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Loss expectation and income shifting

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ABSTRACT

This study examines the effects of expected losses on the income-shifting strategies of multinational corporations (MNCs). Using a set of worldwide MNC affiliates, this study first finds empirical evidence for ex ante adjustments of income-shifting strategies according to reverse incentives for potential losses. The results also support the existence of limited flexibility introduced by Hopland et al. (2018, 2021). Second, the estimates of income shifting measured using expected tax rate differences reveal that the traditional methodology of using statutory tax rate differences is subject to an estimation bias. This estimation bias varies depending on the loss expectation status and tax-rate levels of the affiliates.

1. Introduction

Multinational corporations (MNCs) have incentives to reduce their worldwide tax burden using tax-motivated income shifting, in which income is shifted from a high-tax-rate affiliate to a low-tax-rate affiliate. Since the revelation of tax scandals in which large MNCs used aggressive income-shifting strategies to report very low effective tax rates on overseas profits, a substantial body of literature has examined tax-motivated income shifting by profitable affiliates (Beer et al., 2018; Clausing, 2003; Bernard et al., 2006; Huizinga and Laeven, 2008; Clausing, 2009; Dharmapala, 2014; Cristea and Nguyen, 2016; Davies et al., 2018; Dyreng and Markle, 2016; Tørsløv et al., 2020). Researchers have recently begun shedding light on the role of losses in the income-shifting strategies of MNCs (Gramlich et al., 2004; Onji and Vera, 2010; De Simone et al., 2017). Because the marginal tax rate of affiliates with losses is significantly lower than the statutory tax rate, loss affiliates have 'reverse incentives' to shift out less income (De Simone et al., 2017) or even to shift income into their jurisdictions from outside (Klassen et al., 1993) to benefit from losses.

Hopland et al. (2018) examine the influence of 'flexibility' on the income-shifting strategies of loss affiliates. Flexibility indicates the ability of an MNC to adjust its income-shifting strategy to the optimal level after profit and loss status is determined. If affiliates have full flexibility, they can immediately and freely adjust their income-shifting strategy once they decide to report losses at the end of the fiscal year (*ex post* adjustment). If affiliates are under limited flexibility, they will adjust their income-shifting strategies in advance of the determination of profit and loss status in the early period of the fiscal year (*ex ante* adjustment). To execute *ex ante* adjustment, affiliates take into account the possibility of incurring losses in the future. Hopland et al. (2018) find high flexibility in transfer prices and significantly limited flexibility in internal debts. However, while Hopland et al. (2018) find both flexibility and inflexibility of MNCs by observing the *ex post* adjustment of

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affiliates with current losses, they do not directly test whether and to what extent MNCs make *ex ante* adjustments according to loss expectation. The present study fills this void by scrutinizing the effects of loss expectation on tax-motivated income shifting under limited flexibility.

This study first identifies empirical evidence of *ex ante* adjustment by loss-expecting profit affiliates under limited flexibility. Even among profitable affiliates, those that previously expected to incur losses in the future are predicted to engage in lower levels of income shifting because of reverse incentives for potential losses compared with affiliates that expected to achieve profits. The present study further examines whether affiliates with low and high flexibility in income shifting engage in precautious actions based on loss expectation to different extents.

In addition to examining the influence of loss expectation on income-shifting strategies, this study attempts to confirm the estimation bias in estimates of income shifting measured using the statutory tax rate difference. Hopland et al. (2018, 2021) note that the traditional method of measuring income shifting using profitable affiliates based on the statutory tax rate difference overestimates the level of income shifting and underestimates the tax sensitivity of income shifting because it ignores *ex ante* adjustments by affiliates facing potential losses. Hopland et al. (2018, 2021) recommend estimating income shifting using the full sample of profitable and loss affiliates based on the 'expected' tax rate difference, which incorporates the probability of losses. Based on their recommendation, this study measures income shifting using the expected tax rate difference and compares the results of this estimation with those obtained by the traditional method. It also examines whether the estimation bias varies depending on loss expectation status and tax rate levels.

This study uses a panel dataset of worldwide MNCs. Ownership and financial data of profitable affiliates are collected from Bureau van Dijk's Orbis database. The final sample of affiliate-years comprises 93,424 observations domiciled in 95 countries for the years 2010–2014.

The empirical analysis yields the following findings. First, even among equally profitable affiliates, those expecting to incur losses in the future exhibit less income shifting than those expecting to realize profits in the future. This result supports the prediction that loss expectation influences the adjustment of the level of income shifting *ex ante* by affiliates under limited flexibility. In addition, the magnitude of *ex ante* adjustment is greater for affiliates with lower flexibility than for those with higher flexibility, which reconfirms the existence and varying levels of flexibility.

Second, on average, the estimates of income shifting measured using the statutory tax rate difference are greater than those measured using the expected tax rate difference. This estimation bias varies among affiliates depending on their loss expectation status and tax rate levels. For the group of affiliates that expect less income shifting when loss probability is taken into consideration, the traditional measurement produces an overestimation bias. However, an underestimation bias is observed for the group of affiliates that expect more income to be shifted in or out according to potential losses. Lastly, no estimation bias is found for the group of affiliates with no loss probability. Overall, the results suggest that future research should explicitly consider the effects of *ex ante* adjustments of income shifting by loss-expecting affiliates and reverse incentives for income shifting by loss affiliates when measuring income shifting.

A significant proportion of MNC affiliates achieve losses.[1] Despite the introduction of Base Erosion and Profit Shifting (BEPS) by the Organisation for Economic Co-operation and Development (OECD) (2015), anecdotal evidence reveals that MNCs continue to execute income-shifting strategies by utilizing new tax rulings or tax havens.[2] Hence, the relationship between losses and income shifting warrants investigation to address MNCs' new techniques for income shifting.

This paper provides several contributions to the literature. First, it extends the line of research on tax-motivated income shifting by loss affiliates by testing the effects of loss expectation. The present study advances upon De Simone et al. (2017) by identifying that the income-shifting strategies of MNCs under limited flexibility are affected not only by current losses but also by the probability of losses. In addition, the study extends the findings of Hopland et al. (2018, 2021) by directly implementing the probability of incurring losses in the empirical model.

Second, this study provides empirical evidence of the estimation bias of the traditional methodology for measuring income shifting based on the rationale and theoretical model established by Hopland et al. (2018, 2021). An important implication of the present study is that future research on income shifting should consider the incentives of loss affiliates or loss-expecting affiliates when estimating income shifting. Dharmapala (2014) finds that the estimates of income shifting measured by recent empirical studies are smaller than those measured by earlier studies because the recent literature uses firm-level microdata. As the methodology for estimating income shifting continues to evolve by considering various factors, including flexibility and losses, implicit taxes (Markle et al., 2020), and mechanisms of shifting income (De Simone et al., 2020), estimates of income shifting in the future empirical literature will gradually approach the true estimates of income shifting.

Last, this study provides implications for policymakers by suggesting that they consider the incentives of loss affiliates or loss-expecting affiliates when designing regulations for income shifting. The BEPS Action Plan of the Organisation for Economic Co-operation and Development (OECD) (2015) brought significant and substantial changes to MNCs, including the obligation to prepare Country-by-Country Reporting (CbCR). CbCR contains information on the profit and loss status

[1] Cooper and Knittel (2006) report that loss affiliates account for approximately 40 to 50 percent of total U.S. observations. In De Simone et al. (2017), 20 percent of total European affiliates report losses. Hopland et al. (2018) report that 30 percent of their total Norwegian observations are loss-making affiliates. Therefore, loss affiliates typically account for a significant proportion of a given sample.

[2] Jesse Drucker and Simon Bowers, "After a Tax Crackdown, Apple Found a New Shelter for Its Profits", The New York Times, November 6, 2017; Andrew Walker, "Apple has €13bn Irish tax bill overturned", BBC, July 15, 2020.

of MNC affiliates in different tax-rate jurisdictions. Policymakers can benefit from CbCR to identify loss affiliates and understand their relative incentives at an overall level.

This study is organized as follows: Section 2 reviews the relevant literature and develops the hypotheses. Section 3 describes the sample and explains the research design. Section 4 reports and discusses the results of the hypothesis testing. Finally, section 5 provides the conclusions and limitations of the study.

2. Background and hypotheses

2.1. Measuring income shifting by multinational corporations

Early studies of income shifting focused on finding empirical evidence of income shifting by MNCs from higher-tax-rate jurisdictions to lower-tax-rate jurisdictions (Collins et al., 1998; Klassen and Laplante, 2012a; Clausing, 2003). Recent studies have expanded this research area by examining the effects of various factors on the income-shifting behavior of MNCs. For example, researchers have examined how tax-motivated income shifting is affected by factors such as the accounting principle (De Simone, 2016), tax laws and regulations (Lohse et al., 2012; Saunders-Scott, 2014; Riedel et al.,2015; Beuselinck et al., 2015), implicit taxes (Markle et al., 2020), and other firm-level characteristics, including profitability, financial constraints, investment opportunities, financial reporting incentives, and tax uncertainty (Klassen and Laplante, 2012b; Dyreng and Markle, 2016; De Simone et al., 2017; Delis et al., 2020).

The key methodology in empirical research on income shifting is to estimate the level of income shifting according to tax incentives. The precise level of income shifting can only be measured using the actual amounts of transfer prices and internal debts, such as intercompany sales, purchases, royalty payments, management service fees, and interest for internal debts. However, most countries do not require companies to disclose the amount of intercompany transactions. For this reason, previous studies generally estimate income shifting by MNCs using empirical models. Among various models, the following model established by Hines and Rice (1994) is the most widely applied:[3]

$$log\pi_i = \beta_0 + \beta_1 TI_i + \beta_2 logK_i + \beta_3 logL_i + \beta_4 logA_{it} + \varepsilon_{it} \quad (1)$$

Log π is the natural logarithm of reported pre-tax profits of an affiliate; *TI* is the tax incentive for income shifting, measured as the difference in tax rates between the affiliate and the parent company; and *LogK*, *LogL*, and *LogA* are proxies for capital, labor, and productivity. The underlying presumption of this model is that the reported pre-tax income of an affiliate comprises 'true' income and 'shifted' income. True income is assumed to be an outcome of capital, labor, and productivity that follows a Cobb-Douglas production function. The remaining part of pre-tax income unpredicted by these factors is pre-tax income shifted by tax incentives. The tax incentive variable, *TI*, is calculated as the statutory tax rate of the affiliate minus that of the parent company.[4] When an affiliate is in a relatively higher-tax-rate jurisdiction, *TI* will be greater than zero. Because income is shifted out to the parent company in a low-tax-rate jurisdiction, π will decrease, and the coefficient on *TI* will be less than zero. In the same manner, if an affiliate is in a relatively lower-tax-rate jurisdiction, *TI* will be less than zero, and π will increase because income is shifted into the affiliate from the parent company. Therefore, the coefficient on *TI* will still be less than zero. The estimate of *TI* represents the percentage change in pre-tax income associated with a 1-percentage-point change in the tax rate difference (Dharmapala 2014). Therefore, *TI* is generally interpreted as the size of income shifting.

2.2. Hypothesis development

2.2.1. Ex ante adjustment based on loss expectation under limited flexibility (Hypotheses 1a and 1b)

The traditional literature on tax-motivated income shifting generally focuses on the behavior of profitable MNC affiliates. Very few studies specify the potential effects of loss on income-shifting strategy. Klassen et al. (1993) point out that loss affiliates may have different incentives for income shifting because they face varying marginal tax rates depending on the circumstances of tax loss carryforwards. Instead of incorporating the reverse incentives of loss affiliates, Klassen et al. (1993) drop loss-making affiliates from the sample. Similarly, Overesch (2006, 2009) highlights the effects of losses on income-shifting strategy but does not attempt to examine such effects.

More recent studies continue to expand research on tax-motivated income shifting by loss affiliates. First, Gramlich et al. (2004) and Onji and Vera (2010) attempt to identify income shifting between domestic Japanese trusts ("Keiretsus"). These two studies present the first evidence that losses alter the income-shifting strategy of affiliates. However, their results cannot be generalized to MNC affiliates with different levels of tax rates and loss carryforward regulations.

De Simone et al. (2017) report empirical evidence of differences in income-shifting strategies between MNC affiliates with current-year losses and profits. Using 59,743 European affiliate-year observations for the 2003–2012 period, they find that loss affiliates benefit from their losses by shifting less income out of higher-tax-rate jurisdictions compared with profit affiliates. De Simone et al. (2017) provide novel evidence of tax-motivated shift-to-loss income shifting under the international

[3] Other models include those employed by Collins et al. (1998), Dharmapala and Riedel (2013), Dyreng and Markle (2016), and Dyreng, Hills, and Markle (2022).

[4] Huizinga and Laeven (2008) calculate tax incentives, *C*, by averaging the tax rate differences between an affiliate and all other affiliates and the parent company.

setting. However, because they compare estimates of income shifting between affiliates with losses and profits in the current year, their results assume that affiliates are subject to full flexibility.

In subsequent research, Hopland et al. (2018) introduce the concept of flexibility in income shifting. By combining the reverse incentives for income shifting of loss affiliates and the concept of flexibility, Hopland et al. (2018) assume that loss affiliates will report a lower level of income shifting (i.e., lower net outgoing transfer payments and less internal leverage) under high flexibility because they are able to adjust the income-shifting strategy *ex post* by reflecting tax incentives arising from losses. Under low or insufficient flexibility, profit and loss affiliates are expected to report similar levels of income shifting because all affiliates will reduce their income shifting by taking into account the probability of incurring losses. Using data on the direct transfer payments and internal debt of 128 Norwegian affiliates, they find that loss affiliates report lower outgoing payments than profitable affiliates. The results indicate that transfer pricing provides significant flexibility for loss affiliates to adjust income shifting *ex post*. Meanwhile, internal debt is found to provide no significant flexibility for loss affiliates. However, the large standard error in the results prevents Hopland et al. (2018) from definitively rejecting the possibility that at least some *ex post* or *ex ante* debt shifting occurs.

Hopland et al. (2018) confirm the existence of (in)flexibility and varying levels of flexibility among transfer pricing and internal debts by empirically detecting *ex post* adjustments by affiliates with current-year losses. The existence of (in)flexibility found in their study, however, does not suggest that MNC affiliates are subject to full or no flexibility. Affiliates must be given either absolute certainty or uncertainty in their tax planning under full and no flexibility, respectively, which is unrealistic in practice. As Hopland et al. (2018) explicitly note, their results infer that there is at least some flexibility in transfer payment and smaller flexibility in internal debts. Collectively, it is more realistic to assume that MNC affiliates have partially limited flexibility and take positions somewhere between the two extremes of full and no flexibility. That is, MNC affiliates differ only in their degree of flexibility.

Under partially limited flexibility, Hopland et al. (2018) assume that profitable and loss affiliates will report similar levels of income shifting because both will shift income *ex ante* by taking the 'loss probability' into account. That is, both profitable and loss affiliates will expect potential losses and precautionarily reduce the level of income shifting. Despite this reasoning, Hopland et al. (2018) do not directly consider 'loss expectation' or 'probability of incurring losses' in their empirical analysis.[5] If affiliates make *ex ante* adjustments by considering the loss probability, even profitable affiliates should reduce income shifting if loss is expected. Therefore, this study first examines the effects of loss expectation, not current-year loss, on the level of income shifting by profitable affiliates based on the following hypothesis:

HYPOTHESIS 1a. Under limited flexibility, profitable affiliates expecting to incur losses will shift less income than those expecting to incur profits in the future.

Although this study assumes that affiliates are subject to limited flexibility, the degree of flexibility will differ among affiliates. According to Hopland et al. (2018), affiliates with high flexibility do not necessarily have to make *ex ante* adjustments, while those with low flexibility are required to do so. Therefore, *ex ante* adjustment based on the loss expectation will be more pronounced for profitable affiliates with lower flexibility than for those with higher flexibility. Accordingly, Hypothesis 1b posits the following:

HYPOTHESIS 1b. *The reduction in income shifting according to the loss expectation is greater in profitable affiliates with lower flexibility in income shifting than in those with higher flexibility.*

The present study expects to directly identify the role of loss expectation in the income-shifting strategies of MNC affiliates (H1a) and obtain empirical evidence of (in)flexibility in income shifting (H1b) using a large sample of worldwide MNC affiliates.

2.2.2. Estimates of income shifting considering loss expectation (Hypotheses 2a and 2b)

Since Klassen et al. (1993), dropping loss affiliates to eliminate the effects of their reverse incentives has become the dominant methodology for measuring income shifting. However, recent studies highlight that ignoring loss affiliates can be problematic because the proportion of loss affiliates in the total number of affiliates is typically high.[6] Hopland et al. (2018, 2021) suggest that the traditional methodology of measuring income shifting using the statutory tax rate difference of profitable affiliates is only appropriate under full flexibility. As discussed earlier, most MNC affiliates are likely to have limited flexibility in reality[7] and make *ex ante* adjustments by taking the probability of incurring losses into account. In other word, affiliates will

[5] Hopland et al. (2018) indirectly control for *ex ante* adjustment by adding a loss indicator for the previous year and the interaction of the loss indicators for the previous and current years as variables. Unlike Hopland et al. (2018), this study directly incorporates the probability of incurring losses into the empirical model and observes the precautious actions of profitable affiliates facing varying levels of loss probability.

[6] In Cooper and Knittel (2006), loss affiliates account for approximately 40 to 50 percent of total U.S. observations. In De Simone et al. (2017), 20 percent of total European affiliates report losses. Hopland et al. (2018) report that 30 percent of their total Norwegian observations are loss-making affiliates. Therefore, loss affiliates typically account for a significant proportion of a given sample.

[7] To adjust income-shifting strategies by changing transfer prices or intercompany debts, MNCs must review whether the new transactions align with their global transfer price policy and the tax rules of the affiliate countries. Therefore, it is practically difficult to adjust transfer prices or establish intercompany debt transactions to the optimal level rapidly after observing performance outcomes at the end of the year.

exploit income-shifting strategies based on the expected tax rate difference which incorporates loss expectations rather than on statutory tax rates. Therefore, the traditional methodology of using statutory tax rates under the assumption of full flexibility will neglect the effects of *ex ante* adjustment for potential losses under limited flexibility.

Hopland et al. (2018) report that estimates of income shifting will be biased upward if income shifting is measured using the statutory tax rate difference without controlling for loss expectations because the estimates will omit the effects of the reverse incentives of losses. By contrast, the tax sensitivity of income shifting will be biased downward because the responses of affiliates' reported income interpreted by previous studies are in fact attributable to the smaller expected tax rate difference.

In this sense, Hopland et al. (2018) suggest that income shifting should be measured using the sample of both profitable and loss affiliates and the tax incentive variable corresponding to the expected tax rate difference adjusted for loss probability, rather than the statutory tax rate difference. Hopland et al. (2021) subsequently develop the theory of flexibility and its implications for income shifting and present a model for income shifting adjusted for loss expectation. They explicitly note that predicting affiliates' probabilities of incurring losses in the future based on historical accounting data and constructing expected tax rate differences by incorporating such predictions would reduce the estimation bias of the traditional methodology.

As suggested by Hopland et al. (2018, 2021), this study attempts to measure income shifting based on the expected tax rate difference. Because the expected tax rate is the measure controlled for loss expectations, the estimates of income shifting measured using the expected tax rate difference would encompass the *ex ante* adjustment made according to the reverse incentives for potential losses, that is, the reduction in income shifting to benefit from expected losses. Consequently, the estimate of income shifting measured using the expected tax rate difference is expected to be less negative than that measured using the statutory tax rate difference because a less negative estimate implies a smaller amount of income shifting according to Eq. (1). Accordingly, Hypothesis 2a is as follows:

HYPOTHESIS 2a. *On average, the estimate of income shifting measured based on the expected tax rate difference will be less negative than that measured based on the statutory tax rate difference.*

As a subordinate hypothesis to the second hypothesis, this study further examines whether affiliates that differ in their loss expectation status and tax-rate levels show different trends in their estimates. If both an affiliate and its parent company do not expect to incur loss in the future, there will be no *ex ante* adjustment and consequently no estimation bias. If an affiliate and/or its parent company foresee loss, in general, less income will be shifted, and there will be an overestimation bias, consistent with Hopland et al. (2018, 2021) and Hypothesis 2a. That is, the estimates of income shifting measured based on the expected tax rate difference will be less negative than those measured based on the statutory tax rate difference.

On the contrary, however, income shifting could be amplified for certain affiliates if either the affiliate or its parent company is located in a lower-tax-rate country and expects to incur losses. For example, if a lower-tax-rate subsidiary affiliate expects to incur losses while its parent company expects profits, more income will be shifted into the affiliate than when loss probability is not considered. Similarly, if a higher-tax-rate subsidiary affiliate expects to incur profit while its parent company anticipates losses, more income will be shifted out to the parent company. In this case, the traditional methodology of using the statutory tax rate difference would underestimate the size of income shifting. Consequently, the estimates would be more negative than when measured based on the expected tax rate difference.[8]

Although Hypothesis 2a predicts an overestimation bias on average, this study expects that the estimation bias will differ by affiliates depending on their loss expectation status and tax-rate levels. Accordingly, Hypothesis 2b is established as follows:

HYPOTHESIS 2b. *The difference between the estimates measured using the expected tax rate difference and the statutory tax rate difference will vary by affiliates depending on their loss expectation status and tax-rate levels.*

3. Research method

3.1. Data

This study uses data of worldwide MNCs obtained from Bureau van Dijk's Orbis database. The initial set of data consists of unconsolidated financial and ownership information for the period 2007–2014.[9] First, a sample of parent companies operating in the industrial sector is collected.[10] Next, all subsidiaries controlled by the parent companies are included in the sample.[11]

[8] Please see Appendix C for more detailed information.

[9] This study limits financial data to the 2007-2014 period to control for the impact of external regulatory effects of the BEPS Action Plan on the tax planning of MNCs because these effects may bias the results of the study.

[10] The Orbis database defines parent companies of MNCs as Global Ultimate Owners (GUOs). A GUO is an entity that controls more than one subsidiary but is not controlled by any single shareholder. Controlling is defined as greater than 50 percent ownership.

[11] Markle (2016) aggregates unconsolidated financial information of subsidiaries of a parent company if there is more than one foreign subsidiary in one country in order to control the effects of the organizational structure of MNCs. This paper, however, does not aggregate financial information of subsidiaries because aggregation offsets the profits and losses of subsidiaries.

An MNC is excluded if the group has no or only one parent company in the dataset. Affiliate-years established in the same country as the parent company are also excluded because parent companies have no tax incentive for income shifting. Any affiliate-years operating in the financial sector, those with missing values for variables, or those with no tax rate difference between a subsidiary and the parent companies are also excluded. Parent-years are excluded from the final sample of observations to avoid capturing the same income-shifting transaction between an affiliate and its parent company twice from both sides. Last, loss affiliates are excluded to ensure consistency in the analysis. Because this study aims to confirm the effects of loss expectation on the *ex ante* adjustment of profitable affiliates and to estimate income shifting using the tax rate difference adjusted for loss expectation, dropping loss affiliates will not cause bias in the analysis. The final sample of affiliate-years comprises 93,434 observations from 6,648 affiliates domiciled in 95 countries.

Table 1
Sample selection and statistics.

Panel A: Sample selection

Affiliate-years of parent companies and their affiliates in Bureau van Dijk's Orbis database operating in an industrial sector from 2007 to 2014.	2,821,904
Less: Multinational groups without parent companies or those having parent companies only	(1,125,080)
Less: Domestic subsidiaries located in the same country as the parent company	(1,001,600)
Less: Banks and insurance companies (NACE codes 64, 65, or 66)	(8,069)
Less: Missing values of major variables	(524,790)
Less: No tax rate difference between a subsidiary and the parent company (*STRdiff*=0)	(1,584)
Less: Parent companies	(38,055)
Less: Loss firm-years (EBIT<0)	(29,302)
Total profitable firm-years (EBIT>0) used in the estimation	93,424

Panel B: Sample composition

Affiliate-year (95 countries)			Group-year (34 countries)		
Country	Frequency	Percent	Country	Frequency	Percent
United Kingdom	11,789	12.6%	United States	21,079	22.6%
France	10,069	10.8%	Germany	10,926	11.7%
Germany	8,327	8.9%	Japan	9,380	10.0%
Spain	6,459	6.9%	United Kingdom	8,565	9.2%
Belgium	6,315	6.8%	France	6,631	7.1%
Italy	6,224	6.7%	Sweden	4,806	5.1%
Poland	4,858	5.2%	Italy	4,461	4.8%
Czech Republic	3,978	4.3%	Switzerland	3,428	3.7%
Romania	3,242	3.5%	Netherlands	3,032	3.2%
Sweden	3,052	3.3%	Belgium	2,780	3.0%
South Korea	2,430	2.6%	Spain	2,162	2.3%
Norway	2,427	2.6%	Finland	2,142	2.3%
Portugal	2,169	2.3%	Ireland	2,125	2.3%
Hungary	1,957	2.1%	Austria	1,953	2.1%
Finland	1,839	2.0%	Luxembourg	1,903	2.0%
Slovakia	1,755	1.9%	Denmark	1,299	1.4%
Netherlands	1,678	1.8%	Norway	1,099	1.2%
Austria	1,657	1.8%	Australia	1,037	1.1%
Australia	1,637	1.8%	South Korea	891	1.0%
Denmark	1,425	1.5%	Canada	859	0.9%
Ireland	1,400	1.5%	Hungary	494	0.5%
India	1,344	1.4%	Slovenia	391	0.4%
New Zealand	973	1.0%	Portugal	331	0.4%
Serbia	762	0.8%	Israel	325	0.3%
Estonia	710	0.8%	Greece	296	0.3%
Bulgaria	700	0.7%	Poland	231	0.2%
Slovenia	593	0.6%	Czech Republic	181	0.2%
Malaysia	585	0.6%	New Zealand	140	0.1%
Croatia	524	0.6%	Slovakia	130	0.1%
Luxembourg	402	0.4%	Turkey	127	0.1%
Thailand	274	0.3%	Iceland	84	0.1%
Japan	264	0.3%	Chile	60	0.1%
Bosnia and Herzegovina	211	0.2%	Estonia	53	0.1%
Ukraine	182	0.2%	Mexico	23	0.0%
Morocco	128	0.1%			
Algeria	76	0.1%			
Pakistan	74	0.1%			
United States	56	0.1%			
Latvia	53	0.1%			
Nigeria	47	0.1%			
Others (55 countries)	779	0.8%			
Total	93,424	100.0%	Total	93,424	100.0%

Panel A in Table 1 outlines the sample selection procedure. A large number of observations are lost due to missing values of major variables. Panel B in Table 1 presents the sample composition by affiliate-year and group-year countries. The country with the largest number of affiliate-year observations is the United Kingdom (12.6 percent). Approximately 22.6 percent of the sample is composed of MNCs from the U.S.

3.2. Research model

3.2.1. Tests of Hypotheses 1a and 1b

Because this study uses panel data of affiliates in groups of corporations located in a number of countries, the data may be influenced by various time-invariant factors such as the host country, corporate group, and industry. To effectively control for time-invariant heterogeneity across affiliates and countries, fixed-effect panel regression is used for hypothesis testing.[12] To test Hypothesis 1, Eq. (2), a modified form of the model of Hines and Rice (1994), is estimated:[13]

$$LogEBIT_{it} = \beta_0 + \beta_1 STRdiff_{it} + \beta_2 LossExp_{it} + \beta_3 STRdiff * LossExp_{it} + \beta_4 LogTFA_{it} + \beta_5 LogCOMP_{it} + \beta_6 LogGDP_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (2)$$

The dependent variable, *LogEBIT*, is the natural logarithm of earnings before interest and tax. *STRdiff* is the statutory tax rate difference, which captures tax incentives for income shifting. *STRdiff* is calculated as the statutory tax rate of an affiliate minus the statutory tax rate of the parent company. *LossExp* is an indicator variable for affiliates that are expected to incur losses in the future. *LossExp* has a value of one if the probability of incurring losses is higher than 50 percent and zero otherwise. The probability of incurring losses (*H(p)*) is calculated by averaging the ratio of loss incurrence (one if loss is incurred and zero otherwise) for the past three years.[14] Since this study attempts to test *ex ante* adjustment, that is, the income-shifting behavior of loss-expecting firms, measuring the level of expectation of losses is more important than the actual loss-prediction power of the variables. In this regard, incurring losses in previous years would be the most influential factor impacting firms' expectations of future losses. A detailed explanation of the calculation and prediction of the *LossExp* ratio is provided in Appendix B.

Hypothesis 1a predicts that, even among equally profitable affiliates, loss-expecting affiliates will shift less income than profit-expecting affiliates. Therefore, *STRdiff*LossExp* (β_3) is predicted to be greater than zero for a pooled sample of profitable affiliate-years.

Hypothesis 1b further predicts that profitable affiliate-years with lower flexibility in income shifting will engage in *ex ante* adjustment according to loss expectation to a greater extent than those with higher flexibility. To test Hypothesis 1b, Eq. (2) is estimated separately using two subsamples of affiliate-years with lower and higher flexibility. Following Hopland et al.'s (2018) conclusion that intangibles provide substantial flexibility for income shifting, this study defines low and high flexibility using the level of intangibles. Specifically, this study constructs *LowFlex*, an indicator variable equaling one if intangibles scaled by total assets is below the median and zero otherwise. Affiliates with low (high) flexibility are consequently defined as those having a value of 1 (0) for *LowFlex*. The coefficient on *STRdiff*LossExp* (β_3) is expected to be greater for affiliates with lower flexibility than for affiliates with higher flexibility.

The other variables in Eq. (2), *LogTFA, LogCOMP, and LogGDP*, are variables for capturing the true income of affiliates (Hines and Rice, 1994; Huizinga and Laeven, 2008; Markle, 2016; De Simone et al., 2017). *LogTFA* is a proxy for capital measured as the natural logarithm of the tangible fixed assets of the affiliate. *LogCOMP* represents labor and is the natural logarithm of the compensation expenses of the affiliate. Last, *LogGDP* is a proxy for productivity calculated as the natural logarithm of the per capita GDP (in millions of U.S. dollars) of the home country of the affiliate.

3.2.2. Tests of Hypotheses 2a and 2b

To test Hypothesis 2, the following baseline models are estimated:

$$LogEBIT_{it} = \beta_0 + \beta_1 STRdiff_{it} + \beta_2 LogTFA_{it} + \beta_3 LogCOMP_{it} + \beta_4 LogGDP_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (3)$$

$$LogEBIT_{it} = \beta_0 + \beta_1 ExpTRdiff_{it} + \beta_2 LogTFA_{it} + \beta_3 LogCOMP_{it} + \beta_4 LogGDP_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (4)$$

First, Eq. (3) is estimated using the pooled sample of profitable affiliate-year observations. Because Eq. (3) represents the traditional methodology for measuring income shifting, *STRdiff* is used as a proxy for the tax incentive variable. To be consistent with Eqs. (3) and (4) is also estimated using the sample of profitable affiliate-year observations.[15] *ExpTRdiff*

[12] For all regression analyses conducted in this study, the null hypotheses for Hausman tests are rejected (P>chi2= 0.000), supporting the application of the fixed-effect model.

[13] All analyses conducted in this study are re-examined using OLS with year and country fixed effects and standard errors clustered by groups. Overall, the results remain unchanged.

[14] This study also uses other proxies for *LossExp* employing different numbers of years and methods of computation of probability as robustness checks.

[15] In robustness checks, equation (4) is estimated using the full sample of both profitable and loss affiliate-year observations and the dependent variable of *Log (ROA+1)*. The results and inferences generally remain unchanged throughout the analysis.

is used as the tax incentive variable and is computed as the expected tax rate (*ExpTR*) of an affiliate minus the expected tax rate of the parent company. The expected tax rate is calculated as suggested by Hopland et al. (2021) according to Eq. (5):

$$ExpTR_i = [1 - H(p_i)]t_i + H(p_i) * t_{il} \tag{5}$$

Basically, *ExpTR* is calculated by averaging the tax rate for profits (t_i) and the tax rate for losses (t_{il}) weighted by the probability of incurring losses ($H(p)$). The probability of incurring losses is calculated in the same way as in the calculation of *LossExp*, i.e., by averaging the ratio of loss incurrence for the past three years. The statutory tax rate is used as a proxy for the tax rate on profits (t_i). For the tax rate on losses (t_{il}), Hopland et al. (2021) present Eq. (6):

$$t_{il} = \frac{\varnothing m}{(1+r)^m} t_i \tag{6}$$

$\varnothing m$ is the probability that the loss carryforwards can be claimed within period m. r is the discount rate. Therefore, t_{il} is calculated as the statutory tax rate discounted and weighted by the probability of losses being offset by profits in the future (Hopland et al., 2021). t_{il} is always smaller than t_i. As the probability of incurring losses increases, the weight on t_{il} increases, and consequently *ExpTR* decreases. However, the calculation of *ExpTR* following Eq. (6) is dominated by the discount rate (r) and the loss offset period (m).[16] To resolve this problem, Eq. (7) is used as an alternative for the calculation of t_{il}:[17]

$$t_{il} = \varnothing m * \max[0, t_{amt}] + (1 - \varnothing m) * t_i \tag{7}$$

In Eq. (7), t_{il} is calculated as the weighted average of the tax rate applied when loss can be claimed (the first term) and the tax rate applied when loss cannot be claimed (the second term). If loss can be claimed, the tax rate will be either zero or the alternative minimum tax rate, depending on the tax regulations of the country. If it is not possible to claim loss, the statutory tax rate will be applied. The probability that the loss carryforwards can be claimed within period m ($\varnothing m$) is equivalent to one minus the probability of incurring losses for m consecutive years. Therefore, $\varnothing m$ is calculated using the following Eq. (8):

$$\varnothing m = 1 - H(p_i)^m \tag{8}$$

Hypothesis 2a, which posits that, on average, estimates of income shifting will be biased upward if income shifting is measured using the statutory tax rate difference without controlling for loss expectation, is supported if the coefficient on *ExpTRdiff* is less negative than the coefficient on *STRdiff*.

Hypothesis 2b predicts that the difference between the estimates measured using *ExpTRdiff* and *STRdiff* will vary depending on the loss expectation status and tax-rate levels of affiliates. To test Hypothesis 2b, this study categorizes the sample of profitable affiliate-years into the following three groups and tests Eqs. (3) and (4) separately using the subsamples: the zero loss-probability group (Zero_LossProb), the loss-probability and more income-shifting group (LossProb_MoreShifting), and the loss-probability and less income-shifting group (LossProb_LessShifting).

Affiliate-years are categorized into the Zero_LossProb group if the loss probability ($H(p)$) of both an affiliate and its parent company are zero. Because there will be no *ex ante* adjustment and consequently no estimation bias in this group, the coefficients on *STRdiff* and *ExpTRdiff* will not be significantly different.

Affiliate-years are categorized into the LossProb_MoreShifting group if the loss probability ($H(p)$) is greater than zero for the lower-tax-rate affiliate (parent company) but zero for its higher-tax-rate parent company (affiliate). Affiliate-years in this group would execute more income shifting to maximize tax benefits from losses, and the estimates of income shifting measured using *STRdiff* would have an underestimation bias. Therefore, the coefficient on *ExpTRdiff* will be more negative than the coefficient on *STRdiff*.

The remaining affiliate-years are categorized into the LossProb_LessShifting group. Income shifting will be deterred by *ex ante* adjustment in this group of affiliate-years, causing an overestimation bias. Consequently, the coefficient on *ExpTRdiff* will be less negative than the coefficient on *STRdiff*. Appendix C provides a more detailed explanation of the variation in the estimation bias by affiliate conditions.

[16] Assume that there are two companies, Company A and Company B, located in countries A and B, respectively. In addition, assume that country A permits offsets of losses for 20 years, while country B allows loss carryforwards for 5 years. Both countries apply a statutory tax rate (t_i) of 35 percent and a discount rate (r) of 10 percent, and the probability that the loss carryforwards can be claimed within the permitted period ($\varnothing m$) is 100 percent for both Company A and Company B. According to equation (6), t_{il} is 5.2 percent for Company A but 21.7 percent for Company B. The significant difference in the values of t_{il} of the two companies results from the loss carryforward period (m) and the relevant discount effects.

[17] The analysis is re-examined using t_{il} calculated according to Hopland et al. (2021). The results are explained in the robustness test. In general, consistent but statistically weak results are observed.

4. Results

4.1. Descriptive statistics and correlation analysis

Panel A in Table 2 presents the summary statistics for the variables using the full sample of 93,424 profitable affiliate-years during the period 2010–2014.[18] The mean value of the statutory tax rates of affiliates (*STR*) is 26.3 percent, while that of parent companies (*Parent_STR*) is 31.0 percent. This indicates that affiliate-year observations in the final sample are, on average, located in lower-tax-rate jurisdictions than their parent companies. The mean value of loss expectation (*LossExp*) is 0.104, indicating that approximately 10.4 percent of the profitable observations have a higher than 50 percent probability of incurring losses in the next year. The mean values of the expected tax rates of affiliates (*ExpTR*) and parent companies (*Parent_ExpTR*) are 23.6 and 25.7 percent, respectively. These values are both lower than the *STRs* of affiliates and parent companies because of the reduction in the marginal tax rate due to loss probability. Notably, the absolute value of the expected tax rate difference (*ExpTRdiff*), 2.4 percent, is smaller than the absolute value of the statutory tax rate difference (*STRdiff*), 4.7 percent. These descriptive statistics support the view of Hopland et al. (2018, 2021) that the estimates of income shifting in previous studies underestimate tax sensitivity because income-shifting responses are in fact based on a smaller tax rate difference under limited flexibility.

Table 3 shows the Pearson correlations of the variables in the regression Eq. s. Consistent with the previous literature on income shifting, *STRdiff* is negatively related to *LogEBIT*. This correlation supports income shifting from higher-tax-rate parent companies to lower-tax-rate subsidiary companies. *LossExp* is negatively correlated with *LogEBIT*, implying that historical loss incurrence has predictive power for future losses.

4.2. Hypothesis testing

4.2.1. Tests of Hypotheses 1a and 1b

Table 4 illustrates the main regression results for Hypotheses 1a and 1b. The pooled sample of profitable affiliate-year observations is used to test H1a, while the two subsamples of observations with lower and higher flexibility are used to test H1b. Column (1) shows the results for the pooled sample of profitable affiliates. The coefficient on the tax incentive variable *STRdiff* is significantly negative (−0.651; p = 0.004), which indicates tax-motivated income shifting of profitable affiliates previously expecting to incur profits. In terms of economic significance, a 10-percentage-point increase in the tax rate difference between an affiliate and its parent company would decrease the EBIT of profit-expecting affiliates by 6.51 percent. On the contrary, the coefficient on the interaction of *STRdiff* and *LossExp* is positive and significant (0.525; p = 0.007). The estimates imply that a 10-percentage-point increase in the tax rate difference would increase the EBIT of loss-expecting affiliates by 5.25 percent. These results indicate that loss-expecting profitable affiliates reduce tax-motivated income shifting as the probability of incurring losses in the future increases, consistent with Hypothesis 1a.

Columns (2) and (3) report the results for the subsamples of profitable affiliates with lower and higher flexibility in income shifting, respectively. While the results for the other variables are generally consistent between the two subsamples, the coefficients on the interaction of *STRdiff* and *LossExp* differ. The coefficient is significantly positive (0.580; p = 0.041) for profitable affiliates with lower flexibility but positive and insignificant for affiliates with higher flexibility (0.409; p = 0.199). This finding implies that only affiliates with lower flexibility engage in precautious actions to adjust their income-shifting strategies in accordance with loss expectation, which supports H2b. The above results provide empirical evidence of *ex ante* adjustment for loss expectation given the significant limited flexibility in the international setting.

4.2.2. Tests of Hypotheses 2a and 2b

Table 5 presents the results for the tests of the second set of hypotheses. Hypothesis 2a is tested using the pooled sample of profitable affiliate-year observations, while Hypothesis 2b is tested separately using the three subsamples of profitable affiliates with different conditions for loss expectation and tax-rate levels (i.e., Zero_LossProb, LossProb_MoreShifting, and LossProb_LessShifting).

Column (1) in Table 5 shows estimates for Eq. (3), which uses *STRdiff* as the proxy for tax incentives for income shifting. The coefficient on *STRIDFF* is −0.625 and significant (p = 0.005). Column (2) in Table 5 reports estimates for Eq. (4), where *ExpTRdiff* is used as the tax incentive variable. Consistent with H2a, the coefficient on *ExpTRdiff* is significant and less negative than the coefficient on *STRdiff* (0.438; p = 0.006). However, the positive and significant estimate measured based on *ExpTRdiff* indicates that the reverse incentives for income shifting (Klassen et al., 1993; De Simone et al., 2017) outweigh the effects of tax-motivated income shifting for profitable affiliates, which is not consistent with the intuition. Therefore, we further scrutinize the estimation bias of affiliates under different conditions by testing Hypothesis 2b.

Columns (3) and (4) show estimates for Eqs. (3) and (4), respectively, using the profitable affiliates in the Zero_LossProb group. The estimate measured by *ExpTRdiff* (−0.628; p = 0.087) is highly consistent with that measured by *STRdiff* (−0.632; p = 0.078) because no precautionary adjustment is required in this group of affiliates. Columns (5) and (6) show the estima-

[18] The initial set of data comprises financial and ownership information for the period 2007-2014. Because information on loss incurrence for the previous three years is required to construct the loss expectation variable, the final sample consists of affiliate-years for the period 2010-2014. All continuous variables are winsorized at the 5th and 95th percentiles to mitigate the effects of outliers.

Table 2
Descriptive statistics.

Variables	n	Mean	SD	Min	p25	Median	p75	Max
LogEBIT	93,424	7.230	1.791	4.007	5.916	7.208	8.517	10.568
STR	93,424	0.263	0.060	0.000	0.210	0.280	0.314	0.407
Parent_STR	93,424	0.310	0.073	0.125	0.250	0.300	0.400	0.407
STRdiff	93,424	− 0.047	0.084	− 0.190	− 0.106	− 0.054	0.019	0.105
LossExp	93,424	0.104	0.305	0.000	0.000	0.000	0.000	1.000
ExpTR	93,424	0.236	0.075	0.000	0.190	0.242	0.300	0.407
Parent_ExpTR	93,424	0.257	0.074	0.042	0.209	0.260	0.300	0.407
ExpTRdiff	93,424	−0.024	0.096	−0.195	−0.100	−0.022	0.046	0.147
LogTFA	93,424	6.923	2.574	2.303	4.949	6.985	8.914	11.406
LogCOMP	93,424	8.236	1.542	5.501	7.085	8.210	9.355	11.120
LogGDP	93,424	10.361	0.567	9.024	10.002	10.617	10.747	11.038

Table 3
Correlation matrix.

Variables	*LogEBIT*	*STRdiff*	*LossExp*	*LowFlex*	*ExpTRdiff*	*LogTFA*	*LogCOMP*	*LogGDP*
LogEBIT	1.000							
STRdiff	**−0.021**	1.000						
LossExp	**−0.139**	**0.01**	1.000					
LowFlex	**−0.183**	**−0.088**	−0.005	1.000				
ExpTRdiff	**0.107**	**0.729**	**−0.237**	**−0.050**	1.000			
LogTFA	**0.621**	**−0.039**	**−0.021**	**−0.213**	**0.019**	1.000		
LogCOMP	**0.711**	**0.045**	**−0.044**	**−0.26**	**0.119**	**0.63**	1.000	
LogGDP	**0.115**	**0.293**	−0.005	**−0.022**	**0.285**	**−0.045**	**0.249**	1.000

Notes: Bold data denote statistically significant correlations (p > 0.005). All variables are defined in Appendix A.

Table 4
Tests of *ex ante* adjustment based on loss expectation under limited flexibility (H1a and H1b).

	Sample: Profitable affiliates Dependent variable: *LogEBIT*			
Variables	Pred.	Pooled (1)	Lower flexibility (*LowFlex*=1) (2)	Higher flexibility (*LowFlex*=0) (3)
Intercept		−0.419	−1.158	−0.156
		(0.623)	(0.859)	(0.908)
STRdiff	-	−0.651***	−0.642**	−0.625*
		(0.225)	(0.312)	(0.334)
LossExp	-	−0.111***	−0.093***	−0.127***
		(0.018)	(0.029)	(0.028)
*STRdiffF*LossExp*	+	0.525***	0.580**	0.409
		(0.195)	(0.284)	(0.318)
LogTFA	?	0.045***	0.049***	0.038***
		(0.007)	(0.009)	(0.011)
LogCOMP	+	0.449***	0.436***	0.445***
		(0.019)	(0.026)	(0.027)
LogGDP	+	0.350***	0.416***	0.345***
		(0.061)	(0.084)	(0.088)
Fixed Effects		Y	Y	Y
N		93,424	46,714	46,710
Overall R^2		0.505	0.441	0.519
F-value		155.926***	77.574***	76.680***

Notes: *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standard errors corrected for clustering at the group level are reported in parentheses below the estimates. Fixed effects include parent, company, industry, and year fixed effects. All variables are defined in Appendix A.

tion results for the LossProb_MoreShifting group, for which more income shifting is predicted under consideration of loss probability. Consistent with the prediction, the estimate measured by *ExpTRdiff* (−0.568; p = 0.094) is more negative than the estimate measured by *STRdiff* (0.007; p = 0.994). These results indicate that the traditional methodology underestimates the level of income shifting by the LossProb_MoreShifting group by neglecting loss expectation. Lastly, Columns (7) and (8) report the results for the LossProb_LessShifting group with an overestimation bias. As predicted, the estimate measured by *ExpTRdiff* (−0.288; p = 0.025) is less negative than the estimate measured by *STRdiff* (−0.788; p = 0.030). Overall, these results support Hypothesis 2b that affiliates that differ in loss expectation status and tax-rate levels face varying estimation bias.

Table 5
Measuring estimates of income shifting considering loss expectation (H2a and H2b).

	Sample: profitable affiliates Dependent variable: *LogEBIT*							
	Pooled		Zero_LossProb		LossProb_MoreShifting		LossProb_LessShifting	
Variables	*STRdiff* (1)	*ExpTRdiff* (2)	*STRdiff* (3)	*ExpTRdiff* (4)	*STRdiff* (5)	*ExpTRdiff* (6)	*STRdiff* (7)	*ExpTRdiff* (8)
Intercept	−0.977	−1.127*	1.356	1.352	-3.103*	-3.086*	-2.086**	-2.421**
	(0.622)	(0.624)	(1.034)	(1.034)	(1.847)	(1.853)	(0.959)	(0.951)
TAXRATEdiff	−0.625***	0.239***	−0.632*	−0.628*	0.007	−0.568*	−0.788**	−0.288**
	(0.225)	(0.087)	(0.358)	(0.367)	(0.819)	(0.339)	(0.364)	(0.128)
LogTFA	0.043***	0.044***	0.045***	0.046***	−0.000	0.000	0.049***	0.049***
	(0.007)	(0.007)	(0.011)	(0.011)	(0.020)	(0.020)	(0.011)	(0.011)
LogCOMP	0.454***	0.452***	0.440***	0.440***	0.422***	0.421***	0.453***	0.455***
	(0.019)	(0.019)	(0.039)	(0.039)	(0.054)	(0.054)	(0.027)	(0.027)
LogGDP	0.399***	0.419***	0.202**	0.202**	0.637***	0.633***	0.495***	0.528***
	(0.061)	(0.061)	(0.100)	(0.100)	(0.177)	(0.177)	(0.094)	(0.093)
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
N	93,424	93,424	33,047	33,047	13,042	13,042	47,335	47,335
Overall R^2	0.489	0.478	0.557	0.557	0.424	0.419	0.458	0.438
F-value	213.505***	220.807***	49.046***	49.051***	20.561***	20.580***	122.085***	118.657***

Notes: *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standard errors corrected for clustering at the group level are reported in parentheses below the estimates. Fixed effects include parent, company, industry, and year fixed effects. All variables are defined in Appendix A. The definitions of the subsamples (i.e., Zero_LossProb, LossProb_MoreShifting, and LossProb_LessShifting) are provided in Appendix C.

4.3. Robustness tests

4.3.1. Robustness of the results for Hypotheses 1a and 1b

In this study, *LossExp* takes a value of one if the probability of incurring losses is>50 percent and zero otherwise. The probability of incurring losses (*H(p)*) is calculated by averaging the ratio of loss incurrence (one if loss is incurred and zero otherwise) for the past three years. To ensure the robustness of the measure for *LossExp*, other proxies that employ different numbers of years and methods of probability computation are used. First, the probability of incurring losses is calculated as the arithmetic mean of the ratio of loss incurrence for the past one (*H(p)1*) to two (*H(p)2*) years. The probability is further calculated as the weighted arithmetic mean of loss incurrence for the past two (*H(p)2W*) to three (*H(p)3W)* years. Depending on the number of years and the calculation method (*H(p)1*, *H(p)2, H(p)2W, H(p)3W)*, four variables (*LossExp1, LossExp2, LossExp2W, LossExp3W*) are established to check the robustness of the results of this study. A detailed explanation of the calculation and predictive power of each *LossExp* proxy is provided in Appendix B.

Table 6 reports the results of the re-examination of the first set of hypotheses using other proxies for *LossExp*. The coefficient on the interaction of *STRdiff* and *LossExp* is always positive and only significant in the subsample of affiliates with lower flexibility, except for when *LossExp2* is used in Column (4). These tests indicate that the results of the analysis are robust to various methods of constructing the measure of *LossExp*.

4.3.2. Robustness of the results for Hypotheses 2a and 2b

Two additional tests are undertaken to confirm the robustness of the results for Hypotheses 2a and 2b. First, following the recommendation of Hopland et al. (2018, 2021) to measure income shifting using both profitable and loss affiliates while controlling for loss expectations, Eq. (4) is estimated with the tax incentive measure of *ExpTRdiff* using profitable and loss affiliates. When loss affiliate-year observations are included in the analysis, *LogEBIT* is likely to produce bias in the results because of the high correlation between *LogEBIT* and the indicator variable for losses. Therefore, *Log(ROA + 1)* is used as the dependent variable, and an indicator variable for current loss is controlled, consistent with Claessens and Laeven (2004) and De Simone et al. (2017). *Log(ROA + 1)* is calculated as the natural logarithm of *ROA* plus one, where *ROA* is computed as *EBIT* divided by total assets.[19] For comparison, Eq. (3) for the tax incentive measure of *STRdiff* is also estimated using dependent variable of *Log(ROA + 1)* and a sample of profitable affiliates.

Table 7 presents the results of the analysis. The coefficient on *ExpTRdiff* is consistent with the coefficient on *STRdiff* for the Zero_LossProb group in Columns (3) and (4) and less negative and insignificant for the LossProb_LessShifting group in Columns (5) and (6). However, the coefficient on *ExpTRdiff* is positive and insignificant for the LossProb_MoreShifting group in Column (8). Overall, the results generally support Hypotheses 2a and 2b, except for the LossProb_MoreShifting group. However, significant meaning should be inferred from this robustness analysis with caution because it is not appropriate to compare two estimates measured using two different sets of observations.

Second, to calculate the expected tax rate, Hopland et al. (2021) uses Eq. (6) as the tax rate on losses (t_{il}), while this study alternatively employs Eq. (7). To check the robustness of the main analysis, this study re-examines regression Eq. (4) using the expected tax rate calculated using (6) presented by Hopland et al. (2021). Untabulated results show consistent estimates,

[19] One is added to *ROA* before taking the logarithm to measure the profit level of both profitable and loss affiliates in logarithmic form.

Table 6
Testing Hypotheses 1a and 1b using other proxies for *LossExp*.

		Sample: profitable affiliates Dependent variable: *LogEBIT*											
		LossExp1			*LossExp2*			*LossExp2W*			*LossExp3W*		
Variables	Pred.	Pooled (1)	Lower flexibility (2)	Higher flexibility (3)	Pooled (4)	Lower flexibility (5)	Higher flexibility (6)	Pooled (7)	Lower flexibility (8)	Higher flexibility (9)	Pooled (10)	Lower flexibility (11)	Higher flexibility (12)
Intercept		-2.886***	-3.442***	-2.453***	−1.898***	-3.113***	−1.275	−1.519***	-2.733***	−0.735	0.363	−0.476	0.727
		(0.467)	(0.637)	(0.670)	(0.548)	(0.596)	(0.785)	(0.546)	(0.767)	(0.785)	(0.620)	(0.750)	(0.903)
STRdiff	-	−1.033***	−1.295***	−0.820***	−0.654***	−0.669***	−0.638*	−0.648***	−0.667**	−0.623*	−0.696***	−0.638***	−0.742**
		(0.202)	(0.279)	(0.301)	(0.223)	(0.229)	(0.330)	(0.222)	(0.306)	(0.330)	(0.224)	(0.246)	(0.331)
LossExp	-	−0.279***	−0.239***	−0.314***	−0.158***	−0.119***	−0.188***	−0.249***	−0.204***	−0.285***	−0.183***	−0.159***	−0.197***
		(0.012)	(0.017)	(0.017)	(0.013)	(0.014)	(0.017)	(0.013)	(0.019)	(0.019)	(0.014)	(0.016)	(0.020)
*STRdiff*LossExp*	+	0.219*	0.288*	0.086	0.311**	0.235*	0.334*	0.228*	0.331*	0.051	0.355**	0.249**	0.486
		(0.127)	(0.170)	(0.191)	(0.132)	(0.140)	(0.196)	(0.134)	(0.182)	(0.206)	(0.142)	(0.157)	(0.222)
LogTFA	?	0.061***	0.071***	0.052***	0.055***	0.060***	0.047***	0.056***	0.062***	0.049***	0.046***	0.049***	0.039***
		(0.006)	(0.008)	(0.009)	(0.006)	(0.006)	(0.010)	(0.006)	(0.008)	(0.010)	(0.007)	(0.007)	(0.011)
LogCOMP	+	0.482***	0.444***	0.503***	0.473***	0.448***	0.486***	0.472***	0.446***	0.486***	0.442***	0.432***	0.437***
		(0.016)	(0.023)	(0.022)	(0.018)	(0.014)	(0.024)	(0.018)	(0.025)	(0.024)	(0.019)	(0.015)	(0.027)
LogGDP	+	0.551***	0.617***	0.509***	0.469***	0.591***	0.414***	0.432***	0.555***	0.360***	0.281***	0.355***	0.267***
		(0.045)	(0.062)	(0.064)	(0.055)	(0.059)	(0.077)	(0.055)	(0.078)	(0.077)	(0.061)	(0.073)	(0.088)
Fixed Effects		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
N		123,621	61,811	61,810	108,587	54,294	54,293	108,587	54,294	54,293	93,424	46,714	46,710
Overall R^2		0.487	0.424	0.510	0.495	0.418	0.520	0.503	0.428	0.531	0.524	0.458	0.543
F-value		416.646***	205.577***	225.979***	284.713***	132.090***	150.539***	325.610***	153.537***	175.021***	188.907***	89.282***	99.256***

Notes: *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standard errors corrected for clustering at the group level are reported in parentheses below the estimates. Fixed effects include parent, company, industry, and year fixed effects. All variables are defined in Appendix A.

Table 7
Testing H2a and H2b using an alternative dependent variable and sample.

	Dependent variable: *Log(ROA+1)*							
	Pooled		Zero_LossProb		LossProb_MoreShifting		LossProb_LessShifting	
Sample	Profitable	Profitable and loss	Profitable	Profitable and loss	Profitable	Profitable and loss	Profitable	Profitable and loss
Variables	*STRdiff* (1)	*ExpTRdiff* (2)	*STRdiff* (3)	*ExpTRdiff* (4)	*STRdiff* (5)	*ExpTRdiff* (6)	*STRdiff* (7)	*ExpTRdiff* (8)
Intercept	0.319***	0.155***	0.445***	0.414***	0.061	−0.295**	0.292***	0.115*
	(0.049)	(0.044)	(0.095)	(0.095)	(0.140)	(0.120)	(0.068)	(0.061)
TAXRATEdiff	−0.052***	0.006	−0.114***	−0.095***	−0.020	0.004	−0.051*	−0.007
	(0.018)	(0.004)	(0.033)	(0.033)	(0.063)	(0.014)	(0.026)	(0.006)
LOSS		−0.139***		−0.142***		−0.140***		−0.136***
		(0.001)		(0.003)		(0.003)		(0.001)
LogTFA	−0.006***	−0.003***	−0.007***	−0.006***	−0.009***	−0.004***	−0.005***	−0.002***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
LogCOMP	0.007***	0.001	0.007***	0.005*	0.005	−0.004	0.008***	0.000
	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)	(0.003)	(0.001)	(0.001)
LogGDP	−0.023***	−0.005	−0.033***	−0.029***	0.005	0.042***	−0.022***	−0.002
	(0.005)	(0.004)	(0.009)	(0.009)	(0.013)	(0.011)	(0.007)	(0.006)
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
N	93,424	122,113	33,047	36,324	13,042	18,976	47,335	66,813
Overall R^2	0.015	0.522	0.011	0.294	0.031	0.499	0.018	0.548
F-value	44.664***	2,607.446***	18.836***	551.875***	8.198***	497.482***	16.981***	1,794.893***

Notes: *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standard errors corrected for clustering at the group level are reported in parentheses below the estimates. Fixed effects include parent, company, industry, and year fixed effects. All variables are defined in Appendix A. The definitions of the subsamples (i.e., Zero_LossProb, LossProb_MoreShifting, and LossProb_LessShifting) are provided in Appendix C.

although the statistical significance of the coefficients is weaker than those observed in the main analysis. As previously mentioned, the carryforward years (m) and the discount rate (r) in Eq. (6) dominate the expected tax rate. These two factors are predicted to influence the expected tax rate and the estimates of Eq. (4).

4.4. Additional analysis

Longer loss carryback/carryforward periods increase firms' anticipation that they can offset losses in the future (Langenmayr and Lester, 2018). In this regard, when loss-expecting affiliates make advance adjustments for income shifting,

Table 8
Tests of the effects of carryforward limitation on *ex ante* income shifting.

		Sample: Profitable affiliates Dependent variable: *LogEBIT*	
Variables	Pred.	*Incentive = LossExp* (1)	*Incentive = NOL* (2)
Intercept		−0.312	−3.212***
		(0.623)	(0.477)
STRdiff	−	−0.782***	−1.013***
		(0.256)	(0.207)
Incentive	−	−0.104***	−0.203***
		(0.018)	(0.013)
NOLlimit	+	0.000	−0.020
		(0.000)	(0.028)
*STRdiff*Incentive*	+	0.243	−0.032
		(0.237)	(0.153)
*STRdiff*NOLlimit*	+	0.494	0.022
		(0.488)	(0.219)
*STRdiff*Incentive*NOLlimit*	+	0.857**	0.411*
		(0.355)	(0.230)
LogTFA	?	0.045***	0.058***
		(0.007)	(0.006)
LogCOMP	+	0.448***	0.487***
		(0.019)	(0.016)
		(0.061)	(0.046)
Fixed Effects		Y	Y
N		93,424	123,766
Overall R^2		0.502	0.480
F-value		120.553***	238.401***

Notes: *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standard errors corrected for clustering at the group level are reported in parentheses below the estimates. Fixed effects include parent, company, industry, and year fixed effects. All variables are defined in Appendix A.

affiliates with long or indefinite carryforward years will have relatively weaker reverse incentives for income shifting because they can utilize losses whenever they realize profits. On the contrary, affiliates with short loss carryforward years will have stronger incentives to utilize losses within the limited period.

This additional analysis tests whether loss-expecting affiliates with limited loss carryforward periods shift income to a lesser extent than those with long or unlimited loss carryforward periods.

Table 8 shows the results of the analysis. *Incentive* is an indicator variable for incentives for loss utilization. Two proxies of *LossExp* and *NOL* are used for *Incentive*. The first proxy of *LossExp* is the same variable used in the main analysis. The second proxy of *NOL* is an indicator variable for net operating loss carryforward.[20] *NOLlimit* is an indicator variable equaling one if the home country of the affiliate limits loss carryforward years to less than 10 years and zero otherwise.

The positive coefficient on the interaction *STRdiff*Incentive*NOLlimit* indicates that affiliates with a limited loss carryforward period will engage in income shifting to a lesser extent than those with a long or indefinite loss carryforward period. Columns (1) and (2) in Table 8 report the results of the additional analysis. The coefficients on the interaction *STRdiff*LossExp*NOLlimit* are consistently positive and significant at the 1 percent and 10 percent levels in Columns (1) and (2). These results provide evidence that loss-expecting affiliates with limited loss carryforward periods reduce their income-shifting activities to utilize losses within the permitted offset periods.

5. Conclusion

The previous literature on income shifting by MNCs has generally focused on the behavior of profitable affiliates, but attention has recently turned to income-shifting strategies in consideration of losses. The main purpose of this study is to expand this line of research by taking into account loss expectation. In particular, the present study obtains the following empirical evidence using a sample of worldwide MNC affiliates. First, profitable affiliates with limited flexibility increase their *ex ante* adjustment when expecting a higher probability of incurring losses in the future. Second, the extent of such precautious action is greater for affiliates with lower flexibility than for those with higher flexibility. Third, the comparison with the estimates measured using the tax rate differences adjusted for loss expectation shows that the estimates measured by the traditional methodology of using statutory tax rate differences are biased because this estimation neglects precautionary income shifting for potential losses. Last, this estimation bias differs by affiliates depending on their loss expectation status and tax-rate levels.

This study expands research on the income-shifting strategies of loss affiliates by directly testing the effects of loss expectation on profitable affiliates. In addition, the present study contributes to generalizing the findings of Hopland et al. (2018) by identifying empirical evidence of *ex ante* adjustments due to limited flexibility in income-shifting strategies using a large sample of MNC affiliates. The empirical evidence of the estimation bias of the traditional methodology for measuring income shifting is also an important contribution. The results of this study highlight the necessity of incorporating the probability of incurring losses when estimating income shifting by MNC affiliates.

In addition to its multiple contributions, this study has certain limitations. First, because transfer prices and intercompany debts are undisclosed data in most countries, this study could not investigate *ex ante* adjustments using transfer prices and intercompany debts in a segregated manner similar to Hopland et al. (2018). Second, the final sample of observations used in this study is concentrated in European MNC affiliates mainly due to the sample composition of the Orbis database. Based on the results of the sample verification, however, this skewness in the sample observation is not expected to influence the implications of the study.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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[20] Because the value or existence of net operating loss carryforward is undisclosed data in the Orbis database, net operating losses are manually predicted using the actual profit and loss before tax (*PLBT*). For example, if affiliate A reported (-) 100, (+) 50, and (+) 30 as PLBT in year *t-3, t-2*, and *t-1*, respectively, its net operating loss carryforward is calculated as 50 and 20 in year t-1 and year t, respectively. Any losses incurred by the affiliate before 2007 are not considered, which is a limitation in the manual calculation of net operating loss carryforward.

Appendix A Variable definitions

Panel A: Variables for main analysis

Variable	Definition
LogEBIT	is the natural logarithm of earnings before interest and taxes (EBIT).
STR	is the statutory tax rate of the country where the affiliate is located.
Parent_STR	is the statutory tax rate of the country where the parent company of the affiliate is located.
STRdiff	is a measure of tax incentives for income shifting calculated by subtracting the parent company's statutory tax rate (*Parent_STR*) from the affiliate's statutory tax rate (*STR*).
LossExp	is an indicator variable equaling one if the probability of incurring loss (*H(p)*) is higher than 50 percent and zero otherwise. *H(p)* is calculated as the arithmetic mean of the loss recognition ratio (equaling one if loss is incurred and zero otherwise) for the past three years.
LowFlex	is an indicator variable equaling one if intangibles scaled by total assets is below the median (low flexibility) and zero (high flexibility) otherwise.
ExpTR	is the expected tax rate of the affiliate calculated according to the following equations: $ExpTR = [1 - H(p)]t_i + H(p) * t_{il}$ Where $H(p)$ is the probability of incurring losses; t_i is the statutory tax rate; t_{il} is the tax rate applied on losses calculated as: $t_{il} = \varnothing m * \max[0, t_{amt}] + (1 - \varnothing m) * t_i$, $\varnothing m = 1 - H(p)^m$. Where $\varnothing m$ is thse probability of losses being used within carryforward years m and t_{amt} is the alternative minimum tax rate.
Parent_ExpTR	is the expected tax rate of the parent company of the affiliate.
ExpTRdiff	is the measure of tax incentives for income shifting adjusted for loss expectation calculated according to the following equations: $ExpTRdiff = ExpTR - Parent\_ExpTR$
LogTFA	is the natural logarithm of tangible fixed assets.
LogCOMP	is the natural logarithm of the compensation expense.
LogGDP	is the natural logarithm of the per capita GDP (in millions of U.S. dollars) of the home country of the affiliate.

Panel B: Variables for robustness and additional analysis

Variable	Definition
Log(ROA+1)	is the natural logarithm of returns on asset (ROA) plus one. ROA is calculated as EBIT scaled by lagged total assets.
NOLlimit	is an indicator variable equaling one if the home country of the affiliate limits the carryforward period for losses to less than 10 years and zero otherwise.
NOL	is an indicator variable equaling one if the affiliate has net operating loss carryforward and zero otherwise.

Appendix B Calculation of *LossExp* and prediction ratio

Scenario	Indicator	*t-3*	*t-2*	*t−1*
A	Reported profit/loss	−10	−10	10
	LOSSt	100%	100%	0%
B	Reported profit/loss	10	10	−10
	LOSSt	0%	0%	100%

If a company reported profits or losses during the period from *t-3* to *t* as shown in the table above, the probability of incurring losses (*H(p)*) in year *t* is calculated as follows:

Scenario	*LossExp*	*H(p)*	*Value*
A	*LossExp1*	$H(p) = 0\%$	0
	LossExp2	$H(p) = \frac{(0\%+100\%)}{2} = 50\%$	1
	LossExp (main variable)	$H(p) = \frac{(0\%+100\%+100\%)}{3} = 66.67\%$	1
	LossExp2W	$H(p) = \frac{(0\%*2)+(100\%*1)}{3} = 33.33\%$	0
	LossExp3W	$H(p) = \frac{(0\%*3)+(100\%*2)+(100\%*1)}{6} = 50\%$	1
B	*LossExp1*	$H(p) = 100\%$	1
	LossExp2	$H(p) = \frac{(100\%+0\%)}{2} = 50\%$	1
	LossExp (main variable)	$H(p) = \frac{(100\%+0\%+0\%)}{3} = 33.33\%$	0
	LossExp2W	$H(p) = \frac{(100\%*2)+(0\%*1)}{3} = 66.66\%$	1
	LossExp3W	$H(p) = \frac{(100\%*3)+(0\%*2)+(0\%*1)}{6} = 50\%$	1

The prediction ratio and standard deviation of each *LossExp* variable are shown in the table below. The prediction ratio indicates the ratio of the number of affiliate-year observations for which the LossExp variables correctly predict the profit and loss status of the next year.

	Prediction ratio	SD
LossExp1	0.634	0.482
LossExp2	0.573	0.495
LossExp (main variable)	0.644	0.479
LossExp2W	0.634	0482
LossExp3W	0.608	0.488

Appendix C Estimation bias by affiliates differing in loss expectation status and tax-rate levels

Loss probability		Tax-rate level of an affiliate (outward/ inward income shifting)	Income shifting	Estimate (β) measured using *ExpTRdiff* (estimation bias)	Group
Affiliate	Parent company				
H(p)= 0	H(p)= 0	High (outward)	No *ex ante* adjustment and estimation bias due to zero probability of incurring loss	Negative (no bias)	Zero_ LossProb
		Low(inward)		Negative no bias)	Zero_LossProb
H(p)> 0	H(p)= 0	High (outward)	Less income is shifted out from the affiliate to the parent company because the affiliate expects to incur losses	Less negative or insignificant (overestimation)	LossProb_LessShifting
		Low (inward)	More income is shifted into the affiliate from the parent company to offset expected losses	More negative (underestimation)	LossProb_MoreShifting
H(p)= 0	H(p)> 0	High (outward)	More income is shifted into the affiliate from the parent company in advance to offset the expected losses of the affiliate	More negative (underestimation)	LossProb_MoreShifting
		Low (inward)	More income is shifted out of the affiliate into the parent company in advance to offset the expected losses of the parent company	Less negative or insignificant (overestimation)	LossProb_LessShifting
H(p)> 0	H(p)> 0	High (outward)	Less income shifting is conducted because both the affiliate and the parent company expect to incur losses	Less negative or insignificant (overestimation)	LossProb_LessShifting
		Low (inward)		Less negative or insignificant (overestimation)	LossProb_LessShifting

References

Beer, S., De Mooij, R. A., and Liu, M. L. 2018. *International corporate tax avoidance: A review of the channels, magnitudes, and blind spots*. CESifo Working Paper No. 7184.

Bernard, A. B., J. B. Jensen, and P. K. Schott. 2006. *Transfer pricing by U.S.-Based Multinational Fimrs*. Working Paper No. 12493, National Bureau of Economic Research.

Beuselinck, C., Deloof, M., Vanstraelen, A., 2015. Cross-jurisdictional income shifting and tax enforcement: evidence from public versus private multinationals. Rev. Account. Stud. 20 (2), 710–746.

Claessens, S., Laeven, L., 2004. What drives bank competition? Some international evidence. J. Money, Credit Bank 36 (3), 563–583.

Clausing, K.A., 2003. Tax motivated transfer pricing and US intrafirm trade prices. J. Public Econ. 87 (9–10), 2207–2223.

Clausing, K.A., 2009. Multinational firm tax avoidance and tax policy. Natl. Tax J. 62 (4), 703–725.

Collins, J., Kemsley, D., Lang, M., 1998. Cross-jurisdictional income shifting and earnings valuation. J. Account. Res. 36 (2), 209–229.

Cooper, M., Knittel, M., 2006. Partial loss refundability: how are corporate tax losses used? Natl. Tax J. 59 (3), 651–663.

Cristea, A.D., Nguyen, D.X., 2016. Transfer pricing by multinational firms: New evidence from foreign firm ownerships. Am. Econ. J. Econ. Policy 8 (3), 170–202.

Davies, R.B., Martin, J., Parenti, M., Toubal, F., 2018. Knocking on tax haven's door: Multinational firms and transfer pricing. Rev. Econ. Statist. 100 (1), 120–134.

De Simone, L., 2016. Does a common set of accounting standards affect tax-motivated income shifting for multinational firms? J. Account. Econ. 61, 145–165.

De Simone, L., Klassen, K.J., Seidman, J.K., 2017. Unprofitable affiliates and income shifting behavior. Account. Rev. 92 (3), 113–136.

De Simone, L., Huang, J., Krull, L.K., 2020. R&D and the rising profitability of U.S. Multinational corporations. Account. Rev. 92 (3), 177–204.

Delis, M.D., Hasan, I., Karavitis, P.I., 2020. Profit shifting and tax-rate uncertainty. J. Bus. Finance Account. 47 (5–6), 645–676.

Dharmapala, D., 2014. What do we know aout Base Erosion and Profit Shifting? A review of the empirical literature. Fiscal Studies 35 (4), 421–448.

Dharmapala, D., Riedel, N., 2013. Earnings shocks and tax-motivated income-shifting: evidence from European multinationals. J. Public Econ. 97, 95–107.

Dyreng, S., R. Hills, and K. Markle. 2022. *Tax deficits and the income shifting of US multinationals*. Working paper.

Dyreng, S.D., Markle, K.S., 2016. The effect of financial constraints on income shifting by US multinationals. Account. Rev. 91 (6), 1601–1627.

Gramlich, J.D., Limpaphayom, P., Rhee, S.G., 2004. Taxes, keiretsu affiliation, and income shifting. J. Account. Econ. 37 (2), 203–228.

Hines, J.R., Rice, E.M., 1994. Fiscal paradise: foreign tax havens and American business. Quart. J. Econ. 109 (1), 149–182.

Hopland, A. O., P. Lisowsky, M. Mardan, and D. Schindler. 2021. *Inflexibility in income shifting: Implications, detection and remedies*. Working paper.

Hopland, A.O., Lisowsky, P., Mardan, M., Schindler, D., 2018. Flexibility in income shifting under losses. Account. Rev. 93 (3), 163–183.

Huizinga, H., Laeven, L., 2008. International profit shifting within multinationals: A multi-country perspective. J. Public Econ. 92 (5), 1164–1182.

Klassen, K.J., Lang, M., Wolfson, M., 1993. Geographic income shifting by multinational corporations in response to tax rate changes. J. Account. Res. 31 (Supplement), 140–173.

Klassen, K.J., Laplante, S.K., 2012a. Are U.S. multinational corporations becoming more aggressive income shifters? J. Account. Res. 50 (5), 1245–1285.

Klassen, K.J., Laplante, S.K., 2012b. The effect of foreign reinvestment and financial reporting incentives on cross-jurisdictional income shifting. Contem. Account. Res. 29 (3), 928–955.

Langenmayr, D., Lester, R., 2018. Taxation and corporate risk-taking. Account. Rev. 93 (3), 237–266.

Lohse, T., Riedel, N., Spengel, C., 2012. The Increasing Importance of Transfer Pricing Regulations –. a Worldwide Overview. Oxford University Centre for Business Taxation Working Paper.

Markle, K., 2016. A Comparison of the tax-motivated income shifting of multinationals in territorial and worldwide countries. Contem. Account. Res. 33 (1), 7–43.

Markle, K.S., Mills, L.F., Williams, B., 2020. Implicit corporate taxes and income shifting. Account. Rev. 95 (3), 315–342.

Onji, K., Vera, D., 2010. Tax law asymmetries and income shifting: Evidence from Japanese capital keiretsu. B.E. J. Econ. Anal. Policy 10 (1), 1–35.

Organisation for Economic Co-operation and Development (OECD). 2015. *Action Plan on Base Erosion and Profit Shifting*. OECD Publishing.

Overesch, M., 2009. The effects of multinationals' profit shifting activities on real investments. Natl. Tax J. 62 (1), 5–22.

Overesch, M. 2006. *Transfer Pricing of Intrafirm Sales as a Profit Shifting Channel—Evidence from German Firm Data*. Discussion Paper No. 06-084, Center for European Economic Research.

Riedel, N., T. Zinn, and P. Hofmann. 2015. *Do Transfer Pricing Laws Limit International Income Shifting? Evidence from Europe*. CESifo Working Paper, No. 4404.

Saunders-Scott, M. J. 2014. *Three Essays on Profit Shifting*. A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Economics) in the University of Michigan.

Tørsløv, T., L. Wier and G. Zueman. 2020. *The missing profits of nations*. Working Paper No. 24701, National Bureau of Economic Research.