DOES EXCHANGE OF INFORMATION DETER TAX AVOIDANCE: EVIDENCE FROM CONVENTION OF DOUBLE TAXATION TAXES ON INCOME

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ABSTRACT

This project studies whether the establishment of a convention of double taxation taxes on income between the United States of America and other countries deter the U.S. registered multinational firms from engaging in a higher level of tax avoidance. Because the differences in income tax laws and information asymmetry between the U.S. and other countries, businesses operate in multiple jurisdictions could minimize the overall income tax liability by shifting their income in either country. While income tax convention intends to reduce double taxation on income for multinationals, it includes provisions such as article 26 Exchange of Information and Administrative Assistance that enables contracting countries to help each other in collecting their fair share of revenue. Taking advantage of the double income taxation conventions signed by the U.S. and other countries, I investigate the effect of a convention on multinationals' tax avoidance and erosion behavior (proxied by cash, GAAP, and current effective tax rates). I find that multinational firms with material operations in countries that have income tax convention with the U.S. will have higher effective tax rates afterward, suggesting the establishment of double taxation convention helps U.S. tax authority in combating tax erosion by the U.S. registered multinational firms.

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I. INTRODUCTION

In recent years, because of continued low effective tax rates, U.S. multinational corporations (MNCs) have received unwanted attention from companies' stakeholders – from investors, media, political activists, to policymakers. The focus is on the notion that U.S. multinationals are effectively not paying their fair share of income taxes to the U.S. government. Rego (2003) finds that firms with foreign operations are associated with lower effective tax rates. Reasons could be abundant resources of multinational firms, use of tax haven, income shifting or more tax benefits provided by governments (Altshuler and Grubert 2005; Collins et al. 1998; Desai and Dharmapala 2006; Desai et al. 2006; Drake et al. 2018).

However, research rarely discuss how governments could respond to the increasing tax avoidance activities besides discovering more factors that possibly associated with lower effective tax rates. Exceptions come from studies that investigate the relation between scrutiny of tax enforcement and tax avoidance and compliance. Hoopes et al. (2012) reports that stricter IRS tax enforcement reduces firms' aggressive tax positions. In an international setting, studies show that multinational firms shift more income out of high-tax countries when local tax enforcement is relatively weak (Beuselinck et al. 2015; Atwoods et al. 2012). I extend this line of research by studying the deterrence effect of income tax convention establishment on U.S. multinational firms' tax avoidance.[1] To my knowledge, this is the first study that empirically examines the deterrence effect of income tax convention on MNCs' tax avoidance. This question is important given the sizable loss

[1] The tax planning strategies include shifting income from high-tax countries to low-tax countries, shifting income to low statutory tax rates country, and non-taxable intercompany payments.

of annual tax revenue of $100 to 240 billion to OECD countries and the recent demand for information transparency between tax authorities (OECD BEPS 2013).

Based on the idea that improving communication between tax administrations and providing them with sufficient information to assess high-level "Base Erosion and Profit Shifting" (hereafter BEPS) related risk, Organization for Economic Co-operation and Development OECD/G20 launched the BEPS project in 2013, including Action 5, 6, 12, 13, and 14 that are directly related to information transparency.[2] Notably, Action 13 (*Transfer Pricing Documentation and Country-by-Country Reporting*) recommends that multinationals prepare a new type of annual report – a country-by-country report (CBCR). The CBCR provides tax authority of the contracting countries with visibility over key elements of a firm's financial performance resulted from foreign operations. BEPS Action 13 recommends three models of Competent Authority Agreements which are Multilateral Convention on Administrative Assistance in Tax Matters, Bilateral tax conventions, and Tax Information Exchange Agreements (TIEA) to facilitate CBCR.

Interestingly, even though the intensive discussions about improving firms' information transparency to reduce base erosion by exchange of information between tax authorities, related exchange of information provision has long been embedded in the U.S. income tax convention. Under these conventions, residents or citizens of foreign countries can apply for reduced tax rates or exemption on a certain category of income (specified in convention) they earn from sources within the territory of the U.S. Generally, the convention model includes articles defining who fall within the

[2] Action 5: Counter harmful tax practices more effectively, taking into account transparency and substance; Action 6: Prevent treaty abuse; Require taxpayers to disclose their aggressive tax planning arrangements; Action 12: Disclosure of aggressive tax planning; Action 13: Re-examine transfer pricing documentation; Action 14: Make dispute resolution mechanisms more effective.

ambit, what taxes are covered, limitation on benefits, relief from double taxation. Last but not the least Article 26: *Exchange of Information and Administrative Assistance*. Article 26 of U.S. income tax convention is essentially the core of the BEPS campaign - increasing firms' information transparency to their respective tax authorities. While the information asymmetry between tax authorities is hard to observe, this paper directly investigates how an establishment of income tax convention with another jurisdiction would deter high-level tax avoidances of U.S. registered multinational firms. The question that policymakers have been wondering since the U.S. government began drafting a model of an income tax convention (Dennis 1986). As building an income tax convention between two countries requires higher level of information communication between tax authorities regarding multinational firms' business operations and results within their jurisdiction, I predict that U.S. income tax convention could increase Internal Revenue Service's (IRS) understanding of its multinational firms' operation outcomes from contracting countries, thus facilitating easier detection and audit of firms' illegal base erosion. This information bridge between tax authorities deters multinational firms' high-level tax avoidance. In sum, by looking at the effect of the establishment of an income tax convention between the U.S. and other countries, this study not only provides us some insights about the importance of communication between tax authorities in multinational firms' tax avoidance but also responds to OECD's BEPS project.

It is unclear as to the effect of income tax convention on multinational firms' tax avoidance. On the one hand, the objective of income tax convention is to reduce double taxation for multinationals, while encouraging foreign direct investment. To facilitate the above functions, exchange of information between two jurisdictions must be established. If U.S. multinational firms underestimate their foreign income

resulted from operations in contracting countries by taking advantage of the information gap between tax authorities, the information exchange after income tax convention could make these firms report the hidden taxable income. On the other hand, some may argue that the expected effect of Article 26 is questionable due to a couple of reasons. First, an income tax convention includes not only Article 26 but also other Articles that help contracting countries to resolve double taxation issues. Therefore, if a firm is paying double income taxes on its foreign income, the convention should help the firm reduce its tax burden. Second, new income tax convention may not be able to provide more information for the U.S. government because the U.S. and contracting countries may not have resources to follow through the Article. When requested by the other contracting country, the "Exchange of Information" Article in convention requires contracting countries to provide necessary information or even research when needed. However, both requesting and researching information cost resources, thus it could be merely "threatening words" on paper to multinational firms. Third, multinational firms' tax minimization strategies are usually loopholes in the tax laws but not illegal per se (Evers, Meier, and Spengel, 2014). Therefore, an agreement of information exchange between two contracting countries may not change multinational firms' behavior toward using less effective tax minimization strategies. Ultimately, how income tax convention would change multinationals' tax planning is an empirical question.

To investigate the effect of income tax convention on the U.S. registered multinational firms' tax planning, I first combine firms' reported worldwide, foreign and domestic current GAAP effective tax rates and cash effective tax rates, which are collected from Compustat North America with comprehensive major subsidiary

information of each firm from their exhibit 21 from form 10-K on www.SEC.gov.[3] Next, I collect other financial data as controls to determine whether establishments of an income tax convention between the governments of the U.S. and other countries are related to changes in multinational firms' tax avoidance levels. I follow the research design used in the tax avoidance literature. I regress my tax avoidance measures on a spectrum of firm characteristics and year and industry fixed effects. I investigate whether the signing of income tax convention affects the U.S. registered multinational firms' effective tax rates. Specifically, I examine whether income tax convention affects high-level tax avoiders. Prior studies find that relation between factors in question and conditional mean of tax avoidance may not represent the relation of other parts of the tax avoidance distribution (Armstrong et al. 2015, Chyz and Gaertner 2017). Since the deterring effect of information exchange is most likely on firm's illegal or extreme tax avoidance but not legal or originally reported tax planning, this study focuses on the effect of income tax convention on *high-level tax avoiders* which is identified if the observation is ranked in the lowest quintile of effective tax rates within the industry and year *t-1*.[4] Second, I investigate the effect on domestic and foreign income. Then I examine the possible channels that multinational firms employ to avoid tax. I look at whether the effect is more pronounced for firms have higher ratio of tax haven usage (Dyreng et al. 2009), firms with low-income flexible (De Simone et al. 2014), and firms with higher predicted possibility of

[3] Thanks for Scott Dyreng for making detailed exhibit 21 data publicly available. the sample period only ranges from 1994 to 2014. I hand-collected year 2015 and 2016 data.

[4] Follow Hanlon and Heitzman 2010, I do not distinguish legal tax avoidance from illegal tax avoidance. My tax avoidance measures do not distinguish between real activities that are tax favored, avoidance activities specifically undertaken to reduce taxes, and targeted tax benefits from lobbying activities.

engaging in tax sheltering (proxied by *Shelter* developed by Wilson 2009). Then, I test if the reiteration of the Tax Information Exchange Agreement (required by BEPS Project) further reduce multinational firms' tax avoidance. Additionally, I test if the deterrence effect is different for firms with higher probability of receiving IRS audit. I replace tax avoidance measures with the book to taxable income differences and use an alternative independent variable- the number of convention countries which a firm has operations in (to proxy for the intensity difference in deterring effect of a convention). Finally, to examine the difference in effective tax rates between high and low tax avoiders and the dynamic of the deterrence effect, I re-estimate equation (1) by using quintile and dynamic regression. If income tax convention facilitates the communication between the contracting countries and deters multinational firms' high-level tax avoidance, I predict that income tax convention leads to higher effective tax rates for high level tax avoiders.

My main empirical results indicate that the signing of an income tax convention between the U.S. and the contracting countries has an economically significant effect on the U.S. registered multinational firms' effective tax rates. The establishment of income tax convention is associated with 3.4% increase in a firm's one-year cash effective tax rate (*CETR*) for the firm-year observation that ranked in the lowest quantile of *CETR*. Based on the sample mean of pretax income after special items of $738 million, 3.4% increase in cash effective tax rate translates to nearly $24.96 million in annual cash tax burden for the high-level tax avoiders.

Next, I extend my main findings and examine the effect of income tax convention on domestic and foreign effective tax rates based on the assumption that there are differences in tax law and industry disclosure requirements between U.S. and income tax convention contracting countries. The results show that the signing of

income tax convention only has effect on multinational firms' foreign effective tax rates, consistent with my prediction that income tax convention provides U.S. government with more information about a firm's foreign operations and results, thus deterring tax avoidance through foreign operations. Next, I explore how multinational firms avoid tax through three possible channels. First, I examine if low-income flexibility firms face stronger deterring effect from establishments of income tax convention. Low-income flexibility firms are considered having higher incremental risk to shift income from high-tax jurisdiction to low-tax jurisdiction compared to high-income flexibility firms. Second, I exam if income tax convention has a stronger effect for firms that have relative more foreign operations in tax haven countries (proxied by the ratio of the number of tax haven operations to the number of total foreign operations). Third, I investigate if firms with high probability of engaging in tax sheltering face stronger deterrence effect from income tax convention. My analyses show that income tax convention increases effective tax rates of firms with lower income flexibility, firms that have higher ratio of tax haven usage and firms with higher possibility of engaging in tax sheltering activities. With on-going actions of OECD BEPS program, U.S. has been signing Tax Information Exchange Agreement with countries. The Tax Information Exchange of Information Agreement is essentially reiteration of Article 26 in Income tax convention. By replacing *PostCon* with *TIEA*, I find the reiteration of TIEA still have a deterrence effect on firms' tax avoidance. Finally, I find that firms with higher probability of receiving IRS audit experience stronger deterrence effect from income tax convention than firms that are not. The main results are still robust when I use an alternative measure of my variable of interest (*Num_Con)* and replacing effective tax rates with book-tax difference measures. In addition, I find no deterrence effect on low tax avoidance firms (firms

that ranked in the highest quintile of effective tax rates). In sum, my results support my hypothesis that establishments of income tax conventions reduce tax authorities' information gap and deter extreme tax avoidance.

This study makes several important contributions. First, this study can help policymakers understand whether increasing information transparency of multinationals helps tax authorities combat base erosion and profit shifting. As the major theme of BEPS plan is to increase multinationals' information transparency and tax authorities' communication on multinational firms' operation results within their jurisdictions, this study provides some insights of the expected results of the BEPS actions. Second, this study contributes to an understanding of the literature on the effect of information transparency on firms' aggressive tax planning. Previous studies mostly focus on information asymmetry between companies and investors. This study, however, looks at the issue from a different angle - the information asymmetry between tax authorities and firms. Third, this study provides answers to the long-standing question: whether Article 26 of income tax convention has tax avoidance deterring effect.

The paper is organized as follows. Section 2 provides some background of the "Exchange of information" Article from Convention. Section 3 develops my hypothesis. Section 4 describes my empirical methodology and data. In Section 5, I present my main results and in Section 6, I check the robustness of my main results. Concluding remarks are provided in Section 7.

II. BACKGROUND AND RELATED LITERATURE

Review of U.S. Tax Treaty

The United States has long been active in the multilateral drafting and interpretation processes relating to the OECD Model Convention and Commentary, which are widely used in the negotiation and interpretation of bilateral treaties (this study uses tax treaty and income tax convention interchangeably). The official U.S. Model Treaty was first published in 1977 and soon followed by a new version, released in draft form, in 1981.[5] It was last updated in 1996, at which point a Model Technical Explanation was added. The current U.S. Model Treaty and Technical Explanation do not reflect significant advances since 1996, but the U.S. Treasury Department issued a new one in 2006 and 2016 with partial revision. All three models have Article 26: *Exchange of information and Administrative Assistance.* A tax treaty mainly has three objectives. One is to reduce double taxation.[6] Second is to prevent excessive taxation. The third is to minimize tax avoidance through information exchange provision (Throop 1959).

Tax treaties are bilateral agreements that serve to harmonize the tax systems of the two countries applicable to companies and other persons involved in cross-border investment and trade. As a U.S. registered firm, in the absence of a tax treaty, income from cross-border transactions or investment would be subject to potential double taxation, first by the country where the income arises and again by the IRS.[7]

[5] See Narotzki 2017 for detailed summary.
[6] See Article 23, 2016 U.S. Model Income Tax Convention
[7] The United States adopts worldwide tax system (credit system or residence-based system). Under worldwide tax system, the tax payments of underlying can be deferred until those foreign income be distributed to the parent company in form of dividend. To prevent incentive for resident company shifting income to low-tax countries, U.S. also has "controlled foreign company" rules (CFC

Tax treaties eliminate this double taxation by allocating taxing jurisdiction over the income between the two countries. In addition, the tax systems of most countries impose withholding taxes, on payments of dividends, interest, and royalties to foreigners. Treaties lower the withholding rates on a bilateral basis. As tax treaties have been viewed as a mechanism for eliminating tax competition, most discussions regarding tax treaties have focused on the effect of income tax treaty on eliminating double taxation, thus affecting cross-border foreign direct investment. Prior studies have shown that double taxation treaties (DTTs) lead to higher foreign direct investment (Blonigen and Davies 2004; Chisik and Davies 2004; Blonigen 2005; Weyzig 2013)

Another function of treaties is the mutual agreement procedure[8], to resolve disputes in particular cases or reach a bilateral agreement on issues of interpretation or application. Last but not least, taxpayers are not the only beneficiaries of tax treaties. Treaties protect the legitimate enforcement interests of the United States and other governments by providing assistance for the administration of their tax laws and the implementation of their treaty policy. Article 26 of U.S. Model Income Tax Convention, *Exchange of Information and Administrative Assistance* provides for the exchange of information between tax authorities is an excellent example of benefits that result from an expanded tax treaty network. In order to ratify the enforcement component of income tax convention, including fiscal evasion and tax avoidance within both contracting countries, four types of information exchange are expected: 1) information furnished on a routine basis; 2) spontaneous exchanges without a

legislation). CFC legislation subject foreign source income to immediate domestic taxation (no deferral). For detailed discussion of tax system and CFC regulations, see Markle and Robinson (2012).

[8] See Article 25, 2016 U.S. Model Income Tax Convention

specific request; 3) furnishing specific information at the request of the treaty partner; and 4) mutual notification of competent authorities as to changes in their respective tax laws.[9] The inclusion of Article intended to closing loopholes in municipal codes and international treaties (Ernest 1983). The existence of Article 26 is also in line with the recent effort of OECD's BEPS action plan in increasing multinationals information transparency. To enable BEPS's country-by-country reporting (CbCR), OECD countries including the U.S. has to negotiate and sign "Competent Authority Arrangement" with other treaty countries.[10] Competent Authority Arrangement essentially reiterates and refers to Article 26 in 2016 U.S. Model Income Tax Convention. Although the Income tax convention is extant in practices, research is still limited regarding whether the Exchange of Information provision in income tax convention can improve a firm's information transparency and reduces tax avoidance.

Multinational Operations and Tax Effective Rates

For nearly two decades, countless researches examine firms' effective tax rates, while there are only a handful of studies that focus on firms' worldwide tax burden on worldwide pretax income.[11] A seminal paper by Dyreng, Hanlon, and Maydew (2008) investigate U.S. firms' long-term effective tax rates. The study finds some firms can maintain approximately 20% cash effective tax rates with full sample mean of 30%. Dyreng et al. 2017 investigate systematic changes in firms' effective tax rates over the past 25 years. Drake et al. 2018 find the declining trend of multinational firms' ETRs is due to increased international tax benefits and foreign

[9] Internal Revenue Manual-Audit, CCH(1981)
[10] As of 9 November 2018, U.S. has not signing for the Multilateral Competent Authority Agreement. See signatories of The Multilateral Competent Authority Agreement on The Exchange of Country-By-Country Reports (Cbc Mcaa) and Signing Dates by OECD.
[11] See Callihan 1994, Shackelford and Shevlin 2008, and Hanlon and Heitzman 2010 for summaries.

operations. Chyz et al. (2016) find that multinational firms bear a lower implicit tax burden than domestic firms. It contributes to increasing foreign income and declining effective tax rates.

A stream of studies examines the effect of multinational operations on worldwide effective tax rates. Rego (2003) finds that multinational firms' low effective tax rates are due to the scale of operations. Markle and Shackelford (2009) MNCs that incorporated in the United States face higher tax rates than domestic firms and MNCs domiciled in Canada. Dyreng and Lindsey (2009) finds that on average U.S. firms that disclosed material operations in at least one tax haven country have a worldwide tax burden on worldwide income that is approximately 1.5 percentage points lower than firms that do not. They focus on the effect of MNCs' foreign operation in tax haven on MNCs' various tax rates. In this study, my primary interest is the effect of an income tax convention between two tax authorities on MNCs' various tax rates.

Altshuler and Grubert (2005) examine the trend of multinationals' tax liabilities from 1992 to 2002 and conclude that the reduction in foreign statutory tax rates is the main reason for decreasing average tax rates between 1992 and 1998. They also suggest that the decline after 1997 is due to firms taking advantage of the "check-the-box" (CTB) regulations. In the debate surrounding the efficacy of multinational taxation, U.S. multinationals are viewed as being aggressive in reducing their worldwide tax burdens because of variations in resources and operations in different jurisdictions.

Tax Authority's Function in Tax Avoidance

In general, when local tax enforcement is weak, firms shift more income from high-tax countries to low-tax countries (Beuselinck et al. 2015). A notable study that directly examines the tax authority's function in deterring corporate income tax is Hoopes et al. 2012. The paper uses IRS audit rate data from TRAC and finds U.S. public firms undertake less aggressive tax positions when tax enforcement is stricter. In a more indirect sense, Gupta and Lynch 2015 use hand-collected data on state department's tax enforcement expenditures and find that $1 increase in current period corporate enforcement is associated with an $8 to $11 increase in state tax collections in the following two years. Kubick et al. 2016 find SEC common letter also has a deterring effect on corporate income tax avoidance.

Another stream of research investigates different enforcement strategies. The basic economic model of tax avoidance is Allingham and Sandmo 1972 model. It demonstrates how self-interest taxpayers trade off the benefits of evasion and the costs from being caught. In the model, the key factors that affect tax avoidance are the statutory tax rates, the probability of getting caught, and the penalty of being detected by authority. While most academic literature talks about authority enforcement and tax compliance, few studies discuss the possibility of voluntary compliance by promoting tax morale[12] (Luttmer and Singhal 2014, Dwenger et al. 2016). Many field experiments have been implemented to investigate how social norm affects tax

[12] Examples from Luttmer and Singhal 2014: 1) Some of U.S. states have "name and shame" program in which the names of top tax debtors are revealed publicly. 2) Opposite to shame the tax avoider, some countries use media to appraise the high-paying taxpayers. Kenya ran a Taxpayers' week from 18th to 23rd October 2004, which coincide with Kenyatta Day celebrations. Kenyatta Day is a day used to honor their national heroes. They recognized distinguished taxpayers like national heroes during the week. Using administrative records of taxes paid and true tax liabilities from a field experiment on a local church tax in Germany, Dwenger et al. 2016 find tax compliance is substantially driven by duty-to-comply preferences.

compliance. Castro and Scartascini 2015 find the most effective messages are those in actual fines and potential legal consequences in case of noncompliance among other messages such as the levels of enforcement, equity, and fairness of the tax system. Feller et al. 2013 find the text of mailings sent to potential evaders of TV license fees can influence evaders' behavior. Hallsworth et al. 2017, using administrative data from over 200 individuals in the United Kingdom, show that including social norm messages in official reminder letters increased payment rates for overdue tax. When both the effect of social norms and enforcement on the dynamic of tax compliance are considered, studies find the effect of enforcement on compliance depends on whether a taxpayer is initial compliant or noncompliant (Davis et al. 2003; Tayler and Bloomfield 2011). There are also studies that investigate the association between tax enforcement and unintended consequences, such as financial reporting quality, tax haven activity, related-party trades, cost of capital, etc. (Desai et al. 2007; Guedhami and Pittman 2008; El Ghoul et al. 2011; Hanlon et al. 2014).

Besides strengthening tax enforcement and compliance, policymakers have been promoting greater information transparency to reduce firms' aggressive tax avoidance.[13] Clearly, from the point of view of information asymmetry between companies and investors, studies document consistent findings that information asymmetry is positively related to aggressively tax planning (Scholes, Wilson and Wolfson 1992; Kerr 2012; Hanlon 2005; Ayers, Jiang, and Laplante 2009; Comprix, Graham, and Moore 2011; Balakrishnan, Blouin and Guay 2018; Chen and Lin 2017; Beck, Lin and Ma 2014; Frank, Lynch and Rego 2009). Even though researchers have

[13] On 25 May 2018, the cooperation between tax authorities was enhanced to include mandatory automatic exchange information in relation to reportable cross-border arrangements (Council Directive 2018/822/EU).

consensus on the association between information asymmetry and aggressive tax planning, few studies examine the causal effect of the relation. Notably, Chen and Lin 2017 use the change of analyst coverage as a proxy for the change of information transparency between firms and their investors and find that firms avoid tax more aggressively after a reduction in analyst coverage.

From the aspect of information asymmetry between tax authorities, Pomeranz 2015 finds that value-added taxation generates paper trails on transactions between firms. She provides evidence that information transparency has a deterring effect on a firm's avoidance of value-added tax. Evers et al. 2014 does not find CbC reporting of BEPS reduce firms' income shifting behavior. While the exchange of information has been considered the main measure in combating international tax avoidance (Wisselink 1997; Cantley 2004; Seer 2013), there is limited research that provides empirical evidence whether the exchange of information between tax authorities helps to combat base erosion and tax avoidance. This study intends to contribute to the literature on this perspective.

In the next section, I develop my hypothesis.

III. HYPOTHESIS DEVELOPMENT

Since 1980s, with the prosperity of international transactions and increased opportunity for tax avoidance and evasion to a level where increased cooperation among tax authorities is necessary,[14] Organization for Economic Cooperation and Development (OECD) and members of the Council of Europe (CoE) drafted a model multilateral convention in a hope to address the increasing tax avoidance and evasion issues.[15] The first order objective of the multilateral convention is to extend and align contracting countries tax laws cross borders. The government of the United States of America has also published several models of income convention in 1996, 2006, and 2016. [16] Each model includes Article 26 - Exchange of Information and Administrative Assistance (EIAA) to combat international tax avoidance. [17] This EIAA provision is particularly constructed to fight base erosion and profit shifting as suggested in the original draft multilateral convention. As the review above suggest, many researches study the interplay between tax enforcement, compliance, and avoidance (Hoopes et al. 2012; Luttmer and Singhal 2014; Beuselinck et al. 2015). Studies also find information asymmetry between corporations and investors is

[14] Draft Multilateral Convention on Mutual Administrative Assistance in Tax Matters (OECD/CoE, 1986) [hereafter Convention]. The term "tax evasion" connotes activity punishable by criminal statutes. The term "tax avoidance" means the opposite of legitimate tax planning. It occurs when taxpayers that operate transnationally attempt to minimize their tax liability by manipulating differences in national tax systems in order to distort or misrepresent income. Tax avoidance often is manifested in the following techniques: (1) accumulation of profits from foreign investment in tax-haven companies which pay little or no tax on profits; (2) artificial allocation of costs so that a disproportionate share of costs offsets income realized from a high tax country; or (3) artificial shifting of profits to a low tax country.

[15] See The Multilateral Convention on Mutual Administrative Assistance in Tax Matters Amended by the 2010 protocol, OECD.

[16] The official document is: "CONVENTION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF THE CONTRACTING COUNTRY FOR THE AVOIDACNE OF DOUBLE TAXATION AND THE PREVENTION OF TAX EVASION WITH RESPECT TO TAXES ON INCOME". These three versions can be found on IRS website.

[17] Internal Revenue Manual-Audit, CCH (1981) explicitly indicate exchange of information provision in income tax convention is beneficial in discovering tax avoidance.

positively related to aggressive tax planning. Hope et al. 2013 find multinational firms that withhold geographic earnings have lower effective tax rate, suggesting information asymmetry between tax authorities and firms leads to higher tax avoidance. As governments around the world keep promoting the exchange of information in combating tax avoidance based on the hypothesis that improved communication between tax authorities increases a firm's likelihood of being audited and penalized, surprisingly no academic study provides evidence to support this hypothesis. In addition, most of recent convention, agreement, tax treaties arise from BEPS project refer back to the EIAA provision in income tax convention. In this study, I directly examine if the establishment of income tax convention effectively restrains multinational firms' tax erosion and income shifting activities through US model income tax convention with built-in Exchange of Information article. I expect establishments of income tax convention will enable IRS to access more information of U.S. firms' foreign operation, thus increasing the chance in detecting firms' extreme tax avoidance. Facing higher likelihood of being caught, U.S. multinational firms will react by reducing their high-level tax avoidance (I employ various effective tax rates to proxy for firms' tax avoidance).[18]

Hence, following the above discussion, I state my first hypotheses (all hypotheses are stated in the alternative).

H1: *The establishments of Income tax convention reduce high-level tax avoiders' ETRs*

[18] According to 26 USC 7201, "A person convicted of tax evasion is subject to a prison term of up to five years and a fine of up to $250,000. Filing a false return subject a person to a prison term of up to three years and a fine of up to $250,000.

The establishment of income tax intends to prevent double taxation and increase information exchange between contracting countries. Through income tax convention, IRS can only gain more information about US firms' foreign operation in contracting countries, but not firms' operating results from states. Therefore, I predict the deterring effect of income tax convention on multinational firms' tax avoidance should be more pronounced on tax planning through foreign income instead of domestic income. Hence, I expect to find a different level of authority enforcement on firms' domestic and foreign effective tax rates. This leads to my second hypothesis.

H2: *The establishment of income tax convention has different effects on US multinationals' domestic and foreign effective tax rates.*

Beyond testing above two hypotheses, I examine the possible explanations for the changes in effective tax rates of US multinationals before and after the establishment of income tax convention, including the ease of international income shifting, through tax haven, and tax sheltering. I also conducted several sets of additional analyses and robustness tests to support my predictions.

IV. SAMPLE AND RESEARCH DESIGN

Tax Avoidance Measures

Following prior literature, I use effective tax rates to measure the extent of corporate income tax avoidance, with a lower effective tax rate implying a greater extent of tax avoidance.[19] My first effective tax rate is cash effective tax rates (*CETR*). *CETR* is measured as the cash tax paid divided by pre-tax income. I use *CETR* as the primary measure of tax avoidance, because it captures permanent and temporary tax deferral strategies. My second effective tax rate is GAAP effective tax rate (*ETR*) that measures the actual tax burden as a percentage of pretax income in a period.[20] My third measure is firms' current effective tax rate (*CurrentETR),* defined as current tax expense divided by pretax income. *CurrentETR* exclude deferred taxes including those arise from foreign income that are not designated as permanently reinvested income (Hope et al. 2013). Dyreng et al. (2008) note that one-year ETRs are not strong predictors of long-run ETRs, suggesting that a one-year measure can be a noisy proxy for long-run corporate tax avoidance and asymmetry persistence for high and low one-year ETRs. Hence, I also include three-year cash, GAAP, and current effective tax rates (*CETR3, ETR3, and CurrentETR3*) as alternative measures of tax avoidance to alleviate the concerns.[21] C*ETR3* (*ETR3 and CurrentETR3*) is calculated as the sum of cash taxes paid (income tax expense; income tax expense minus deferred

[19] I use effective tax rates to capture tax avoidance rather than book to taxable differences for a number of reasons. First, book to taxable income differences are highly related to effective tax rates. I also replace effective tax rates with common book-tax differences to retest my hypothesis. The results are robust. Second, effective tax rates are simple to interpret, visible from financial statements. Third, book to taxable income differences suffer from country difference in book to tax conformity. Effective tax rates are widely available to public.

[20] GAAP ETRs do not reflect temporary tax savings from timing differences like accelerated depreciation, uncertain tax positions, and foreign earnings not designated as permanently reinvested, and valuation allowance.

[21] The main results are not quantitatively different if I use five-year C*ETR*, *ETR*, and *CurrentETR*.

tax expense) in year t through t+2 divided by the sum of pretax income before special items in years *t* through *t+2.* To mitigate the effect of outliers, I require the sum of cash tax paid (income tax expense; income tax expense minus deferred tax expense) to be positive over these three windows, and ratio values greater than one are set to one. Finally, I also provide evidence using benchmarked ETRs. I benchmark every firm's effective tax rates to other firms of similar size, industry and year, consistent with the approach used in Armstrong et al. (2015).[22] The adjusted measures benchmark firms' tax aggressiveness relative to those of firms in similar size and same industry. This benchmarking process captures the cross-sectional difference in timing and permanent difference.

Research design

I test my first hypothesis with the following regression:

$$
\begin{aligned}
Effective\ tax\ rates_{i,t} &= \alpha_0 + \alpha_1 PostCon_{i,t} + \alpha_2 RETR_{i,t-1} + \alpha_3 RETR_{i,t-1} * PostCon_{it} \\
&+ \alpha_4 CAPX_{i,t} + \alpha_5 CNOL_{i,t} + \alpha_6 NOL_{i,t} + \alpha_7 INTAN_{i,t} + \alpha_8 LEV_{i,t} \\
&+ \alpha_9 GP_{i,t} + \alpha_{10} PPE_{i,t} + \alpha_{11} ROA_{i,t} + \alpha_{12} RND_{i,t} + \alpha_{13} SALEGR_{i,t} \\
&+ \alpha_{14} AD_{i,t} + \alpha_{15} SIZE_{i,t} + \alpha_{16} FOR_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{1}
$$

[22] I normalize every firm's various effective tax rates by subtracting by a benchmark effective tax rate. The benchmark effective tax rates are the annual averages of effective tax rates calculated the same way as each firm's effective tax rate measure for each firm's size and industry peer group. Size peers are firms in the same quintile of total assets. Industry peers are firms in the same Fama-French 30 industry classification. The main results are still robust even I used unadjusted measurement of effective tax rates.

I modify the research design used in tax avoidance literature where the dependent variable of interest is regressed on a set of firm characteristics and year and industry fixed effects. Where *Effective tax rates* (C*ETR, ETR, and CurrentETR*) are my income tax avoidance measures, as explained above. My variable of interest, *PostCon*, is a dummy variable equals to 1 if the firm has operations in at least one tax treaty country in year *t*, 0 otherwise.[23] Prior tax avoidance literature draws inferences from different factors related to the conditional mean of the continuum of tax avoidance distribution. However, the relationship between factors and the average level of tax avoidance may not represent other parts of the distribution (Armstrong et al. 2015, Chyz and Gaertner 2017). This study examines how income tax convention affects multinational firm's tax planning. I conjecture that the Article 26 of income tax convention could enable more communication between tax authorities and deter firms from engaging in illegal tax planning or high-level tax avoidance which is on the extreme side of the tax avoidance continuum. Hence, I follow prior studies and create an indicator *RETR,* a dummy variable, equal to 1 if a firm's effective tax rates are ranked in the lowest quintile of the sample within the same industry in year *t-1*, zero otherwise. Therefore, the interaction term of *RETR* and *PostCon* captures the effect of income tax convention on high-level tax avoiders. I predict a positive coefficient on *RETR*PostCon* based on H1. I control many factors that prior studies have found associated with corporate tax avoidance. I include *CAPX* (total capital expenditure divided by total assets), *CNOL* (Change of tax loss carry forward), *NOL* (the existence of tax loss carry forward), *INTAN* (intangible assets scaled by total assets), *LEV* (total liabilities divided by total assets), *GP* (gross profit divided by total

[23] I follow Dyreng et al. 2009 approach in constructing *PostCon.* They build an indicator TaxHaven that equal to 1 if a firm has operation in at least one documented tax haven in that year.

sales), *PPE* (plant, property, and equipment divided by total assets), *ROA* (pre-tax income divided by total assets), *RND* (equals to 1 if research and development expense is nonzero or missing), *SALEGR* (the percentage change in sales between years), *AD* (advertisement expense scaled by total assets), *SIZE* (natural logarithm of a firm's total assets), and *FOR* (total foreign earnings scaled by total assess) (Gupta and Newberry 1997, Collins et al. 1998, Rego 2003, Dyreng et al. 2010, Chen et al. 2010, Rego and Wilson 2012, Graham 2000). I predict firms with higher *CAPX, FOR, GP, INTAN, LEV*, and *RND* to have more tax avoidance (Chen et al. 2010, Dyreng et al. 2010), while firms with higher *AD*, *NOL, PPE,* and *SALEGR* will have less. I do not have predictions for *SIZE* and *ROA*, as argued by literature, though better performing and larger firms have more resources and opportunities for tax planning, they may also subject to higher public scrutiny (Rego 2003, Desai and Dharmapala 2006).[24] All variables are defined in the appendix, and all continuous variables are winsorized at the 1st and 99th percentiles. Finally, I include year and industry fixed effects to eliminates the possibility that *RETR*PostCon* picks up the time and industry invariant fixed effects.

Sample Selection and Descriptive Statistics

My sample includes all U.S. registered firms from Compustat North America. The sample period starts from 1994 because the electronic filing of exhibit 21 of 10-k is available after 1994. The sample ends in 2016 because of U.S. tax cut and job creation act. Prior studies have found that there is a significant variation of firms'

[24] Rego 2003 and Desai and Dharmapala 2006 find opposite relation between firm's size and effective tax rates. Gupta and Newberry 1997 find firm size and ETRs are not associated if the examining window is longer.

effective tax rates around 2017 and 2018. I exclude firms without CIK number that I used to link financial data with material foreign subsidiary data from exhibit 21 of 10-k. I require firms to have non-missing values of foreign income or foreign tax expense.

I match each Compustat firm-year to countries where they report material operations. Each firm may have more than one material foreign operation. The exhibit 21 data are provided by Scott Dyreng for sample period 1994 to 2014. For the sample period 2015 and 2016, I use my Python program to scan through form exhibit 21 in 10-K files. While the Python program does not scrape all information in exhibit 21 due to the variety of format adopted by each firm, I compensate for the missing information by manually hand-collecting. After identifying a list of countries where the firm-year has major operations, I restrict the sample to firms with multinational operations. Following Dyreng and Lindsey's (2009) measure for a firm having an operation in a tax haven, I define a firm as multinational firm if it has a nonzero value of foreign current tax expense (*txfo*) or pretax foreign income (*pifo*). I exclude firms with total assets less than $10 million and firms with negative pre-tax income. I also exclude utility and financial sectors. Imposing these requirements on the data translates into a sample of 28,513 firm-years corresponding to 8,190 unique firms. I set the variable *PostCon* equal to 1 if the firm has operations in at least one country that have income tax convention with the government of US in year *t*, 0 otherwise. Using these criteria, I identify 12,740 firm-years with at least one disclosed material operation in a country with a tax treaty. The remaining 15,773 firm-years are coded as multinational firms without operation in countries with a tax treaty. I have 34

countries that signed an income tax convention with the government of U.S. during my sample period from 1994 to 2016.[25]

<Insert TABLE 1>

Panel A and B of Table 2 provides the summary statistics of the sample. I examine the sample separately for convention firms and non-convention firms. Means of the six effective tax rates for convention firms are lower than non-convention firms. This is consistent with the declining trend of effective tax rates over the past two decades. Convention firm-year observations are in the later years of the whole sample. For the control variables, convention firms are similar to non-convention firms on almost all aspects except *NOL, INTAN, RND, SIZE,* and *FOR*. For example, convention firms tend to have larger *NOL* (78.4% vs.51.4% at the mean), more intangible assets *INTAN* (21.0% vs. 13.3%), more research and development expense *RND* (3.1% vs. 1.7%) and larger in *SIZE* (7.27 vs. 5.98) and have more foreign income relative to total income *FOR* (3.1% vs. 0.8%) than non-convention firms.

<Insert TABLE 2>

Table 3 presents Pearson and Spearman correlations. I find a consistent positive correlation between *PostCon* and my measures of tax avoidance, suggesting after convention year, firms have higher effective tax rates. The majority of control variables shows significant correlations with my measures of tax avoidance, suggesting the importance of controlling these factors in the multivariate tests.

<Insert TABLE 3>

[25] The countries and signing dates are presented in Appendix B.

V. PRIMARY FINDINGS

Main analysis

Table 4 presents the results from estimating Equation (1). I provide results for one-year effective tax rates (*CETR, ETR,* and *CurrentETR*), and three-year effective tax rates (*CETR3, ETR3, and CurrentETR3*) in Panel A and Panel B, respectively. For each column, I test whether firms' effective tax rates differ after their foreign operations' countries establishing income tax convention with US. I focus on the high-level tax avoider because information exchange most likely affects firms' extreme tax avoidance.[26] Hence, I test if the coefficients on *RETR*PostCon* are significantly different from zero. *RETR* capture firms' tax aggressiveness. *RETR* equals to one if a firm's effective tax rates are ranked in the lowest quintile in the same industry and year *t-1*.

Panel A of Table 4 shows the estimation results for Equation (1) using one-year effective tax rates. First column uses cash effective tax rates (*CETR*); second column uses GAAP effective tax rates (*ETR*); third column uses current effective tax rates (*CurrentETR*). The coefficients of the interaction term of *PostCon* and tax aggressive indicator *RETR* are positive and highly significant ($p<0.01$) for all three columns using different measures of effective tax rates.[27] Especially, taking *CETR* as an example, the coefficient of *RETR*PostCon* is 0.023 with t-statistic 2.78. I can interpret this finding as high-level tax avoiders' cash effective tax rates are 2.3 percentage higher than non-high-level tax avoiders after their foreign operation

[26] Similar to most tax avoidance literature, I do not distinguish between legal and illegal tax arrangement. Extreme tax avoidance captures both tax positions. Income tax convention should affect firms' decision about those tax position that are more likely to be challenged by tax authority.
[27] The main results are still robust if I replace unadjusted ETRs with normalized ETRs. The robust tests are presented in Panel A of Appendix C.

country build convention with U.S., controlling for firm characteristics and fixed effects for year and industry. These results are consistent with H1 that establishments of income tax convention reduce firms' high-level tax avoidance. The establishment of income tax convention is associated with 3.4% increase in a firm's one-year cash effective tax rate (*CETR*) for the firm-year observation that ranked in the lowest quantile of *CETR*. Based on the sample mean of pretax income after special items of $738 million, 3.4% increase in cash effective tax rate translates to nearly $24.96 million in annual cash tax burden for the high-level tax avoiders. Most coefficients of control variables are statistically significant except *PPE* and *AD*.[28] I find tax loss carry forward (*NOL*), leverage (*LEV),* fixed assets *(PPE),* return on asset *(ROA),* research and development (*RND*), sales growth (*SALEGR*), size *(SIZE)* and foreign income relative to total earnings (*FOR*) are negatively relate to effective tax rates, while change of net tax loss carry forward *(NCOL),* advertisement expense *(AD),* are positively relate to our measures of tax avoidance. The directions of the coefficients are consistent with findings from prior literature.

<Insert TABLE 4>

Federal and foreign effective tax rates

Next, I explore how the establishment of income tax convention affects multinational firms' domestic and foreign effective tax rates. The establishment of income tax intends to prevent double taxation and increase information exchange between contracting countries. Through income tax convention, IRS can only gain more information about US firms' foreign operation in contracting countries, but not

[28] The main results are still robust even when I include firm fixed effect in Equation (1).

their operation within states. The deterring effect of income tax convention on multinational firms' tax avoidance should be more pronounced on tax planning through foreign income instead of domestic income. I expect deterrence effect on foreign effective tax rates (*Foreign_ETR*), but not domestic effective tax rates (*FED_ETR*).[29] I follow Dyreng and Lindsey (2009) criteria in measuring domestic effective tax rate (*FED_ETR*) and foreign effective tax rates (*Foreign_ETR*). *FED_ETR* is calculated as federal income tax expense (txfed) divided by domestic pretax income (pidom) and *Foreign_ETR* is defined as foreign income tax expense (txfo) divided by foreign income (pifo). All negative values are set to missing. I also include three-year measures of *FED_ETR* and *Foreign_ETR* to match my main test. Column (1) and (2) of table 5 reports the regression results of equation (1) using *FED_ETR* and *FED_ETR3* as dependent variables. Column (3) and (4) of table 4 reports regression results of *Foreign_ETR* and *Foreign_ETR3* as dependent variables. As shown, the coefficient of our variable of interest *RETR*PostCon* from column (1) and (2) is insignificant (-0.012, t-statistics= - 1.26; -0.002, t-statistics = -0.15), while the coefficients of *RETR*PostCon* from column (3) and (4) are significantly positive (0.042, t-statistics = 4.47; 0.060, t-statistics = 3.26).[30] The results suggest that high-level tax avoiders have higher foreign effective tax rates after US build convention with countries where they have material operations, consistent with my hypothesis that exchange of information between tax authorities should only affect firm's tax avoidance from foreign income, since the establishment of income tax convention between U.S. and other country only improves U.S. tax authority's understanding of

[29] I did not use cash based effective tax rates due to data limitation.
[30] The results remain robust if I replace unadjusted ETRs with normalized ETRs or remove control variables. The robust tests are presented in panel B of Appendix C.

their registered firms' foreign operation outcomes but not the outcomes within U.S. jurisdiction.

<Insert TABLE 5>

VI. ADDITIONAL TESTS

Income flexibility

I next consider different possibilities that multinational firms could exploit their nature of operations by either shift business profit into lower tax jurisdictions or orchestrate non-taxable income in relating jurisdictions. First, prior studies find income mobile firms can save greater tax with lower incremental risk (De Simone et al. 2014, Kleinbard 2012). Firms can shift income through transfer pricing strategies, setting the price of goods and services between related parties (e.g., transactions between a parent and subsidiary) in reducing overall taxes. If one party is in a jurisdiction with a lower income tax rate, a selling price can be set to shift profits from the higher tax to lower tax jurisdiction. Here, I consider whether low income mobile firms experience stronger deterrence effect from income tax convention.

Following the methodology of prior literature (De Simone et al. 2014), I classify firms as income mobile by quintile ranking of R&D, advertising, profit margin, foreign sales, and high-tech industry. First, I rank all firm-year observations by year based on R&D and advertising expenses; both are scaled by total assets. Then, I rank all observations by year based on foreign income and profit margin; both scaled by total sales. I set each missing value to zero when ranking these four variables. I assign a value of four for firm-year observations that are ranked in the top quintile of each factor, and assign a value of three for observations that are ranked in the second highest quintile, and so on. Observations that are ranked in the lowest quintile of each factor receive a value of zero. Then, I sum these assign value up and add a value of four if the firm is in the high-tech industries.[31] Finally, each firm-year observations

[31] Follow De Simone et al. 2014, I classify firms that have following three-digit SIC codes as high-tech firms: 283, 357, 360-369, 481, 737, 873.

gets a total value ranging from 0 to 20. The lower the score the less income mobile is the firm. Score of income mobility capture firms' ability of exploiting opportunities for tax savings with lower incremental risk, including probability of audit, uncertainty about future tax obligations and penalties. Next, I divide my sample into low vs. high income mobility. I classify a firm as low income mobile if it is ranked in the lowest quintile of the total score of income mobility, and high income mobile if it is ranked in the highest quintile of the total score of income mobility. I re-estimate Equation (1) and test the difference in deterring effect between low- and high-income mobile firms. If high income mobile firms can exploit the difference in tax law in different jurisdictions with lower incremental risk, I predict high-income mobile firm face lower pressure from the establishment of an income tax convention. Thus, I expect smaller deterring effect for high income mobile firms after an income tax convention. The estimation results are presented in Table 6.

Columns (1) and (2) present results using cash effective tax rates (*CETR*), columns (3) and (4) use *ETR,* and column (5) and (6) use *CurrentETR.* Columns (1), (3) and (5) use observations with lower income mobility, while columns (2), (4) and (6) use observations with high-income mobility. I find the coefficients of *RETR*PostCon* for low-income mobility group are significant positive compared to non-significance of high-income mobility subsample if using *ETR* and *CurrentETR* (Column (3), (4), (5), and (6)). The tests of difference in coefficients on *PostCon* are significant at the 0.01 level using Wald Chi-square test. The results suggest that multinational firms that possess low-income mobility face stronger deterring effect from establishments of an income tax convention.

<Insert TABLE 6>

Tax Haven

Prior research finds that foreign income and operation in tax havens are associated with lower effective tax rates (e.g., Wilson 2009, Dyreng et al. 2009, Lisowsky 2010).

Next, I follow prior research to identify firms with material operations located in foreign tax havens (Dyreng and Lindsey 2009).[32] I first calculate the ratio of a firm's number of operations in tax haven to the number of foreign operations. Then I divide the sample into low versus high usage of tax haven. An observation is classified as low usage of tax haven if the ratio of tax haven to total foreign operation is ranked in the lowest quintile, and an observation is classified as high usage of tax haven if a firm's ratio ranked in the highest quintile. Because of the income tax convention, firms may face higher pressure when shifting income into tax haven, thus I expect stronger deterring effect for firms that have higher usage of tax haven compared to firms that do not. Table 7 display the results. The coefficients on *RETR*PostCon* are significantly positive for high tax haven usage observations, but no significance for low tax have usage observations if using *CETR* and *CurrentETR* to measure tax avoidance. The test of difference in coefficients are also significant. The coefficients on *RETR*PostCon* are both significant positive for low and high tax haven usage observations. The results suggest that firms save tax through tax haven experience stronger deterrence effect from establishments of income tax convention.

<Insert TABLE 7>

[32] See Appendix F for the list of tax haven from Dyreng and Lindsey 2009. I designate a country as tax haven if it is documented in the list of Tax Haven Countries from TABLE 1 of Dyreng and Lindsey 2009. The lists of tax haven countries are identified from the following sources: (1) Organization for Economic Cooperation and Development (OECD), (2) the U.S. Stop Tax Havens Abuse Act, (3) The International Monetary Fund (IMF), and (4) the Tax Research Organization.

Tax sheltering

Next, I also examine whether the signing of an income tax convention affects multinationals' extreme tax avoiding behaviors. As suggested by Hanlon and Heitzman (2009), Wilson's (2009) predicted a probability of engaging in tax shelters could capture the most aggressive and complex tax sheltering activities. Hence, I use Wilson's *SHELTER* as an alternative dependent variable to confirm my hypothesis. *SHELTER* focuses primarily on a firm's tendency to undertaking an extreme form of tax avoidance.[33] Specifically, I define *SHELTER* as the predicted value from the equation,

$$SHELTER = -4.86 + 5.20 \times BTD + 4.08 \times |DAP| - 1.41 \times LEV + 0.76 \times AT + 3.51 \times ROE + 1.72 \times FOREIGN\ INCOME + 2.43 \times RND \quad (2)$$

where *BTD* is the total book to taxable difference; |DAP| is the absolute value of discretionary accruals from the performance-adjusted modified cross-sectional Jones model; *LEV* is long-term debt divided by total assets; *AT* is the log of total assets; *ROE* is pre-tax earnings divided by total assets; *FOREIGN INCOME* is an indicator variable set equal to one for firm-years that report foreign income, and zero otherwise; and *RND* is research and development expenses divided by lagged total assets. According to Wilson (2009), a higher value of *SHELTER* is consistent with a greater level of tax avoidance. The Wilson model predicts the likelihood that a firm is currently engaging in tax sheltering activities. From Table 8, I find significantly positive coefficients on my variable of interest *RETR*PostCon* for observations with

[33] *SHELTER* is classified by Hanlon and Heitzman (2009) as the extreme form of tax avoidance.

high tax shelter probability. The tests of difference in coefficients between low and high tax shelter group are significant for my three measures of tax avoidance. The results suggest that firms that have higher probability of engaging in illegal tax sheltering activities experience stronger deterring effect from establishments of income tax convention.

<*Insert TABLE 8*>

Tax Information Exchange Agreement

Lastly, I identify countries that signed Tax Information Exchange Agreement with the U.S. and build a variable *TIEA* that equals to 1 if a firm has at least one material operation located in the contracting country in year *t*. Tax information exchange agreement is an agreement required by OECD's program in combating BEPS through increasing multinational firms' information transparency. The content of the tax information exchange agreement is essentially the same as Article 26 in U.S. income tax convention. I restrict my sample to firm-year observations that have at least one operation in convention country. Then I estimate Equation (1), replacing *PostCon* with *TIEA.* In doing so, I can examine if reiteration of Exchange of Information has incremental deterrence effect in addition to income tax convention. As reported in Table 8, all coefficients of variables of interest *RETR*TIEA* are significantly positive. The results support my hypothesis that exchange of information deters multinational firms' tax avoidance and reiteration of similar regulation has incremental effect.

<*Insert TABLE 9*>

Probability of IRS Audit

Hoopes et al. 2012 finds that IRS audit reduces the likelihood that firms undertake aggressive tax positions. I predict that firms with higher probability of getting IRS audit react more to establishments of income tax convention than their opposite peers. I separate my sample into two group with high and low probability of getting tax audit from IRS. Follow Hope et al. 2013, I classified firms having high probability of being audited by IRS if their total assets are greater than $250 million and is in any of the following industries: Natural Resources, Construction, Heavy Manufacturing, and Transportation.[34]

The results are reported in Table 10. The coefficients on *RETR*PostCon* are significantly positive for subsample with high probability of receiving IRS audit across three different tax avoidance measures (column (2), (4), and (6)). The coefficients on *RETR*PostCon* for low IRS audit observations are insignificant positive for *CETR* and Current*ETR* (Column (1) and (5)) but *ETR* (column (3)). The tests of difference in coefficients between low and high IRS audit group are all significantly different from each other. Overall, I conclude the results support my expectation that firms with higher probability of receiving IRS audit react more to deterrence effect from establishments of income tax convention.

<Insert TABLE 10>

[34] The two digits SIC are: 07-10, 12, 15-17, 28, 32-34, 37, 40-41, 44-45, and 47. For detailed requirements, please refer to Transactional Records Access Clearinghouse.

VII. ROBUSTNESS TESTS

Alternative independent variable

I also consider if firms experience stronger or weaker tax avoidance deterrence effect from income tax convention if a firm has more operations located in convention countries. Hence, I create a variable *Num_Con* which is the natural log of one plus the number of operations a firm have in convention country in the year. As reported in Table 11, the coefficients of *RETR* Num_Con* are significantly positive across three measures of tax avoidance and both one-year and three-year, suggesting stronger tax avoidance deterrence effect if a firm has more operation in convention countries.[35]

<Insert TABLE 11>

Alternative tax avoidance measures

To provide more robust results and deal with concerns related to using effective tax rates as firm's tax avoidance aggressiveness in my main tests, in this robustness test, I replace effective tax rates measures with three book-tax difference measures, and re-estimate Equation (1).[36] Book to taxable income differences resulted from two potential sources, the difference between financial accounting and tax rules and either aggressive reporting for book or tax purposes.[37] Here, I use book to taxable income difference to capture firms' aggressive reporting for saving income tax. If the communication between tax authorities could deter firm's aggressive tax reporting, I

[35] I also test the intensity of deterring effect by consider the weight of a firm's operation to its total foreign operations. The *ALT_CON* will then be the intensity of the number of operations in convention countries to the number of total foreign operations. The results are presented in Panel D of Appendix C and are similar the evidence showed in Table 11.
[36] As summarized in Hanlon and Heitzman 2010, GAAP ETR reflect deferral strategies while Cash ETR does not. GAAP ETR is computable by jurisdiction, while Cash ETR is not.
[37] Hanlon et al. 2005 suggest lower book and taxable income difference could reduce financial fraud. By taxing on reported financial income of public corporations, the authority could reduce and deter accounting frauds which are created by tax rules authorizing specific deviations from the base.

should find lower book to taxable income difference afterward.[38] Hence, I use book-tax difference as my alternative measure of a firm's tax aggressiveness. My first book-tax difference measure is *BTD_BSW* which is estimated as *[(U.S. Deferred Tax + Foreign Deferred Tax)/0.35]/Average Total Assets* (Blaylock et al. 2012). *BTD_BSW* provides a reasonable approximation of temporary book-tax differences but ignores all permanent differences, credits, and the book-tax difference for the stock option deduction. The second book-tax difference is *BTD_HLS* (Hanlon, Laplante and Shevlin 2005) which is estimated as the difference between GAAP income minus taxable income. The GAAP income is pretax book income subtracting minority interest. The measure of taxable income for *BTD_HLS* is estimated by summing current federal income tax expense and current foreign tax expense to derive total current tax expense, then divided by the top U.S. statutory tax rate applicable to that data year. Then subtract the change in net operating loss carryforwards from the measure of taxable income for the data year.[39] *BTD_HLS* considers the worldwide income difference and possible measurement errors from a firm's net operating loss carryforwards. The third is *BTD_DD* (Desai and Dharmapala 2006) which is estimated as abnormal total book-tax difference adjusted for earnings management through accruals. The total book-tax difference is estimated as the difference between pretax book income and domestic taxable income which is estimated by current federal tax expense divided by statutory tax rates. All three BTD measures are scaled by average total assets. I replace the tax avoidance measures by these three book-tax differences and re-estimate Equation (1). For these book-tax difference measures, I

[38] As suggested by Hanlon and Heitzman (2010), the continuum of tax avoidance includes clearly legal transactions, placing capital in investment with lower explicit taxes, to tax sheltering where the legality of the transaction is less clear. Hence, I acknowledge non-conforming tax positions between book and taxable income does not represent all tax planning activities of a firm.
[39] The top statutory tax rates are 35% throughout my sample period.

also construct a higher book-tax income difference indicator, *RBTD,* which equals to one if a firm-year observation is ranked in the highest quintile of book to taxable income differences. I replace ETRs with BTDs and re-test Equation (1). The results are presented in Table 11. The findings are consistent with my results of Table 4. The coefficients of my variable of interest *RBTD*PostCon* are significantly negative when *BTD_BSW, BTD_HLS* and *BTD_DD* are dependent variables, suggesting firms with higher book to taxable income difference have a lower book to taxable income differences after the establishment of a convention. In sum, multinational firms' book to taxable income difference declines after the U.S. signs income tax convention with one of the countries where they have material operations.

<Insert TABLE 12>

Uncertain tax benefits

Next, I consider whether income tax convention has any effect on a firm's uncertain tax benefits. Uncertain tax benefit (UTB) is a firm's estimation of the potential amount of tax savings that are likely to be payable to tax authorities after a firm's return being audited by tax authorities. If income tax convention increases communication between tax authorities and thus improve information transparency, I expect firm would reserve less UTB after the income tax convention. I re-estimate Equation (1) by replacing ETRs with firm's UTB account. The results are reported in Table 13. Consistent with my conjecture, the amount of UTB decreases after income tax convention.

<Insert TABLE 13>

Quintile Regression

Here, I test the difference in deterrence effects between low and high-level tax avoiders. In my main results, I find evidence that high-level tax avoiders have higher effective tax rates if the countries of firms' foreign operations have income tax convention with US. If the income tax convention only has effect on firms' extreme tax planning, I should only find deterring effect on high-level tax avoiders. For this test, I create an indicator, *LowRETR,* equals to one if a firm is ranked in the lowest quintile of effective tax rates, and *HighRETR* equals to one if a firm is ranked in the highest quintile of effective tax rates. *LowRETR* should capture high-level tax avoiders, while *HighRETR* captures low-level tax avoiders. I then interact these indicators with my variable of interest *PostCon,* and re-run Equation (1). The results are presented in Panel A and B of Table 14. Panel A shows one-year tax avoidance measures, and Panel B shows three-year measures. As shown, all coefficients on *LowRETR*PostCon* are significant positive, consistent with my main results. The coefficients of *HighRETR*PostCon* are insignificant except those of one-year tax avoidance measures. In sum, the results support that income tax convention can deter firms' high-level tax avoidance.

<Insert TABLE 14>

Other Factors Affecting ETRs

There are many factors affecting the effective tax rates of multinational firms over my sample period (1994-2016). Altshuler and Grubert (2005) suggest the reduction in foreign statutory tax rates is the main reason form decreasing average tax rates between 1992 and 1998. Hence, I include each firm's average foreign statutory tax rates to control the effect of decreasing foreign tax rates and rerun my Equation (1). Foreign statutory tax rates also control for firms' difference in incentive of income

shifting. In addition, to account for each contracting country's resource to carry out the information request, I also include the average GDP per capita of each firm's foreign operation country. As presented in Table 15, my findings are still robust.

<Insert TABLE 15>

VIII. CONCLUSION

I examine whether income tax convention has a deterrence effect on the U.S. registered multinational firms' high-level tax avoidance. The first order objective of the multilateral convention is to reduce double taxation through extending and aligning contracting countries' tax laws cross borders. However, the U.S. model income tax convention also includes Article 26 - *Exchange of Information and Administrative Assistance* which are meant to reduce international tax avoidance. By exploiting U.S. register firms' disclosure of material foreign operations from exhibit 21 of 10-K filing, I am able to investigate whether establishments of income tax convention deter firms' high-level tax avoidance. I find consistent evidence that establishments of income tax convention lead to higher cash, GAAP, and current effective tax rates.

Next, I extend my main findings and examine the effect of income tax convention on domestic and foreign effective tax rates. Because the income tax convention enables IRS to possibly acquire information of U.S. registered firm's foreign operation through the communication build by Article 26, I predict the deterring effect only exist on foreign tax avoidance. The exchange of information bridge between U.S. and contracting countries does not provide IRS with more domestic business information of U.S. firms. I find that firms have higher foreign ETRs after income tax convention, while no statistically significant change for federal ETRs. Next, I explore how multinational firms avoid tax through three possible channels. First, I examine if low-income flexibility firms face stronger deterring effect from establishments of income tax convention. Low-income flexibility firms are considered having more ability to shift income from high-tax jurisdiction to low-tax

jurisdiction with higher incremental risk. Second, I examine if income tax convention has a stronger effect on multinationals that also have relative more foreign operations in tax haven (proxied by the ratio of the number of tax haven operations to the number of total foreign operations). Third, I investigate if firms with high probability of engaging tax sheltering face stronger deterring effect from income tax convention. My analyses show that income tax convention has stronger deterring effect on firms that are low-income mobile, have higher ratio of tax havens to foreign operation, and higher probability of engaging illegal tax sheltering. With actions of OECD BEPS program keeps rolling out, U.S. has been signing Tax Information Exchange Agreement with countries. The Tax Information Exchange of Information Agreement is essentially reiteration of Article 26 in Income tax convention. Replacing my *PostCon* with *TIEA*, I find the reiteration of TIEA still have deterring effect on firms' tax avoidance. Finally, I find firms with higher probability of receiving IRS audit experience stronger deterring effect from income tax convention than frim that are not. The main results are still robust when I use an alternative measure of my variable of interest (*Num_Con)* and replacing effective tax rates with book-tax difference measures. I find no deterring effect on low tax avoidance firms (firms that ranked in the highest quintile of effective tax rates). In sum, my results support my hypothesis that establishments of income tax conventions reduce tax authorities' information gap and deter extreme tax avoidance.

This study makes several important contributions. First, this study can help policymakers understand whether increasing information transparency of multinationals helps tax authorities combating base erosion and profit shifting. As the major theme of BEPS plan is increasing multinationals' information transparency and tax authorities' communication on multinational firms' operation results within their

jurisdictions, this study should provide some foresight of the expected results of series of BEPS actions. Second, this study can contribute to the literature that discusses the effect of information transparency on firms' aggressive tax planning. Previous studies mostly focus on information asymmetry between companies and investors. This study looks at the issue from a different angle - the information asymmetry between tax authorities and firms. Third, this study answers to the long-standing question: whether Article 26 of income tax convention has tax avoidance deterring effect.

LIST OF TABLES

TABLE 1

Sample Selection	N
Compustat North America firms from 1994 -2016	210,616
Less:	
Banking, insurance, and utility sector	(48,461)
Observations with total assets < $10 million	(34,894)
Observation without foreign tax expense or foreign income	(16,673)
No foreign subsidiary data	(33,885)
Missing data for control variables	(48,190)
Total observations for analysis	28,513

TABLE 2

Panel A: Descriptive statistics for firm-years with at least one material operation in convention country

Variable	N	Mean	S.D.	P25	P50	P75	Min	Max
CETR	12,740	0.301	0.196	0.181	0.278	0.368	0.000	1.000
CETR3	9,213	0.316	0.182	0.215	0.292	0.364	0.000	1.000
ETR	12,740	0.337	0.140	0.277	0.338	0.380	0.000	1.000
ETR3	9,304	0.338	0.143	0.278	0.337	0.378	0.000	1.000
CurrentETR	12,740	0.331	0.182	0.230	0.315	0.389	0.000	1.000
CurrentETR3	9,175	0.340	0.170	0.251	0.321	0.385	0.000	1.000
CAPX	12,740	0.047	0.042	0.020	0.035	0.060	0.000	0.421
CNOL	12,740	0.001	0.043	0.000	0.000	0.000	-0.278	1.058
NOL	12,740	0.784	0.411	1.000	1.000	1.000	0.000	1.000
INTAN	12,740	0.210	0.192	0.044	0.164	0.336	0.000	0.768
LEV	12,740	0.181	0.175	0.018	0.154	0.276	0.000	1.099
GP	12,740	0.427	0.204	0.276	0.398	0.560	-0.011	0.930
PPE	12,740	0.446	0.312	0.208	0.368	0.613	0.003	1.883
ROA	12,740	0.117	0.069	0.069	0.103	0.150	-0.371	0.360
RND	12,740	0.031	0.046	0.000	0.010	0.044	0.000	0.581
SALEGR	12,740	0.115	0.230	0.012	0.078	0.172	-0.802	4.902
AD	12,740	0.013	0.032	0.000	0.000	0.009	0.000	0.205
SIZE	12,740	7.273	1.659	6.109	7.227	8.376	2.384	10.763
FOR	12,740	0.031	0.038	0.000	0.018	0.050	-0.126	0.137

Panel B: Descriptive statistics for firm-years with no material operation in convention country

Variable	N	Mean	S.D.	P25	P50	P75	Min	Max
CETR	15,773	0.301	0.207	0.163	0.291	0.388	0.000	1.000
CETR3	11,025	0.325	0.192	0.220	0.312	0.387	0.000	1.000
ETR	15,773	0.347	0.134	0.314	0.369	0.395	0.000	1.000
ETR3	11,246	0.354	0.139	0.319	0.368	0.393	0.000	1.000
CurrentETR	15,773	0.321	0.185	0.213	0.329	0.402	0.000	1.000
CurrentETR3	10,852	0.339	0.175	0.253	0.339	0.399	0.000	1.000
CAPX	15,773	0.068	0.068	0.023	0.047	0.088	0.000	0.421
CNOL	15,773	-0.001	0.038	0.000	0.000	0.000	-0.278	1.058
NOL	15,773	0.514	0.500	0.000	1.000	1.000	0.000	1.000
INTAN	15,773	0.133	0.182	0.000	0.047	0.198	0.000	0.768
LEV	15,773	0.171	0.193	0.002	0.115	0.276	0.000	1.099
GP	15,773	0.380	0.193	0.237	0.348	0.496	-0.589	0.930
PPE	15,773	0.541	0.396	0.217	0.460	0.782	0.003	1.883
ROA	15,773	0.118	0.078	0.062	0.101	0.157	-0.156	0.360
RND	15,773	0.017	0.039	0.000	0.000	0.013	0.000	0.473
SALEGR	15,773	0.170	0.320	0.024	0.107	0.233	-0.802	4.902
AD	15,773	0.013	0.032	0.000	0.000	0.010	0.000	0.205
SIZE	15,773	5.979	1.840	4.632	5.792	7.101	2.384	10.763
FOR	15,773	0.008	0.024	0.000	0.000	0.000	-0.126	0.137

This table reports descriptive statistics for main regression variables. All variables are defined in Appendix A and all continuous variables are winsorized at the 1st and 99th percentiles.

TABLE 3
Pearson correlation

	CETR	CETR3	ETR	ETR3	CurrentETR	CurrentETR3	PostCon
CETR	1.000						
CETR3	**0.381**	1.000					
ETR	**0.418**	**0.276**	1.000				
ETR3	**0.232**	**0.410**	**0.364**	1.000			
CurrentETR	**0.629**	**0.331**	**0.548**	**0.268**	1.000		
CurrentETR3	**0.322**	**0.259**	**0.309**	**0.226**	**0.410**	1.000	
PostCon	**0.044**	**0.016**	**-0.009**	-0.021	**0.056**	**0.067**	1.000
CAPX	0.005	**-0.016**	**0.087**	**0.071**	**-0.018**	**-0.023**	**-0.119**
CNOL	**-0.101**	**-0.103**	**-0.160**	**-0.124**	**-0.117**	**-0.124**	**-0.022**
NOL	**-0.213**	**-0.217**	**-0.204**	**-0.198**	**-0.217**	**-0.187**	**0.230**
INTAN	**0.035**	**0.013**	**0.038**	**0.009**	**0.026**	**0.020**	**0.202**
LEV	**-0.007**	**-0.007**	**0.076**	**0.042**	**-0.049**	**-0.055**	**0.022**
GP	**0.050**	**0.053**	**0.079**	**0.069**	**0.067**	**0.069**	**0.059**
PPE	**-0.031**	**-0.036**	**0.020**	**0.018**	**-0.081**	**-0.075**	**-0.121**
ROA	**0.274**	**0.207**	**0.334**	**0.257**	**0.310**	**0.319**	**0.097**
RND	**-0.178**	**-0.179**	**-0.262**	**-0.224**	**-0.156**	**-0.151**	**0.078**
SALEGR	**-0.028**	**-0.074**	**0.008**	-0.008	**0.010**	**0.020**	**-0.034**
AD	**0.036**	**0.044**	**0.023**	0.019	**0.040**	**0.042**	**-0.021**
SIZE	**0.137**	**0.087**	**0.185**	**0.133**	**0.144**	**0.147**	**0.432**
FOR	**0.093**	**0.028**	**0.051**	**0.010**	**0.113**	**0.115**	**0.289**

	CAPX	CNOL	NOL	INTAN	LEV	GP	PPE
CAPX	1.000						
CNOL	**-0.033**	1.000					
NOL	**-0.095**	**0.092**	1.000				
INTAN	**-0.252**	**-0.010**	**0.139**	1.000			
LEV	**0.120**	**-0.037**	**0.057**	**0.212**	1.000		
GP	**0.033**	**-0.133**	**-0.028**	**0.050**	**-0.003**	1.000	
PPE	**0.539**	-0.010	**-0.066**	**-0.350**	**0.225**	**0.012**	1.000
ROA	**0.076**	**-0.396**	**-0.246**	**0.019**	**-0.042**	**0.278**	**-0.028**
RND	**-0.127**	**0.223**	**0.156**	**-0.079**	**-0.247**	**-0.130**	**-0.176**
SALEGR	**0.091**	**-0.028**	**-0.001**	**0.058**	**0.021**	0.009	**-0.085**
AD	0.003	**0.001**	**-0.042**	**-0.016**	**-0.062**	**0.042**	**-0.028**
SIZE	**0.073**	**-0.125**	**0.046**	**0.247**	**0.315**	**0.063**	**0.049**
FOR	**-0.014**	**-0.078**	**0.064**	**0.046**	**-0.048**	**0.069**	**-0.065**

	ROA	RND	SALEGR	AD	SIZE	FOR
ROA	1.000					
RND	**-0.389**	1.000				
SALEGR	**0.100**	0.015	1.000			
AD	0.042	**-0.060**	**-0.029**	1.000		
SIZE	**0.296**	**-0.224**	**0.004**	0.020	1.000	
FOR	**0.254**	**-0.001**	**0.052**	**0.020**	**0.288**	1.000

This table reports *Pearson correlations.* Correlation coefficients in italics are significant at the 10% level or better using two-tailed p-values. All variables are defined in Appendix A and all continuous variables are winsorized at the 1st and 99th percentiles.

TABLE 4

The effect of income convention on effective tax rates for U.S. multinationals

Panel A	(1)	(2)	(3)
Variable	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$
$PostCon_{i,t}$	0.011**	0.001	0.014***
	(2.76)	(0.19)	(3.01)
$RETR_{i,t-1}$	-0.162***	-0.158***	-0.181***
	(-23.81)	(-16.35)	(-28.66)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.023****	**0.060*****	**0.033*****
	(2.78)	**(5.58)**	**(3.25)**
$CAPX_{i,t}$	-0.051*	0.053***	-0.122***
	(-2.06)	(3.01)	(-4.01)
$CNOL_{i,t}$	0.230***	0.137***	0.264***
	(9.28)	(4.72)	(7.13)
$NOL_{i,t}$	-0.013***	0.010***	-0.002
	(-3.01)	(3.47)	(-0.67)
$INTAN_{i,t}$	0.001	0.014	-0.010
	(0.05)	(1.56)	(-1.00)
$LEV_{i,t}$	-0.014	0.005	-0.035**
	(-1.08)	(0.44)	(-2.83)
$GP_{i,t}$	-0.042*	-0.019	-0.016
	(-1.83)	(-1.25)	(-0.90)
$PPE_{i,t}$	-0.020**	-0.019***	-0.025***
	(-2.81)	(-3.21)	(-3.01)
$ROA_{i,t}$	-0.298***	-0.098***	-0.207***
	(-7.14)	(-4.05)	(-6.18)
$RND_{i,t}$	0.007	-0.035	0.156**
	(0.09)	(-0.60)	(2.35)
$SALEGR_{i,t}$	-0.053***	0.004	0.004
	(-5.53)	(0.49)	(0.48)
$AD_{i,t}$	0.178***	0.091***	0.138***
	(4.25)	(3.57)	(3.53)
$SIZE_{i,t}$	-0.008***	-0.003**	-0.004***
	(-5.76)	(-2.67)	(-3.25)
$FOR_{i,t}$	-0.403***	-0.431***	-0.470***
	(-3.92)	(-5.47)	(-4.72)
Intercept	0.468***	0.411***	0.441***
	(32.13)	(39.05)	(37.84)
N	28,513	28,513	28,513
R-sq	0.163	0.225	0.205

This table presents the regression results of the effect of the income tax convention on multinationals' one-year effective tax rates. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 4

The effect of income convention on effective tax rates for U.S. multinationals

Panel B	(1)	(2)	(3)
Variable	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$PostCon_{i,t}$	0.005	-0.001	0.009
	(1.11)	(-0.14)	(1.68)
$RETR_{i,t-1}$	-0.126***	-0.137***	-0.141***
	(-17.92)	(-10.41)	(-23.57)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.024****	**0.056*****	**0.040*****
	(2.53)	**(4.17)**	**(4.08)**
$CAPX_{i,t}$	-0.116***	0.070***	-0.106***
	(-3.15)	(3.18)	(-3.17)
$CNOL_{i,t}$	0.073***	0.073***	0.095*
	(2.89)	(2.98)	(2.07)
$NOL_{i,t}$	-0.002	0.010***	0.008*
	(-0.31)	(3.50)	(2.03)
$INTAN_{i,t}$	0.001	0.016	-0.009
	(0.06)	(1.22)	(-0.52)
$LEV_{i,t}$	-0.041***	-0.004	-0.050***
	(-3.12)	(-0.33)	(-4.08)
$GP_{i,t}$	-0.041	-0.013	-0.014
	(-1.51)	(-0.74)	(-0.75)
$PPE_{i,t}$	-0.026**	-0.030***	-0.041***
	(-2.40)	(-3.78)	(-3.72)
$ROA_{i,t}$	-0.159***	-0.025	-0.122***
	(-4.37)	(-1.40)	(-4.02)
$RND_{i,t}$	-0.065	-0.134*	0.174**
	(-0.80)	(-1.82)	(2.21)
$SALEGR_{i,t}$	-0.020**	0.009	0.015*
	(-2.31)	(1.20)	(1.76)
$AD_{i,t}$	0.143**	0.080	0.126**
	(2.44)	(1.62)	(2.11)
$SIZE_{i,t}$	-0.011***	-0.003**	-0.007***
	(-5.66)	(-2.74)	(-4.30)
$FOR_{i,t}$	-0.287**	-0.409***	-0.403***
	(-2.62)	(-4.25)	(-3.45)
Intercept	0.481***	0.408***	0.455***
	(34.23)	(48.39)	(38.58)
N	20,238	20,550	20,027
R-sq	0.125	0.177	0.157

This table presents the regression results of the effect of the income tax convention on multinational firms' three-year effective tax rates. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 5

The effect of income convention on domestic and foreign effective tax rates for U.S. multinationals

Variable	(1) $FED\_ETR_{i,t}$	(2) $FED\_ETR3_{i,t}$	(3) $Foreign\_ETR_{i,t}$	(4) $Foreign\_ETR3_{i,t}$
$PostCon_{i,t}$	0.013	0.006	0.011	0.012
	(1.70)	(0.62)	(1.38)	(1.32)
$RETR_{i,t-1}$	-0.140***	-0.122***	-0.171***	-0.090***
	(-16.86)	(-9.91)	(-17.48)	(-4.62)
$RETR_{i,t-1}$ $* PostCon_{i,t}$	**-0.012**	**-0.002**	**0.042*****	**0.060*****
	(-1.26)	**(-0.15)**	**(4.47)**	**(3.26)**
$CAPX_{i,t}$	-0.057	-0.159**	-0.216***	-0.006
	(-1.38)	(-2.20)	(-3.23)	(-0.11)
$CNOL_{i,t}$	0.037***	0.022	-0.039***	-0.014
	(4.09)	(1.21)	(-3.83)	(-0.69)
$NOL_{i,t}$	-0.044***	-0.024**	-0.009	0.023**
	(-4.98)	(-2.66)	(-1.26)	(2.12)
$INTAN_{i,t}$	0.026**	0.010	0.045**	-0.013
	(2.40)	(0.68)	(2.58)	(-0.60)
$LEV_{i,t}$	-0.065***	-0.073***	0.024**	0.010
	(-4.81)	(-5.32)	(2.14)	(0.50)
$GP_{i,t}$	-0.006***	-0.008***	-0.002	-0.007
	(-3.83)	(-5.25)	(-1.01)	(-0.29)
$PPE_{i,t}$	-0.025*	-0.028**	0.006	-0.022
	(-1.82)	(-2.15)	(0.47)	(-1.29)
$ROA_{i,t}$	0.228***	0.333***	0.129***	0.069*
	(8.00)	(11.78)	(5.92)	(2.06)
$RND_{i,t}$	-0.072	-0.042	0.058	0.042
	(-1.64)	(-1.10)	(0.75)	(0.33)
$SALEGR_{i,t}$	0.018***	0.013	0.009	0.004
	(3.62)	(1.65)	(1.30)	(0.37)
$AD_{i,t}$	0.209***	0.190**	-0.064	0.140
	(3.17)	(2.19)	(-0.44)	(1.04)
$SIZE_{i,t}$	0.011***	0.013***	0.000	-0.005*
	(6.65)	(6.67)	(0.05)	(-1.75)
$FOR_{i,t}$	0.405***	0.235**	-0.089	-1.937***
	(4.97)	(2.50)	(-0.98)	(-17.66)
Intercept	0.234***	0.213***	0.271***	0.420***
	(18.55)	(12.57)	(12.18)	(14.44)
N	20,537	15,288	20,537	12,562
R-sq	0.224	0.194	0.119	0.137

This table presents the regression results of the effect of the income tax convention on multinational firms' domestic and foreign effective tax rates. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 6

Tax avoidance through foreign activity: Income Mobility

	$CETR_{i,t}$		$ETR_{i,t}$		$CurrentETR_{i,t}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Income Mobility	Low	High	Low	High	Low	High
$PostCon_{i,t}$	-0.001	-0.010	-0.011	0.013	0.001	0.011
	(-0.06)	(-0.84)	(-1.15)	(1.31)	(0.05)	(0.90)
$RETR_{i,t-1}$	-0.126***	-0.094***	-0.187***	-0.106***	-0.117***	-0.097***
	(-9.47)	(-8.64)	(-12.88)	(-6.68)	(-11.17)	(-7.20)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.035***	**0.028****	**0.076****	**0.032**	**0.057*****	**-0.003**
	(1.88)	**(2.57)**	**(2.37)**	**(1.31)**	**(3.26)**	**(-0.11)**
$CAPX_{i,t}$	-0.046	-0.179*	0.130**	0.086	-0.022	-0.163***
	(-0.61)	(-1.84)	(2.19)	(1.63)	(-0.37)	(-4.15)
$CNOL_{i,t}$	0.076*	0.016	-0.059	0.019	0.005	0.030
	(1.88)	(0.63)	(-1.67)	(0.90)	(0.15)	(1.60)
$NOL_{i,t}$	-0.061***	-0.046***	-0.014**	-0.018**	-0.057***	-0.048***
	(-4.13)	(-5.66)	(-2.41)	(-3.01)	(-6.37)	(-4.01)
$INTAN_{i,t}$	0.044	0.051	0.055***	-0.041*	0.019	0.009
	(1.45)	(1.52)	(3.60)	(-2.16)	(0.65)	(0.26)
$LEV_{i,t}$	-0.074**	-0.009	-0.001	-0.011	-0.101***	-0.079
	(-2.62)	(-0.23)	(-0.09)	(-0.29)	(-4.96)	(-1.30)
$GP_{i,t}$	-0.004	-0.002	-0.005	-0.002	-0.005*	0.002
	(-1.42)	(-0.54)	(-1.45)	(-0.35)	(-1.87)	(0.48)
$PPE_{i,t}$	-0.009	0.042	-0.013	-0.029*	-0.031**	-0.030
	(-0.62)	(1.55)	(-1.36)	(-1.84)	(-2.37)	(-1.05)
$ROA_{i,t}$	0.238***	0.176***	0.248***	0.244***	0.273***	0.227***
	(3.57)	(9.16)	(7.04)	(8.44)	(4.43)	(6.80)
$RND_{i,t}$	-0.241	-0.213**	-0.213	-0.250***	-0.631	-0.173
	(-0.57)	(-2.70)	(-0.36)	(-3.23)	(-1.21)	(-1.67)
$SALEGR_{i,t}$	-0.011	-0.017	-0.003	0.024	-0.002	0.055**
	(-1.67)	(-1.18)	(-0.62)	(1.13)	(-0.40)	(2.34)
$AD_{i,t}$	0.301	0.038	0.266	-0.089	0.019	-0.171**
	(0.94)	(0.43)	(1.12)	(-1.23)	(0.07)	(-2.34)
$SIZE_{i,t}$	0.010***	0.001	0.008***	0.002	0.008**	0.009***
	(3.15)	(0.67)	(3.18)	(0.49)	(2.48)	(3.98)
$FOR_{i,t}$	0.311	-0.092	0.468	-0.316*	0.560	-0.223
	(0.81)	(-0.38)	(1.22)	(-1.88)	(1.52)	(-1.24)
Intercept	0.241***	0.242***	0.282***	0.285***	0.275***	0.271***
	(10.15)	(7.76)	(21.58)	(9.32)	(12.57)	(9.72)
Wald Chi-sq	0.25		2.87*		10.49***	
N	5567	3813	5567	3813	5567	3813
R-sq	0.193	0.119	0.281	0.178	0.207	0.170

This table presents the regression results of the effect of establishments of income tax convention on multinational firms' effective tax rates. Column (1), (3), and (5) reports subsample results for firms that has lower income mobility, while column (2), (4), and (6) reports firms that has higher income mobility. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 7

Tax avoidance through foreign activity: Tax Haven

	$CETR_{i,t}$		$ETR_{i,t}$		$CurrentETR_{i,t}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Tax Haven	Low	High	Low	High	Low	High
$PostCon_{i,t}$	0.003	-0.018	-0.002	0.001	0.012	-0.006
	(0.29)	(-1.31)	(-0.24)	(0.15)	(1.59)	(-0.47)
$RETR_{i,t-1}$	-0.083***	-0.106***	-0.140***	-0.118***	-0.088***	-0.104***
	(-6.66)	(-6.11)	(-13.89)	(-8.39)	(-6.89)	(-7.98)
$RETR_{i,t-1} * PostCon_{i,t}$	**-0.003**	**0.040****	**0.026****	**0.047****	**-0.000**	**0.036****
	(-0.24)	**(2.60)**	**(2.31)**	**(2.10)**	**(-0.02)**	**(2.69)**
$CAPX_{i,t}$	-0.056	-0.051	0.071	0.172**	-0.027	-0.091
	(-0.95)	(-0.60)	(1.05)	(2.39)	(-0.44)	(-1.28)
$CNOL_{i,t}$	0.033***	-0.007	-0.060***	-0.001	-0.022	0.018
	(3.49)	(-0.19)	(-3.73)	(-0.04)	(-1.55)	(0.99)
$NOL_{i,t}$	-0.059***	-0.043***	-0.027***	-0.021**	-0.065***	-0.044***
	(-8.30)	(-4.30)	(-4.77)	(-2.16)	(-12.23)	(-4.70)
$INTAN_{i,t}$	0.051***	0.053**	0.033***	0.031	0.012	-0.001
	(3.40)	(2.56)	(2.88)	(1.46)	(0.70)	(-0.04)
$LEV_{i,t}$	-0.055***	-0.106***	0.008	-0.041	-0.077***	-0.132***
	(-2.92)	(-2.95)	(0.37)	(-1.57)	(-4.20)	(-3.77)
$GP_{i,t}$	-0.004*	-0.007*	-0.000	-0.004	-0.003	-0.003
	(-1.95)	(-2.06)	(-0.23)	(-1.13)	(-1.31)	(-0.91)
$PPE_{i,t}$	0.003	-0.006	-0.006	-0.039*	-0.018*	-0.034*
	(0.18)	(-0.34)	(-0.59)	(-1.76)	(-1.76)	(-2.05)
$ROA_{i,t}$	0.265***	0.250***	0.260***	0.312***	0.292***	0.296***
	(9.15)	(6.48)	(11.24)	(10.48)	(16.22)	(9.61)
$RND_{i,t}$	-0.100*	-0.198***	-0.108*	-0.208***	-0.044	-0.148***
	(-2.06)	(-3.38)	(-2.06)	(-6.33)	(-0.81)	(-3.46)
$SALEGR_{i,t}$	-0.015***	-0.026**	0.003	-0.013	0.004	-0.006
	(-3.28)	(-2.87)	(0.50)	(-1.68)	(0.51)	(-0.67)
$AD_{i,t}$	0.105**	0.117	0.039	0.090	0.098	0.139
	(2.56)	(1.12)	(0.54)	(0.76)	(1.31)	(1.43)
$SIZE_{i,t}$	0.007**	0.006	0.010***	0.008**	0.010***	0.011***
	(2.41)	(1.65)	(4.07)	(2.57)	(4.19)	(3.22)
$FOR_{i,t}$	0.545***	-0.225	0.251	-0.514***	0.572***	-0.228
	(3.80)	(-1.37)	(1.63)	(-4.38)	(3.49)	(-1.48)
Intercept	0.231***	0.247***	0.262***	0.273***	0.252***	0.262***
	(12.96)	(12.94)	(14.58)	(11.53)	(21.05)	(12.52)
Wald Chi-sq	4.63**		1.46		11.80***	
N	4,758	4530	4,758	4530	4,758	4530
R-sq	0.133	0.216	0.162	0.264	0.165	0.222

This table presents the regression results of the effect of establishments of income tax convention on multinational firms' effective tax rates condition on their usage of tax haven. A firm is defined as low *Tax Haven* if it's ratio of reported operations in tax haven to foreign countries is ranked in the lowest quintile, and high *Tax Haven* if ranked in the highest quintile. Column (1), (3) and (5) reports subsample results for firms designated as low *Tax Haven*, while column (2), (4), (6), reports firms as high *Tax Haven*. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 8

Tax avoidance through foreign activity: Tax Sheltering

	$CETR_{i,t}$		$ETR_{i,t}$		$CurrentETR_{i,t}$	
	(1)	(2)	(3)	(4)	(5)	(6)
Tax Sheltering	Low	High	Low	High	Low	High
$PostCon_{i,t}$	0.009	0.001	0.011	-0.002	0.003	0.009
	(0.55)	(0.07)	(0.82)	(-0.32)	(0.16)	(0.60)
$RETR_{i,t-1}$	-0.087***	-0.126***	-0.181***	-0.204***	-0.118***	-0.173***
	(-8.84)	(-4.05)	(-10.04)	(-7.05)	(-10.70)	(-4.79)
$RETR_{i,t-1} * PostCon_{i,t}$	**-0.002**	**0.079****	**0.014**	**0.071*****	**0.000**	**0.142*****
	(-0.10)	**(2.22)**	**(1.17)**	**(4.75)**	**(0.01)**	**(4.69)**
$CAPX_{i,t}$	0.061	-0.311**	0.010	0.053	-0.098	-0.318
	(0.76)	(-2.41)	(0.22)	(0.78)	(-1.51)	(-1.72)
$CNOL_{i,t}$	0.021	0.089**	-0.021*	0.029	0.013	0.089
	(1.63)	(2.55)	(-2.06)	(0.85)	(1.35)	(1.67)
$NOL_{i,t}$	-0.174***	-0.006	-0.084***	0.007	-0.151***	-0.008
	(-15.93)	(-0.90)	(-5.95)	(0.76)	(-14.10)	(-0.62)
$INTAN_{i,t}$	-0.007	0.053**	-0.031	-0.000	-0.028	0.033
	(-0.23)	(2.83)	(-1.18)	(-0.01)	(-1.29)	(1.25)
$LEV_{i,t}$	-0.039	-0.075**	0.016	0.012	-0.046	-0.107***
	(-1.55)	(-2.18)	(0.83)	(0.50)	(-1.51)	(-2.92)
$GP_{i,t}$	-0.001	-0.001	-0.000	-0.005	0.000	0.001
	(-1.30)	(-0.27)	(-0.26)	(-1.39)	(0.31)	(0.20)
$PPE_{i,t}$	-0.006	0.037	-0.008	-0.018	-0.005	0.008
	(-0.44)	(1.66)	(-0.78)	(-1.41)	(-0.41)	(0.29)
$ROA_{i,t}$	0.112***	0.200***	0.103***	0.253***	0.084***	0.267***
	(5.30)	(4.40)	(5.63)	(5.87)	(4.48)	(5.95)
$RND_{i,t}$	-0.012	-0.295***	-0.031	-0.219**	-0.014	-0.197**
	(-0.36)	(-17.08)	(-1.01)	(-2.24)	(-0.48)	(-2.70)
$SALEGR_{i,t}$	-0.001	-0.032*	0.001	0.008	-0.000	0.006
	(-0.30)	(-2.07)	(0.15)	(0.57)	(-0.03)	(0.42)
$AD_{i,t}$	0.265*	-0.110	0.314**	0.006	0.298**	0.104
	(1.80)	(-0.74)	(2.21)	(0.05)	(2.12)	(0.91)
$SIZE_{i,t}$	0.011*	0.014***	0.011**	0.008**	0.023***	0.014***
	(1.96)	(3.54)	(2.73)	(2.39)	(5.09)	(3.52)
$FOR_{i,t}$	0.676***	-0.223	0.499***	-0.507***	0.618***	-0.363**
	(7.79)	(-1.58)	(7.75)	(-4.42)	(6.22)	(-2.40)
Intercept	0.282***	0.141***	0.316***	0.247***	0.268***	0.179***
	(18.31)	(8.89)	(19.05)	(9.28)	(18.81)	(9.63)
Wald Chi-sq	3.71*		10.43***		13.24***	
N	3617	3604	3617	3604	3617	3604
R-sq	0.335	0.132	0.416	0.234	0.382	0.136

This table presents the regression results of the effect of establishment of income tax convention on multinational firms' effective tax rates condition on the propensity in engaging tax sheltering activities. A firm is defined as low *Tax Sheltering* if it's tax sheltering score is ranked in the lowest quintile, and high *Tax Sheltering* if ranked in the highest quintile. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 9

The effect of tax information exchange agreement (TIEA) on U.S. multinationals' effective tax rates

Variable	(1) $CETR_{i,t}$	(2) $ETR_{i,t}$	(3) $CurrentETR_{i,t}$
$TIEA_{i,t}$	-0.004	-0.001	-0.001
	(-0.67)	(-0.28)	(-0.24)
$RETR_{i,t-1}$	-0.093***	-0.110***	-0.098***
	(-10.13)	(-12.80)	(-10.52)
$RETR_{i,t-1} * TIEA_{i,t}$	**0.023****	**0.041*****	**0.017***
	(2.71)	**(4.83)**	**(1.85)**
$CAPX_{i,t}$	-0.051	0.067*	-0.081***
	(-1.17)	(1.74)	(-3.60)
$CNOL_{i,t}$	0.009	-0.036***	-0.003
	(0.79)	(-4.66)	(-0.26)
$NOL_{i,t}$	-0.036***	-0.015***	-0.031***
	(-5.86)	(-3.37)	(-6.21)
$INTAN_{i,t}$	0.063***	0.028**	0.031**
	(4.58)	(2.53)	(2.60)
$LEV_{i,t}$	-0.047**	0.001	-0.067***
	(-2.84)	(0.04)	(-3.79)
$GP_{i,t}$	-0.007***	-0.006**	-0.004**
	(-4.94)	(-2.72)	(-2.29)
$PPE_{i,t}$	0.005	-0.008	-0.018
	(0.49)	(-0.75)	(-1.46)
$ROA_{i,t}$	0.232***	0.292***	0.298***
	(7.95)	(11.49)	(10.67)
$RND_{i,t}$	-0.219***	-0.197***	-0.118***
	(-8.44)	(-9.10)	(-6.36)
$SALEGR_{i,t}$	-0.027***	0.001	0.012
	(-4.33)	(0.26)	(1.53)
$AD_{i,t}$	-0.057	-0.081**	-0.089*
	(-1.35)	(-2.32)	(-2.09)
$SIZE_{i,t}$	0.002	0.003*	0.005**
	(1.11)	(1.94)	(2.28)
$FOR_{i,t}$	0.206*	-0.128	0.169
	(1.98)	(-1.50)	(1.60)
Intercept	0.252***	0.282***	0.266***
	(17.35)	(19.83)	(15.09)
N	11,736	11,736	11,736
R-sq	0.132	0.178	0.148

This table presents the regression results of the effect of establishments of Tax Information Exchange Agreement on multinational firms' tax avoidance. I replace measures of effective tax rates with three book-tax difference. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively. The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 10
Probability of IRS Audit

	$CETR_{i,t}$		$ETR_{i,t}$		$CurrentETR_{i,t}$	
	(1)	(2)	(3)	(4)	(5)	(6)
IRS Audit Risk	Low	High	Low	High	Low	High
$PostCon_{i,t}$	0.004	0.019**	0.002	-0.002	0.005	0.020***
	(0.99)	(2.35)	(0.44)	(-0.66)	(1.12)	(2.90)
$RETR_{i,t-1}$	-0.107***	-0.115***	-0.151***	-0.166***	-0.099***	-0.111***
	(-17.11)	(-11.03)	(-20.67)	(-9.65)	(-18.25)	(-9.52)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.008**	**0.034*****	**0.042*****	**0.081*****	**0.000**	**0.034*****
	(1.10)	**(3.26)**	**(3.71)**	**(4.64)**	**(0.07)**	**(3.15)**
$CAPX_{i,t}$	-0.030	-0.118	0.110***	0.117***	-0.047	-0.109
	(-0.88)	(-1.59)	(3.38)	(2.94)	(-1.51)	(-1.68)
$CNOL_{i,t}$	0.004	0.012	-0.034***	-0.014	-0.010	0.004
	(0.66)	(1.14)	(-4.14)	(-1.19)	(-1.35)	(0.53)
$NOL_{i,t}$	-0.094***	-0.048***	-0.052***	-0.015**	-0.095***	-0.044***
	(-13.07)	(-7.39)	(-9.16)	(-2.71)	(-19.62)	(-6.66)
$INTAN_{i,t}$	0.031**	0.068***	0.028**	0.054***	0.004	0.045**
	(2.32)	(4.26)	(2.20)	(3.72)	(0.52)	(2.85)
$LEV_{i,t}$	-0.057***	-0.073***	-0.008	-0.034*	-0.088***	-0.106***
	(-3.90)	(-3.53)	(-0.94)	(-1.85)	(-7.13)	(-4.78)
$GP_{i,t}$	-0.004***	-0.003	-0.004*	-0.002	-0.003*	-0.001
	(-3.98)	(-1.30)	(-1.91)	(-0.88)	(-1.82)	(-0.70)
$PPE_{i,t}$	-0.000	0.003	-0.010	-0.005	-0.012	-0.024*
	(-0.02)	(0.24)	(-1.04)	(-0.52)	(-1.22)	(-1.95)
$ROA_{i,t}$	0.124***	0.124***	0.152***	0.160***	0.148***	0.162***
	(8.68)	(4.72)	(12.33)	(6.37)	(9.50)	(4.92)
$RND_{i,t}$	-0.088***	-0.154***	-0.109***	-0.149***	-0.054***	-0.105**
	(-3.85)	(-2.97)	(-5.77)	(-3.52)	(-2.91)	(-2.34)
$SALEGR_{i,t}$	-0.011***	-0.020*	0.004	0.004	0.008*	0.001
	(-2.99)	(-1.98)	(0.93)	(0.76)	(1.93)	(0.11)
$AD_{i,t}$	0.028	-0.055	0.006	-0.018	0.009	-0.003
	(0.97)	(-0.74)	(0.16)	(-0.36)	(0.16)	(-0.06)
$SIZE_{i,t}$	0.011***	0.005***	0.012***	0.004**	0.017***	0.007***
	(4.26)	(3.41)	(5.05)	(2.45)	(7.19)	(4.47)
$FOR_{i,t}$	0.447***	0.166	0.261***	-0.181*	0.513***	0.168
	(4.15)	(1.21)	(4.11)	(-1.91)	(5.66)	(1.23)
Intercept	0.247***	0.234***	0.275***	0.294***	0.251***	0.259***
	(17.51)	(13.85)	(21.35)	(33.08)	(22.58)	(18.44)
Wald Chi-sq	6.05**		8.31***		13.21***	
N	14,427	14,086	14,427	14,086	14,427	14,086
R-sq	0.161	0.163	0.238	0.234	0.225	0.198

This table presents the regression results of the effect of establishments of income tax convention on multinational firms' effective tax rates condition on their probability of receiving IRS tax audit. A firm is classified as high probability of getting IRS audit if it has more than 250 million in total asset and is in any of the following industries: Natural Resources, Construction, Heavy Manufacturing, and Transportation propensity in engaging tax sheltering activities. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively. The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 11

Alternative independent variable: number of convention country

Panel A	(1)	(2)	(3)
Variable	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$
$Num\_Con_{i,t}$	0.009**	-0.005**	0.008**
	(2.78)	(-2.15)	(2.70)
$RETR_{i,t-1}$	-0.109***	-0.156***	-0.109***
	(-15.30)	(-16.31)	(-17.03)
$RETR_{i,t-1} * Num\_Con_{i,t}$	**0.018*** **	**0.047*** **	**0.021*** **
	(3.91)	**(10.83)**	**(3.80)**
$CAPX_{i,t}$	-0.078**	0.089**	-0.078**
	(-2.87)	(2.76)	(-2.21)
$CNOL_{i,t}$	0.020**	-0.023**	0.007
	(2.53)	(-2.40)	(0.97)
$NOL_{i,t}$	-0.071***	-0.031***	-0.068***
	(-11.19)	(-6.47)	(-14.53)
$INTAN_{i,t}$	0.045***	0.035***	0.021**
	(4.04)	(3.33)	(2.64)
$LEV_{i,t}$	-0.054***	0.003	-0.086***
	(-4.20)	(0.34)	(-7.34)
$GP_{i,t}$	-0.004***	-0.004***	-0.003**
	(-3.27)	(-3.02)	(-2.64)
$PPE_{i,t}$	0.000	-0.010	-0.019*
	(0.04)	(-1.24)	(-2.09)
$ROA_{i,t}$	0.191***	0.218***	0.231***
	(9.91)	(14.04)	(12.30)
$RND_{i,t}$	-0.120***	-0.130***	-0.076***
	(-4.07)	(-4.56)	(-3.60)
$SALEGR_{i,t}$	-0.013***	0.001	0.004
	(-3.20)	(0.19)	(1.14)
$AD_{i,t}$	-0.012	-0.019	0.001
	(-0.38)	(-0.73)	(0.02)
$SIZE_{i,t}$	0.004**	0.007***	0.008***
	(2.66)	(6.03)	(6.36)
$FOR_{i,t}$	0.193	-0.026	0.227*
	(1.64)	(-0.33)	(2.09)
Intercept	0.261***	0.285***	0.274***
	(24.42)	(36.67)	(32.36)
N	24,603	24,603	24,603
R-sq	0.177	0.250	0.202

This table presents the regression results of the effect of establishments of income tax convention on multinational firms' effective tax rates. I replace *PostCon* with *ALT_CON* and re-estimate Equation (1). Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 11

Alternative independent variable: number of convention country

Panel B	(1)	(2)	(3)
Variable	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$Num\_Con_{i,t}$	0.012***	-0.005*	0.013***
	(4.49)	(-1.87)	(5.46)
$RETR_{i,t-1}$	-0.078***	-0.118***	-0.086***
	(-17.77)	(-13.87)	(-17.72)
$RETR_{i,t-1} * Num\_Con_{i,t}$	**0.019*** **	**0.029*** **	**0.019*** **
	(3.74)	**(8.38)**	**(4.00)**
$CAPX_{i,t}$	-0.153***	0.062	-0.099**
	(-5.68)	(1.31)	(-2.60)
$CNOL_{i,t}$	0.009	-0.015	0.000
	(0.77)	(-0.88)	(0.02)
$NOL_{i,t}$	-0.055***	-0.025***	-0.048***
	(-11.25)	(-4.21)	(-10.80)
$INTAN_{i,t}$	0.021*	0.021	0.002
	(1.87)	(1.60)	(0.23)
$LEV_{i,t}$	-0.052***	0.024	-0.062***
	(-3.89)	(1.52)	(-4.77)
$GP_{i,t}$	-0.005*	-0.003	-0.003
	(-1.87)	(-1.36)	(-1.16)
$PPE_{i,t}$	0.001	-0.008	-0.019*
	(0.07)	(-1.16)	(-1.76)
$ROA_{i,t}$	0.274***	0.287***	0.303***
	(11.77)	(14.42)	(13.12)
$RND_{i,t}$	-0.186***	-0.134***	-0.088**
	(-5.04)	(-3.55)	(-2.58)
$SALEGR_{i,t}$	-0.009**	-0.004	0.002
	(-2.37)	(-1.01)	(0.49)
$AD_{i,t}$	0.050	-0.005	0.031
	(1.40)	(-0.13)	(0.72)
$SIZE_{i,t}$	0.002	0.006***	0.005***
	(0.90)	(3.04)	(3.21)
$FOR_{i,t}$	0.135	-0.116*	0.129
	(1.37)	(-1.79)	(1.38)
Intercept	0.271***	0.272***	0.268***
	(21.74)	(22.97)	(26.04)
N	18,149	18,380	17,911
R-sq	0.150	0.186	0.171

This table presents the regression results of the effect of establishments of income tax convention on multinational firms' effective tax rates. I replace *PostCon* with *ALT_CON* and re-estimate Equation (1). Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 12

Alternative dependent variables: Book to taxable income difference

	(1)	(2)	(3)	(4)	(5)	(6)
	$BTD\_BSW_{i,t}$		$BTD\_HLS_{i,t}$		$BTD\_DD_{i,t}$	
$PostCon_{i,t}$	-0.003***	-0.002**	-0.009***	-0.003	-0.002	0.000
	(-3.79)	(-2.57)	(-5.41)	(-1.53)	(-0.65)	(0.15)
$RBTD_{i,t-1}$		0.026***		0.047***		0.045***
		(13.64)		(8.40)		(8.79)
$RBTD_{i,t-1} * PostCon_{i,t}$		**-0.006****		**-0.024*****		**-0.013****
		(-2.23)		**(-4.21)**		**(-2.36)**
$CAPX_{i,t}$	0.065***	0.056***	0.051**	0.022	0.121***	0.103**
	(3.89)	(3.41)	(2.25)	(0.87)	(3.63)	(2.83)
$CNOL_{i,t}$	-0.045***	-0.069***	1.010***	1.055***	-0.129***	-0.057
	(-11.27)	(-10.43)	(58.05)	(19.01)	(-12.00)	(-1.64)
$NOL_{i,t}$	0.008***	0.004***	0.012***	0.005***	0.011***	0.005***
	(12.56)	(8.15)	(7.68)	(3.38)	(9.29)	(6.21)
$INTAN_{i,t}$	0.007***	0.011***	-0.009*	0.004	0.019***	0.028***
	(3.27)	(6.61)	(-1.91)	(0.56)	(3.09)	(5.09)
$LEV_{i,t}$	0.015***	0.013***	0.025***	0.016***	0.014**	0.009*
	(6.66)	(5.75)	(5.91)	(3.59)	(2.15)	(1.82)
$GP_{i,t}$	-0.001	-0.003	0.004	0.006	0.032***	0.016***
	(-0.31)	(-0.83)	(0.69)	(0.92)	(4.93)	(3.19)
$PPE_{i,t}$	0.003*	0.003*	0.004	0.009	0.035***	0.025***
	(1.81)	(2.03)	(0.82)	(1.72)	(4.42)	(5.44)
$ROA_{i,t}$	0.025**	0.019**	0.069**	0.029	-0.039*	-0.039*
	(2.66)	(2.17)	(2.50)	(0.94)	(-1.74)	(-1.80)
$RND_{i,t}$	-0.063***	-0.053***	-0.069***	-0.073***	0.025	-0.016
	(-6.88)	(-3.47)	(-4.03)	(-3.86)	(0.79)	(-0.47)
$SALEGR_{i,t}$	-0.002	-0.003	0.002	-0.002	-0.017*	-0.032**
	(-1.35)	(-1.29)	(0.51)	(-0.53)	(-1.91)	(-2.88)
$AD_{i,t}$	-0.016	-0.014	-0.039	-0.054	-0.032	-0.037
	(-1.39)	(-1.29)	(-1.69)	(-1.27)	(-1.45)	(-1.36)
$SIZE_{i,t}$	-0.001**	-0.000	-0.001**	-0.001	0.001	0.001
	(-2.68)	(-1.36)	(-2.38)	(-0.88)	(0.90)	(1.64)
$FOR_{i,t}$	-0.047*	-0.023	0.252***	0.267***	-0.258***	-0.108**
	(-1.93)	(-1.09)	(3.65)	(4.66)	(-5.70)	(-2.57)
Intercept	0.000	-0.006	-0.004	-0.013*	-0.010	-0.006
	(0.04)	(-1.53)	(-0.81)	(-2.02)	(-1.55)	(-1.03)
N	41,102	28,513	24,496	16,398	12,519	8,276
R-sq	0.085	0.156	0.488	0.440	0.162	0.233

This table presents the regression results of the effect of the income tax convention on multinationals' tax avoidance. I replace measures of effective tax rates with three measures of book-tax difference (*BTD_BSW, BTD_HLS, and BTD_DD*) Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 13

Alternative Tax Positions: Uncertain Tax Benefits

	(1)	(2)
	$UTB_{i,t}$	
$PostCon_{i,t}$	0.003***	0.003***
	(6.65)	(5.59)
$RUTB_{i,t-1}$		0.036***
		(9.97)
$RUTB_{i,t-1} * PostCon_{i,t}$		**-0.008****
		(-2.63)
$CAPX_{i,t}$	-0.019**	-0.007
	(-2.57)	(-1.66)
$CNOL_{i,t}$	0.005*	0.004**
	(2.00)	(3.32)
$NOL_{i,t}$	0.001**	0.000
	(3.01)	(0.98)
$INTAN_{i,t}$	-0.004*	0.000
	(-2.14)	(0.26)
$LEV_{i,t}$	-0.007***	-0.002*
	(-4.44)	(-2.20)
$GP_{i,t}$	0.001*	0.001*
	(2.30)	(2.18)
$PPE_{i,t}$	-0.000	0.001
	(-0.17)	(1.20)
$ROA_{i,t}$	-0.001	-0.001
	(-0.25)	(-0.30)
$RND_{i,t}$	0.065***	0.037***
	(3.61)	(3.76)
$SALEGR_{i,t}$	-0.002	-0.001
	(-1.59)	(-1.88)
$AD_{i,t}$	0.028**	0.015*
	(2.68)	(2.18)
$SIZE_{i,t}$	0.001***	0.000
	(3.84)	(0.90)
$FOR_{i,t}$	0.035**	0.003
	(2.73)	(0.31)
Intercept	0.001	0.000
	(0.39)	(0.21)
N	13,468	13,468
R-sq	0.186	0.531

This table presents the regression results of the effect of establishment of income tax convention on multinational firms' tax avoidance. I replace measures of effective tax rates with firm's uncertain tax benefit position (UTB). UTB is an account that firm used to payable to tax authority in case of unfavorable tax audit. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 14

Quintile Regression of Table 4

Panel A	(1)	(2)	(3)
Variable	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$
$PostCon_{i,t}$	-0.003	-0.001	0.007
	(-0.52)	(-0.55)	(1.29)
$LowRETR_{i,t-1}$	-0.150***	-0.143***	-0.161***
	(-21.45)	(-15.46)	(-27.61)
$HighRETR_{i,t-1}$	0.041***	0.054***	0.067***
	(5.44)	(12.76)	(10.36)
$LowRETR_{i,t-1} * PostCon_{i,t}$	0.033***	0.064***	0.042***
	(3.65)	(6.47)	(3.82)
$HighRETR_{i,t-1} * PostCon_{i,t}$	0.033***	0.005**	0.012*
	(3.88)	(2.14)	(1.95)
$CAPX_{i,t}$	-0.064**	0.091***	-0.064*
	(-2.31)	(2.91)	(-1.94)
$CNOL_{i,t}$	0.020**	-0.023**	0.007
	(2.49)	(-2.34)	(0.93)
$NOL_{i,t}$	-0.066***	-0.032***	-0.064***
	(-10.41)	(-6.68)	(-13.70)
$INTAN_{i,t}$	0.047***	0.027**	0.024**
	(4.33)	(2.74)	(2.86)
$LEV_{i,t}$	-0.056***	-0.001	-0.085***
	(-4.66)	(-0.06)	(-7.86)
$GP_{i,t}$	-0.004***	-0.003***	-0.003**
	(-3.18)	(-3.05)	(-2.57)
$PPE_{i,t}$	-0.000	-0.007	-0.016*
	(-0.01)	(-0.99)	(-1.88)
$ROA_{i,t}$	0.194***	0.219***	0.228***
	(10.39)	(14.12)	(12.66)
$RND_{i,t}$	-0.107***	-0.124***	-0.072***
	(-4.04)	(-4.94)	(-3.71)
$SALEGR_{i,t}$	-0.012***	0.001	0.003
	(-3.05)	(0.23)	(1.06)
$AD_{i,t}$	-0.014	-0.024	-0.018
	(-0.48)	(-0.98)	(-0.46)
$SIZE_{i,t}$	0.006***	0.007***	0.009***
	(4.33)	(5.68)	(7.32)
$FOR_{i,t}$	0.253**	-0.018	0.293***
	(2.27)	(-0.25)	(2.97)
Intercept	0.236***	0.271***	0.242***
	(22.68)	(30.53)	(31.27)
N	28,513	28,513	28,513
R-sq	0.185	0.260	0.217

This table replicates the quintile regression results of the effect of establishment of income tax convention on multinational firms' tax avoidance. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 14

Quintile Regression of Table 4

Panel B	(1)	(2)	(3)
Variable	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$PostCon_{i,t}$	0.007	-0.003	0.007
	(1.15)	(-0.68)	(1.31)
$LowRETR_{i,t-1}$	-0.106***	-0.124***	-0.118***
	(-15.26)	(-10.23)	(-21.07)
$HighRETR_{i,t-1}$	0.049***	0.046***	0.055***
	(4.96)	(8.32)	(8.84)
$LowRETR_{i,t-1} * PostCon_{i,t}$	0.021*	0.056***	0.039***
	(1.95)	(4.72)	(3.85)
$HighRETR_{i,t-1} * PostCon_{i,t}$	0.011	0.005	0.005
	(1.25)	(0.54)	(0.83)
$CAPX_{i,t}$	-0.136***	0.064	-0.088**
	(-5.16)	(1.38)	(-2.43)
$CNOL_{i,t}$	0.009	-0.014	-0.000
	(0.74)	(-0.82)	(-0.03)
$NOL_{i,t}$	-0.050***	-0.026***	-0.045***
	(-9.31)	(-4.21)	(-9.49)
$INTAN_{i,t}$	0.026**	0.015	0.008
	(2.40)	(1.16)	(0.82)
$LEV_{i,t}$	-0.056***	0.020	-0.063***
	(-4.27)	(1.32)	(-4.74)
$GP_{i,t}$	-0.005*	-0.003	-0.003
	(-1.86)	(-1.32)	(-1.10)
$PPE_{i,t}$	0.000	-0.006	-0.016
	(0.03)	(-0.87)	(-1.57)
$ROA_{i,t}$	0.280***	0.288***	0.301***
	(12.27)	(14.63)	(13.26)
$RND_{i,t}$	-0.169***	-0.126***	-0.080**
	(-5.04)	(-3.85)	(-2.55)
$SALEGR_{i,t}$	-0.009**	-0.004	0.001
	(-2.24)	(-1.04)	(0.25)
$AD_{i,t}$	0.043	-0.013	0.017
	(1.23)	(-0.37)	(0.41)
$SIZE_{i,t}$	0.004*	0.006***	0.007***
	(1.77)	(2.98)	(3.81)
$FOR_{i,t}$	0.198*	-0.105	0.203**
	(2.06)	(-1.59)	(2.30)
Intercept	0.241***	0.259***	0.239***
	(21.03)	(19.22)	(23.08)
N	20,238	20,550	20,027
R-sq	0.157	0.192	0.180

This table replicates the quintile regression results of the effect of establishments of income tax convention on multinational firms' tax avoidance. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

TABLE 15
Other Factors Affecting ETRs

	(1)	(2)	(3)	(4)	(5)	(6)
	$CETR_{i,t}$		$ETR_{i,t}$		$CurrentETR_{i,t}$	
$PostCon_{i,t}$	0.006	-0.003	-0.002	-0.008	0.007	0.001
	(1.26)	(-0.53)	(-0.48)	(-1.20)	(1.48)	(0.13)
$RETR_{i,t-1}$	-0.159***	-0.117***	-0.159***	-0.136***	-0.180***	-0.133***
	(-20.62)	(-15.74)	(-17.54)	(-11.42)	(-28.11)	(-24.90)
$RETR_{i,t-1} * PostCon_{i,t}$	0.027***	0.020*	0.066***	0.058***	0.041***	0.039***
	(3.06)	(2.00)	(6.80)	(5.04)	(3.41)	(3.70)
$CAPX_{i,t}$	-0.064**	-0.113**	0.054**	0.071**	-0.122***	-0.107**
	(-2.12)	(-2.30)	(2.85)	(2.68)	(-3.82)	(-2.64)
$CNOL_{i,t}$	0.287***	0.157***	0.171***	0.111***	0.340***	0.192***
	(14.58)	(4.69)	(4.86)	(4.25)	(9.31)	(4.14)
$NOL_{i,t}$	-0.018***	-0.008	0.005	0.005	-0.006	0.003
	(-3.67)	(-1.56)	(1.52)	(1.41)	(-1.73)	(0.96)
$INTAN_{i,t}$	0.004	0.001	0.020**	0.011	-0.006	-0.011
	(0.29)	(0.03)	(2.12)	(0.79)	(-0.60)	(-0.52)
$LEV_{i,t}$	-0.035**	-0.050**	-0.002	-0.005	-0.062***	-0.071***
	(-2.24)	(-2.76)	(-0.11)	(-0.27)	(-4.81)	(-3.91)
$GP_{i,t}$	-0.044**	-0.045	-0.021	-0.020	-0.013	-0.012
	(-2.22)	(-1.62)	(-1.53)	(-1.09)	(-0.76)	(-0.62)
$PPE_{i,t}$	-0.021**	-0.029**	-0.019***	-0.033***	-0.026***	-0.044***
	(-2.48)	(-2.49)	(-3.32)	(-4.20)	(-3.08)	(-3.69)
$ROA_{i,t}$	-0.305***	-0.169***	-0.089***	-0.023	-0.206***	-0.130***
	(-7.95)	(-4.65)	(-3.67)	(-1.55)	(-6.52)	(-4.34)
$RND_{i,t}$	0.033	-0.016	0.003	-0.068	0.182***	0.194**
	(0.45)	(-0.17)	(0.06)	(-0.98)	(2.93)	(2.51)
$SALEGR_{i,t}$	-0.043***	-0.009	0.008	0.013	0.009	0.018**
	(-4.99)	(-1.26)	(1.12)	(1.54)	(1.14)	(2.14)
$AD_{i,t}$	0.191***	0.153*	0.088**	0.098	0.137***	0.135
	(3.53)	(1.91)	(2.61)	(1.48)	(3.68)	(1.67)
$SIZE_{i,t}$	-0.007***	-0.011***	-0.002	-0.002	-0.002*	-0.005***
	(-4.87)	(-5.55)	(-1.52)	(-1.71)	(-1.97)	(-3.23)
$FOR_{i,t}$	-0.434***	-0.253**	-0.447***	-0.407***	-0.497***	-0.385***
	(-3.88)	(-2.24)	(-5.51)	(-4.52)	(-4.74)	(-3.21)
$GDP\_per_{i,t}$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.47)	(-0.69)	(-1.69)	(-0.41)	(-0.48)	(-0.23)
$STR_{i,t}$	0.000	0.000*	0.000***	0.000*	0.000*	0.000**
	(1.64)	(1.76)	(2.96)	(1.90)	(1.97)	(2.32)
Intercept	0.469***	0.486***	0.404***	0.410***	0.434***	0.451***
	(35.25)	(35.44)	(40.59)	(46.99)	(40.25)	(41.14)
N	28,513	20,238	28,513	20,550	28,513	20,027
R-sq	0.160	0.123	0.235	0.177	0.209	0.157

This table presents the regression results of the effect of the income tax convention on multinationals' tax avoidance. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

APPENDIX A
Variable Definitions

	Dependent variables (Tax Avoidance Proxies)
CETR	Cash taxes paid (*txpd)* divided by pretax book income before special items (*pi-spi*). I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
CETR3	Sum of cash taxes paid (*txpd*) in periods *t* through *t*+2 divided by pretax book income before special items (*pi-spi*) in periods *t* through *t*+2. I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
ETR	Income tax expense (*txt)* divided by pretax book income before special items (*pi-spi*). I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
ETR3	Sum of Income tax expense (*txt*) in periods *t* through *t*+2 divided by pretax book income before special items (*pi-spi*) in periods *t* through *t*+2. I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
CurrentETR	Current tax expense (*txt-txdi*) divided by pretax book income before special items (*pi-spi*). I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
CurrentETR3	Sum of current tax expense (*txt-txdi*) in periods *t* through *t*+2 divided by pretax book income before special items (*pi-spi*) in periods *t* through *t*+2. I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
FED_ETR	Federal income tax expense (*txfed)* divided by pretax domestic income (*pidom*). I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
FED_ETR3	Sum of federal income tax expense (*txfed*) in periods *t* through *t*+2 divided by pretax domestic income (*pidom*) in periods *t* through *t*+2. I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
Foreign_ETR	Foreign income tax expense (*txfo)* divided by pretax foreign income (*pifo*). I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
Foreign_ETR3	Sum of foreign income tax expense (*txfo*) in periods *t* through *t*+2 divided by pretax foreign income (*pifo*) in periods *t* through *t*+2. I require positive values for the numerator and denominator, and ratio values greater than one are reset to one.
Nol_ETRs	I normalize every firm's various effective tax rates by subtracting by a benchmark effective tax rate. The benchmark effective tax rates are the annual averages of effective tax rates calculated the same way as each firm's effective tax rate measure for each firm's size and industry peer group. Size peers are firms in the same quintile of total assets. Industry peers are firms in the same Fama-French 30 industry classification.
	Alternative dependent variables
BTD_BSW	[(U.S. deferred tax + foreign deferred tax)/0.35]/average total assets. (Blaylock, Shevlin, and Wilson 2012)
BTD_HLS	[(Pretax book income – minority interest) – (current federal income tax expense + current foreign income tax expense)/0.35 + change in net operating loss carryforwards]/average total assets. (Hanlon, Laplante, and Shevlin 2005)
BTD_DD	Abnormal total book-tax difference adjusted for earnings management through accruals. (Desai and Dharmapala 2006)
	Independent variables
PostCon	A dummy variable, equal to 1 if the firm has operations in at least one signed tax treaty country in year *t*, 0 otherwise. The year is signed date in Appendix B.

ALT_CON	Natural log of number of convention country a firm has operation in year plus one.
RETR	A dummy variable, equal to 1 if a firm's effective tax rates are ranked in the lowest quintile of the sample within the same industry in year t-1, zero otherwise.
AD	Advertising expense (*xad*) scaled by total asset (*at*)
AGE	The natural logarithm of the difference between the first year when the firm appears in COMPUSTAT and the current year.
CAPX	Ratio of capital expenditures (*capx*) to gross property, plant, and equipment (*ppegt*)
CNOL	Change of net operating loss (*tlcf*)
FOR	Foreign earnings (*pifo*) scaled by total assets (*at*)
GP	Gross profit (*gp*) scaled by sales (*sale*)
INTAN	Intangible assets divided by total assets (*at*)
LEV	Long-term debt (*dltt*) scaled by total assets (*at*)
Mkt to Book	The market-to-book ratio measured as the ratio of the market value to the book value of total assets.
NOL	Indicator variable equal to 1 if the firm reported a net operating loss (*tlcf*) in any year during *t-1* through *t+2,* 0 otherwise
PPE	Property, plant, and equipment (*ppegt*) scaled by the sum of total assets (*at*)
ROA	Return on assets equal to the sum of earnings before tax and special items (*pi-spi*) divided by total assets (*at*)
RND	Indicator equals to 1 if research and development expense (*xrd*) is non-zero and non-missing in any year during *t* to *t+2,* 0 otherwise
SALEGR	Sales growth
SIZE	The natural log of total assets (*at*)
GDP_per	The average GDP per capita of each firm's foreign operation country
STR	The average statutory tax rates of each firm's foreign operation country

APPENDIX B

Panel A List of Convention Countries

Convention Countries	Signed Year	General Effective Date
Austria	May 31, 1996	Jan. 1, 1999
Bangladesh	Sept. 26, 2004	Jan. 1, 2007
Belgium	Nov. 27, 2006	Jan. 1, 2008
Bulgaria	Feb. 23, 2007	Jan. 1, 2009
Chile	Feb. 4, 2010	Jan. 1, 2012
Czech Republic	Sept. 16, 1993	Jan. 1, 1994
Denmark	Jan. 1, 2001	Jan. 1, 2002
Estonia	Nov. 22, 2006	Jan. 1, 2007
France	Aug. 31, 1994	Jan. 1, 1996
Hungary	Feb. 3, 2010	Jan. 1, 2012
Iceland	Oct. 23, 2007	Jan. 1, 2009
Ireland	Jul. 28, 1997	Jan. 1, 1998
Israel	Jan. 26, 1993	Jan. 1, 1995
Italy	Aug. 25, 1999	Jan. 1, 2010
Japan	Nov. 6, 2003	Jan. 1, 2005
Latvia	Nov. 22, 2006	Jan. 1, 2008
Lithuania	Nov. 22, 2006	Jan. 1, 2008
Luxembourg	April. 3, 1996	Jan. 1, 2001
Malta	Aug. 8, 2008	Jan. 1, 2011
Mexico	Sept. 18, 1992	Jan. 1, 1994
Netherlands	Dec. 18, 1992	Jan. 1, 1994
Poland	Feb. 13, 2013	Jan. 1, 2015
Portugal	Sept. 6, 1994	Jan. 1, 1996
Russia	Jun. 27, 1992	Jan. 1, 1994
Slovenia	Jun. 21, 1999	Jan. 1, 2002
South Africa	Feb. 17, 1997	Jan. 1, 1998
Sweden	Sept. 1, 1994	Jan. 1, 1996
Switzerland	Oct. 2, 1996	Jan. 1, 1998
Thailand	Nov. 26, 1996	Jan. 1, 1998
Turkey	Mar. 28, 1996	Jan. 1, 1998
Ukraine	Mar. 4, 1994	Jan. 1, 2001
United Kingdom	Jul. 24, 2001	Jan. 1, 2004
Venezuela	Jan. 25, 1999	Jan. 1, 2000
Vietnam	Jul. 7, 2015	Jan. 1, 2017

This table lists countries that signs income tax convention with the government of United States of America during 1994 to 2018. The data are current as of December 31, 2018 and can be collected from website of United States internal revenue service: 1) https://www.irs.gov/businesses/international-businesses/united-states-income-tax-treaties-a-to-z; 2) https://www.treasury.gov/resource-center/tax-policy/treaties/Pages/treaties.aspx; 3) https://www.state.gov/s/l/treaty/tias/index.htm.
Belgium renew income tax convention in 2006. The previous one is signed in 1970.
Italy renew income tax convention in 1999. The previous one is signed in 1984. The new convention pended for almost 10 years due to issues concerning the exchange of information provision of the treaty. For more information, see https://www.euitalianinternationaltax.com/articles/u-s-italy-tax-treaty/
Japan renew income tax convention in 2003. The previous one is signed in 1971.
Luxembourg renew income tax convention in 1996. The previous one is signed in 1996.
Poland renew income tax convention in 2013. The previous one is signed in 1974.
United Kingdom renew income tax convention in 2001. The previous one is signed in 2001.

Panel B List of Tax Information Exchange Agreement

TIEA Countries	Signed Year
Antigua and Barbuda	Dec. 6, 2000
Aruba	Nov. 21, 2003
Bahamas	Jan. 25, 2002
British Virgin Islands	April 3, 2002
Cayman Islands	Nov. 29, 2013
Gibraltar	Mar. 31, 2009
Guernsey	Sept. 19, 2002
Hong Kong	Jan. 1, 2015
Isle of Man	Oct. 2, 2002
Jersey	Nov. 4, 2002
Netherlands	April 17, 2002
Liechtenstein	Dec. 8, 2008
Monaco	Sept. 8, 2009
Panama	Nov. 30, 2010
Singapore	Nov. 16, 2018

This table lists countries that signs Tax Information Exchange Agreement (TIEA) with the government of United States of America during 1994 to 2018. The data are current as of December 31, 2018 and can be collected from website of United States internal revenue service: 1) https://www.irs.gov/businesses/international-businesses/united-states-income-tax-treaties-a-to-z; 2) https://www.treasury.gov/resource-center/tax-policy/treaties/Pages/treaties.aspx.

Panel C List of Tax Haven Countries

Andorra	Gibraltar	Monaco
Anguilla	Grenada	Montserrat
Antigua and Barbuda	Guernsey and Aldemey	Nauru
Aruba	Ireland	Netherlands Antilles
Bahamas	Isle of Man	Niue
Bahrain	Jersey	Palau
Barbados	Kitts and Nevis	Panama
Belize	Latvia	Samoa
Bermuda	Lebanon	San Marino
Botswana	Liberia	Seychelles
British Virgin Islands	Liechtenstein	Singapore
Brunei Darussalam	Luxembourg	St. Lucia
Cape Verde	Macao	St. Vincent and the Grenadines
Cayman Islands	Macau	Switzerland
Cook Islands	Maldives	U.S. Virgin Islands
Costa Rica	Malta	Uruguay
Cyprus	Marshall Islands	Vanuatu
Dominica	Mauritius	

This table presents the countries that are identified in Dyreng and Lindsey 2009 as Tax Haven countries. They are found in following sources: (1) Organization for Economic Cooperation and Development (OECD). (2) the U.S. Stop Tax Havens Abuse Act. (3) The International Monetary Fund (IMF), and (4) the Tax Research Organization.

APPENDIX C

Panel A

The effect of income convention on effective tax rates for U.S. multinationals
Using benchmarked effective tax rates

	(1)	(2)	(3)	(4)	(5)	(6)
	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$PostCon_{i,t}$	0.002	0.009*	-0.003	-0.005	0.006	0.010*
	(0.55)	(1.89)	(-0.89)	(-1.13)	(1.20)	(1.98)
$RETR_{i,t-1}$	-0.122***	-0.083***	-0.145***	-0.127***	-0.113***	-0.092***
	(-17.71)	(-11.66)	(-14.06)	(-12.09)	(-15.32)	(-15.06)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.025*****	**0.020****	**0.062*****	**0.057*****	**0.017****	**0.017***
	(3.07)	**(2.19)**	**(5.42)**	**(4.92)**	**(2.34)**	**(1.96)**
$CAPX_{i,t}$	-0.075***	-0.134***	0.054*	0.026	-0.098***	-0.105***
	(-3.09)	(-6.72)	(1.75)	(0.56)	(-3.73)	(-3.29)
$CNOL_{i,t}$	0.013*	0.006	-0.027***	-0.017	-0.001	-0.006
	(1.75)	(0.48)	(-4.43)	(-1.30)	(-0.22)	(-0.54)
$NOL_{i,t}$	-0.066***	-0.050***	-0.029***	-0.022***	-0.062***	-0.042***
	(-8.61)	(-8.08)	(-4.87)	(-3.46)	(-10.85)	(-7.62)
$INTAN_{i,t}$	0.034**	0.015	0.022*	0.012	0.009	-0.003
	(2.63)	(1.31)	(2.03)	(0.84)	(1.07)	(-0.32)
$LEV_{i,t}$	-0.053***	-0.043***	-0.002	0.016	-0.078***	-0.063***
	(-4.49)	(-3.29)	(-0.27)	(1.02)	(-6.84)	(-4.69)
$GP_{i,t}$	-0.004***	-0.004	-0.002**	-0.002	-0.002*	-0.001
	(-3.13)	(-1.74)	(-2.39)	(-0.88)	(-2.04)	(-0.75)
$PPE_{i,t}$	-0.001	-0.001	-0.009	-0.007	-0.019**	-0.019
	(-0.22)	(-0.06)	(-1.35)	(-1.18)	(-2.45)	(-1.73)
$ROA_{i,t}$	0.193***	0.263***	0.207***	0.261***	0.222***	0.273***
	(13.27)	(13.54)	(23.21)	(19.99)	(17.44)	(14.73)
$RND_{i,t}$	-0.136***	-0.196***	-0.151***	-0.157***	-0.092***	-0.108***
	(-6.21)	(-6.68)	(-8.47)	(-7.52)	(-5.10)	(-5.05)
$SALEGR_{i,t}$	-0.019***	-0.013***	-0.007***	-0.009***	-0.004	-0.003
	(-5.48)	(-3.85)	(-4.16)	(-2.94)	(-1.21)	(-0.92)
$AD_{i,t}$	-0.016	0.012	-0.024	-0.002	-0.023	0.017
	(-0.58)	(0.37)	(-0.73)	(-0.07)	(-0.62)	(0.42)
$SIZE_{i,t}$	-0.013***	-0.006***	-0.014***	-0.013***	-0.010***	-0.010***
	(-6.62)	(-4.69)	(-9.89)	(-7.91)	(-8.17)	(-5.80)
$FOR_{i,t}$	0.245**	0.176*	-0.053	-0.118	0.218**	0.151*
	(2.58)	(1.97)	(-0.74)	(-1.60)	(2.16)	(1.77)
Intercept	0.111***	0.095***	0.161***	0.128***	0.163***	0.128***
	(8.68)	(11.73)	(16.33)	(12.33)	(18.33)	(10.97)
N	28,513	20,238	28,513	20,550	28,513	20,027
R-sq	0.129	0.094	0.165	0.119	0.138	0.112

This appendix presents the regression results of the effect of the income tax convention on multinationals' unadjusted effective tax rates. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

Panel B

The effect of income convention on domestic and foreign effective tax rates for U.S. multinationals
Using benchmarked effective tax rates

	(1)	(2)	(3)	(4)
Variable	$\boldsymbol{FEDETR_{i,t}}$	$\boldsymbol{FEDETR3_{i,t}}$	$\boldsymbol{Foreign\_ETR_{i,t}}$	$\boldsymbol{Foreign\_ETR3_{i,t}}$
$PostCon_{i,t}$	0.001	0.004	0.008*	0.016***
	(0.30)	(1.25)	(1.98)	(3.54)
$RETR_{i,t}$	-0.095***	-0.079***	-0.128***	-0.110***
	(-6.71)	(-6.31)	(-11.70)	(-10.49)
$RETR_{i,t-1} * PostCon_{i,t}$	**-0.009**	**0.003**	**0.029****	**0.022****
	(-0.61)	**(0.21)**	**(3.23)**	**(2.67)**
$CAPX_{i,t}$	-0.041	-0.064	-0.237***	-0.187***
	(-0.82)	(-1.05)	(-5.78)	(-3.63)
$CNOL_{i,t}$	0.001	0.013	-0.020	-0.007
	(0.10)	(1.03)	(-1.48)	(-0.45)
$NOL_{i,t}$	-0.046***	-0.029**	-0.011	-0.011
	(-3.74)	(-2.65)	(-1.68)	(-1.29)
$INTAN_{i,t}$	0.006	-0.002	0.056***	0.036*
	(0.49)	(-0.10)	(3.45)	(1.97)
$LEV_{i,t}$	-0.117***	-0.098***	0.031	0.073**
	(-8.85)	(-4.81)	(1.67)	(2.55)
$GP_{i,t}$	-0.006**	-0.010**	0.000	-0.003
	(-2.23)	(-2.57)	(0.01)	(-0.86)
$PPE_{i,t}$	-0.008	-0.018	0.012	0.023*
	(-0.77)	(-1.45)	(1.59)	(1.96)
$ROA_{i,t}$	0.150***	0.304***	0.063***	0.085**
	(10.64)	(9.51)	(4.11)	(2.43)
$RND_{i,t}$	-0.153***	-0.094***	-0.010	-0.102
	(-5.24)	(-3.24)	(-0.14)	(-1.08)
$SALEGR_{i,t}$	-0.001	-0.012	-0.014*	-0.005
	(-0.11)	(-1.51)	(-2.02)	(-0.71)
$AD_{i,t}$	0.119*	0.119	-0.026	-0.021
	(1.83)	(1.41)	(-0.22)	(-0.16)
$SIZE_{i,t}$	-0.000	-0.002	-0.008***	-0.007***
	(-0.15)	(-1.21)	(-4.33)	(-4.22)
$FOR_{i,t}$	0.205***	0.038	0.218**	-0.015
	(3.99)	(0.37)	(2.32)	(-0.27)
Intercept	0.082***	0.064***	0.071***	0.056***
	(5.66)	(4.17)	(5.55)	(3.62)
N	17,106	12,369	17,106	10,297
R-sq	0.089	0.080	0.050	0.039

This table presents the regression results of the effect of the income tax convention on multinationals' unadjusted domestic and foreign effective tax rates. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

Panel C

Re-estimate of Equation (1) using propensity matched sample by size, year, and RETR

	(1)	(2)	(3)	(4)	(5)	(6)
	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$PostCon_{i,t}$	0.007	0.012	-0.001	0.000	0.007	0.009
	(0.88)	(1.72)	(-0.41)	(0.04)	(0.86)	(1.32)
$RETR_{i,t-1}$	-0.111***	-0.065***	-0.153***	-0.142***	-0.106***	-0.078***
	(-7.30)	(-6.24)	(-9.20)	(-7.03)	(-8.59)	(-5.53)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.033****	**0.014**	**0.059*****	**0.065*****	**0.028*****	**0.026****
	(2.71)	**(1.09)**	**(3.62)**	**(3.63)**	**(3.48)**	**(2.26)**
$CAPX_{i,t}$	-0.126***	-0.280***	0.070	0.130*	-0.163***	-0.172**
	(-3.51)	(-4.67)	(1.69)	(1.84)	(-3.22)	(-2.70)
$CNOL_{i,t}$	0.032*	0.010	-0.031*	-0.043**	0.009	-0.036
	(2.06)	(0.37)	(-1.78)	(-2.37)	(0.74)	(-1.58)
$NOL_{i,t}$	-0.046***	-0.029***	-0.006	-0.005	-0.040***	-0.020**
	(-7.31)	(-3.99)	(-1.05)	(-0.69)	(-6.95)	(-2.56)
$INTAN_{i,t}$	0.058***	0.034	0.048***	0.033**	0.028**	-0.001
	(4.89)	(1.42)	(3.82)	(2.26)	(2.21)	(-0.05)
$LEV_{i,t}$	-0.075***	-0.099***	-0.018	-0.009	-0.103***	-0.085***
	(-5.48)	(-5.38)	(-1.20)	(-0.55)	(-7.63)	(-3.22)
$GP_{i,t}$	-0.008**	-0.013*	-0.006**	-0.006*	-0.006**	-0.005
	(-2.56)	(-1.89)	(-2.41)	(-1.86)	(-2.16)	(-0.94)
$PPE_{i,t}$	0.005	0.016	-0.006	-0.003	-0.018	-0.023
	(0.44)	(1.37)	(-0.86)	(-0.28)	(-1.63)	(-1.61)
$ROA_{i,t}$	0.269***	0.369***	0.312***	0.380***	0.335***	0.418***
	(10.02)	(9.57)	(19.66)	(11.97)	(11.48)	(10.13)
$RND_{i,t}$	-0.204***	-0.275***	-0.230***	-0.302***	-0.122***	-0.197***
	(-6.22)	(-9.07)	(-8.70)	(-10.60)	(-4.74)	(-4.64)
$SALEGR_{i,t}$	-0.023***	-0.014*	-0.003	-0.010*	0.003	-0.010
	(-4.03)	(-2.08)	(-0.64)	(-1.76)	(0.43)	(-1.02)
$AD_{i,t}$	0.021	0.058	-0.069**	-0.123	-0.024	0.069
	(0.37)	(0.65)	(-2.41)	(-1.74)	(-0.52)	(0.52)
$SIZE_{i,t}$	0.002	-0.002	0.003*	0.001	0.005***	0.001
	(1.32)	(-0.84)	(1.75)	(0.23)	(3.20)	(0.48)
$FOR_{i,t}$	0.100	0.072	-0.239**	-0.267**	0.095	-0.006
	(0.82)	(0.66)	(-2.54)	(-2.76)	(0.72)	(-0.05)
Intercept	0.257***	0.280***	0.295***	0.283***	0.273***	0.282***
	(19.14)	(16.72)	(20.52)	(16.10)	(24.78)	(15.72)
N	16,020	12,060	15,947	12,189	15,986	12,005
R-sq	0.155	0.124	0.193	0.152	0.170	0.135

This appendix presents the regression results of the effect of the income tax convention on multinationals' effective tax rates based on propensity score matching sample. The sample is matched on size, year, and RETR. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

Panel D

The intensity difference of convention on effective tax rates of U.S. multinationals

	(1)	(2)	(3)	(4)	(5)	(6)
	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$PostCon_{i,t}$	0.005	0.008	-0.010	-0.008	0.012*	0.008
	(0.51)	(0.70)	(-1.55)	(-1.17)	(1.85)	(1.03)
$RETR_{i,t-1}$	-0.105***	-0.073***	-0.146***	-0.126***	-0.173***	-0.126***
	(-14.59)	(-15.57)	(-17.81)	(-11.14)	(-27.71)	(-19.95)
$RETR_{i,t-1} * PostCon_{i,t}$	**0.035****	**0.032***	**0.108*****	**0.107*****	**0.054***	**0.056****
	(2.33)	**(1.80)**	**(7.58)**	**(5.08)**	**(2.03)**	**(2.22)**
$CAPX_{i,t}$	-0.082**	-0.158***	0.096***	0.066	-0.081**	-0.104**
	(-2.86)	(-5.51)	(2.96)	(1.41)	(-2.28)	(-2.67)
$CNOL_{i,t}$	0.020**	0.008	-0.025**	-0.015	0.007	-0.000
	(2.41)	(0.71)	(-2.58)	(-0.94)	(0.87)	(-0.02)
$NOL_{i,t}$	-0.069***	-0.053***	-0.033***	-0.026***	-0.067***	-0.046***
	(-10.88)	(-10.04)	(-6.18)	(-4.40)	(-14.69)	(-10.04)
$INTAN_{i,t}$	0.047***	0.026**	0.032***	0.019	0.023**	0.005
	(4.24)	(2.21)	(3.22)	(1.48)	(2.64)	(0.50)
$LEV_{i,t}$	-0.057***	-0.056***	0.007	0.026	-0.089***	-0.066***
	(-4.34)	(-4.02)	(0.72)	(1.66)	(-7.12)	(-4.69)
$GP_{i,t}$	-0.004***	-0.004	-0.003***	-0.003	-0.003**	-0.002
	(-3.04)	(-1.70)	(-3.08)	(-1.29)	(-2.40)	(-0.99)
$PPE_{i,t}$	-0.000	0.000	-0.010	-0.008	-0.019**	-0.019*
	(-0.01)	(0.02)	(-1.28)	(-1.22)	(-2.16)	(-1.78)
$ROA_{i,t}$	0.192***	0.276***	0.222***	0.289***	0.232***	0.304***
	(9.91)	(11.89)	(13.98)	(14.67)	(12.40)	(13.37)
$RND_{i,t}$	-0.113***	-0.174***	-0.134***	-0.137***	-0.072***	-0.080**
	(-4.11)	(-5.10)	(-4.66)	(-3.72)	(-3.56)	(-2.64)
$SALEGR_{i,t}$	-0.013***	-0.010**	0.001	-0.004	0.003	0.001
	(-3.34)	(-2.66)	(0.18)	(-1.01)	(0.92)	(0.20)
$AD_{i,t}$	-0.010	0.050	-0.023	-0.008	-0.000	0.029
	(-0.31)	(1.34)	(-0.89)	(-0.24)	(-0.01)	(0.66)
$SIZE_{i,t}$	0.006***	0.005**	0.006***	0.005**	0.010***	0.008***
	(4.96)	(2.31)	(4.41)	(2.69)	(8.84)	(4.66)
$FOR_{i,t}$	0.229*	0.188*	-0.096	-0.155**	0.253**	0.179*
	(1.93)	(1.81)	(-1.30)	(-2.30)	(2.31)	(1.80)
Intercept	0.250***	0.258***	0.289***	0.273***	0.265***	0.255***
	(27.45)	(23.02)	(35.14)	(22.32)	(35.76)	(26.15)
N	28,513	20,238	28,513	20,550	28,513	20,027
R-sq	0.176	0.148	0.229	0.174	0.206	0.155

This appendix presents the regression results of the effect of the income tax convention on multinationals' effective tax rates based on propensity score matched sample. The sample is matched on size, year, and RETR. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

Panel E

Estimates of the effect of income convention on effective tax rates for U.S. multinationals
With different controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$CETR_{i,t}$				$CETR3_{i,t}$			
$PostCon_{i,t}$	0.014***	0.007**	0.008*	0.010**	-0.010***	-0.001	0.000	0.002
	(6.36)	(2.36)	(2.01)	(2.12)	(-4.23)	(-0.27)	(0.03)	(0.39)
$RETR_{i,t}$		-0.166***	-0.164***	-0.160***		-0.125***	-0.122***	-0.117***
		(-44.78)	(-35.96)	(-20.46)		(-28.52)	(-28.58)	(-16.02)
$RETR_{i,t-1} * PostCon_{i,t}$		0.029***	0.028***	0.027***		0.022***	0.023***	0.020*
		(4.91)	(4.56)	(3.03)		(3.19)	(4.12)	(1.96)
$CAPX_{i,t}$		-0.018	-0.084***	-0.063*		-0.058**	-0.130**	-0.112**
		(-0.76)	(-3.99)	(-2.07)		(-2.06)	(-2.75)	(-2.26)
$CNOL_{i,t}$		0.275***	0.284***	0.288***		0.139***	0.155***	0.157***
		(9.40)	(8.49)	(14.60)		(3.89)	(4.46)	(4.64)
$NOL_{i,t}$		-0.023***	-0.017***	-0.018***		-0.009***	-0.006	-0.008
		(-8.83)	(-4.83)	(-3.65)		(-3.12)	(-1.73)	(-1.56)
$INTAN_{i,t}$		-0.014*	0.004	0.005		-0.017*	-0.001	0.002
		(-1.86)	(0.35)	(0.34)		(-1.93)	(-0.04)	(0.08)
$LEV_{i,t}$		-0.007	-0.032***	-0.035**		-0.022**	-0.043***	-0.050**
		(-0.82)	(-3.04)	(-2.23)		(-2.21)	(-3.66)	(-2.75)
$GP_{i,t}$		-0.040***	-0.034***	-0.044**		-0.043***	-0.034***	-0.046
		(-5.97)	(-5.76)	(-2.22)		(-5.53)	(-4.31)	(-1.61)
$PPE_{i,t}$		-0.032***	-0.022***	-0.021**		-0.037***	-0.029***	-0.029**
		(-7.52)	(-4.69)	(-2.50)		(-7.68)	(-4.44)	(-2.48)
$ROA_{i,t}$		-0.294***	-0.299***	-0.304***		-0.146***	-0.164***	-0.169***
		(-16.83)	(-9.09)	(-7.94)		(-7.35)	(-7.41)	(-4.64)
$RND_{i,t}$		-0.003	-0.046	0.035		-0.061*	-0.106	-0.013
		(-0.10)	(-0.62)	(0.49)		(-1.69)	(-1.49)	(-0.14)
$SALEGR_{i,t}$		-0.040***	-0.044***	-0.043***		-0.001	-0.009	-0.009
		(-10.94)	(-5.08)	(-5.01)		(-0.28)	(-1.33)	(-1.27)
$AD_{i,t}$		0.224***	0.259***	0.191***		0.188***	0.219***	0.153*
		(6.08)	(8.99)	(3.52)		(4.61)	(5.05)	(1.90)
$SIZE_{i,t}$		-0.008***	-0.007***	-0.007***		-0.011***	-0.010***	-0.011***
		(-12.18)	(-7.05)	(-5.02)		(-14.34)	(-7.66)	(-5.54)
$FOR_{i,t}$		-0.466***	-0.455***	-0.438***		-0.276***	-0.275***	-0.257**
		(-11.90)	(-8.02)	(-3.87)		(-6.36)	(-5.10)	(-2.22)
Time FE	No	No	Yes	Yes	No	No	Yes	Yes
Industry FE	No	No	No	Yes	No	No	No	Yes
Cons	0.278***	0.482***	0.468***	0.471***	0.319***	0.489***	0.483***	0.488***
	(201.25)	(90.31)	(53.27)	(34.56)	(207.58)	(79.46)	(60.50)	(34.13)
N	41103	28513	28513	28513	28166	20238	20238	20238
R-sq	0.001	0.140	0.155	0.160	0.001	0.092	0.113	0.123

This appendix presents the regression results of the effect of the income tax convention on multinationals' effective tax rates. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

Panel E (cont.)
Estimates of the effect of income convention on effective tax rates for U.S. multinationals
With different controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		$ETR_{i,t}$				$ETR3_{i,t}$		
$PostCon_{i,t}$	0.003*	-0.006***	-0.003	-0.001	-0.013***	-0.008***	-0.006***	-0.003
	(1.88)	(-3.18)	(-1.62)	(-0.33)	(-6.76)	(-3.67)	(-3.23)	(-0.65)
$RETR_{i,t}$		-0.162***	-0.162***	-0.160***		-0.139***	-0.139***	-0.136***
		(-66.10)	(-36.05)	(-17.48)		(-43.34)	(-27.05)	(-11.42)
$RETR_{i,t-1}$ $* PostCon_{i,t}$		0.068***	0.066***	0.066***		0.060***	0.059***	0.058***
		(19.06)	(11.93)	(6.74)		(13.06)	(9.43)	(5.04)
$CAPX_{i,t}$		0.100***	0.062***	0.054**		0.136***	0.085***	0.072**
		(6.62)	(5.25)	(2.87)		(6.93)	(3.73)	(2.71)
$CNOL_{i,t}$		0.173***	0.170***	0.171***		0.108***	0.110***	0.111***
		(9.41)	(4.92)	(4.84)		(4.36)	(3.60)	(4.27)
$NOL_{i,t}$		-0.002	0.006***	0.005		-0.001	0.006***	0.005
		(-1.34)	(3.14)	(1.48)		(-0.55)	(3.55)	(1.42)
$INTAN_{i,t}$		0.001	0.022**	0.020**		-0.010*	0.012	0.012
		(0.20)	(2.27)	(2.19)		(-1.66)	(1.41)	(0.84)
$LEV_{i,t}$		0.019***	-0.004	-0.001		0.018**	-0.007	-0.005
		(3.45)	(-0.73)	(-0.09)		(2.55)	(-0.84)	(-0.26)
$GP_{i,t}$		-0.009**	-0.005	-0.022		-0.008	-0.003	-0.021
		(-2.07)	(-1.59)	(-1.56)		(-1.49)	(-0.54)	(-1.08)
$PPE_{i,t}$		-0.026***	-0.019***	-0.019***		-0.041***	-0.034***	-0.033***
		(-9.64)	(-5.54)	(-3.29)		(-11.85)	(-6.26)	(-4.20)
$ROA_{i,t}$		-0.098***	-0.094***	-0.088***		-0.027*	-0.028*	-0.022
		(-8.85)	(-4.46)	(-3.63)		(-1.90)	(-1.81)	(-1.51)
$RND_{i,t}$		-0.032*	-0.066	0.005		-0.105***	-0.144**	-0.066
		(-1.66)	(-1.30)	(0.08)		(-4.12)	(-2.85)	(-0.94)
$SALEGR_{i,t}$		0.013***	0.009	0.008		0.020***	0.015*	0.013
		(5.63)	(1.58)	(1.12)		(6.57)	(1.92)	(1.53)
$AD_{i,t}$		0.064***	0.081***	0.088**		0.061**	0.078**	0.098
		(2.76)	(5.25)	(2.59)		(2.12)	(2.15)	(1.48)
$SIZE_{i,t}$		-0.003***	-0.001	-0.002		-0.003***	-0.002*	-0.002
		(-6.25)	(-1.13)	(-1.48)		(-5.33)	(-1.93)	(-1.69)
$FOR_{i,t}$		-0.503***	-0.478***	-0.452***		-0.460***	-0.433***	-0.409***
		(-20.04)	(-10.83)	(-5.62)		(-14.69)	(-11.23)	(-4.50)
Time FE	No	No	Yes	Yes	No	No	Yes	Yes
Industry FE	No	No	No	Yes	No	No	No	Yes
Cons	0.336***	0.417***	0.398***	0.406***	0.351***	0.418***	0.403***	0.412***
	(339.44)	(123.98)	(47.39)	(39.22)	(297.74)	(96.11)	(62.65)	(45.50)
N	41103	28513	28513	28513	28702	20550	20550	20550
R-sq	0.000	0.209	0.227	0.234	0.002	0.150	0.167	0.177

This appendix presents the regression results of the effect of the income tax convention on multinationals' effective tax rates with different controls. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

Panel E (cont.)
Estimates of the effect of income convention on effective tax rates for U.S. multinationals
With different controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		$CurrentETR_{i,t}$				$CurrentETR3_{i,t}$		
$PostCon_{i,t}$	0.023***	0.007***	0.009***	0.012***	0.002	0.002	0.004	0.007
	(11.23)	(2.83)	(3.74)	(3.11)	(0.81)	(0.60)	(1.34)	(1.39)
$RETR_{i,t}$		-0.186***	-0.185***	-0.181***		-0.140***	-0.139***	-0.133***
		(-57.38)	(-35.57)	(-28.01)		(-35.43)	(-29.11)	(-24.80)
$RETR_{i,t-1} * PostCon_{i,t}$		0.043***	0.043***	0.041***		0.040***	0.042***	0.039***
		(8.40)	(8.36)	(3.41)		(6.57)	(7.45)	(3.69)
$CAPX_{i,t}$		-0.054**	-0.121***	-0.121***		-0.029	-0.099**	-0.106**
		(-2.58)	(-4.69)	(-3.76)		(-1.13)	(-2.53)	(-2.58)
$CNOL_{i,t}$		0.333***	0.338***	0.340***		0.183***	0.192***	0.192***
		(13.02)	(8.24)	(9.28)		(5.61)	(4.19)	(4.18)
$NOL_{i,t}$		-0.014***	-0.005**	-0.006		-0.001	0.005	0.004
		(-6.06)	(-2.49)	(-1.69)		(-0.49)	(1.63)	(0.97)
$INTAN_{i,t}$		-0.028***	-0.003	-0.005		-0.034***	-0.012	-0.009
		(-4.20)	(-0.37)	(-0.50)		(-4.32)	(-1.00)	(-0.45)
$LEV_{i,t}$		-0.035***	-0.064***	-0.062***		-0.045***	-0.070***	-0.070***
		(-4.69)	(-8.08)	(-4.78)		(-4.88)	(-7.63)	(-3.88)
$GP_{i,t}$		-0.008	-0.002	-0.013		-0.009	-0.001	-0.012
		(-1.35)	(-0.34)	(-0.76)		(-1.33)	(-0.20)	(-0.62)
$PPE_{i,t}$		-0.038***	-0.029***	-0.026***		-0.055***	-0.047***	-0.044***
		(-10.34)	(-6.36)	(-3.09)		(-12.59)	(-5.53)	(-3.67)
$ROA_{i,t}$		-0.207***	-0.206***	-0.206***		-0.121***	-0.129***	-0.130***
		(-13.56)	(-7.07)	(-6.49)		(-6.81)	(-6.44)	(-4.31)
$RND_{i,t}$		0.164***	0.115*	0.184***		0.169***	0.120	0.198**
		(6.15)	(1.91)	(2.94)		(5.29)	(1.66)	(2.54)
$SALEGR_{i,t}$		0.013***	0.009*	0.009		0.027***	0.018***	0.018**
		(4.13)	(1.95)	(1.13)		(6.89)	(2.97)	(2.16)
$AD_{i,t}$		0.190***	0.220***	0.137***		0.204***	0.227***	0.135
		(5.92)	(7.51)	(3.67)		(5.56)	(5.49)	(1.67)
$SIZE_{i,t}$		-0.004***	-0.002**	-0.002*		-0.006***	-0.005***	-0.005***
		(-6.63)	(-2.73)	(-1.90)		(-9.13)	(-5.44)	(-3.20)
$FOR_{i,t}$		-0.564***	-0.537***	-0.499***		-0.450***	-0.428***	-0.388***
		(-16.52)	(-13.82)	(-4.69)		(-11.60)	(-9.25)	(-3.17)
Time FE	No	No	Yes	Yes	No	No	Yes	Yes
Industry FE	No	No	No	Yes	No	No	No	Yes
Cons	0.304***	0.454***	0.434***	0.435***	0.336***	0.463***	0.451***	0.452***
	(238.26)	(97.89)	(63.54)	(39.37)	(233.81)	(84.09)	(81.61)	(39.68)
N	41103	28513	28513	28513	27775	20027	20027	20027
R-sq	0.003	0.185	0.203	0.209	0.000	0.127	0.147	0.157

This appendix presents the regression results of the effect of the income tax convention on multinationals' effective tax rates with different controls. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

	Panel F *Dynamic Regression*					
	(1)	(2)	(3)	(4)	(5)	(6)
	$\boldsymbol{CETR_{i,t}}$	$\boldsymbol{ETR_{i,t}}$	$\boldsymbol{CurrentETR_{i,t}}$	$\boldsymbol{CETR3_{i,t}}$	$\boldsymbol{ETR3_{i,t}}$	$\boldsymbol{CurrentETR3_{i,t}}$
$PostCon_{i,t-2}$	-0.016	-0.005	-0.002	0.006	-0.003	-0.024***
	(-1.71)	(-0.74)	(-0.63)	(1.13)	(-0.53)	(-2.98)
$PostCon_{i,t-1}$	0.000	-0.005	0.003	-0.003	0.002	0.008
	(0.04)	(-1.02)	(0.64)	(-0.68)	(0.24)	(0.92)
$PostCon_{i,t}$	0.008	-0.003	-0.001	-0.011***	0.011**	0.007
	(1.49)	(-0.95)	(-0.41)	(-3.10)	(2.72)	(1.17)
$PostCon_{i,t+1}$	0.017**	0.001	0.006	0.010**	0.019**	0.005
	(2.44)	(0.31)	(1.16)	(2.28)	(2.73)	(0.58)
$PostCon_{i,t+2}$	-0.001	0.000	-0.002	0.007*	0.001	-0.006
	(-0.06)	(0.01)	(-0.56)	(1.94)	(0.05)	(-0.72)
$RETR_{i,t-1}$	-0.162***	-0.188***	-0.163***	-0.174***	-0.183***	-0.136***
	(-21.76)	(-34.45)	(-17.47)	(-22.16)	(-27.44)	(-20.48)
$RETR_{i,t-1} * PostCon_{i,t-2}$	0.050*	0.035*	0.051***	0.042***	0.026	0.031
	(1.76)	(1.90)	(4.82)	(3.36)	(1.24)	(1.20)
$RETR_{i,t-1} * PostCon_{i,t-1}$	**0.041****	**0.024***	**0.065*****	**0.057*****	**0.055*****	**0.029**
	(2.21)	**(2.07)**	**(5.15)**	**(4.24)**	**(3.95)**	**(1.15)**
$RETR_{i,t-1} * PostCon_{i,t}$	**0.031*****	**0.029*****	**0.068*****	**0.060*****	**0.046*****	**0.042*****
	(3.15)	**(4.11)**	**(6.63)**	**(7.59)**	**(3.72)**	**(3.74)**
$RETR_{i,t-1} * PostCon_{i,t+1}$	-0.023	-0.013	0.009	0.017	-0.057***	-0.031**
	(-0.92)	(-1.12)	(0.80)	(1.53)	(-4.24)	(-2.13)
$RETR_{i,t-1} * PostCon_{i,t+2}$	-0.018	-0.010	0.037***	0.015*	0.014	0.017
	(-1.00)	(-1.26)	(6.17)	(1.99)	(0.69)	(0.61)
$CAPX_{i,t}$	-0.063*	-0.121***	0.053**	0.013	-0.122***	-0.105**
	(-2.00)	(-5.98)	(2.71)	(0.53)	(-3.81)	(-2.56)
$CNOL_{i,t}$	0.287***	0.090*	0.170***	0.056*	0.340***	0.192***
	(13.96)	(2.00)	(4.78)	(1.85)	(9.07)	(4.09)
$NOL_{i,t}$	-0.018***	-0.019***	0.005	-0.008**	-0.006	0.004
	(-3.51)	(-6.34)	(1.40)	(-2.16)	(-1.52)	(0.86)
$INTAN_{i,t}$	0.005	0.001	0.020**	0.002	-0.006	-0.009
	(0.32)	(0.11)	(2.12)	(0.19)	(-0.53)	(-0.44)
$LEV_{i,t}$	-0.035**	-0.050***	-0.002	-0.033***	-0.062***	-0.070***
	(-2.25)	(-5.31)	(-0.10)	(-3.05)	(-4.66)	(-3.87)
$GP_{i,t}$	-0.044**	-0.031**	-0.021	-0.014	-0.012	-0.012
	(-2.19)	(-2.13)	(-1.55)	(-1.11)	(-0.74)	(-0.59)
$PPE_{i,t}$	-0.021**	-0.003	-0.019***	-0.009	-0.026***	-0.044***
	(-2.39)	(-0.46)	(-3.13)	(-1.36)	(-3.01)	(-3.56)
$ROA_{i,t}$	-0.305***	-0.118***	-0.090***	-0.017	-0.207***	-0.129***
	(-7.80)	(-4.74)	(-3.70)	(-0.97)	(-6.50)	(-4.33)
$RND_{i,t}$	0.033	-0.157***	-0.000	-0.164***	0.182***	0.195**
	(0.46)	(-3.99)	(-0.01)	(-4.40)	(2.91)	(2.50)
$SALEGR_{i,t}$	-0.043***	-0.026***	0.008	-0.003	0.009	0.018*
	(-4.70)	(-7.15)	(1.12)	(-0.70)	(1.03)	(2.04)

$AD_{i,t}$	0.191***	0.078**	0.087**	-0.007	0.137***	0.134
	(3.52)	(2.16)	(2.53)	(-0.20)	(3.69)	(1.67)
$SIZE_{i,t}$	-0.007***	-0.007***	-0.002	-0.001	-0.002*	-0.005***
	(-5.02)	(-7.91)	(-1.35)	(-0.59)	(-1.80)	(-3.07)
$FOR_{i,t}$	-0.434***	-0.178**	-0.454***	-0.149*	-0.498***	-0.389***
	(-3.85)	(-2.33)	(-5.63)	(-1.87)	(-4.71)	(-3.18)
Cons	0.471***	0.418***	0.406***	0.385***	0.435***	0.453***
	(34.57)	(37.18)	(37.76)	(44.91)	(38.09)	(37.13)
N	28513	27172	28513	27778	28513	20027
R-sq	0.161	0.335	0.236	0.301	0.210	0.157

This table presents the dynamic regression results of the effect of the income tax convention on multinationals' tax avoidance. Industry and year fixed effects are included. Standard errors are computed after clustering by industry and year. *, **, *** Denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively The two-tailed t-statistics are reported in parentheses. Coefficients and t-statistics of interest are in bold. All of the variables are defined in Appendix A.

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