_5\ LogTA_{it}\ + FE_{it} + \varepsilon_{it}$$

The dependent variable is $Activity_{it}$ which is measured using LogTangi. *LogTangi* is the natural log of total tangible assets of affiliate *i* in year *t*. *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. The first three columns are estimated without control variables and the last three columns include control variables. *ROA* is net income scaled by total assets. *Leverage* is total affiliate liabilities scaled by total assets. *LogTA* is the log of affiliate's total assets. I estimate. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 11: Cross-Sectional Test of Tax Avoidance & Income Shifting

Panel A: Income Shifting & Tax Enforcement (TE)

Variables		TE=1	TE=0	TE=1	TE=0	TE=1	TE=0
π	β_1	-1.085	-1.578	-0.809	-1.215	-0.364	-0.775
		(1.539)	(1.592)	(1.611)	(1.670)	(1.740)	(1.790)
CBCR	β_3	0.372***	0.357***	0.368***	0.375***	0.385***	0.371***
		(0.059)	(0.070)	(0.061)	(0.071)	(0.062)	(0.074)
π _POST	β_4	-2.501***	-2.409**	-3.290**	-3.242**	-3.918***	-3.874***
		(0.956)	(0.982)	(1.364)	(1.369)	(1.250)	(1.257)
π _CBCR	β_5	0.760	2.893	0.504	2.365	0.532	1.955
		(1.669)	(1.906)	(1.761)	(1.981)	(1.916)	(2.090)
POST_CBCR	β_6	-0.105***	-0.078	-0.128***	-0.080	-0.112**	-0.071
		(0.039)	(0.054)	(0.044)	(0.062)	(0.051)	(0.068)
π _POST_CBCR	**β_7**	**2.122***	**-1.145**	**2.903***	**-1.520**	**3.054****	**-1.573**
		(1.178)	**(1.010)**	**(1.537)**	**(1.878)**	**(1.472)**	**(1.801)**
LogFA	β_8	0.157***	0.160***	0.152***	0.155***	0.153***	0.154***
		(0.016)	(0.018)	(0.016)	(0.018)	(0.016)	(0.017)
LogComp	β_9	0.406***	0.382***	0.422***	0.389***	0.420***	0.390***
		(0.032)	(0.035)	(0.032)	(0.034)	(0.033)	(0.037)
LogGDP	β_{10}	-0.010	0.010	-0.011	0.007	-0.017	0.001
		(0.024)	(0.028)	(0.024)	(0.028)	(0.024)	(0.027)
***Z* Statistics**		**2.105**		**1.822**		**1.989**	
N		90,334	29,382	57,535	15,605	19,072	2,692
adj. R-sq.		0.596	0.562	0.573	0.533	0.603	0.566
FE		✓	✓	✓	✓	✓	✓
SE Cluster		Parent	Parent	Parent	Parent	Parent	Parent
Missing Affiliate Data		N/A	N/A	<30%	<30%	<10%	<10%

This Table reports OLS estimates of the profit shifting equation estimated separately based on affiliate country tax enforcement strength:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

TE is defined as 1 if CBCR is 1 and average tax administration expenditure (pre-implementation period) scaled by gross domestic product (in affiliate home country) is above the median tax expenditure for all counties, and 0 otherwise. The dependent variable is *LogPTI* (natural log of affiliate's PTI). *CBCR* is an indicator variable equal to one for the affiliates whose ultimate global parent are subject to disclosure under CbCr. The *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements under *CBCR* were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets. *LogComp* is a log of an affiliate's total compensation expense. *LogGDP* is the log of affiliate's host country gross domestic product. All columns include industry and year fixed effects. With the inclusion of year fixed effects, the *POST* term is dropped from estimation, and these terms have been omitted for brevity. I estimate White (1980) heteroscedasticity-consistent standard errors clustered at the parent level, which are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 11: Cross Sectional Test of Tax Avoidance & Income Shifting (cont'd.)

Panel B: Tax Avoidance & Tax Enforcement (TE)

	Median			P25/75		
	(1)	(2)	(3)	(4)	(5)	(6)
CBCR	-0.003	-0.023*	0.001	-0.028*	-0.017	0.022
	(0.012)	(0.012)	(0.023)	(0.014)	(0.030)	(0.032)
TE	-0.002	0.0025	0.001	0.019***	-0.016	-0.003
	(0.004)	(0.004)	(0.012)	(0.005)	(0.016)	(0.023)
CBCR_POST	-0.014	-0.015	0.037	-0.018	0.003	0.057**
	(0.017)	(0.016)	(0.029)	(0.017)	(0.027)	(0.028)
CBCR_TE	0.003	0.007	0.0037	0.009	0.018	0.009
	(0.007)	(0.006)	(0.012)	(0.009)	(0.017)	(0.023)
	0.025	**0.024**	**-0.048**	**0.028***	**-0.001**	**-0.067****
CBCR_POST_TE(β_7)	(0.016)	(0.016)	(0.032)	(0.017)	(0.028)	(0.031)
Size		0.0064	-0.011		-0.013	-0.011
		(0.005)	(0.012)		(0.010)	(0.016)
Leverage		0.083***	0.039		0.024	0.077*
		(0.028)	(0.033)		(0.017)	(0.042)
ROA		-0.025	-0.369**		-0.457***	-0.355*
		(0.019)	(0.148)		(0.174)	(0.200)
Innovation			0.055			0.0500
			(0.039)			(0.044)
R&D			-0.001			-0.001
			(0.001)			(0.001)
AvgSTR			0.736***			0.482**
			(0.182)			(0.237)
N_AffCountry			-0.082***			-0.084***
			(0.009)			(0.009)
Firm & Year FE	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm
N	46,708	36,390	4,163	30,424	5,283	2,978
adj. R-sq.	0.253	0.352	0.340	0.357	0.353	0.344

This Table reports OLS estimates of the following equation:

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 TE + \beta_4 CBCR*POST + \beta_5 POST* TE + \beta_6 CBCR* TE + \beta_7 CBCR*POST* TE + \beta X_{it} + FE_{it} + \varepsilon_{it}$

Where TA is the tax avoidance variable and is measured using ETR. In columns (1) to (3) [(4) to (6)], TE is defined as 1 if CBCR is 1 and average tax administration expenditure (pre-implementation period) scaled by gross domestic product (in parent home country) is above the median (25th percentile) tax expenditure for all countries, and 0 otherwise. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, POST and POST_TE drop from the estimation and as such are not reported in this Table. X_{it} is the vector of control variables. Hubber White robust standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 12: Cross Sectional Test of Tax Avoidance & Income Shifting

Panel A: Income Shifting & Detection Risk (DR)

Variables		DR=1	DR=0	DR=1	DR=0	DR=1	DR=0
π	β_1	-1.086	-1.166	0.851	-2.581	1.036	-1.539
		(1.407)	(1.732)	(1.960)	(2.626)	(2.288)	(2.900)
π _POST	β_4	-1.504	-2.139	-2.922**	-2.477	-2.435*	-2.348
		(1.102)	(1.359)	(1.289)	(1.552)	(1.353)	(1.617)
π _CBCR	β_5	1.416	2.333	-1.321	3.809	-1.239	0.164
		(1.471)	(2.038)	(1.953)	(2.90)	(2.280)	(3.554)
POST_CBCR	β_6	-0.154***	-0.147***	-0.151***	-0.129***	-0.121***	-0.129***
		(0.034)	(0.039)	(0.0361)	(0.040)	(0.0435)	(0.0470)
π _POST_CBCR	**β_7**	**0.936**	**0.187**	**2.235***	**0.703**	**3.520****	**-2.120**
		(1.203)	**(1.606)**	**(1.012)**	**(1.790)**	**(1.536)**	**(2.025)**
LogFA	β_8	0.061***	0.0138	0.049***	0.005	0.0126	0.009
		(0.018)	(0.0198)	(0.019)	(0.020)	(0.022)	(0.023)
LogComp	β_9	0.447***	0.472***	0.451***	0.456***	0.505***	0.438***
		(0.049)	(0.061)	(0.054)	(0.066)	(0.065)	(0.075)
LogGDP	β_{10}	-0.035	-0.519**	0.103	-0.484*	-0.135	-0.374
		(0.211)	(0.235)	(0.225)	(0.250)	(0.281)	(0.301)
***Z* Statistics**		**0.373**		**0.745**		**2.219**	
N		90,334	29,382	57,535	15,605	19,072	2,692
adj. R-sq.		0.596	0.562	0.573	0.533	0.603	0.566
FE		✓	✓	✓	✓	✓	✓
SE Cluster		Parent	Parent	Parent	Parent	Parent	Parent
Missing Affiliate Data		N/A	N/A	<30%	<30%	<10%	<10%

This Table reports OLS estimates of the profit shifting equation estimated separately based on parent-level detection risk:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

DR is 1 if CBCR is 1 and ETR_5 in pre-implementation period is greater than median value of ETR_5, and 0 otherwise. The dependent variable is *LogPTI* (natural log of affiliate's PTI). *CBCR* is an indicator variable equal to one for the affiliates whose ultimate global parent are subject to disclosure under CbCr. In other words, *CBCR* equals 1(0) for affiliates of European MNCs with revenue more(less) than €750M. The *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements under *CBCR* were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets. *LogComp* is a log of an affiliate's total compensation expense. *LogGDP* is the log of affiliate's host country gross domestic product. All columns include industry and year fixed effects. With the inclusion of year fixed effects, the *POST* term is dropped from estimation, and these terms have been omitted for brevity. I estimate White (1980) heteroscedasticity-consistent standard errors clustered at the parent level, which are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 12: Cross Sectional Test of Tax Avoidance & Income Shifting (cont'd.)

Panel B: Tax Avoidance & Detection Risk (DR)

	Median			P25/75		
	(1)	(2)	(3)	(4)	(5)	(6)
CBCR	0.008	-0.007	0.004	-0.010	-0.010	0.006
	(0.012)	(0.012)	(0.023)	(0.014)	(0.016)	(0.028)
DR	0.062***	0.042***	0.042***	0.087***	0.069***	0.082***
	(0.004)	(0.004)	(0.010)	(0.006)	(0.007)	(0.018)
CBCR_POST	-0.015	-0.014	0.001	-0.016	-0.017	-0.003
	(0.017)	(0.016)	(0.023)	(0.017)	(0.017)	(0.024)
CBCR_DR	-0.011	-0.009	-0.009	0.0079	-0.007	-0.015
	(0.007)	(0.006)	(0.010)	(0.010)	(0.012)	(0.018)
	0.028*	**0.029***	**0.003**	**0.029***	**0.029***	**0.007**
CBCR_POST_DR(β_7)	(0.016)	(0.015)	(0.023)	(0.016)	(0.016)	(0.025)
Size		0.007	-0.012		0.007	-0.011
		(0.005)	(0.008)		(0.005)	(0.008)
Leverage		0.083***	0.024		0.083***	0.023
		(0.027)	(0.015)		(0.028)	(0.014)
ROA		-0.025	-0.444***		-0.024	-0.445***
		(0.018)	(0.130)		(0.018)	(0.131)
Innovation			0.035**			0.035**
			(0.014)			(0.014)
R&D			0.046			0.082*
			(0.046)			(0.046)
AvgSTR			0.406			-0.709***
			(0.257)			(0.256)
N_AffCountry			-0.115***			-0.116***
			(0.009)			(0.009)
Firm & Year FE	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm
N	46,708	36,390	6,840	44,120	34,097	6,381
adj. R-sq.	0.255	0.353	0.340	0.261	0.355	0.344

This Table reports OLS estimates of the following equation:

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 DR + \beta_4 CBCR*POST + \beta_5 POST* DR + \beta_6 CBCR* DR + \beta_7 CBCR*POST* DR + \beta X_{it} + FE_{it} + \varepsilon_{it}$

Where TA is the tax avoidance variable and is measured using ETR. In columns (1) to (3) [(4) to (6)], DR is defined as 1 if CBCR is 1 and average tax administration expenditure (pre-implementation period) scaled by gross domestic product (in parent home country) is above the median (25th percentile) tax expenditure for all countries, and 0 otherwise. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, POST and POST_DR drop from the estimation and as such are not reported in this Table. X_{it} is the vector of control variables. Hubber White robust standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 13: Cross Sectional Test of Tax Avoidance & Income Shifting

Panel A: Income Shifting & Public Pressure (PP)

Variables		PP=1	PP=0	PP=1	PP=0	PP=1	PP=0
π	β_1	0.202	1.864	0.248	1.405	0.179	0.510
		(0.505)	(0.240)	(0.498)	(0.646)	(0.765)	(0.926)
CBCR	β_3	-0.015	0.099	-0.002	0.157*	-0.002	0.531**
		(0.518)	(0.169)	(0.936)	(0.080)	(0.956)	(0.047)
π _POST	β_4	0.114	-3.289	0.247	-6.744	0.606	-9.853
		(0.757)	(0.526)	(0.555)	(0.285)	(0.366)	(0.516)
π _CBCR	β_5	-0.010	-2.209	0.259	-2.250	-0.306	-3.162
		(0.976)	(0.171)	(0.587)	(0.467)	(0.785)	(0.575)
POST_CBCR	β_6	-0.099***	-0.248	-0.105***	-0.155	0.001	-0.194
		(0.000)	(0.194)	(0.000)	(0.465)	(0.998)	(0.524)
π _POST_CBCR	**β_7**	**-0.057**	**2.831**	**-0.816**	**6.093**	**1.384**	**10.08**
		(0.898)	(0.587)	(0.162)	(0.337)	(0.346)	(0.509)
LogFA	β_8	0.193***	0.176***	0.192***	0.161***	0.150***	0.184***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LogComp	β_9	0.527***	0.578***	0.506***	0.565***	0.574***	0.513***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LogGDP	β_{10}	0.035***	0.0817***	0.022	0.090***	0.014	0.156***
		(0.005)	(0.000)	(0.170)	(0.001)	(0.644)	(0.003)
***Z* Statistics**		**0.287**		**-0.128**		**-0.727**	
N		97,954	26,920	60,889	15,931	19,572	3,689
adj. R-sq.		0.602	0.528	0.577	0.500	0.607	0.482
FE		✓	✓	✓	✓	✓	✓
SE Cluster		Parent	Parent	Parent	Parent	Parent	Parent
Missing Affiliate Data		N/A	N/A	<30%	<30%	<10%	<10%

This Table reports OLS estimates of the profit shifting equation estimated separately based on parent-level public pressure:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

PP is 1 if CBCR is 1 and average Google searches in the pre-implementation period are greater than the median value of Google searches, and 0 otherwise. The dependent variable is *LogPTI* (natural log of affiliate's PTI). *CBCR* is an indicator variable equal to one for the affiliates whose ultimate global parent are subject to disclosure under CbCr. In other words, *CBCR* equals 1(0) for affiliates of European MNCs with revenue more(less) than €750M. The *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements under *CBCR* were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets. *LogComp* is a log of an affiliate's total compensation expense. *LogGDP* is the log of affiliate's host country gross domestic product. All columns include industry and year fixed effects. With the inclusion of year fixed effects, the *POST* term is dropped from estimation, and these terms have been omitted for brevity. I estimate White (1980) heteroscedasticity-consistent standard errors clustered at the parent level, which are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 13: Cross-Sectional Test of Tax Avoidance & Income Shifting (cont'd.)

Panel B: Tax Avoidance & Public Pressure (PP)

	Google Trend			Factiva		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CBCR	0.027	0.015	-0.001	0.073***	0.023	0.006
	(0.303)	(0.51)	(0.990)	(0.02)	(0.021)	(0.022)
PP	-0.024	-0.018	0.006	-0.001	-0.010	-0.006
	(0.174)	(0.261)	(0.784)	(0.016)	(0.015)	(0.024)
CBCR_POST	-0.004	-0.005	0.007	0.005	-0.001	-0.008
	(0.767)	(0.747)	(0.742)	(0.015)	(0.015)	(0.022)
CBCR_PP	-0.026	-0.031	0.001	-0.078***	-0.041*	-0.023
	(0.328)	(0.199)	(0.980)	(0.023)	(0.023)	(0.027)
CBCR_POST_PP(β_7)	**0.013**	**0.015**	**-0.004**	**0.009**	**0.016**	**0.015**
	(0.409)	(0.317)	(0.841)	(0.015)	(0.015)	(0.025)
Size		0.006	-0.012		0.006	-0.012
		(0.220)	(0.127)		(0.005)	(0.008)
Leverage		0.083***	0.024		0.083***	0.025
		(0.003)	(0.125)		(0.027)	(0.015)
ROA		-0.025	-0.446***		-0.025	-0.445***
		(0.178)	(0.001)		(0.018)	(0.130)
Innovation			0.037***			0.036**
			(0.010)			(0.014)
R&D			0.004			0.024
			(0.043)			(0.042)
AvgSTR			0.436***			-0.362***
			(0.131)			(0.132)
N_AffCountry			-0.091***			-0.091***
			(0.006)			(0.006)
Firm & Year FE	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm
N	46,708	36,390	6,840	46,708	36,390	6,840
adj. R-sq.	0.253	0.352	0.338	0.253	0.352	0.338

This Table reports OLS estimates of the following equation:

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 PP + \beta_4 CBCR*POST + \beta_5 POST* PP + \beta_6 CBCR* PP + \beta_7 CBCR*POST* PP + \beta X_{it} + FE_{it} + \varepsilon_{it}$

Where TA is the tax avoidance variable and is measured using *ETR*. In columns (1) to (3) [(4) to (6)], PP is defined as 1 if CBCR is 1 and average google searches (Factiva hits) in pre-implementation period scaled by total assets is above the median value, and 0 otherwise. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, POST and POST_PP drop from the estimation and as such are not reported in this Table. X_{it} is the vector of control variables. Hubber White robust standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 14: Cross Sectional Test of Tax Avoidance & Income Shifting

Panel A: Income Shifting & Political Cost (PC)

Variables		PC=1	PC=0	PC=1	PC=0	PC=1	PC=0
π	β_1	-2.419***	-1.609***	-0.048	-0.032	-0.048	-0.032
		(0.727)	(0.232)	(1.692)	(0.614)	(1.692)	(0.614)
CBCR	β_3	-0.015	0.099	-0.002	0.157*	-0.002	0.531**
		(0.518)	(0.169)	(0.936)	(0.080)	(0.956)	(0.047)
π _POST	β_4	0.114	-3.289	0.247	-6.744	0.606	-9.853
		(0.757)	(0.526)	(0.555)	(0.285)	(0.366)	(0.516)
π _CBCR	β_5	-0.010	-2.209	0.259	-2.250	-0.306	-3.162
		(0.976)	(0.171)	(0.587)	(0.467)	(0.785)	(0.575)
POST_CBCR	β_6	-0.099***	-0.248	-0.105***	-0.155	0.001	-0.194
		(0.000)	(0.194)	(0.000)	(0.465)	(0.998)	(0.524)
π _POST_CBCR	**β_7**	**-2.476***	**0.118**	**-1.543***	**-0.060**	**-1.543***	**-0.060**
		(1.467)	**(0.578)**	**(0.894)**	**(0.388)**	**(0.894)**	**(0.388)**
LogFA	β_8	0.414***	0.278***	-0.017	0.024**	-0.017	0.024**
		(0.014)	(0.004)	(0.036)	(0.012)	(0.036)	(0.012)
LogComp	β_9	0.277***	0.444***	0.278***	0.453***	0.278***	0.453***
		(0.022)	(0.007)	(0.069)	(0.032)	(0.069)	(0.032)
LogGDP	β_{10}	0.108***	0.046***	1.334***	0.158	1.334***	0.158
		(0.021)	(0.007)	(0.462)	(0.181)	(0.462)	(0.181)
Z Statistics		**0.287**		**-0.128**		**-0.727**	
N		97,954	26,920	60,889	15,931	19,572	3,689
adj. R-sq.		0.602	0.528	0.577	0.500	0.607	0.482
FE		✓	✓	✓	✓	✓	✓
SE Cluster		Parent	Parent	Parent	Parent	Parent	Parent
Missing Affiliate Data		N/A	N/A	<30%	<30%	<10%	<10%

This Table reports OLS estimates of the profit shifting equation estimated separately based on parent-level public pressure:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

PC is 1 if CBCR is 1 and the firm operates in the tobacco products, pharmaceuticals, health care services, defense, petroleum, natural gas, telecommunications and transportation services and 0 otherwise. The dependent variable is *LogPTI* (natural log of affiliate's PTI). *CBCR* is an indicator variable equal to one for the affiliates whose ultimate global parent are subject to disclosure under CbCr. In other words, *CBCR* equals 1(0) for affiliates of European MNCs with revenue more(less) than €750M. The *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements under *CBCR* were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets. *LogComp* is a log of an affiliate's total compensation expense. *LogGDP* is the log of affiliate's host country gross domestic product. All columns include industry and year fixed effects. With the inclusion of year fixed effects, the *POST* term is dropped from estimation, and these terms have been omitted for brevity. I estimate White (1980) heteroscedasticity-consistent standard errors clustered at the parent level, which are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 14: Cross-Sectional Test of Tax Avoidance & Income Shifting (cont'd.)

Panel B: Tax Avoidance & Political Cost (PC)

	ETR			TaxDiff		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
CBCR	0.001	-0.021*	-0.027	0.008	-0.015	-0.016
	(0.899)	(0.073)	(0.212)	(0.444)	(0.189)	(0.531)
CBCR_POST	0.008	0.008	0.002	0.009	0.00	-0.001
	(0.335)	(0.225)	(0.910)	(0.304)	(0.264)	(0.944)
CBCR_PC	0.004	0.027	0.015	0.001	0.0247	0.004
	(0.840)	(0.190)	(0.711)	(0.956)	(0.228)	(0.916)
POST_PC	0.001	0.0003	0.008	0.006	0.005	0.005
	(0.947)	(0.943)	(0.725)	(0.278)	(0.330)	(0.847)
CBCR_POST_PC(β_7)	**0.005**	**0.001**	**-0.042**	**-0.007**	**-0.011**	**-0.038**
	(0.709)	(0.956)	(0.140)	(0.616)	(0.343)	(0.189)
Size		0.014**	-0.012		0.014**	-0.013
		(0.014)	(0.351)		(0.015)	(0.331)
Leverage		0.103***	0.101**		0.099***	0.104**
		(0.003)	(0.027)		(0.004)	(0.028)
ROA		-0.021	-0.265*		-0.020	-0.265**
		(0.201)	(0.051)		(0.210)	(0.049)
Innovation			0.0712*			0.077**
			(0.070)			(0.025)
R&D			-0.001**			-0.001*
			(0.032)			(0.099)
AvgSTR			0.810***			0.233
			(0.000)			(0.278)
N_AffCountry			-0.091***			-0.091***
			(0.006)			(0.006)
Firm & Year FE	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm
N	46,708	36,390	6,840	46,708	36,390	6,840
adj. R-sq.	0.253	0.352	0.338	0.253	0.352	0.338

This Table reports OLS estimates of the following equation:

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 PC + \beta_4 CBCR*POST + \beta_5 POST* PC + \beta_6 CBCR* PC + \beta_7 CBCR*POST* PC + \beta X_{it} + FE_{it} + \varepsilon_{it}$

Where TA is the tax avoidance variable and is measured using *ETR*. In columns (1) to (6)], PC is defined as 1 if CBCR is 1 the firm operates in the tobacco products, pharmaceuticals, health care services, defense, petroleum, natural gas, telecommunications and transportation services, and 0 otherwise. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, POST and POST_PC drop from the estimation and as such are not reported in this Table. X_{it} is the vector of control variables. Hubber White robust standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 15: Cumulative Abnormal Returns around the €750M Cut-Off

Panel A: Comparison of Mean

	Event 1			Event 2		
CBCR=	1	0	Diff	1	0	Diff
CAR	**0.012**	**0.008**	**0.004**	**-0.003**	**0.004**	**0.007*** **
Std	*(0.002)*	*(0.012)*	*(0.004)*	*(0.002)*	*(0.001)*	*(0.003)*
N	314	372		452	526	

This Table reports the mean tCAR around the AI13 cut-off for the two key event dates. Event 1 refers to February 6th, 2015 and Event 2 refers to March 8th, 2015. CBCR is an indicator variable equal to 1 if the total consolidated revenue in 2014 (Event 1) or 2015 (Even 2) is greater than €750M and 0 if the total consolidated revenue in 2014 (Event 1) or 2015 (Even 2) is less than €750M. CAR is the three day cumulative abnormal return and is calculated as per Appendix C. Robust standard errors are reported in the parenthesis. **, *** indicate significance at 0.10, 0.05 and 0.01.

Panel B: Nonparametric Regression Discontinuity Estimation

	Event 1			Event 2		
Variables	Optimal	250	550	Optimal	250	550
CBCR	**-0.009**	**0.106**	**0.008**	**-0.025****	**-0.039****	**-0.0246****
Std	*(0.170)*	*(0.021*	*(0.017)*	*(0.014)*	*(0.018)*	*(0.013)*
Z	0.571	0.424	0.500	-1.73	-2.118	-1.829
N	730	730	730	1,046	1,046	1,046

This Table reports the results of estimating a nonparametric local linear regression on either side of the €750M cut-off using a triangle kernel. I use the optimal bandwidth selection algorithm following Calonical, Cattaneo & Titiuuik (2014) and also use two additional bandwidths (250 and 550). Event 1 refers to February 6, 2015 and Event 2 refers to March 8, 2015. The outcome variable is the CAR calculated as per Appendix C. CBCR is an indicator variable equal to 1 if the total consolidated revenue in 2014 (Event 1) or 2015 (Even 2) is greater than €750M and 0 if the total consolidated revenue in 2014 (Event 1) or 2015 (Even 2) is less than €750M. Bias correct standard errors are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10, 0.05 & 0.01 using the bias-corrected *z* statistics.

Table 16: Additional Analysis

Panel A: Regression Discontinuity Analysis of Spillover of Information

Variables	Optimal	250	450	500
CBCR (1)	-0.009	-0.012	0.009	0.013
(ETR)	*(0.362)*	*(0.112)*	*(0.412)*	*(0.281)*
CBCR (2)	-0.014	0.009	-0.026	-0.020
(ETR)	*(0.729)*	*(0.598)*	*(0.579)*	*(0.423)*
CBCR (1)	0.0427	0.0863	0.0351	0.0425
(CETR)	*(0.362)*	*(0.112)*	*(0.412)*	*(0.281)*
CBCR (2)	-0.063	-0.043	-0.010	-0.072
(CETR)	*(0.372)*	*(0.658)*	*(0.190)*	*(0.328)*

This Table reports the results of estimating a non-parametric local linear regression on either side of €750M cut-off using a triangle kernel. The outcome variable in the first (last) two rows is *ETR (CETR)* which is calculated as total annual tax expense (cash taxes paid) divided by the pre-tax income. *ETR & CETR* are reset at 1 & 0. In row 1, *CBCR* is an indicator variable equal to 1 for firms with consolidated revenue more than €750M in the preceding year (starting in 2014) and 0 for firms with consolidated revenue less than €750M in the preceding year (starting in 2014). In row 2, *CBCR* is an indicator variable equal to 1 for firms with group with consolidated revenue more than €750M in 2014 and 0 for firms with consolidated revenue less than €750M in 2014. P-values calculated using Z score are reported in the parenthesis. *, **, *** indicate statistical significance at 0.10, 0.05 and 0.01 respectively.

Table 16: Additional Analysis (cont'd.)

Panel B: Confound Effect of Other Tax Changes on Regression Discontinuity Estimates

Variables	Optimal	250	450	500
CBCR (1)	-0.009	-0.012	0.009	0.013
(ETR)	*(0.362)*	*(0.112)*	*(0.412)*	*(0.281)*
CBCR (2)	-0.014	0.009	-0.026	-0.020
(ETR)	*(0.729)*	*(0.598)*	*(0.579)*	*(0.423)*
CBCR (1)	0.0427	0.0863	0.0351	0.0425
(CETR)	*(0.362)*	*(0.112)*	*(0.412)*	*(0.281)*
CBCR (2)	-0.063	-0.043	-0.010	-0.072
(CETR)	*(0.372)*	*(0.658)*	*(0.190)*	*(0.328)*

This Table reports the results of estimating a non-parametric local linear regression on either side of €750M cut-off using a triangle kernel. The outcome variable in the first (last) two rows is *ETR (CETR)* which is calculated as total annual tax expense (cash taxes paid) divided by the pre-tax income. *ETR & CETR* are reset at 1 & 0. In row 1, *CBCR* is an indicator variable equal to 1 for firms with consolidated revenue more than €750M in the preceding year (starting in 2014) and 0 for firms with consolidated revenue less than €750M in the preceding year (starting in 2014). In row 2, *CBCR* is an indicator variable equal to 1 for firms with group with consolidated revenue more than €750M in 2014 and 0 for firms with consolidated revenue less than €750M in 2014. P-values calculated using Z score are reported in the parenthesis. *, **, *** indicate statistical significance at 0.10, 0.05 and 0.01 respectively.

Table 16: Additional Analysis (cont'd.)

Panel C: Confound Effect of Other Tax Changes on Difference in Difference Estimates

Variables		PP=1	PP=0	PP=1	PP=0	PP=1	PP=0
π	β_1	0.202	1.864	0.248	1.405	0.179	0.510
		(0.505)	(0.240)	(0.498)	(0.646)	(0.765)	(0.926)
CBCR	β_3	-0.015	0.099	-0.002	0.157*	-0.002	0.531**
		(0.518)	(0.169)	(0.936)	(0.080)	(0.956)	(0.047)
π _POST	β_4	0.114	-3.289	0.247	-6.744	0.606	-9.853
		(0.757)	(0.526)	(0.555)	(0.285)	(0.366)	(0.516)
π _CBCR	β_5	-0.010	-2.209	0.259	-2.250	-0.306	-3.162
		(0.976)	(0.171)	(0.587)	(0.467)	(0.785)	(0.575)
POST_CBCR	β_6	-0.099***	-0.248	-0.105***	-0.155	0.001	-0.194
		(0.000)	(0.194)	(0.000)	(0.465)	(0.998)	(0.524)
π _POST_CBCR	**β_7**	**-0.057**	**2.831**	**-0.816**	**6.093**	**1.384**	**10.08**
		(0.898)	(0.587)	(0.162)	(0.337)	(0.346)	(0.509)
LogFA	β_8	0.193***	0.176***	0.192***	0.161***	0.150***	0.184***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LogComp	β_9	0.527***	0.578***	0.506***	0.565***	0.574***	0.513***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LogGDP	β_{10}	0.035***	0.0817***	0.022	0.090***	0.014	0.156***
		(0.005)	(0.000)	(0.170)	(0.001)	(0.644)	(0.003)
Z Statistics		**0.287**		**-0.128**		**-0.727**	
N		97,954	26,920	60,889	15,931	19,572	3,689
adj. R-sq.		0.602	0.528	0.577	0.500	0.607	0.482
FE		✓	✓	✓	✓	✓	✓
SE Cluster		Parent	Parent	Parent	Parent	Parent	Parent
Missing Affiliate Data		N/A	N/A	<30%	<30%	<10%	<10%

This Table reports OLS estimates of the profit shifting equation estimated separately based on parent-level public pressure:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

PP is 1 if CBCR is 1 and average Google searches in the pre-implementation period are greater than the median value of Google searches, and 0 otherwise. The dependent variable is *LogPTI* (natural log of affiliate's PTI). *CBCR* is an indicator variable equal to one for the affiliates whose ultimate global parent are subject to disclosure under CbCr. In other words, *CBCR* equals 1(0) for affiliates of European MNCs with revenue more(less) than €750M. The *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements under *CBCR* were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's revenue. *LogFA* is the log of the affiliate's fixed assets. *LogComp* is a log of an affiliate's total compensation expense. *LogGDP* is the log of affiliate's host country gross domestic product. All columns include industry and year fixed effects. With the inclusion of year fixed effects, the *POST* term is dropped from estimation, and these terms have been omitted for brevity. I estimate White (1980) heteroscedasticity-consistent standard errors clustered at the parent level, which are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 17: Sensitivity Analysis

Panel A: Regression Discontinuity Analysis of Tax Avoidance

Pre-Implementation Period

BW	Optimal	250	450	550	Optimal	250	450	550
	No Controls				Controls			
CBCR	0.009	0.004	-0.002	-0.005	0.018	0.014	0.013	0.010
(ETR)	(0.640)	(0.790)	(0.890)	(0.712)	(0.329)	(0.367)	(0.324)	(0.388)
CBCR	0.008	0.011	0.015	0.009	0.022	0.013	0.015	0.018
(TaxDiff)	(0.686)	(0.507)	(0.324)	(0.493)	(0.220)	(0.388)	(0.249)	(0.128)
CBCR	0.015	0.010	0.014	0.014	0.025	0.027	0.013	0.015
(CETR)	(0.495)	(0.603)	(0.413)	(0.351)	(0.326)	(0.167)	(0.427)	(0.298)

Post-Implementation Period

BW	Optimal	250	450	550	Optimal	250	450	550
	No Controls				Controls			
CBCR	**0.022**	**0.019**	**0.014**	**0.022**	**0.019**	**0.032****	**0.022**	**0.019**
(ETR)	(0.216)	(0.222)	(0.367)	(0.216)	(0.222)	(0.035)	(0.216)	(0.222)
CBCR	**0.002**	**0.018**	**0.013**	**0.002**	**0.018**	**0.030****	**0.002**	**0.018**
(TaxDiff)	(0.879)	(0.255)	(0.388)	(0.879)	(0.255)	(0.043)	(0.879)	(0.255)
CBCR (TaxDiff)	**0.039**	**-0.006**	**0.013**	**0.039**	**-0.006**	**0.030**	**0.039**	**-0.006**
(CETR)	(0.118)	(0.859)	(0.562)	(0.118)	(0.859)	(0.153)	(0.118)	(0.859)

This Table reports the results of estimating a nonparametric local linear regression on either side of €750M cut-off using a triangle kernel in the pre-implementation period (Year<=2015). *CBCR* is an indicator variable equal to 1 for firms with consolidated revenue more than €750M in the preceding year and 0 for firms with consolidated revenue less than €750M in the preceding. The first column is estimated using the optimal bandwidth selection algorithm following Calonical, Cattaneo & Titiuuik (2014). 250, 450, and 500 bandwidth are used to estimate the nonparametric regression in other columns. The outcome variable in the first row is *ETR*, in the second row is *TaxDiff* and in the third row is *CETR*. *ETR* is calculated as total annual tax expense divided by the pre-tax income. *CETR* is calculated as cash taxes paid divided by PTI. *TaxDiff* is calculated as the difference between *ETR* and *STR*. *ETR* and *CETR* are reset at 1 & 0, and the reset *ETR* is used to calculate *TaxDiff*. The first four columns report the results without any covariates, and in the last four columns, additional covariates (Leverage, Size & ROA) are included. Standard error is clustered at the firm level and p-values calculated using the Z score are reported in the parenthesis. *, **, *** indicate statistical significance at 0.10, 0.05 and 0.01 respectively. All variables are as defined in Appendix A.

Table 17: Sensitivity Analysis (cont'd.)

Panel B: Difference in Difference Analysis of Tax Avoidance

	ETR			TaxDiff			CETR		
CBCR (β_1)	0.007	-0.007	-0.005	0.013	-0.004	-0.003	0.016*	0.028	0.024
	(0.008)	(0.009)	(0.012)	(0.008)	(0.009)	(0.012)	(0.064)	(0.114)	(0.271)
CBCR*POST	**0.007***	**0.009****	**0.005**	**0.006***	**0.011***	**0.008**	**0.001**	**0.009**	**0.006**
	(0.089)	(0.007)	(0.434)	(0.066)	(0.091)	(0.231)	(0.802)	(0.182)	(0.460)
Size		0.021**	-0.006	0.021**	-0.006	-0.007		0.0122	0.0121
		(0.000)	(0.369)	(0.000)	(0.362)	(0.310)		(0.319)	(0.326)
Leverage		0.016**	0.030*	0.016**	0.037*	0.030*		0.032	0.032
		(0.006)	(0.059)	(0.005)	(0.061)	(0.083)		(0.369)	(0.362)
ROA		-0.002	-0.044*	-0.006	-0.470*	-0.430*		-1.76*	-1.759*
		(0.241)	(0.000)	(0.216)	(0.000)	(0.000)		(0.000)	(0.000)
Innovation			0.032**		0.037**	0.037**			-0.026
			(0.041)		(0.018)	(0.026)			(0.299)
R&D			-0.001			0.001			-0.001*
			(0.349)			(0.546)			(0.055)
Firm & Year	✓	✓	✓	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
N	88,930	68,383	10,953	47,365	36,321	22,419	19,219	141,12	8,506
adj. R-sq.	0.242	0.339	0.348	0.322	0.413	0.456	0.221	0.269	0.336

This Table reports OLS estimates of the following equation:

$$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 POST + \beta_3 CBCR_{it} * POST + \beta X_{it} + FE_{it} + \varepsilon_{it}$$

Where TA is the tax avoidance variable and is measured using *ETR, TaxDiff & CETR. CBCR* is an indicator variable equal to 1 (0) for firms with consolidated revenue more (less) than €750M in the preceding year (starting in 2016). *POST* is an indicator variable equal to 1 for all years in which the full *CBCR* requirements were in effect (2016 onwards) and 0 otherwise. X_{it} is a vector of control variables. All columns are estimated with firm and year fixed effects. Due to the inclusion of these fixed effects, the POST term drops from the estimation and as such is not reported in this column. White (1980) heteroscedasticity-consistent standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 17: Sensitivity Analysis (cont'd.)

Panel C: Income Shifting Activities of Affiliates (Alt_C$_{it}$)

		Full Sample				Restricted Sample		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
π	β_1	-0.890**	-0.082	0.030	-0.127	0.164	-0.149	0.163
		(0.249)	(0.255)	(0.488)	(0.718)	(0.257)	(0.763)	(0.971)
CBCR	β_3		-0.012	-0.029	-0.0150	0.019	0.056	-0.018
			(0.018)	(0.028)	(0.038)	(0.018)	(0.042)	(0.0507)
π _POST	β_4		-0.219	0.087	0.945*	-0.04	0.345	1.407*
			(0.228)	(0.358)	(0.512)	(0.209)	(0.508)	(0.725)
π _CBCR	β_5		0.145	-0.413	-0.433	-0.648**	-1.457**	-1.401
			(0.280)	(0.548)	(0.792)	(0.270)	(0.738)	(1.015)
POST_CBCR	β_6		-0.068**	-0.112**	-	-0.072**	-0.053*	0.141**
			(0.014)	(0.021)	(0.030)	(0.013)	(0.027)	(0.065)
π	**β_7**		**-0.051**	**-0.394**	**1.464***	**-0.005**	**0.298**	**-1.104**
			(0.263)	(0.468)	(0.802)	(0.239)	(0.732)	(1.470)
LogFA	β_8	0.202***	0.0421*	0.0271*	0.025*	0.044**	0.0219	0.066***
		(0.004)	(0.005)	(0.009)	(0.013)	(0.005)	(0.018)	(0.021)
LogComp	β_9	0.556***	0.389**	0.364**	0.388**	0.182**	0.252**	0.219***
		(0.007)	(0.015)	(0.025)	(0.036)	(0.014)	(0.042)	(0.049)
LogGDP	β_{10}	0.067***	0.222**	0.313**	0.012	0.312**	0.187	0.047
		(0.007)	(0.079)	(0.144)	(0.217)	(0.071)	(0.197)	(0.316)
N		145,431	142,088	49,364	24,257	66,323	8,819	4,561
adj. R-sq.		0.491	0.832	0.824	0.820	0.840	0.833	0.797
Parent & Year		✓	✓	✓	✓	✓	✓	✓
SE Clustered		Parent	Parent	Parent	Parent	Parent	Parent	Parent
% of Missing Aff		N/A	N/A	10%	0%	N/A	10%	0%

This Table reports OLS estimates of the profit shifting equation:

$$LogPTI^{r}_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The *POST* is an indicator variable equal to 1 for all years in which the full CbCr requirements were in effect (2016 onwards) and 0 otherwise. π is the tax incentive variable calculated as per equation (4) using affiliate's total assets. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. Columns (1) to (4) are estimated using the full sample and columns (5) to (7) are estimated using affiliates with at least €1M in revenue. Columns (3), (4), (6) & (7) are restricted to affiliate groups with less than 10% or 0% missing affiliate data. All columns are estimated with parent and year fixed effects. With the inclusion of year fixed effects, the *POST* term drops from estimation. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Table 18: Falsification Test of Tax Avoidance

Panel A: Robustness Check of RD Results

BW	Optimal	250	450	500
CBCR (1)	-0.004	0.038	0.001	-0.005
(ETR)	*(0.906)*	*(0.389)*	*(0.968)*	*(0.885)*
CBCR (2)	-0.001	0.052	-0.015	-0.020
(ETR)	*(0.983)*	*(0.028)*	*(0.071)*	*(0.043)*
CBCR (1)	-0.003	0.090	0.0599	0.029
(TaxDiff)	*(0.919)*	*(0.152)*	*(0.182)*	*(0.467)*
CBCR (2)	0.009	-0.013	-0.036	-0.021
(TaxDiff)	*(0.752)*	*(0.833)*	*(0.470)*	*(0.626)*

This Table reports the results of estimating a non-parametric local linear regression on either side of €750M cut-off using a triangle kernel. The outcome variable is *ETR (CETR)* which is calculated as total annual tax expense (cash taxes paid) divided by the pre-tax income. *ETR & CETR* are reset at 1 & 0. In column 1, CBCR is an indicator variable equal to 1 for firms with consolidated revenue more than €1500M in the preceding year (starting in 2015) and 0 for firms with consolidated revenue less than €1500M in the preceding year (starting in 2015). In column 2, CBCR is an indicator variable equal to 1 for firms with consolidated revenue more than €2500M in the preceding year (starting in 2015) and 0 for firms with consolidated revenue less than €2500M in the preceding year (starting in 2015). Standard error is clustered at the firm level and p-values calculated using the Z score are reported in the parenthesis.

Table 18: Falsification Test of Tax Avoidance (cont'd.)
Panel B: Robustness Check of DID Results

	ETR		TaxDiff		CETR	
	(1)	**(2)**	**(1)**	**(2)**	**(1)**	**(2)**
CBCR*PPOST	-0.001	-0.002	-0.006	-0.005	0.008	-0.001
(β_3)	(0.005	(0.005)	(0.00)	(0.005)	(0.009)	(0.008)
ROA		0.026***		0.028***		-0.165***
		(0.006)		(0.006)		(0.006)
Size		0.034*		0.040**		0.040
		(0.019)		(0.020)		(0.033)
Leverage		-0.106		-0.106		0.0403
		(0.086)		(0.084)		(0.070)
FE	✓	✓	✓	✓	✓	✓
SE Clustered	Firm	Firm	Firm	Firm	Firm	Firm
N	28,326	27,477	28,034	27,195	7,571	7,570
adj. R-sq.	0.388	0.392	0.443	0.445	0.314	0.537

This Table reports OLS estimates of the following equation:

$TA_{it} = \beta_0 + \beta_1 CBCR_{it} + \beta_2 PPOST + \beta_3 CBCR_{it} *PPOST + FE_{it} + \varepsilon_{it}$

Where TA is the tax avoidance variable and is measured using ETR, TaxDiff & CETR. CBCR is an indicator variable equal to 1 for firms with consolidated revenue more than €750M in the preceding year and 0 for firms with consolidated revenue less than €750M in the preceding year. The PPOST is an indicator variable equal to 1 for 2014-2015 and 0 for 2010-2013. Hubber White robust standard errors clustered at the firm level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. All variables are as defined in Appendix A.

Table 18: Falsification Test of Tax Avoidance (cont'd.)

Panel C: Robustness Check of Income Shifting Tests

		Full Sample				Restricted Sample		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
π	β_1	0.450*	-0.016	0.146	-0.077	0.495	0.730	0.989
		(0.221)	(0.325)	(0.401)	(0.664)	(0.732)	(0.461)	(0.667)
CBCR	β_3		-0.026	-0.026	-0.055	-0.052	-0.038	-0.008
			(0.032)	(0.042)	(0.064)	(0.072)	(0.030)	(0.040)
π _PPOST	β_4		-0.219	0.087	0.945*	-0.040	0.345	1.407*
			(0.228)	(0.358)	(0.512)	(0.209)	(0.508)	(0.725)
π _CBCR	β_5		0.145	-0.413	-0.433	-0.648**	-1.457**	-1.401
			(0.280)	(0.548)	(0.792)	(0.270)	(0.738)	(1.015)
PPOST_CBCR	β_6		-0.068**	-0.112**	-0.141**	-0.072**	-0.053*	0.141**
			(0.014)	(0.021)	(0.030)	(0.013)	(0.027)	(0.065)
π _PPOST_CBCR	**β_7**		**0.0361**	**-0.047**	**-1.441**	**-3.317****	**-1.015****	**-2.029****
			(0.364)	(0.483)	(1.098)	(1.600)	(0.484)	(0.705)
LogFA	β_8	0.036*	0.187***	0.176***	0.143***	0.138***	0.0240**	0.013
		(0.002)	(0.006)	(0.007)	(0.016)	(0.018)	(0.008)	(0.011)
LogComp	β_9	0.340*	0.542***	0.528***	0.577***	0.581***	0.164***	0.163***
		(0.028)	(0.010)	(0.013)	(0.030)	(0.032)	(0.022)	(0.036)
LogGDP	β_1	0.146	0.048***	0.031*	0.045	-0.010	-0.241*	-0.438**
		(0.155)	(0.012)	(0.016)	(0.033)	(0.046)	(0.141)	(0.209)
N		67,892	39,232	10,168	6,573	29,042	13,924	2,648
adj. R-sq.		0.851	0.556	0.590	0.625	0.861	0.859	0.794
Parent & Year FE		✓	✓	✓	✓	✓	✓	✓
SE Clustered		Parent	Parent	Parent	Parent	Parent	Parent	Parent
% of Missing Aff		N/A	N/A	10%	0%	N/A	10%	0%

This Table reports OLS estimates of the profit shifting equation:

$$LogPTI_{it} = \beta_0 + \beta_1 \pi + \beta_2 POST + \beta_3 CBCR_{it} + \beta_4 POST * CBCR_{it} + \beta_5 POST * \pi + \beta_6 CBCR_{it} * \pi + \beta_7 POST * CBCR_{it} * \pi + \beta_8 LogTA_{it} + \beta_9 LogComp_{it} + \beta_{10} LogGDP_t + FE_{it} + \varepsilon_{it}$$

The dependent variable is *LogPTI* (natural log of affiliate's pre-tax income). *CBCR* equals 1(0) for affiliates of European MNCs that are subject (not subject) to CbCr rules. The PPOST is an indicator variable equal to 1 for 2014-2015 and 0 for 2010-2013. π is the tax incentive variable calculated as per equation (4) using affiliate's total assets. *LogFA* is the log of the affiliate's fixed assets; *LogComp* is a log of an affiliate's total compensation expense & *LogGDP* is the log of affiliate's host country gross domestic product. Columns (1) to (4) are estimated using the full sample and columns (5) to (7) are estimated using affiliates with at least €1M in revenue. Columns (3), (4), (6) & (7) are restricted to affiliate groups with less than 10% or 0% missing affiliate data. All columns are estimated with parent and year fixed effects. With the inclusion of year fixed effects, the *POST* term drops from estimation. White (1980) heteroscedasticity-consistent standard errors clustered at the parent level are reported in the parenthesis. *, **, *** indicate statistical significance at the 0.10. 0.05 & 0.01. The coefficients on the fixed effects and constant term are omitted for brevity.

Chapter Three: Public Country-by-Country Reporting

1.0 INTRODUCTION

There are persuasive arguments on both sides of the debate regarding the effectiveness of public country-by-country reporting (CbCR) as a tool to curb tax-motivated income shifting. Supporters of public CbCR argue that this information will allow a broad group of stakeholders such as public and tax authorities to hold MNCs fiscally accountable wherever they operate. Such public scrutiny is expected to deter MNCs from engaging in aggressive profit shifting arrangements (Murphy 2009; Taxnotes 2014; Trade Union Advisory Committee 2016; Eurodad 2017). Public CbCR could provide the transparency necessary for tax authorities to detect any misalignment between the profits generated in each country and a firm's tax payments. This is especially the case for tax authorities without comprehensive access to financial and tax information on the firm's global operation. The less-informed stakeholder groups such as politicians, individual investors, nongovernment agencies, and consumers could also find the information contained in the published CbCR useful in their assessment of a firm's global activities. Public CbCR can potentially direct political and public pressure toward firms that report abnormally high income in low-tax jurisdictions with no corresponding "substance" (people or property).[43]

Several academic studies find empirical evidence supporting these arguments (e.g., Dyreng et al. 2016; Hoopes et al. 2018; Mills 1998). In recent work, Hanlon (2018) notes that a potential benefit of public CbCR "might be found in a potential behavioural response on the part of companies to curb income shifting once they have to disclose activities and income on a country-by-country basis" (2).

[43] Recent studies find a high presence by 36 of the most prominent EU MNBs in tax-haven countries (Murphy 2015), as well as a significant misalignment between the location of profit and the location of bank activities in terms of turnovers and employees (Jelínková 2016).

Skeptics of public CbCR, however, argue that it is unclear whether and to what extent public CbCR will result in additional insights and benefits to the public, regulators, and tax authorities. Foreign activities of MNCs, especially those of banks, are already subject to numerous financial and regulatory disclosure requirements for both accounting and tax purposes. Existing provisions in most European countries already require the disclosure to tax authorities of specified tax information, including certain tax payments and transfer pricing documentation (Evers et al. 2016). Moreover, given the highly regulated nature of the financial sector, the ability of banks to adjust their income shifting (without attracting regulatory scrutiny) may be limited.

2.0 HYPOTHESIS DEVELOPMENT

Banks can own shares of non-financial firms for strategic as well as financing reasons (i.e., collateral for a loan). CRD IV provides an option for EU MNBs to exclude non-financial affiliates from being part of the CbC report by choosing prudential consolidation instead of a full consolidation approach.[44] Because it is not possible to observe the consolidation choice made by the banks in our study, I separately examine the change in the income-shifting activities of the non-financial affiliates of EU MNBs.

If the banks selectively choose to omit the disclosure for the non-financial affiliates, the non-tax costs associated with tax-motivated income shifting (e.g., reputational and political cost) for the financial affiliates would increase relative to the non-financial affiliates. Assuming that the banks' tax avoidance is in an equilibrium that balance the tax benefits with other tax and non-tax

[44] According to the European Banking Authority's (2013) single rulebook, entities that undertake purely non-financial commercial activities are excluded from the scope of prudential consolidation. For detailed information on the consolidation options for CbCR, see https://eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/-/interactive-single-rulebook/toc/2/article-id/338

costs, the adoption of CbCR under CRD IV, combined with the strategic disclosure choice by the banks, would alter this equilibrium. As a result, banks may be incentivized to increase the level of tax-motivated income shifting among the non-financial affiliates to offset the tax increases due to a reduction of such activities among the financial affiliates.

If for one reason or another, the banks do not exercise such discretion and fully consolidate all non-financial affiliates, there may be no change (or even a reduction) in the level of income shifted because both financial and non-financial affiliates are subject to the same level of scrutiny. Since I am unable to observe the reporting method chosen by a bank,[45] I examine the non-financial affiliates separately and state my second hypothesis in alternate form:

> *H1. Following the implementation of public CbCR under CRD IV, non-financial affiliates of EU MNBs change their income-shifting activity as reflected in higher or lower ETRs*

3.0 DATA AND METHODOLOGY

3.1. Data

I obtained financial statement and ownership data for banks' financial affiliates from the *BankFocus* database compiled by Bureau van Dijk. I obtained financial statement data for the banks and their non-financial affiliates from the *Orbis* database (also by Bureau van Dijk). Our sample data cover a period between 2011 and 2017.

The full CbCR requirements under CRD IV came into effect in 2015; and therefore, in our empirical tests, I compare a firm's income shifting and tax-avoidance activities during the subsequent three years (2015–2017) with the period before the adoption of CRD IV (2011–2013).

[45] We cannot make any predictions on whether a bank will choose full consolidation or partial consolidation basis of reporting. Our review of CRD IV reports published by these banks provides little clarity on the reporting method chosen.

I exclude the observations in 2014 from the dataset because EU MNBs had to disclose a limited set of financial information privately to their local tax authorities in 2014. Furthermore, many financial institutions were not required to participate in this year. As such, I cannot treat 2014 as either a pre-implementation or post-implementation year.[46]

CbCR requirements under CRD IV only apply to "Credit Institutions" or "Investment Firms." As defined under Title I Article 4.1(1) of CRR, a credit institution is "an undertaking the business of which is to receive deposits or other repayable funds from the public and to grant credits on their own account." An investment firm is defined in Article 4.1(2) as "any legal person whose regular occupation or business is the provision of one or more investment services to third parties and/or performance of one or more investment activities on a professional basis."Although it is not clear whether all financial firms engaged in lending money would fall within the scope of CRD IV, it is widely accepted that banking activities including retail and commercial banks would be regulated under CRD IV (EY 2013). My sample, therefore, starts with all EU-headquartered MNBs.[47] To be included in our sample, the banks had to be identified as the global ultimate owner in the *Orbis* and *BankFocus* databases, have headquarters in one of the 28 EU member states, and own at least one foreign subsidiary. I excluded central banks, governmental credit institutions, and microfinance institutions because their incentives to shift income might differ from other banks

[46] I exclude the observations before 2011 because the data are not well-populated for these years and also because the financial industry was severely impacted by the global financial crisis between 2007 and 2009. For all analyses, we also perform robustness tests by including observations in 2014. The results are qualitatively similar whether or not the observations in 2014 are included.

[47] Including commercial banks, savings banks, cooperative banks, real estate and mortgage banks, investment banks, bank holdings and holding companies, securities firms, private banking, finance companies and group finance companies.

(Merz and Overesch 2016). The final sample consists of 83 EU-headquartered MNBs (536 firm-year observations) in the treatment group.[48]

In the test of H1, the subjects of interest are non-financial affiliates of the 83 EU headquartered banks. These are the affiliates that do not operate in the financial industry or the ancillary financial industry.[49] Banks ownership in non-financial firms is motivated by several reasons, and it is not uncommon for banks to hold shares of non-financial firms in exchange for their debt (especially during an economic crisis). It is, therefore, possible that the non-financial affiliates included in the sample are not material subsidiaries of the bank. To mitigate this concern, I restrict the sample to only wholly-owned subsidiaries (100 percent) of the banking group. I start the sample with 3,729 non-financial affiliates. After dropping all inactive affiliates and affiliates without the necessary data to calculate the variables required for our income-shifting model, my final sample includes 336 non-financial affiliates (1,080 affiliate-year observations). The control group in H1 includes non-financial affiliates of non-financial multinationals headquartered in the EU.

3.2 Income-Shifting Model for Non-Financial Affiliates

To test for the impact of CbCR on the tax-motivated income-shifting behaviour of non-financial affiliates, I adopted a difference-in-difference (DID) setup. With the test for H1, I am able to

[48] My sample of 83 EU MNBs is reasonable when compared to the total number of EU banks reported from the regular monitoring exercises by the Bank of International Settlements. In Annex B of the most recent report (dated October 2018), the BIS refers to 36 large international banks and 73 "other" banks in the EU (Bank for International Settlements 2018). Because the focus of my study is EU MNBs with ability to carry out tax-motivated income shifting, I believe that the search criteria used in our study sufficiently capture the observations of interest.

[49] Technically, some affiliates of the financial industry (e.g., insurance firms) may be outside the scope of CRD IV and we could have included these firms in my test of H1. However, the income shifting model used for H1 is not directly applicable for insurance companies, and as such, we do not include them in the final sample of H1.

identify an appropriate control group: non-financial affiliates of European industrial MNCs. These firms are not subject to the requirements of public CbCR under CRD IV.[50] This control group comprises of 5,117 affiliates, or 31,552 affiliate-year observations, of industrial EU MNCs. I then compare the change in the income-shifting activities of the non-financial affiliates of EU MNBs after the adoption of public CbCR with this control group.

To test for income-shifting among the non-financial affiliates of EUMNBs, I adopt the same model as in Hines and Rice (1994) and Huizinga and Laeven (2008). I modify this model for the DID research design as follows:

$$LOGPTI_{it} = \beta_0 + \beta_1\pi_{it} + \beta_2 POST + \beta_3 CBCR + \beta_4\pi_{it} \times POST + \beta_5 CBCR \times POST + \beta_6\pi_{it} \times CBCR + \beta_7\pi_{it} \times POST \times CBCR + \boldsymbol{\beta X_{it}} + \delta_{it} + u_{it} + \varepsilon_{it} \quad (1)$$

π_{it} is the revenue-weighted tax incentive variables (C_{it}) of subsidiary *i* of firm *r* in year *t* and is calculated in using the total formula:

$$C_{it}^{b} = \frac{1}{1-\tau_{it}} \frac{\sum_{k\neq i}^{n} \frac{EA_{kt}(\tau_{i,t}-\tau_{kt})}{1-\tau_{kt}}}{\sum_{k}^{n} \frac{EA_{kt}}{1-\tau_{kt}}} \quad (2)$$

For robustness, I also use total assets to proxy for the scale of the affiliates' operation to calculate an alternative tax incentive variable (Alt_C_{it}). *CBCR* is an indicator variable for the affiliates whose ultimate global parents are subject to disclosure under CRD IV. *LogPTI* is as defined in equation 1. The standard control variables for this model include the log of affiliates'

[50] BEPS Action Item 13 requires multinationals to submit country-by-country reports privately to the local tax authorities. Most EU countries chose an implementation date of either 31 December 2016 for Action Item 13. Because we include 2016/2017 in our sample year, one could argue that we may be capturing the effect of BEPS Action Item 13. However, BEPS Action Item 13 should have the same impact on both the treatment and control group so any difference that we observe can be attributed to public CbCR, since CRD IV only impacts parent companies of the treatment group.

total assets ($LogAssets_{it}$), the log of affiliates' total number of employees (*LogEmp*), and the log of the affiliates' home country GDP ($LogGDP_{it}$).[51]

I estimate the above regression using year and parent/firm fixed effects to control for time trends and unobserved time-invariant characteristics between multinational groups.[52] The coefficient β_7 on the interaction term between *POST*, *CBCR*, and π is the primary variable of interest in equation 3. A negative coefficient on β_7 suggests that EU MNBs engaged in more tax-motivated income shifting (and therefore had a lower ETR) among the non-financial affiliates after these institutions were required to comply with CbCR under CRD IV, and vice versa.

4.0 RESULTS

4.1. Descriptive statistics

Table 1 provides a comparison of the financial and non-financial affiliates of the 83 EU MNBs in our sample. As expected, financial affiliates are larger in terms of size and profitability as compared to non-financial affiliates, though the average number of financial and non-financial affiliates are comparable.

Table 2 reports the descriptive statistics of the variables used in the primary and supplementary analysis. The panels of Table 2 are broken down by treatment and control groups for the test of H1. A review of panels A and B highlights the disparity in size and profitability between financial and non-financial affiliates of EU MNBs.

Table 3 provides a breakdown of affiliates by industry. In panel A, commercial banks make up most of the sample (59.2%), followed by cooperative and saving banks (9.2% each) and finance

[51] The Appendix provides definitions and detailed calculations for the variables in equation 3.

[52] With the inclusion of affiliate and year fixed effects in a DID design, the *POST* and *CBCR* terms are automatically omitted from the estimation.

companies (6.9%). In panel B, administrative and support service activities make up most of the sample for the treatment group (30.09%), following by real estate activities (21.94%) and professional, scientific and technical activities (11.39%).[53]

4.2. Primary results

Table 4 reports the result of estimating equation 1, using standard OLS estimation with robust standard errors. The panels of Table 4 vary by the proxies for the tax incentive variable (π_{it}). Revenue-weighted tax incentive variable (C_{it}) is used in columns (1) to (4), whereas the asset-weighted tax incentive variable (Alt_C_{it}) is used in columns (5) to (8). Columns (1) and (5) are estimated without the interaction term ($\pi_{it} \times POST \times CBCR$), to establish consistency with previous income-shifting studies. Following White (1980), I calculate heteroscedasticity-consistent standard errors clustered at the parent level. As predicted, the coefficients on *LogAssets* (β_8), *LogComp* (β_9), and on *LogGDP* (β_{10}) are positive and statistically significant across all columns. Again, for brevity, the coefficients on the fixed effects are omitted from Table 4.

The main coefficient of interest in Table 4 is β_7, as it provides an estimate of the effect of CbCR on the level of income shifting among the treatment group relative to the control group. Across most specifications, the coefficient of interest β_7 is positive and statistically significant at the 5% and 10% levels. A positive coefficient on the interaction term suggests that in the *POST* period, non-financial affiliates of EU MNBs appear to shift less income to low-tax affiliates relative to the non-financial affiliates of other EU industrial groups that were not subject to any CbCR requirement.

[53] The "other services" category includes holding companies, management companies, payroll processing, and data management amongst other ancillary services that are not related to financial activities and as such are outside the scope of CRD IV.

Additionally, I perform a sensitivity test restricting the treatment sample for H1 to the 195 nonfinancial affiliates that can be seen in the banks' most recent annual report. The results for this sensitivity test are consistent with those in Table 4 and are untabulated for brevity. The magnitude and statistical significance of the main coefficients are slightly stronger with this restriction. The coefficients using $C_{i,t}$ range from 2.242 to 2.618 (significant at 5 and 10% levels), and coefficients using $Alt\_C_{i,t}$ range from 2.420 to 3.220 significant at 1, 5, and 10% levels).

Regarding economic magnitude, the estimate of β_7 of 1.376 (column [2]) indicates that an interquartile increase in C_{it} (0.047) is associated with a 6.46 percent increase (0.047 × 1.376) in the reported profit of non-financial affiliate of EU MNBs in the post-CbCR implementation period. With the median pre-tax income of approximately $1 million, this translates into an incremental increase in the reported income of $65,000 per non-financial affiliate of EU MNBs, relative to the non-financial affiliates of EU industrial firms.

5.0 CONCLUSION

This chapter explores the unexpected adoption of public CbCR under CRD IV as an exogenous shock to disclosure requirements, to examine the effectiveness of increased transparency in curbing income shifting. Using affiliate-level data of European banks, I find some evidence of a decrease in the level of income shifted by these banks' non-financial affiliates even though this requirement does not technically apply to affiliates that undertake non-financial/commercial activities. My interpretation of this result is that public CbCR under CRD IV has had an effect on deterring banks from engaging in income-shifting activities amongst their non-financial affiliates. This result is consistent with the notion that banks are choosing to report on the full consolidation method, which is also reflected in my discussions with practitioners from the big four accounting firms.

Table 1: Comparison of Financial and Non-Financial Affiliates

	PANEL A: Financial Affiliates		PANEL B: Non-financial Affiliates	
	N	Mean	N	Mean
Total Assets	594	93,500,000	1,080	209,722
PTI	594	499,183	1,080	6,504
Tax	586	140,682	993	1,378
Net Income	586	358,501	551	245
ETR	586	29.45%	1,080	33.12%
STR	594	29.09%	1,080	24.77%
Per MNBs	174	3.414	366	2.951

This Table provides descriptive statistics for financial and non-financial affiliates of 83 EU MNBs. All financial figures are in thousands of USD.

Table 2: Descriptive Statistics

H1	Panel A Treatment Group - Non-financial Affiliates of EU MNBs						Panel B Control Group - Non-financial Affiliates of Industrial MNCs					
Variable	**No of Obs**	**Mean**	**Std. Dev**	**P25**	**P50**	**P75**	**No of Obs**	**Mean**	**Std. Dev**	**P25**	**P50**	**P75**
LogPTI	1,080	6.643	2.402	4.983	6.916	8.281	31,552	9.286	1.688	8.282	9.272	10.292
STR	1,080	0.247	0.067	0.190	0.250	0.314	31,552	0.264	0.054	0.220	0.260	0.314
C	1,080	-0.016	0.042	-0.037	0.000	0.010	31,552	-0.005	0.033	-0.015	0.000	0.008
Alt_C	1,080	-0.013	0.044	-0.033	0.000	0.016	31,552	-0.004	0.033	-0.014	0.000	0.008
LogTA	1,080	9.689	2.285	8.223	9.680	11.107	31,552	12.014	1.393	11.051	11.783	12.765
LogEmp	1,080	3.187	1.885	1.609	3.067	4.574	31,552	5.943	1.509	5.068	5.958	6.850
LogGDP	1,080	10.193	0.650	9.791	10.372	10.640	31,552	10.419	0.514	10.282	10.606	10.698

Note: Financial data are derived from *Orbis* database provided by Bureau van Dijk. Where $LogPTI_t$ is the natural log of pre-tax income in year t; STR_t is the domestic statutory tax rate of affiliate's host country in year t*; PTI* is pre-tax income in millions of U.S. dollars; *C* & *Alt_C* are the tax incentive variable and are calculated using the formula in equation 2 ; *LogTA* is the natural log of affiliates total assets; *LogEmp* is the natural log of total number of employees; *LogCD* is the natural log of total customer deposits; *LogEA* is the natural log of total earning assets and *LogGDP* is the *n*atural log of affiliates host country GDP.

Table 3: Industry Breakdown

Industry Classification	Treatment Group		Control Group	
	No. of Affiliates	Percent	No. of Affiliates	Percent
Administrative and support service activities	325	30.09	1,593	5.05
Real estate activities	237	21.94	191	0.61
Professional, scientific and technical activities	123	11.39	1,873	5.94
Information and communication	99	9.17	1,725	5.47
Wholesale and retail trade; leasing of motor vehicles and motorcycles	92	8.52	8,678	27.5
Manufacturing	47	4.35	11,885	37.67
Construction	47	4.35	1,694	5.37
Financial and insurance activities	44	4.07	466	1.48
Others	66	6.12	3,447	10.93
Grand Total	1,080	100	31,552	100

Table 4: Income Shifting Activities of Non-Financial Affiliates

		$C_{i,t}$				$Alt\_C_{i,t}$			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
π	β_1 /–	-1.139**	-1.398***	-1.411***	-0.580	-1.130***	-1.368***	-1.477***	-0.968**
		(0.004)	(0.003)	(0.001)	(0.203)	(0.002)	(0.002)	(0.000)	(0.031)
CBCR	β_2 /?		0.088	0.539**			0.082	0.550***	
			(0.255)	(0.007)			(0.270)	(0.006)	
$\pi \times CBCR$	β_4 /?		1.471*	-0.050	-1.155		1.365	-0.164	-0.729
			(0.068)	(0.964)	(0.380)		(0.111)	(0.878)	(0.503)
$\pi \times POST$	β_5 /?		0.264	0.122	-0.228		0.393	0.160	-0.093
			(0.458)	(0.723)	(0.434)		(0.267)	(0.635)	(0.760)
$POST \times CBCR$	β_6 /?		0.139**	0.132***	0.101**		0.114**	0.122***	0.098**
			(0.015)	(0.009)	(0.015)		(0.035)	(0.005)	(0.025)
$\pi \times POST \times CBCR$	**β_7 /?**		**1.877****	**1.376***	**1.782****		**0.793**	**1.323***	**1.809****
			(0.039)	**(0.085)**	**(0.043)**		**(0.352)**	**(0.085)**	**(0.047)**
LogTA	β_8 /+	0.725***	0.727***	0.711***	0.547***	0.724***	0.726***	0.708***	0.548***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LogEmp	β_9 /+	0.056***	-0.034	-0.010	0.234***	0.057***	0.060***	0.072***	0.059***
		(0.000)	(0.158)	(0.710)	(0.006)	(0.000)	(0.000)	(0.000)	(0.005)
LogGDP	β_{10}/?	-0.037	0.059***	0.072***	0.059***	-0.035	-0.033	-0.006	0.237***
		(0.120)	(0.000)	(0.000)	(0.001)	(0.137)	(0.172)	(0.812)	(0.005)
Year FE		Y	Y	Y	Y	Y	Y	Y	Y
Parent FE		N	N	Y	N	N	N	Y	N
Affiliate FE		N	N	N	Y	N	N	N	Y
Observations		32,628	32,628	32,628	32,628	32,721	32,721	32,721	32,721
Adj R-squared		0.5958	0.5962	0.7080	0.8850	0.5956	0.5959	0.7078	0.8850

Table 5: Robustness Test

Placebo Tests of Income-Shifting Activities Among the Non-Financial Affiliates

Variables	Pred	***C***	***Alt_C***
		(1)	(2)
π	β_1 /−	-1.293***	-1.188***
		(0.003)	(0.007)
CBCR	β_3 / ?	0.720***	0.707**
		(0.010)	(0.013)
$\pi \times CBCR$	β_4 /?	1.014	0.885
		(0.353)	(0.435)
$\pi \times PlaceboOPOST$	β_5 /?	-0.143	-0.238
		(0.613)	(0.414)
$CBCR \times PlaceboPOST$	β_6 /?	0.017	0.016
		(0.623)	(0.673)
$\boldsymbol{\pi \times PlaceboPOST \times CBCR}$	$\boldsymbol{\beta_7}$ **/?**	**-0.533**	**-0.303**
		(0.529)	**(0.749)**
LogTA	β_8 /+	0.711***	0.712***
		(0.000)	(0.000)
LogComp	β_9 /+	0.067***	0.066***
		(0.000)	(0.000)
LogGDP	β_{10} /?	-0.022	-0.026
		(0.463)	(0.387)
Firm FE		Y	Y
Year FE		Y	Y
Observations		21,606	21,530
R-squared		0.725	0.725

This Table reports OLS estimates of the profit shifting equation:

$$LOGPTI_{it} = \beta_0 + \beta_1 \pi_{it} + \beta_2 PlaceboPOST + \beta_3 CBCR + \beta_4 \pi_{it} * CBCR + \beta_5 \pi_{it} * PlaceboPOST + \beta_6 CBCR * PlaceboPOST + \beta_7 \pi_{it} * PlaceboPOST * CBCR + \beta_8 LogAssets_{it} + \beta_9 LogComp_{it} + \beta_5 LogGDP_{it} + FE + \varepsilon_{it}$$

The dependent variable is the log of pre-tax income. CBCR equals 1 for non-financial affiliates of European banks and equals 0 for non-financial affiliates of European industrial groups. *PlaceboPOST* is an indicator variable equal to 1 2013-2014 and 0 for 2011-2012. C is calculated as per equation (2) using affiliate's revenue. C_Assets is calculated as per equation (2) using affiliate's total assets. Control variables are as defined in Appendix A-2. All columns include firm and year fixed effects. We estimate White (1980) heteroscedasticity-consistent standard errors. *,**,*** indicate significance levels at the 10 percent, 5 percent, and 1 percent. P-values are reported in parenthesis. The coefficients on the fixed effects and constant term are omitted for brevity.

Figure 1: Regression Discontinuity Plot of Tax Avoidance

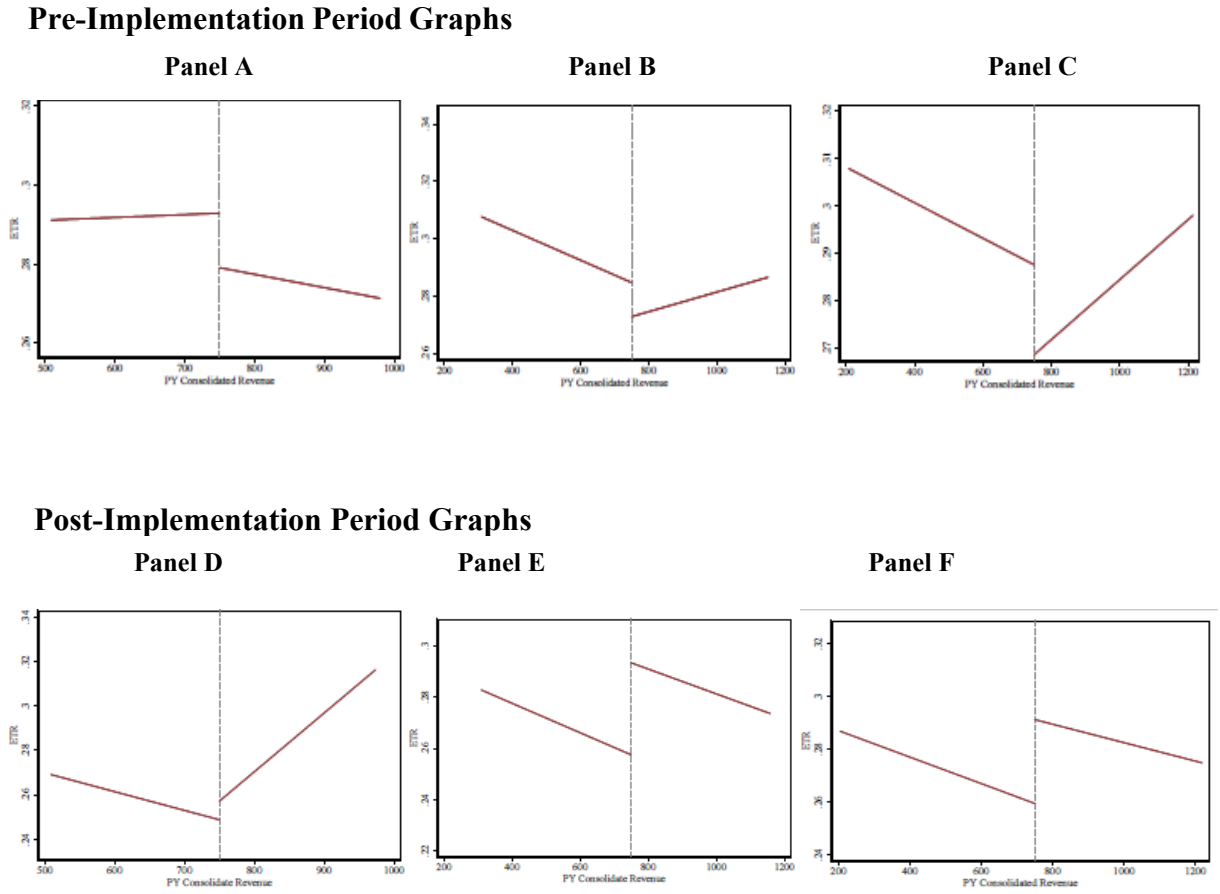


Figure 1 plots ETRs against consolidated revenue around the Action Item 13 cut-off (€750M). Panels A to C are for the pre-implementation period (Year<=2015) and Panels D-F are for the post-implementation period (Year>2015). The vertical line is centered on €750M. The graphs in panel A&D/B&E/C&F provide the RD plots for 250/450/550 bandwidths respectively.

Figure 2: Regression Discontinuity Plot of Tax Avoidance (Panel)

Pre-Implementation Period Graphs

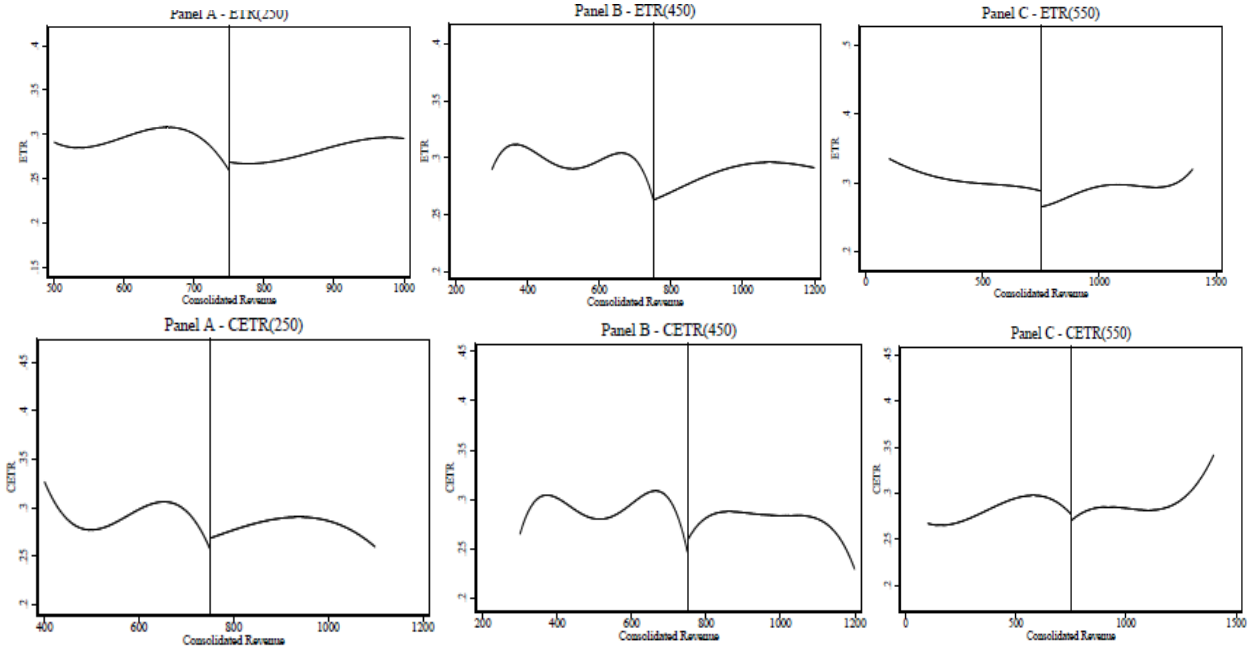


Figure 1 plots tax avoidance against consolidated revenue in the pre-implementation period (Year<=2015)) around the Action Item 13 cut-off (€750M). Panels A-C have *ETR* on the Y-axis and Panel D-F have *CETR* on the Y-axis. All panels have consoldated on the X-axis. The vertical line is centered on €750M. All variables are as defined in Appendix A.

Figure 3: Regression Discontinuity Plot of Tax Avoidance

Post-Implementation Period Graphs

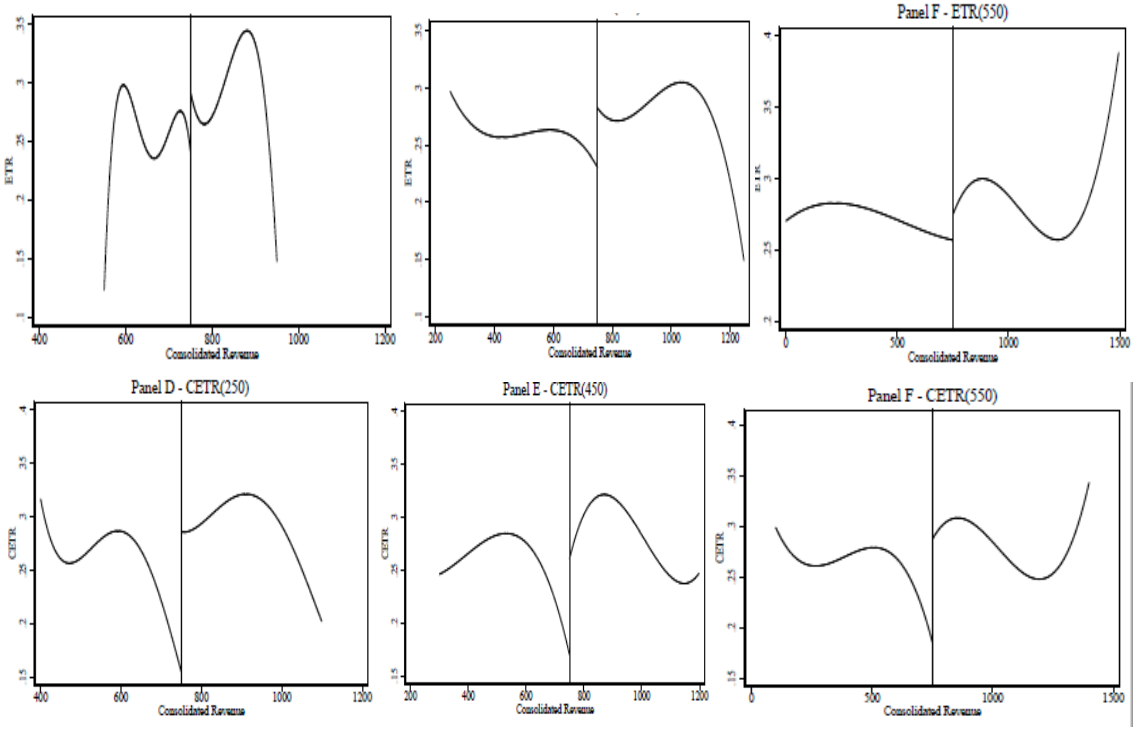


Figure 1 plots tax avoidance against consolidated revenue in the post-implementation period (Year>2015) around the Action Item 13 cut-off (€750M). Panels A-C have *ETR* on the Y-axis and Panel D-F have *CETR* on the Y-axis. All panels have consoldated on the X-axis. The vertical line is centered on €750M. All variables are as defined in Appendix A.

Figure 4: RD Density Plot of Consolidated Revenue

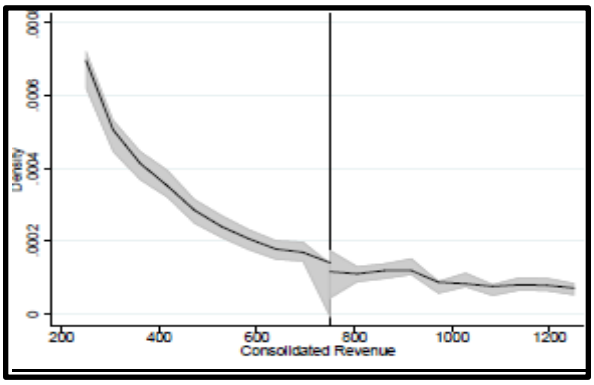
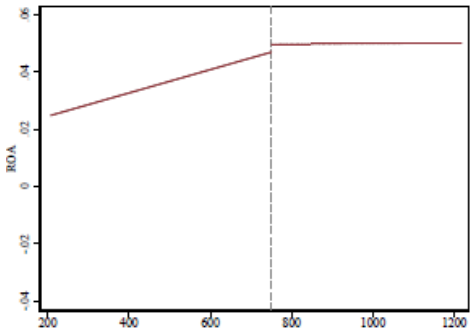


Figure 2 plots the consolidated revenue density around the €750M threshold. The vertical line is centered on €750M. All variables are as defined in Appendix A-2.

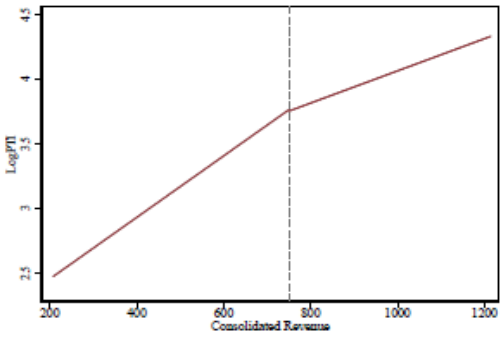
Figure 5: RD Plot of Other Firm Characteristics

Post-Implementation Period

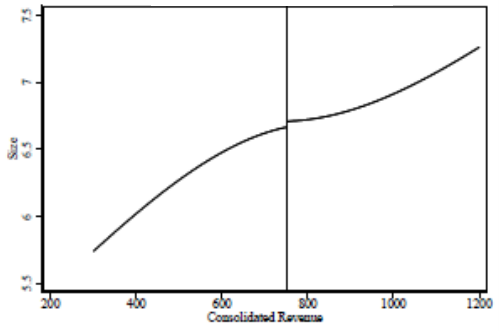
Panel A-ROA



Panel B-LogPTTI



Panel C-Size



Panel D-Leverage

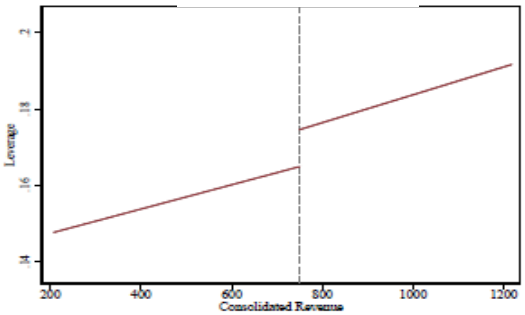


Figure 3 plots firm characteristics (return on assets [ROA], size and leverage) in the post-implementation period (Year>2015) around the Action Item 13 cut-off (€750M). The vertical line is centered on €750M. All variables are as defined in Appendix A.

Figure 6: DID Plot of Tax Avoidance

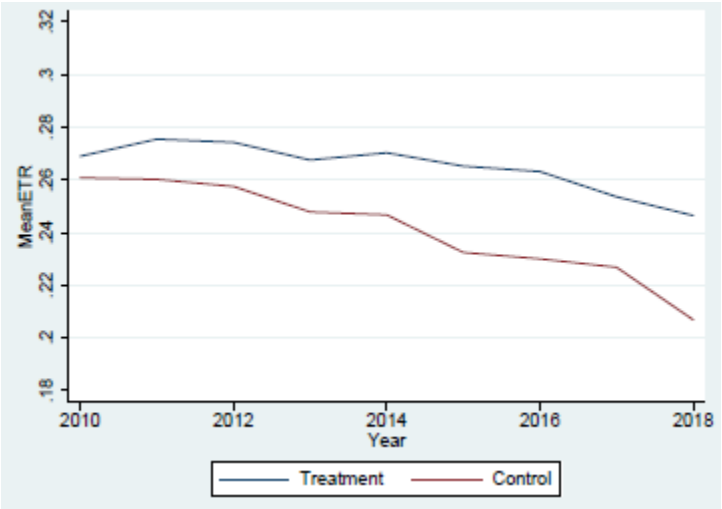


Figure 7: Plot of STR Trends

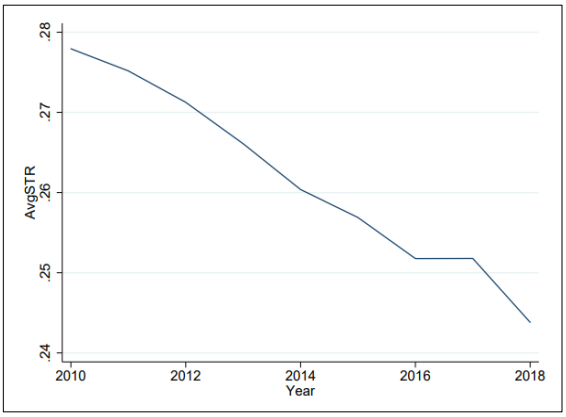


Figure 8: RD Plot of Market Reaction

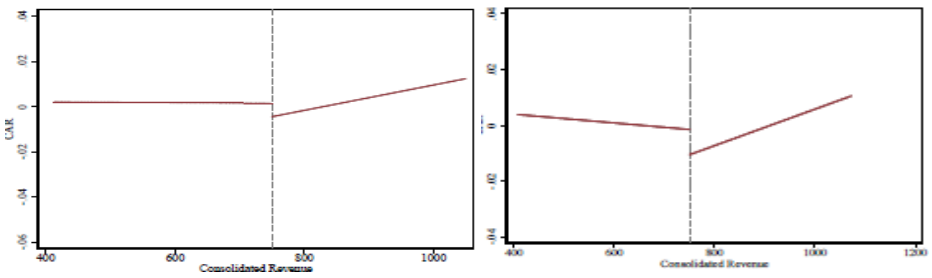


Figure 7 plots CAR for two key event dates around the Action Item 13 cut-off (€750M). The vertical line is centered on €750M. All variables are as defined in Appendix A.

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Appendix A-1: Definitions of Variables (Private CbCr)

Tax Avoidance Tests	
POST	1 for 2016-2018 and 0 for 2011-2015.
CBCR	RD Tests: Indicator variable equal to 1 for firms with revenue in excess of €750M and 0 for firms with revenue less than €750M in 2015 and subsequent years. Tax Avoidance Tests: Indicator variable equal to 1 for firms in all years if revenue in 2015 and subsequent years exceeds €750M and 0 for firms in all years if revenue in 2015 and subsequent years is less than €750M. Income Shifting Tests: Indicator variable equal to 1 for affiliates of firms with revenue in 2015 and subsequent years more than €750M and 0 for affiliates of firms with revenue in 2015 and subsequent years less than €750M.
ETR_{it}	$\frac{BTE}{PTI}$
BTE_{it}	Book-tax expense of firm i in year t
PTI_{it}	Pre-tax income of firm i in year t
ETR_5	$\frac{\sum_{t=2015}^{t-5} BTE}{\sum_{t=2015}^{t-5} PTI}$
TaxDiff	$ETR - STR$
$STR_{k,t}$	Statutory tax rate of country k in year t
$CETR_{it}$	$\frac{Cash\ Taxes\ Paid}{PTI}$
Size	Natural log of total assets
ROA	PTI scaled by total assets
Leverage	Total liabilities scaled by total assets
LTD	Total long-term debt scaled by total assets
Log PTI	Natural log of pre-tax income
Intangibles	Total Intangible assets scaled by Total Assets
R&D	Total R&D expenses scaled by Total Assets
Innovation	Total patents and trademarks scaled by Total Assets
AvgSTR	Average STR in affiliate home country
N_AffCountry	Average number of countries in which the entity has an affiliate
TE	1 if CBCR is 1 and average tax administration expenditure (pre-implementation period) scaled by gross domestic product (in parent home country) is above the median tax expenditure for all counties, and 0 otherwise.
DR	1 if CBCR is 1 and ETR_5 in pre-implementation period is greater than 75th percentile value of ETR_5, and 0 otherwise.
PP	1 if CBCR is 1 and average Google searches in the pre-implementation period are greater than the median value of Google searches, and 0 otherwise.
CAAR	$\frac{1}{N}\int_{i=1}^{N} CAR_i$
CAR	$\int_{i=0}^{T} AR_{it}$

AR_{it}	$R_{it} - (\widehat{\alpha_1} + \hat{\beta} R_{mt})$ $\widehat{\alpha_1}$ & $\hat{\beta}$ are ordinary least squares estimates of α_i & β_i from the following regression:
R_{it}	$\alpha_i + \beta_i R_{mt} + u_{it}$
R_{mt}	Value-Weighted index on day t using S&P Global 1200
	$\widehat{\alpha_1}$ & $\hat{\beta}$ are ordinary least squares estimates of α_i & β_i from the following regression
Event 1	February 6th, 2015
Event 2	March 8th, 2016
Affiliate Level Tests	
Tax Incentives (π)	$\frac{1}{1-\tau_{i,t}} \frac{\sum_{k \neq i}^{n} \frac{\beta_{k,t}(\tau_{i,t} - \tau_{k,t})}{1-\tau_{k,t}}}{\sum_{k}^{n} \frac{\beta_{k,t}}{1-\tau_{k,t}}}$
τ_{it}	The domestic STR of affiliate's host country in year t
$\beta_{k,t}$	Affiliates' Total Revenue for $\mathbf{C}_{i,t}$ Affiliates' Total Assets for $\boldsymbol{C_{i,t}^{A}}$
LogTA	Natural log of affiliates total assets
LogFA	Natural log of affiliate's fixed assets
LomComp	Natural log of affiliate's total compensation
LogEmp	Natural log of affiliate's total employees
LogGDP	Natural log of affiliate's host county GDP

Appendix A-2: Definitions of variables (Public CbCr)

$LogPTI_t$	Natural log of pre-tax income in year t
Tax Incentives (π)	$C_{i,t} = \frac{1}{1-\tau_{i,t}} \frac{\sum_{k \neq i}^{n} \frac{\beta_{k,t}(\tau_{i,t} - \tau_{k,t})}{1-\tau_{k,t}}}{\sum_{k}^{n} \frac{\beta_{k,t}}{1-\tau_{k,t}}}$
τ_{it}	The domestic statutory tax rate (STR) of affiliate's host country in year t
$\beta_{k,t}$	Affiliates' Total Earning Assets for $\boldsymbol{C_{i,t}^{b}}$
	Affiliates' Total Assets for $\boldsymbol{Alt\_C_{i,t}^{b}}$
POST	equals 1 if Year>2014 and equals 0 if Year<2014 & Year>2010
CBCR	Equals 1 for financial affiliates of EU MNBs and 0 for non-European financial affiliates of non-EU MNBs
PlaceboPOST	1 if Year = 2012 or 2013 and 0 if Year =2010 or 2011
ETR	The bank's effective tax rate is computed as the ratio between the total tax expense (*BTE*) and pre-tax income (*PTI*)
LogTA	Natural log of total assets
LogFA	Natural log of fixed assets
LogEA	Natural log of total earning assets
LogLLP	Natural log of total loan loss provision
LogOBS	Natural log of total off-balance sheet items
LogEmp	Natural log of total number of employees
LogCD	Natural log of total customer deposits
LogEA	Natural log of total earning assets
LEVERAGE	Total liabilities scaled by total assets
LEVERAGE_RATIO	Tier 1 capital scaled by total assets, multiplied by -1
LogGDP	Natural log of affiliates host country GDP
ROAA	Return of average assets is computed as the ratio the ratio of PTI and the average of the bank' total assets at the beginning and the end of the year
CAPITALRATIO	Bank's total capital ratio as reported in their financial statements

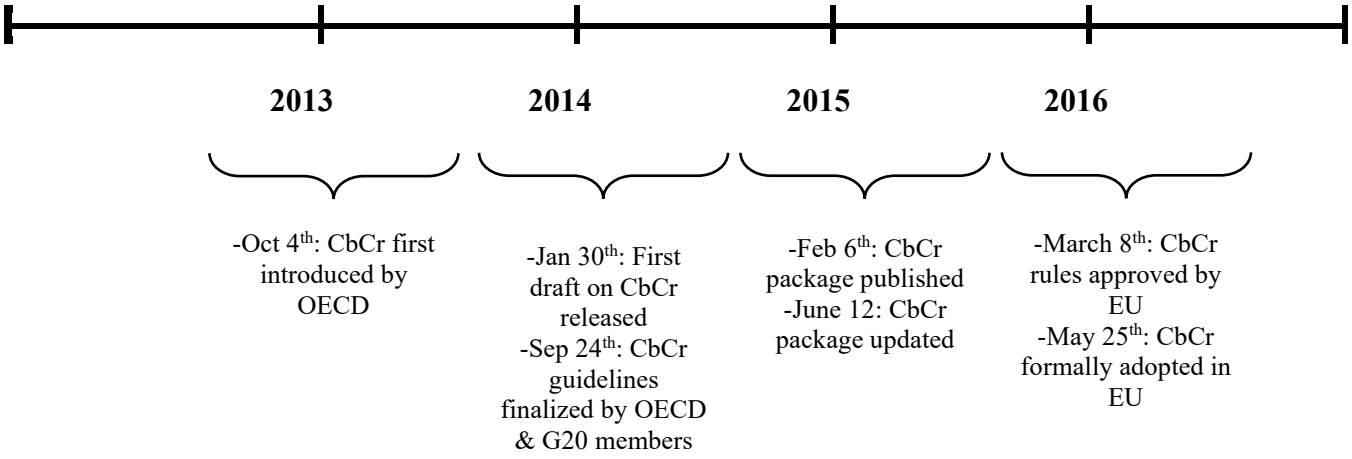
Appendix B: Multivariate Reweighting Techniques

To improve the covariate balance between the treatment and control firms, I use two multivariate reweighting techniques: inverse probability weighting and entropy balancing. The use of these techniques reduces the potential bias due to non-random treatment assignment and also reduces model dependency for the subsequent analysis of treatment effects in the preprocessed data using standard methods such as regression analysis (Abadie and Imbens 2011).

In my first method, I use a weighted regression model, where observations are weighted to ensure similarity on some observed characteristics. This approach is similar to the inverse probability of treatment weighting and the ‘‘groups’’ to be weighted reflect both treatment status as well as time (pre vs. post) (Stuart, Huskamp, Duckworth, Simmons, Song, Chernew & Barry [2014]). Specifically, I follow Stuart et al. (2014)’s weighting strategy that reweights the four groups (treatment pre, treatment post, comparison pre, comparison post) to be similar on a set of main covariates, which are leverage, size, total assets, intangible assets, and profitability.

The second method I use is entropy balancing which is based on a maximum entropy reweighting scheme that enables users to fit weights that satisfy a potentially large set of balance constraints that involve exact balance on the first, second, and possibly higher moments of the covariate distributions in the treatment and the reweighted control group (Hainmueller & Xu 2013). Instead of checking for covariate balance after the preprocessing, the user starts by specifying the desired level of covariate balance using a set of balance conditions. In my analysis, I set the balancing constraints to the second order of moment (i.e., the variance) since the balancing is not achieved with the third moment (skewness).

Appendix C: Timeline for Introduction & Implementation of Country-by-Country Reporting in European Union



Appendix D: Cumulative Abnormal Return Calculation

$$AR = R_{it} - (\widehat{\alpha_1} + \hat{\beta} R_{mt})$$

Where:
AR_{it}=Abnormal return of firm i on day t

$\widehat{\alpha_1}$ & $\hat{\beta}$ are ordinary least squares estimates of α_i & β_i from the following regression:

$$R_{it} = \alpha_i + \beta_i R_{mt} + u_{it}$$

R_{mt}= Value-Weighted index on day t using S&P Global 1200

After calculating the daily abnormal returns, mean cumulative market reaction is defined as follows:

$$CAR = \int_{i=0}^{T} AR_{it}$$

$$CAAR = \frac{1}{N} \int_{i=1}^{N} CAR_i$$

Appendix E: Construction of Alternate Treatment & Control Group

Appendix E provides an overview of the various tax changes that were introduced in EU member states since 2013. To mitigate any bias introduced by the confounding effect of concurrent tax and policy changes, I use the variation in the country-level implementation of tax policies to construct an alternate treatment and control group. For example, Action Item-5 & Action Item 13 were adopted by Belgium, Ireland, Italy, Netherlands, Portugal, and the UK in the same year, i.e., 2016. Action Item-5 introduced a process for reviewing preferential tax regimes and a transparency framework for sharing advance tax rulings. The changes under Action Item 5 can have an impact on a firm's tax behaviour. Similarly, Action Items 8-10, which changed transfer pricing rules were implemented by Hungary, Spain & Luxembourg one year after Action Item 13 (i.e., 2017). If I exclude all countries which introduced other policies, I am left with a very small sample size. Instead, I identify countries which implemented similar policies over the same period. As these changes affect firms to the left and right of the threshold equally, this strategy should help control for the confounding effect of other policies. Specifically, I select countries that adopted Action Item 5: Belgium, Ireland, Italy, Netherlands, Portugal, and the UK and use firms located in these countries to construct the alternate treatment and control group.

Appendix E: Construction of Alternate Treatment & Control group (cont'd.)

Tax Measure	Year*	Adopting States	Impacts TA**	Cut-off
Non-BEPS				
EU Case against Apple	N/A	N/A	No	No
Diverted Profit Tax	2015	UK	Yes	No
Digital tax Proposal	TBD	All	N/A	No
EU VAT	2015	All	Yes	No
Parent-Subsidiary Directive	2015	All	Yes	No
ATAD/ATAD2	TBD	N/A	N/A	No
CRD IV	2015	Financial Industry	Yes	No
EITI	2013	Extractive Industry	Yes	No
BEPS Action Items				
Action Item-1	2015	All	No	No
Action Item-2	2015	Czech, Estonia, Finland, France, Greece, Italy, Netherlands, Portugal, Spain & Sweden	No	No
Action Item-3	2015/2017	Hungary & Spain	Yes****	No
Action Item-4	2017	UK	Yes****	No
Action Item-5	2016	Belgium, Ireland, Italy, Netherlands, Portugal, and the UK	Yes****	No
Action Item-6	2017	Estonia	Yes****	No
Action Item-7	TBD	N/A	N/A	No
Action Item-8	2017	Hungary, Spain & Luxembourg	Yes****	No
Action Item-9	2017	Hungary, Spain & Luxembourg	Yes****	No
Action Item-10	2017	Hungary, Spain & Luxembourg	Yes****	No
Action Item-11	TBD	N/A	N/A	No
Action Item-12	TBD	N/A	N/A	No
Action Item 13	**2016**	**All**	**?**	€750M
Action Item-14	TBD	N/A	N/A	No
Action Item-15	TBD	N/A	N/A	No

* Year in which the measure was implemented by the first EU member state
** Is the measure expected to have an impact on tax avoidance
*** Impact is limited to counties that have adopted the action item

Appendix F: OECD Template for Private Country by Country Reporting

Table 1. Overview of allocation of income, taxes and business activities by tax jurisdiction

Name of the MNE group: Fiscal year concerned: Currency:										
Tax Jurisdiction	Revenues			Profit (Loss) Before Income Tax	Income Tax Paid (on cash basis)	Income Tax Accrued – Current Year	Stated capital	Accumulated earnings	Number of Employees	Tangible Assets other than Cash and Cash Equivalents
	Unrelated Party	Related Party	Total							

Table 2. List of all the Constituent Entities of the MNE group included in each aggregation per tax jurisdiction

Name of the MNE group: Fiscal year concerned:																
Tax Jurisdiction	Constituent Entities resident in the Tax Jurisdiction	Tax Jurisdiction of organisation or incorporation if different from Tax Jurisdiction of Residence	Main business activity(ies)													
			Research and Development	Holding/managing intellectual property	Purchasing or Procurement	Manufacturing or Production	Sales, Marketing or Distribution	Administrative, Management or Support Services	Provision of services to unrelated parties	Internal Group Finance	Regulated Financial Services	Insurance	Holding shares or other equity instruments	Dormant	Other[2]
	1.														
	2.														
	3.														
	2.														
	3.														

Table 3. Additional Information

Name of the MNE group: Fiscal year concerned:
Please include any further brief information or explanation you consider necessary or that would facilitate the understanding of the compulsory information provided in the country-by-country report.

Appendix G- Prudential Consolidation Under CRD IV

CbCr requirements under CRD IV are applied on an individual or (several) consolidated bases.

Individual Bases

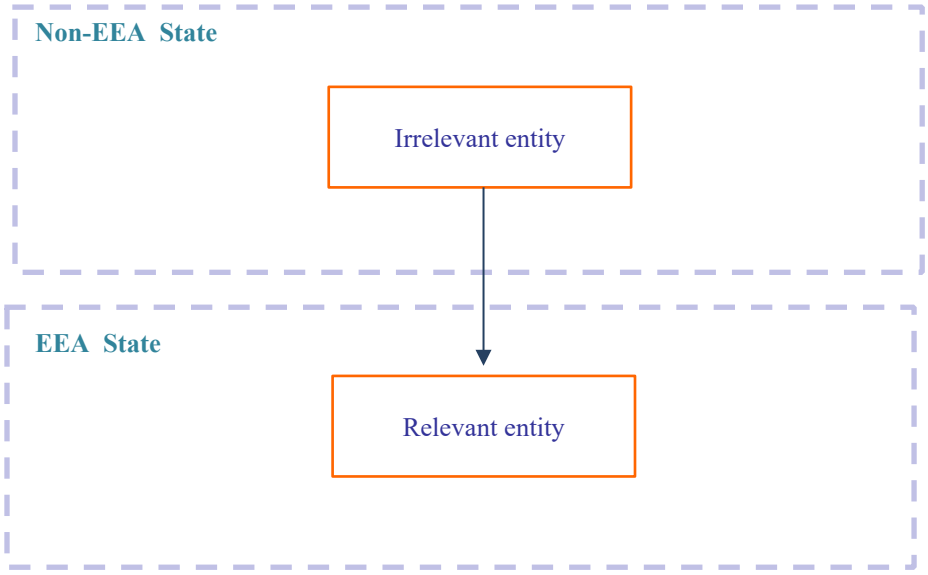
Individual application is based on the unconsolidated accounts of the legal entity which meets the definition of an institution (relevant entity). Entities that are not within the scope of CRD IV are referred to as "Irrelevant entity" in the examples below.

Consolidated Bases

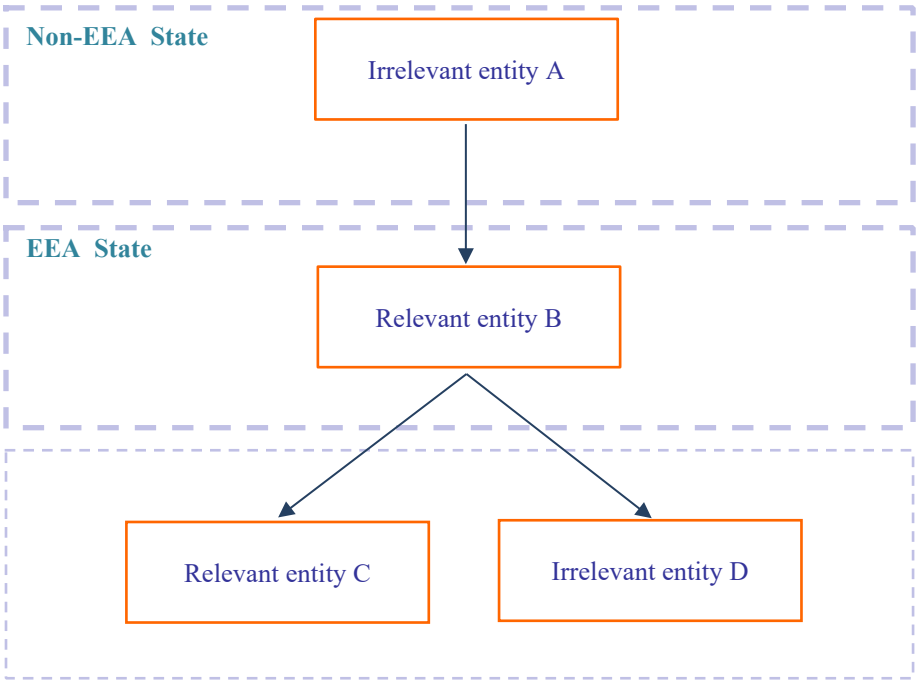
Consolidated application starts by consolidating several relevant legal entities within a financial group into a single (hypothetical) consolidated entity, on which the CbCr requirements are applied. In one financial group, several levels of consolidation may be applicable. The application of consolidated supervision and the determination of the consolidated situation are dependent on a number of characteristics of the financial group such as: legal relation between the entities, activities/licenses and location of the entity and is defined under CRD IV as "Prudential Consolidation". EU consolidation is triggered by the presence of at least one institution within the Europe Economic Area ("EEA").

Following are few examples of how individual and prudential consolidation bases may be applied under CRD IV.

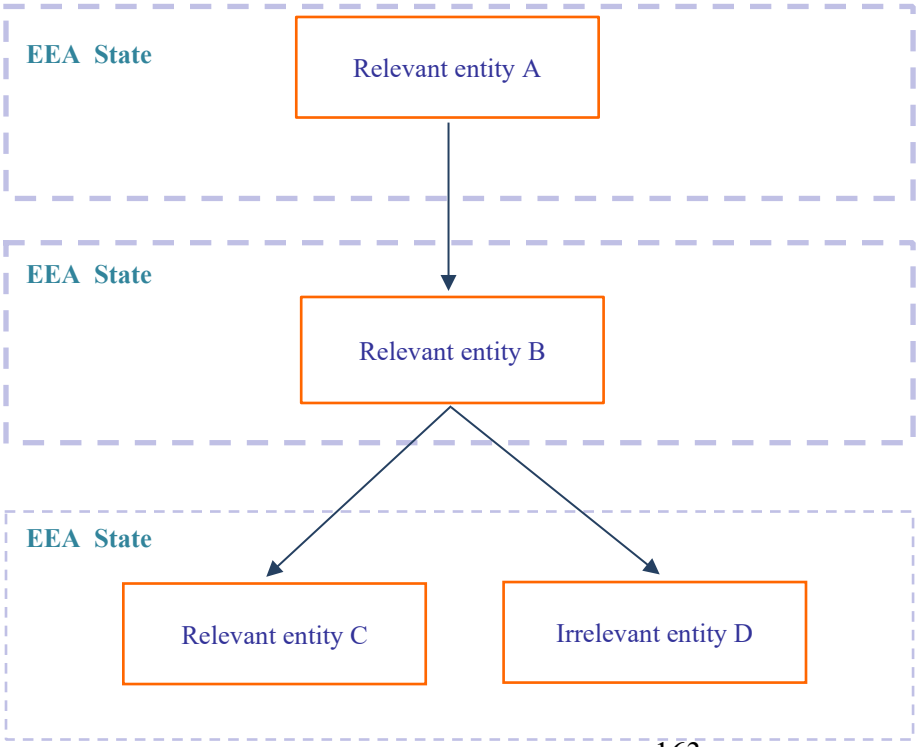
Example 1: Individual bases used for relevant entity as ultimate parent is not within EEA



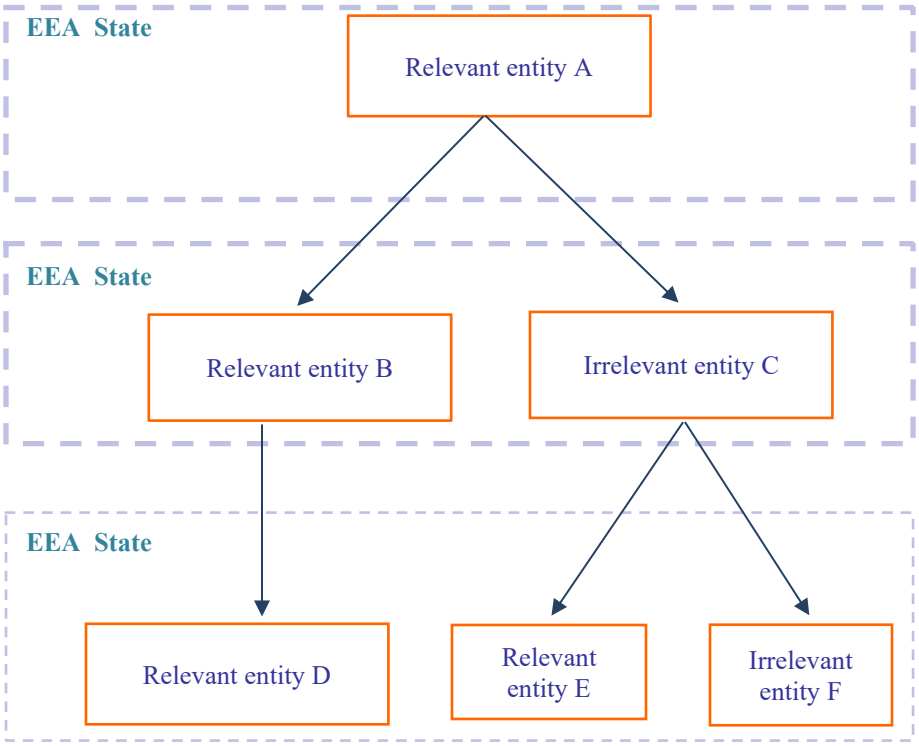
Example 2: Individual bases used for relevant entity B and C to avoid reporting information on irrelevant entity A&D.



Example 3: Full consolidation bases used for relevant entity A.



Example 4: Partial consolidation bases used for relevant entity B and individual bases used for relevant entity A and relevant entity E.



Country-by-country reporting

	For the year ended 31 December 2015			
	Turnover US$m	Average FTE	Profit/(loss) before tax US$m	Corporation tax paid/ (refunded) US$m
Europe				
UK	15,087	44,559	(533)	124
- Of which: UK Bank Levy Charge	-	-	(1,421)	-
France	2,675	8,526	639	170
Germany	828	2,526	239	56
Switzerland	634	1,418	(216)	5
Turkey	614	5,422	(44)	(14)
Armenia	41	333	17	4
Channel Islands and Isle of Man	405	1,150	233	16
Czech Republic	36	94	21	3
Greece	75	381	(32)	20
Ireland	94	378	11	-
Israel	39	101	21	4
Italy	65	117	29	11
Luxembourg	106	340	-	3
Malta	198	1,322	56	25
Monaco	109	209	30	12
Netherlands	29	24	19	3
Poland	102	1,662	9	1
Russia	115	241	82	14
South Africa	127	225	87	24
Spain	108	149	(4)	16
Asia				
Hong Kong[1]	15,616	29,664	9,806	1,102
Australia	869	1,672	373	150
Mainland China	2,607	21,364	3,060	87
- Of which: BoCom	-	-	2,011	-
India	1,853	33,062	606	284
Indonesia	537	5,437	(7)	68
Malaysia	988	9,172	442	87
Singapore	1,293	3,247	507	76
Taiwan	417	2,310	155	27
Bangladesh	194	894	115	67
Brunei	79	481	36	5
Japan	162	453	35	4
Korea	298	672	165	32
Macau	100	229	65	7
Maldives	24	28	21	6
Mauritius	82	368	51	5
New Zealand	102	221	81	17
Philippines	289	5,280	60	6
Sri Lanka	200	4,260	100	56
Thailand	143	466	90	16
Vietnam	168	1,354	81	10
Middle East and North Africa				
Egypt	610	2,914	410	128
Saudi Arabia[2]	-	-	500	-
UAE	1,417	3,274	367	118
Algeria	42	139	19	4
Bahrain	88	237	45	-
Kuwait	48	76	28	-
Lebanon	55	217	20	5
Oman	193	1,034	40	4
Qatar	202	339	109	9
North America				
Canada	1,595	5,663	485	173
USA	5,820	13,925	41	(8)
Bermuda	298	618	88	-

Country-by-country reporting (continued)

	Turnover US$m	Average FTE	Profit/(loss) before tax US$m	Corporation tax paid/ (refunded) US$m
Latin America				
Argentina	1,036	4,258	317	121
Brazil	3,584	19,548	5	169
Mexico	1,971	16,453	32	31
Chile	39	127	12	-
Uruguay	64	284	10	2
Other	61	37	(167)	-
Intra-HSBC items	(4,831)			
Total	59,800	258,954	18,867	3,365
Withholding and other taxes				349
Saudi shareholder tax				138
Total Income Taxes paid				3,852

1. *Hong Kong Special Administrative Region of the People's Republic of China.*
2. *Income from associates: Saudi British Bank and SABB Takaful. Saudi withholding tax paid is disclosed separately.*

The Group's principal subsidiaries and country of operation are as follows:

Principal subsidiary	Country	Nature of activities[1]
Europe		
HSBC Bank plc	England	RBWM, CMB, GB&M, GPB
HSBC France	France	RBWM, CMB, GB&M, GPB
HSBC Private Banking Holdings (Suisse) SA	Switzerland	RBWM, GB&M, GPB
HSBC Trinkaus & Burkhardt AG	Germany	RBWM, CMB, GB&M, GPB
Asia		
Hang Seng Bank Limited	Hong Kong	RBWM, CMB, GB&M
HSBC Bank Australia Limited	Australia	RBWM, CMB, GB&M
HSBC Bank (China) Company Limited	PRC[2]	RBWM, CMB, GB&M, GPB
HSBC Bank Malaysia Berhad	Malaysia	RBWM, CMB, GB&M
HSBC Bank (Taiwan) Limited	Taiwan	RBWM, CMB, GB&M, GPB
HSBC Life (International) Limited	Hong Kong	RBWM, CMB
The Hongkong and Shanghai Banking Corporation Limited	Hong Kong	RBWM, CMB, GB&M, GPB
Middle East and North Africa		
HSBC Bank Middle East Limited	United Arab Emirates	RBWM, CMB, GB&M, GPB
HSBC Bank Egypt S.A.E.	Egypt	RBWM, CMB, GB&M
North America		
HSBC Bank Canada	Canada	RBWM, CMB, GB&M
HSBC Bank USA, N.A.	USA	RBWM, CMB, GB&M, GPB
HSBC Finance Corporation	USA	RBWM, CMB
HSBC Securities (USA) Inc.	USA	RBWM, CMB, GB&M, GPB
Latin America		
HSBC Bank Brasil S.A. – Banco Múltiplo	Brazil	RBWM, CMB, GB&M, GPB
HSBC Mexico, S.A., Institución de Banca Múltiple, Grupo Financiero HSBC	Mexico	RBWM, CMB, GB&M, GPB

1. *HSBC's four principal global businesses are Retail Banking and Wealth Management ('RBWM'), Commercial Banking ('CMB'), Global Banking and Markets ('GB&M') and Global Private Banking ('GPB'). Refer to pages 28 - 31 of HSBC's* Annual Report and Accounts 2015 *for a description of the above global businesses. The principal subsidiaries represent the most significant operations of the Group globally. The business activities of other, smaller subsidiaries include RBWM, CMB, GB&M and GPB but are not considered material for separate disclosure.*
2. *People's Republic of China.*

Details of all HSBC subsidiaries, as required under Section 409 of the Companies Act 2006, are set out on pages 457 to 469 of HSBC's *Annual Report and Accounts 2015*.