

# An empirical study on cross-border profit shifting in Australia

Xuerui (Estelle) Li\* and Alfred Tran\*\*

## **Abstract**

This is an empirical study on the cross-border profit shifting engaged in by Australian subsidiaries of foreign multinational enterprises for tax avoidance. The study reveals that in comparison with domestic-owned listed Australian companies, foreign-owned Australian companies utilise intra-group transfer pricing and pay high interest rates on intra-group debts to shift profits out of Australia to avoid Australian tax to a greater extent, which are manifested in their lower gross profit margins and operating profit margins, higher interest expenses but similar leverage ratios, as well as lower pre-tax profits and income tax expenses.

**Key words:** Cross-border profit shifting, Australian subsidiaries of foreign multinationals, transfer pricing, thin capitalisation

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\* Research School of Accounting, The Australian National University.

\*\* Research School of Accounting, The Australian National University. Corresponding author, email: [Alfred.Tran@anu.edu.au](mailto:Alfred.Tran@anu.edu.au). We gratefully acknowledge the financial support of the ANU College of Business and Economics Research School Grant. We also appreciate the helpful suggestions and comments of the participants of the 2015 Australasian Tax Teachers' Association Conference (19-21 January 2015 at the University of Adelaide) and the Tax and Transfer Policy Institute seminar (13 October 2015 at the Australian National University) on the previous versions of this article.

## 1. INTRODUCTION

In the wake of accelerated globalisation and advanced information technology, multinational enterprises (MNEs) typically engage in cross-border profit shifting to artificially shift their profits from high-tax to low-tax jurisdictions for tax avoidance. The profit shifting results in the erosion of the tax bases and hence reduced tax payments due in the high-tax jurisdictions where the MNEs operate. This practice is referred to by the Organisation for Economic Co-operation and Development (OECD) as base erosion and profit shifting, or BEPS. Research has estimated that BEPS may result in an annual tax revenue loss of USD 100-240 billion (OECD, 2015a). Consider two well-known MNEs as examples. Apple Inc., the giant technology company, has been revealed in recent Congressional hearings in the US that it had successfully sheltered USD 44 billion from taxation worldwide for the years 2009 to 2012 by implementing a tax structure where the transfer of economic rights of its intellectual property played a key role (Ting, 2014). In Australia, BHP has agreed to pay the Australian Taxation Office AUD 529 million over the transfer pricing issues involving its Singaporean marketing hub (Ker, 2018).

This article investigates whether and the extent to which Australian subsidiaries of foreign MNEs (ASFMs) engage in cross-border profit shifting to avoid Australian corporate income tax, focusing on two main tax avoidance strategies: intra-group transfer pricing and thin capitalisation. Intra-group transfer pricing refers to the manipulation of ‘the monetary value attaching to goods, services and intangibles traded between units of the same group which cross national boundaries’ (Elliott & Emmanuel, 2000, p. 216), so that higher profits are recorded in countries with lower tax rates.<sup>1</sup> Thin capitalisation refers to ‘thinly capitalise foreign affiliates in high-tax countries and rely instead to an excessive extent on debt financing’ (Merlo & Wamser, 2014, p. 27). It is an indirect way of profit shifting as companies in high-tax jurisdictions can borrow from related parties in low-tax jurisdictions which results in higher interest expenses (on the intra-group debts) hence lower profits booked in high-tax jurisdictions.

Ideally, tax-motivated cross-border profit shifting would best be revealed by examining subsidiary-level financial and tax data, or intra-group trade data, which are not available to most researchers.<sup>2</sup> Nevertheless, since this article looks at cross-border profit shifting in Australia which operates a dividend imputation system that has a corporate tax avoidance-reducing effect for domestically-owned listed Australian companies (DOLACs), an alternative approach is developed: comparing ASFMs with DOLACs on cross-border profit shifting indicators.

Specifically, prior studies such as Amiram, Bauer and Frank (2019), Ikin and Tran (2013), Li and Tran (2019), and Wilkinson, Cahan and Jones (2001), have provided evidence for the corporate tax avoidance-reducing effect of the dividend imputation system. In the Australian context, the dividend imputation system allows Australian listed companies to pass their domestic corporate income tax to Australian shareholders in the form of franking credits attached to dividend distributions. Australian

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<sup>1</sup> The transfer price *per se* is ‘the price an organization must charge or pay to transfer goods from one subsidiary or internal branch to another segment of the same organization’ (Barnhouse, Booth & Wester 2012, p. 2).

<sup>2</sup> The group-level financial information of many MNEs is available. However, all intra-group transactions are eliminated upon consolidation, rendering detailed subsidiary-level data unrevealed.

shareholders can claim the franking credits received as a tax offset against their personal income tax. As such, for Australian shareholders, Australian corporate income tax does not reduce the after-tax returns on their investment in the companies. Foreign shareholders, however, cannot claim the franking credit tax offset in either Australia or their countries of residence, and therefore view Australian corporate tax as a real cost.<sup>3</sup> In line with this argument, Li and Tran (2019) reveal that among Australian listed companies, those with higher foreign ownership engage in greater tax avoidance than do those with lower foreign ownership.

Based on the findings in prior studies, this article treats DOLACs as the benchmark companies which do not have strong incentives to engage in Australian corporate tax avoidance by means such as shifting profits out of Australia. By contrast, ASFMs, due to their foreign shareholdings and the relatively high corporate tax rate in Australia,<sup>4</sup> are hypothesised to engage in Australian tax avoidance by shifting profits to foreign low-tax jurisdictions where their affiliates operate. More specifically, if ASFMs employ intra-group transfer pricing to shift out profits, they would have reduced gross profit margins and operating profit margins due to the inflated costs of purchases of goods and services or depressed selling prices for intra-group transactions. Likewise, if ASFMs are structured to be thinly capitalised to claim a high level of tax deductions for interest expenses, one would observe substantial interest expenses and relatively high leverage ratios for ASFMs. If by engaging in either intra-group transfer pricing or thin capitalisation, or both, ASFMs effectively shift profits out of Australia, then they would have lowered pre-tax profits as well as lowered income tax expenses.

To compare ASFMs with DOLACs on their cross-border profit shifting, paired sample *t*-tests are performed around six financial ratios which are designed to capture intra-group transfer pricing, thin capitalisation, and the effectiveness of the two profit shifting methods to avoid tax. The results show that compared to the matched DOLACs, ASFMs have lower gross profit to sales revenue ratios and lower earnings before interest and tax (EBIT) to sales revenue ratios, which implies that they engage in intra-group transfer pricing activities. ASFMs have higher interest expense to sales revenue ratios yet similar leverage ratios, which indicates that they may pay higher interest rates on intra-group debts to claim more tax deductions. ASFMs also have lower pre-tax profit to sales

<sup>3</sup> If foreign shareholders receive franked dividends from Australian companies, no further Australian withholding tax on the dividend income is payable. However, in their countries of residence, foreign portfolio shareholders (those with shareholding of less than 10% of the issued equity shares of the Australian company) are liable to pay income tax on the dividend income, and they cannot claim the franking credits received as tax offsets. Therefore, from their perspective, the underlying corporate profits from which dividends are paid out are subject to double taxation: once in Australia in the form of corporate income tax, and again in the shareholders' countries of residence in the form of personal income tax. For a foreign non-portfolio investor (with shareholding of at least 10% of the voting power in the dividend-distributing company) such as the parent company of an ASFM, foreign tax on the non-portfolio dividends is likely to be exempt or can be deferred indefinitely, depending on the tax system that the foreign investor's home country adopts. If the country adopts a territorial tax system, then the non-portfolio dividends are likely to be exempt from income tax (similar to Subdivision 768-A of the *Income Tax Assessment Act 1997* in Australia). If the country adopts a worldwide tax system (such as the US before the recent tax reform), then the investor's home country income tax in excess of foreign tax credit, if any, can be deferred indefinitely as long as the Australian subsidiary does not pay dividends. In both cases, the more Australian corporate income tax the ASFM can avoid, the higher the after-tax returns from the ASFM will be. In sum, for foreign shareholders (portfolio or non-portfolio), Australian corporate income tax reduces their after-tax returns, and franking credits are of no value.

<sup>4</sup> KPMG (2016) provides a list of corporate tax rates around the world. The Australian corporate tax rate (30%) is higher than the OECD average and the average of the European Union (EU).

revenue ratios and lower income tax expense to sales revenue ratios, which suggests that they effectively shift profits out of Australia and lowered their Australian tax liabilities.

Multivariate regression analyses are also performed. The six financial measures of intra-group transfer pricing, thin capitalisation and the effectiveness of the two profit shifting methods are regressed on an ASFM indicator along with control variables. The results are consistent with the findings from the paired sample *t*-tests.

The article contributes to the literature on tax-induced cross-border profit shifting as well as dividend imputation systems. It shows, in an alternative way in the absence of intra-group trade data, that ASFMs engage in cross-border profit shifting to a greater extent than do comparable DOLACs, and hence also provides evidence of the impeding role of foreign ownership on the corporate tax avoidance-reducing effect of the dividend imputation system which has not been adequately examined in prior studies. The article also develops measures, using financial data and in accordance with the pertinent guidelines provided by the OECD to capture corporate tax avoidance via intra-group transfer and thin capitalisation.

The remainder of this article is organised as follows. Section 2 reviews the literature on tax-induced intra-group transfer pricing and thin capitalisation. Hypotheses are developed based on the discussion. Section 3 explains the sample selection and introduces the propensity score matching technique employed to construct the matched samples. Results from the paired sample *t*-tests and the multivariate regression analyses are presented in section 4. Section 5 provides a robustness check. Lastly, section 6 summarises and concludes the article.

## 2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

MNEs typically engage in corporate tax avoidance via cross-border profit shifting to exploit the differences in tax laws and tax rates across jurisdictions. This article focuses on two main cross-border profit shifting practices as suggested in the literature and government reports, namely, intra-group transfer pricing and thin capitalisation.

### 2.1 Intra-group transfer pricing

Intra-group transfer pricing refers to the prices charged on the flow of goods and services between members of an MNE that operate in different countries with different tax rates. It provides a means for MNEs to shift profits from high-tax countries (such as Australia) to low-tax countries to take advantage of the tax rate arbitrage.

Due to the lack of subsidiary-level financial and tax data and intra-group trade data, extant studies have mostly relied on examining the relationship between foreign subsidiaries' profitability levels and the local tax rates to provide indirect evidence of tax-motivated intra-group transfer pricing. A negative relation between profitability and tax rates indicates profit shifting as greater profits are booked into low-tax jurisdictions and consequently the MNE group as a whole has reduced tax liability.

Early studies, based on aggregate country-level data, have documented a negative relation between foreign subsidiaries' tax rates and their profitability levels (e.g., Grubert & Mutti, 1991; Hines & Rice, 1994). Recent firm-level studies have addressed whether and how the tax rate differentials among subsidiaries and between subsidiaries and their parent companies affect their respective profitability levels. For instance,

Dischinger (2007) reveals a negative relation between a subsidiary's pre-tax profit and the statutory corporate tax rate differential of the subsidiary relative to its foreign parent. Further analysis shows that subsidiaries located in countries with high tax rates (relative to that of the parent company) shift out approximately three times more profits than do subsidiaries in low-tax countries (Dischinger, 2007). Similarly, Huizinga and Laeven (2008) also find supporting evidence for tax-induced profit shifting among foreign subsidiaries of European MNEs operating in the manufacturing industry.

In contrast to many cross-border profit shifting studies that focus on the negative relation between tax rate differential and subsidiaries' profitability levels, Egger, Eggert and Winner (2010) investigate the extent to which foreign plant ownership involves lower tax payments than domestic plant ownership in Europe. They use the propensity score matching approach to match European manufacturing plants that are foreign-owned with those that are domestically-owned based on nine firm-level, region-level, industry-level, and region-industry-level characteristics that are expected to affect the probability of a plant being foreign-owned.<sup>5</sup> The matching approach helps to eliminate the self-selection bias (into foreign ownership) which may confound the result when comparing the tax payments of foreign-owned versus domestically-owned plants. With a series of *t*-tests based on the matched sample, Egger et al. (2010) provide supporting evidence for MNEs' tax-induced profit shifting: in low-tax countries, foreign-owned plants make substantially greater profits than do their domestic counterparts; on the contrary, in high-tax countries, they earn significantly lower profits than do comparable domestic counterparts.

A few studies, using intra-group trade data, have provided more direct supporting evidence for tax-induced intra-group transfer pricing of MNEs. For instance, based on monthly intra-firm trade prices (both export and import) of MNEs with either subsidiaries or parent companies located in the US, Clausing (2003) reports a strong relation between the trade countries' tax rates and the prices charged on the intra-group transactions: when the tax rate of the trade country decreases, the US intra-group export (import) prices become lower (higher) relative to non-intra-group trade prices. Also using the US data, Bernard, Jensen and Schott (2006) match, for each firm, the arm's length transaction price for a particular product with the average of the firm's exporting prices to related parties, on a destination country-month-transport mode basis. They find that the US export prices for related parties are lower than those for arm's length customers, and the price discrepancy is larger when the destination country has a lower tax rate and higher import tariffs (Bernard et al., 2006).<sup>6</sup>

In the Australian context, given the relatively high corporate tax rate, ASFMs would have strong incentives to shift profits out of Australia to foreign low-tax countries via intra-group transfer pricing. The intra-group transfer pricing arrangements can take the form of supplying goods and services to related parties (other members within the MNE group) at depressed transfer prices, or by purchasing goods and services (including patented technologies) from related parties at inflated transfer prices. As a consequence,

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<sup>5</sup> The nine firm-level, region-level, industry-level, and region-industry-level characteristics are firm age, number of plants in the same region and industry, ratio of MNEs to all firms in the same region and industry, number of employees in the same region, number of employees per firm in the same region and industry, annual labour costs in the same region, annual labour costs per employee in the same region and industry, material costs per firm in the same region and industry, and employees of the firm.

<sup>6</sup> The US has a relatively high corporate tax rate compared to other countries in the world.

depending on the type of the goods and services that are transacted with related parties, ASFMs would have reduced gross profit margins and reduced operating profit margins.

In the absence of intra-firm trade data, this article proposes an alternative approach to reveal the intra-group transfer pricing engaged in by ASFMs to avoid Australian corporate income tax: comparing them against firms with similar operations but which are not motivated to engage in intra-group transfer pricing to avoid Australian tax. This article argues that DOLACs are the best available benchmarking firms for two reasons. First, as suggested in prior studies, DOLACs do not have strong incentives to avoid Australian tax because their Australian resident shareholders can enjoy franking credit tax offsets. In other words, for DOLACs, Australian corporate tax avoidance is arduous but fruitless: it requires substantial costs but may not proffer real tax savings. Thus, engaging in intra-group transfer pricing to shift profits out of Australia is not expected to be observed among DOLACs. Second, unlike ASFMs, DOLACs are the ultimate parent companies, which means on consolidation, intra-group transactions and balances are eliminated and DOLACs' consolidated financial reports only reflect the results of transactions with external parties which are at arm's length, instead of the results of any intra-group transfer pricing (except for the resultant tax expenses).

Based on the above discussion, this article compares gross profit margins and operating profit margins of ASFMs with those of DOLACs' to detect tax-induced intra-group transfer pricing by ASFMs. If ASFMs engage in tax-induced intra-group transfer pricing to shift profits out of Australia, they would have lower gross profit margins (because of the lower sales revenue or higher cost of sales) and lower operating profit margins (because of the higher management and other fees paid) in comparison with those of DOLACs. Such comparison is also in line with the OECD transfer pricing guidelines to determine whether the transfer prices of intra-group transactions are at arm's length.<sup>7</sup> The following two hypotheses are developed:

*H1A: ASFMs have lower gross profit to sales revenue ratios than do comparable DOLACs.*

*H1B: ASFMs have lower earnings before interest and tax (EBIT) to sales revenue ratios than do comparable DOLACs.*

## 2.2 Thin capitalisation

Generally, thin capitalisation refers to the heavy use of debts, especially debts from related parties, rather than equity, as a source of finance. In the context of cross-border tax avoidance, thin capitalisation can be viewed as shifting debts to subsidiaries located in high-tax countries (e.g., Australia) so that a high level of tax deduction for interest

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<sup>7</sup> To deal with tax avoidance via intra-group transfer pricing, the OECD identifies five methods to determine the 'arm's length' transfer prices of intra-group transactions within MNEs. Three of the five methods determine the 'arm's length' transfer prices by referring to the gross profit margins or the operating profit margins achieved in similar transactions between independent parties. The other two methods require detailed corporate internal data. One of these two methods determines the 'arm's length' transfer prices of intra-group transactions by referring to the prices charged for similar goods or services in a comparable transaction but between independent parties. The other requires the calculation of the total profit generated by the two related parties and a split of the total profit between the two parties based on an appropriate splitting percentage.

expense can be claimed, resulting in subsidiaries in high-tax countries being highly geared.

Prior studies have documented MNEs' use of thin capitalisation for tax avoidance. For instance, Mills and Newberry (2004) find that among US subsidiaries of foreign MNEs, those being part of foreign MNEs with lower average foreign tax rates (i.e., the US tax rate is relatively high) report lower taxable income and have higher leverage ratios and interest expense to sales ratios. Desai, Foley and Hines (2004) document a positive relation between leverage levels and local tax rates for foreign subsidiaries of US MNEs: a 10% higher local tax rate is associated with 2.8% higher leverage ratios. Huizinga, Laeven and Nicodeme (2008) show that an MNE's foreign subsidiaries' capital structures are affected by both the local tax rates and the tax rate differentials across countries where the parent company and other foreign subsidiaries within the group operate. For example, for an MNE with two subsidiaries in two countries, a 10% overall tax rate increase in one country would result in an increase of 2.4% in the leverage ratio in that country but a decrease of 0.6% in the leverage ratio in the other country; in contrast, for stand-alone domestic firms, a 10% increase in the overall tax rate would lead to 1.8% increase in the leverage ratio (Huizinga et al., 2008).

As with intra-group transfer pricing, due to the relatively high corporate tax rate in Australia and the restrictions on claiming the franking credit tax offset by foreign shareholders, ASFMs have incentives to adopt highly geared structures by means such as borrowing from related parties overseas and even at inflated interest rates to claim substantial interest expenses to reduce their Australian tax liabilities. By contrast, DOLACs do not have strong incentives for thin capitalisation. This is also consistent with the findings in a number of Australian studies, such as Twite (2001), which have observed declines in leverage ratios of listed companies after the introduction of the dividend imputation system in Australia. In addition, as explained in the discussion of intra-group transfer pricing in section 2.1 above, DOLACs' consolidated financial reports only reflect the results of transactions with external parties. Thus, DOLACs can serve as a benchmark for the levels of debt and interest expense that Australian companies without tax-induced thin capitalisation normally have. Comparing ASFMs with DOLACs on their interest expenses and leverage ratios can help infer ASFMs' use of thin capitalisation. In fact, the level of interest expense and level of debt, as relative measures, have been suggested or used by countries in formulating thin capitalisation rules.<sup>8</sup>

Following the discussion above, it is hypothesised that ASFMs employ thin capitalisation to increase their tax deductions for interest expenses. Their inflated interest expenses and highly geared structures would be manifested in higher interest expense to sales revenue ratios and higher leverage ratios in comparison with those of DOLACs. Thus, the following two hypotheses are developed:

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<sup>8</sup> The OECD (2012) recognised two primary approaches by which thin capitalisation rules in various countries normally operated: (1) determining a maximum amount of debt on which interest payments can be claimed as tax deductions, and (2) determining a maximum amount of interest that is deductible by referring to interest ratios such as interest to operating profit or cash flow. In 2015, the OECD released the BEPS Project Recommendation on Action Item 4 which suggested a fixed ratio approach to replace the previous thin capitalisation rules. Under the newly recommended approach, interest payments will not be deductible for tax purpose if the ratio of net interest expense to EBITDA (earnings before interest, tax, depreciation and amortisation) exceeds a certain threshold in the range of 10% to 30% (OECD, 2015b).

*H2A: ASFMs have higher interest expense to sales revenue ratios than do comparable DOLACs.*

*H2B: ASFMs have higher leverage ratios (long-term borrowings to total assets) than do comparable DOLACs.*

### 2.3 Effectiveness of ASFMs' tax avoidance arrangements

Cross-border tax avoidance via intra-group transfer pricing and thin capitalisation cannot be captured by conventional tax avoidance measures such as the effective tax rate, because the arrangements result in simultaneous reductions in tax expense, pre-tax accounting profit and taxable income.

Regardless of the choice between intra-group transfer pricing and thin capitalisation, tax-induced cross-border profit shifting results in reduced profit (taxable income) and tax liability. To complement the analyses above, this article examines the extent to which ASFMs successfully shift profits out of Australia and hence enjoy a reduced Australian tax burden.

In line with the argument provided in the previous sections, DOLACs serve as the benchmark because they do not have strong incentives to engage in Australian tax avoidance and their consolidated financial figures (other than tax expense) reflect the results of transactions with external third parties. For tax expense, DOLACs' tax expense may comprise both Australian income tax and foreign income tax. Though Australian corporate income tax paid can be passed to shareholders as franking credits and hence does not reduce shareholders' after-tax returns, foreign income tax cannot. Thus, DOLACs may seek foreign tax avoidance by engaging in tax avoidance arrangements in the foreign countries where they have operations, or by shifting foreign profits to Australia as the resultant Australian tax can be passed to shareholders as franking credits and hence does not reduce shareholders' after-tax returns. In comparison, the second approach is more appealing as it not only reduces foreign taxes but also enhances franking credit availability which would enable the distribution of franked dividends as preferred by the Australian capital market.<sup>9</sup> Such approach makes the tax expenses of DOLACs with foreign operations similar to those without foreign operations. Therefore, arguably, DOLACs' tax expenses reflect the level of tax expenses of Australian companies without extensively engaging in corporate tax avoidance (domestic or foreign), and therefore can serve as the benchmark.

If ASFMs engage in intra-group transfer pricing, or thin capitalisation, or both, to effectively shift profits out of Australia, it is expected that they have lower pre-tax accounting profits and lower income tax expenses, relative to sales revenues, than those of DOLACs, leading to the following two hypotheses:

*H3A: ASFMs have lower pre-tax accounting profit to sales revenue ratios than do comparable DOLACs.*

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<sup>9</sup> Bellamy (1994) finds that the dividend paid per share was higher for companies distributing franked dividends than for companies distributing unfranked dividends. Pattenden and Twite (2008) argue for a tax-induced preference for franked dividends. The Australian Taxation Office (2015) documents increased franked dividend distributions since the introduction of the dividend imputation system.



*H3B: ASFMs have lower income tax expense to sales revenue ratios than do comparable DOLACs.*

### 3. RESEARCH DESIGN

#### 3.1 Data collection and calculation

To test the hypotheses developed in section 2, ASFMs are compared with DOLACs in terms of the six ratios capturing intra-group transfer pricing, thin capitalisation and the effectiveness of these two methods in shifting profits out of Australia to reduce income tax liabilities (hereafter referred to as the outcome ratios).<sup>10</sup> The six outcome ratios are defined and calculated as shown in the following six equations:

$$\text{Gross Profit Ratio} = \frac{\text{Sales revenue} - \text{Cost of goods sold}}{\text{Sales revenue}} \quad (1)$$

$$\text{EBIT Ratio} = \frac{\text{Pre-tax accounting profit} + \text{Interest expense}}{\text{Sales revenue}} \quad (2)$$

$$\text{Interest Expense Ratio} = \frac{\text{Interest expense}}{\text{Sales revenue}} \quad (3)$$

$$\text{Leverage} = \frac{\text{Long-term borrowings}}{\text{Total assets}} \quad (4)$$

$$\text{Pre-Tax Profit Ratio} = \frac{\text{Pre-tax accounting profit}}{\text{Sales revenue}} \quad (5)$$

$$\text{Income Tax Expense Ratio} = \frac{\text{Income tax expense}}{\text{Sales revenue}} \quad (6)$$

The Gross Profit Ratio and the EBIT Ratio capture the outcome of engaging in intra-group transfer pricing. The Interest Expense Ratio and the Leverage capture the outcome of using thin capitalisation. The Pre-Tax Profit Ratio and the Income Tax Expense Ratio measure the extent to which profits are shifted out of Australia and the extent to which Australian tax liabilities are reduced, respectively.

To calculate the above ratios, financial data are hand-collected from annual reports, including notes to financial statements. ASFMs' annual reports are purchased from the Australian Securities and Investments Commission (ASIC).<sup>11</sup> DOLACs' annual reports

<sup>10</sup> This article does not intend to examine the specific arrangements used in practice to achieve cross-border profit shifting for tax avoidance, such as whether or how an ASFM purchases goods from overseas related parties at prices higher than an arm's length range. Such examination requires internal and often confidential data which are not available to outside researchers. In the absence of intra-group transaction data, tax-induced profit shifting behaviour can only be detected by comparing the financial ratios of ASFMs with comparable DOLACs as a control group (comparable in terms of industry, firm size and capital intensity) to detect cross-border profit shifting. The ultimate parent's financial reports do not help to investigate cross-border profit shifting because intra-group transactions are eliminated upon consolidation. In other words, the financial reports of the ultimate parent only show the results of the group as a whole from transactions with outside parties, not the transactions within the group.

<sup>11</sup> ASFMs are not listed on the Australian Securities Exchange (ASX) and therefore are not required to make their annual reports publicly available free of charge. Nevertheless, in accordance with Chapter 2M of the *Corporations Act 2001*, all large proprietary companies and small proprietary companies that are

are obtained from commercial database DatAnalysis Premium. Pre-tax accounting profit does not include the share of associates' profit or loss which is an after-tax figure. Income tax expense does not include royalty-related taxation and resource rent tax.<sup>12</sup> Since some ASFMs present their financial data in thousands of dollars, for consistency, all financial data are collected in thousands of dollars.

## 3.2 Sample selection

### 3.2.1 Initial sample

The sample year is 2012. Because of the significant cost of purchasing annual reports of ASFMs from the ASIC, the sample year and sample size are subject to resource constraints. Moreover, 2012 is the last year to study cross-border profit shifting without the impact of the highly publicised Base Erosion and Profit Shifting (BEPS) Project of the OECD and the related amendments to the Australian tax legislation (including the transfer pricing rules effective from 2013) which are expected to reduce international tax avoidance.

To draw a sample of ASFMs, a list of Australia's top 2,000 companies in the year 2012 is obtained from IBISWorld; the description of each of the companies available on the IBISWorld website is then examined.<sup>13</sup> Companies which are described as 'subsidiaries' of foreign MNEs or 'wholly foreign-owned' are classified as ASFMs. Additional efforts are made to identify companies with names appearing to associate with foreign MNEs but whose foreign ownership cannot be confirmed by screening the information from IBISWorld.<sup>14</sup> Financial companies,<sup>15</sup> companies with operations in countries other than Australia and New Zealand,<sup>16</sup> and companies without 2012 financial information are excluded. The above selection procedure results in 319 ASFMs for which annual reports

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foreign-controlled (with some exceptions) are required to lodge financial reports with ASIC. Their annual reports can be purchased from ASIC at a cost of AUD 38 each.

<sup>12</sup> Royalty-related taxation and resource rent tax are levied based on the mining production output. Thus, they do not change in proportion to profit and are better regarded as part of cost of goods sold than as income tax.

<sup>13</sup> The list includes public companies (both listed and non-listed), large proprietary companies, foreign-owned companies, trusts (e.g., large superannuation funds), as well as public sector and not-for-profit entities (e.g., universities and charitable organisations). Focusing on the top 2,000 companies increases the chance of finding foreign-owned companies which tend to be large in size and hence have annual reports available from ASIC.

<sup>14</sup> For instance, the foreign ownership of some Australian companies is confirmed by examining the list of subsidiaries of their foreign parents. The list can usually be found in the foreign parents' annual reports, or, for US MNEs, in the files lodged to the Securities and Exchange Commission.

<sup>15</sup> ASFMs in the financial industry (e.g., subsidiaries of foreign banks) are excluded because they are subject to prudential regulations and special thin capitalisation rules, so their operations and financial structures are different from other companies.

<sup>16</sup> The exclusion of foreign-owned companies with operations in countries other than Australia and New Zealand is to ensure that the foreign-owned companies to be included in the ASFMs sample are not affected by other foreign tax rates or tax systems. For example, if an Australian subsidiary of a foreign MNE has subsidiaries in Singapore (Singaporean corporate tax has been 17% since 2010), then its financial statement would reflect both the Australian operation and the Singaporean operation. Further, its intra-group transactions with the Singaporean operating part (other than the resultant tax expense) are not reflected in its financial reports. New Zealand is not treated as a foreign country for three reasons. First, the Australian and New Zealand governments have extended their dividend imputation systems to include companies residing in the other country under the trans-Tasman triangular imputation rules. Second, many foreign MNEs set up subsidiaries in Australia which are responsible for both Australian and New Zealand markets. Third, the corporate tax rate in New Zealand has been 28% since 2011, similar to the Australian rate of 30%.

are purchased from the ASIC. In addition, for each of the ASFMs, the parent company information in their annual reports is also examined to ensure that the ASFM is not a subsidiary of another ASFM included in the sample. In cases where an ASFM has a few subsidiaries in Australia, the financial data of the Australian consolidated group is collected.

The sample of DOLACs is based on companies listed on the Australian Securities Exchange (ASX) for the year 2012. Foreign companies, financial companies, trusts and stapled securities are first excluded.<sup>17</sup> The top 500 companies, ranked by sales revenue, are then taken, with the aim of better matching between ASFMs and DOLACs in term of firm size because ASFMs in the sample are generally large in size. Sales revenue, rather than total assets, is used as the ranking base because ranking based on total assets may result in a large number of mining firms with substantial assets to be included in the sample albeit they are still at their start-up stage and do not have significant operating revenue or profit. To ensure that the companies selected as DOLACs have predominantly domestic ownership, those with more than 20% foreign ownership among the top 20 shareholders are excluded.<sup>18</sup> The 20% threshold is employed to maintain a reasonably large sample size. In total, 423 companies are included in the DOLACs sample. Table 1 shows how the samples of ASFMs and DOLACs are derived.

### 3.2.2 *Six sub-samples*

Six sub-samples corresponding to the six outcome ratios are extracted from the initial sample described above, and are used to test the six hypotheses. In each of the six sub-samples, companies with the corresponding outcome ratio greater than 1 or less than 0 are excluded. For example, in the Gross Profit Ratio sub-sample which is used to test H1A, ASFMs and DOLACs with Gross Profit Ratio greater than 1 or less than 0 are excluded. This is to ensure that the results are not dominated by extreme values. Thus, the size of each sub-sample varies, depending on the number of observations with extreme values.

The sizes and compositions (ASFMs and DOLACs) of the six sub-samples are summarised in Table 2.

<sup>17</sup> The ASX identifies 95 foreign incorporated entities quoted on ASX in June 2012. Foreign companies are excluded because the Australian dividend imputation system does not apply to them. Financial companies are excluded because they are subject to special regulations and special disclosure requirements, so some of the required data items in this study are not available for financial companies. Trust funds and trusts in stapled securities are excluded because they are 'pass-through' entities for tax purposes.

<sup>18</sup> Foreign ownership among the top 20 shareholders (i.e., the percentage of foreign shareholding divided by the total percentage of the top 20 shareholdings) is estimated based on the top 20 shareholders information extracted from annual reports and by referring to the Osiris database which shows the nationality of some of the top 20 shareholders. Additional efforts are made to search for the shareholders (mainly corporate shareholders) from some credible websites such as Bloomberg and ASIC Connect to identify their nationalities. Foreign ownership is estimated as the ratio of the percentage of foreign shareholdings to the total percentage of the top 20 shareholders. New Zealand shareholders are not treated as foreign because the Australian and New Zealand governments have extended their dividend imputation systems to include companies residing in the other country under the trans-Tasman triangular imputation rules. In total, 74 companies with foreign ownership being greater than 20% are excluded (including two dual-listed companies: BHP Billiton and Rio Tinto). Three companies with no top 20 shareholder information are also excluded.

**Table 1: Sample Reconciliation**

<b>Panel A: ASFMs sample reconciliation</b>	
Selection procedure	No. of companies
Identified ASFMs on IBISWorld top 2,000 list	380
<i>Less</i> financial companies	(31)
<i>Less</i> companies with operations in countries other than Australia and New Zealand	(6)
<i>Less</i> companies without 2012 financial information available	(24)
<b>ASFMs in the sample</b>	<b>319</b>
<b>Panel B: DOLACs sample reconciliation</b>	
Selection procedure	No. of companies
Companies listed on the ASX for the year 2012	1,977
<i>Less</i> foreign companies identified by ASX	(95)
<i>Less</i> financial companies, trusts and stapled securities	(345)
	1,537
Take the top 500 companies ranked by sales	500
<i>Less</i> companies with more than 20% foreign ownership among the top 20 shareholders	(77)
<b>DOLACs in the sample</b>	<b>423</b>

**Table 2: Sizes and Compositions of Sub-Samples**

Sub-Samples	ASFMs	DOLACs	Total
Gross Profit Ratio Sub-Sample <sup>19</sup>	219	229	448
EBIT Ratio Sub-Sample	260	321	581
Interest Expense Ratio Sub-Sample	319	422	741
Leverage Sub-Sample	316	421	737
Pre-Tax Profit Ratio Sub-Sample	250	308	558
Income Tax Expense Ratio Sub-Sample	271	342	613

<sup>19</sup> The Gross Profit Ratio sub-sample is much smaller than all the other sub-samples because around 40% of the companies do not disclose cost of goods sold hence are excluded. According to the Australian Accounting Standards 101 *Presentation of financial statements*, when presenting expense items in income statements, companies can use a classification based on the nature or the function of the expenses, depending on which one provides reliable and more relevant information. If the company chooses to present expense items based on the nature, no cost of goods sold will be presented in the income statements.

### 3.3 Propensity score matching

Extant studies such as Girma and Görg (2007) and Chari, Chen and Dominguez (2012) have suggested the endogeneity of foreign ownership of companies. This means there are some systematic differences between foreign-owned and domestically-owned companies. Therefore, neither simple *t*-tests on the six outcome ratios, nor regressions of the six outcome ratios on an ASFMs indicator along with control variables, is an appropriate approach to examine whether ASFMs engage in intra-group transfer pricing and thin capitalisation to shift profits out of Australia to reduce their Australian tax liabilities.

To address the endogeneity issue, this article employs the propensity score matching technique, as developed by Rosenbaum and Rubin (1983), to construct a 'matched' or 'paired' sample of ASFMs and DOLACs.

In the context of the current study, propensity score is the predicted probability of a company in the sub-samples being an ASFMs conditional on the baseline covariates or explanatory variables which are expected to affect the pertinent outcome variable but may or may not influence the foreign ownership of the company.<sup>20</sup> Among the six outcome ratios, Gross Profit Ratio, EBIT Ratio, and Pre-Tax Profit Ratio are profitability measures; Income Tax Expense Ratio captures corporate tax avoidance or tax liability; and Interest Expense Ratio and Leverage reflect corporate capital structure. Prior studies have commonly suggested firm size and industry affiliation to be determinants of profitability, tax avoidance, and capital structure (e.g., Goddard, Tavakoli & Wilson, 2005; Porter, 1980; Titman & Wessels, 1988).<sup>21</sup> In addition, capital intensity or tangibility has also been found to be a significant determinant of corporate capital structure, especially in Australia (e.g., Deesomsak, Paudyal & Pescetto, 2004; Fan, Titman & Twite, 2012).<sup>22</sup> Interestingly, firm size and industry affiliation are also foreign ownership influential factors. Egger et al. (2010) and Chari et al. (2012) argue that large companies and companies in certain industries are more likely to be foreign-owned.

Based on the above discussion, for each of the sub-samples of Gross Profit Ratio, EBIT Ratio, Pre-Tax Profit Ratio and Income Tax Expense Ratio, firm size and industry

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<sup>20</sup> In selecting the appropriate baseline covariates or explanatory variables for the matching model, no consensus has been achieved among empirical researchers (Austin, 2011). However, Austin, Grootendorst and Anderson (2007) show that when only the potential confounders (explanatory variables affecting the outcome variable) or the true confounders (explanatory variables affecting both the treatment assignment and the outcome variable) are included in the model so that it is balanced between the treated and untreated subjects, the imbalanced variables would be those affecting the treatment assignment but not the outcome. Moreover, including either of the two confounders in the matching model would generate relatively precise estimation of the treatment effect without introducing additional bias. Brookhart et al. (2006) argue that including variables affecting the treatment only but not the outcome variable would result in increased variance of the treatment effect estimation but not reduced bias. Thus, including explanatory variables that influence the outcome variable and/or the treatment assignment at the same time appears to be appropriate.

<sup>21</sup> Other profitability determinants such as R&D expenditure and marketing or advertising expenditure are not employed as the explanatory variables because ASFMs, as subsidiaries of foreign MNEs, may not incur these expenditures themselves but rely on the group with regards to product innovation, brand name establishment or advertising campaign. Moreover, the financial statements of ASFMs do not disclose as much detailed information as that of DOLACs. For ASFMs, some expenditure items are not separately disclosed.

<sup>22</sup> Other capital structure determinants are capital market-based, such as growth opportunities and share price performance. They are not available for ASFMs because ASFMs are not listed on the ASX.

dummy variables are employed as the explanatory variables; whilst for each of the sub-samples of Interest Expense Ratio and Leverage, in addition to firm size and industry dummy variables, capital intensity is also incorporated as an explanatory variable. The propensity score for each of the sample companies are estimated using the following two logit models:

$$ASFMi = \alpha_0 + \beta_1 SIZE_i + \beta_{2-20} IND + \varepsilon_i \quad (7)$$

$$ASFMi = \alpha_0 + \beta_1 SIZE_i + \beta_2 CAPINT_i + \beta_{3-21} IND + \varepsilon_i \quad (8)$$

Where for firm  $i$ ,

ASF $M$ : ASF $M$  indicator, taking the value of 1 if the company is an ASF $M$ , and 0 otherwise;

SIZE: firm size, measured by the natural logarithm of sales revenue;<sup>23</sup>

CAPINT: capital intensity, measured by non-current assets divided by total assets;

IND: industry dummy variables, created based on four-digit Global Industry Classification Standards (GICS) codes;<sup>24</sup>

$\varepsilon$ : regression error term.

The logit regression results from Equation (7) and Equation (8) are presented in Table 3 (pages 216 to 218). Note that due to matching on industry dummy variables, a few industries are excluded due to lack of observations in the opposite group in the same industry.

From the two logit models, propensity scores are estimated for each of the companies in the six sub-samples. Within each sub-sample, each ASF $M$  is then matched with a DOLAC, without replacement, which has the closest estimated propensity score within a maximum distance which is also known as the caliper. The caliper is initially determined as 25% of the standard deviation of the propensity scores, truncated to two-decimal places without rounding (Guo & Fraser, 2015), then reduced in hundredths till reaching a balanced sample of ASF $M$ s and DOLACs, i.e., ASF $M$ s are not significantly

<sup>23</sup> In comparison with other common firm size measures such as total assets, market capitalisation, and employee numbers, sales revenue is considered as the most appropriate proxy for firm size. Total assets cannot capture the operating scales of ASF $M$ s, especially those with electronic commerce and those whose products are sold by themselves as well as by other companies. Consider Apple Pty Ltd which is the Australian subsidiary of Apple Inc. as an example. The company not only has its own retailing stores in Australian metropolitan cities, but also sells by wholesale or distributes its products to other consumer electronic stores such as JB Hi-Fi. Market capitalisation cannot be used as the firm size measure in this study because ASF $M$ s are not listed on the ASX. Employee number is not disclosed by every company and may include the number of contractors who may have a number of employees and subcontractors not included in the number disclosed.

<sup>24</sup> For DOLACs, their four-digit GICS codes are readily available from the commercial database DatAnalysis Premium. However, for ASF $M$ s, their industry classification is not readily available and therefore needs to be coded manually based on the principal activity information disclosed in their annual reports. There are 20 industries in total where the sample companies operate. Thus, 19 industry dummy variables are created. The base industry is Energy, with GICS code being 1010.

different from DOLACs on the explanatory variables at the 10% level.<sup>25</sup> If the caliper is reduced to 0.01 and a balanced sample is not reached, then the caliper is further reduced in thousandths. Imposing a caliper has been proposed as one of the best ways to reduce possible poor matches and to enhance balance in the explanatory variables (Shipman, Swanquist & Whited, 2017).

#### 4. RESULTS AND DISCUSSION

##### 4.1 Descriptive statistics and paired sample *t*-tests

Table 4 (pages 219 to 226) shows the descriptive statistics for the six sub-samples before and after matching, and *t*-tests serve as balancing tests for the matching. Paired sample *t*-tests are used to test the differences between the matched ASFMs and DOLACs on the six outcome ratios, with *t*-statistics reported in brackets. It is observed that before matching, ASFMs have lower outcome ratios than DOLACs at the 1% level, except Interest Expense Ratio for which the difference is only significant at the 10% level. There are some significant differences between ASFMs and DOLACs in terms of firm size, industry affiliation, and capital intensity before matching. In all of the six sub-samples, before matching, ASFMs are on average larger than DOLACs. For the Interest Expense Ratio sub-sample and the Leverage sub-sample, before matching, ASFMs are on average less capital intensive than DOLACs.

After matching, no significant difference exists among the explanatory variables (including industry dummy variables), indicating that the matching procedure effectively reduces the systematic differences between ASFMs and DOLACs, and the resultant ASFMs are reasonably comparable to DOLACs in each of the six sub-samples.

With regard to the outcome variables, ASFMs are still significantly different from DOLACs in most of the outcome ratios after matching. Specifically, ASFMs have lower Gross Profit Ratio and lower EBIT Ratio than do comparable DOLACs (0.263 versus 0.374, and 0.095 versus 0.142, respectively) and the differences are significant at the 1% level, consistent with H1A and H1B. The results suggest that for every one dollar of sales revenue, ASFMs generate 11.1 cents lower gross profits and 4.7 cents lower EBITs than do comparable DOLACs, which is indicative of ASFMs' being charged inflated prices for the goods or services purchased (greater costs of goods sold and greater expenses such as management and other service fees), or charging depressed prices on the goods sold. Thus, it can be inferred that ASFMs engage in intra-group transfer pricing to shift profits out of Australia to avoid Australian tax.<sup>26</sup>

Regarding thin capitalisation, ASFMs have higher Interest Expense Ratio than do comparable DOLACs (0.029 versus 0.017) and the difference is significant at the 5%

<sup>25</sup> For example, if the standard deviation of the estimated propensity score is 0.1895, then the initial caliper is calculated as  $25\% \times 0.1895$ , truncated to 0.04. Since different sub-samples have different propensity scores and hence standard deviations of propensity scores, the imposed caliper varies across samples. The specific calipers are shown in Table 3 for each of the sub-samples. Attempts have been made to use calipers which are smaller than 0.25 of the standard deviations of the estimated propensity scores. The results are similar to those reported in Table 3.

<sup>26</sup> It is unlikely that the found lower Gross Profit Ratio and lower EBIT Ratio of ASFMs can be attributable to their inefficient operations in Australia for reasons such as being unfamiliar with the local conditions. ASFMs are subsidiaries of foreign MNEs which are well-established and lucrative in the global market. Thus, ASFMs should have ample resources to compete against Australian domestic businesses.

level, consistent with H2A. However, on average, ASFMs have Leverage of 0.111 which is higher than that of comparable DOLACs, 0.098, but the difference is not statistically significant. The two findings together suggest that in comparison with DOLACs, ASFMs incur higher interest expenses for every one dollar of sales revenue generated, but they do not borrow more long-term debts to finance assets. The higher interest expenses but similar long-term debt levels indicate that ASFMs may pay higher interest rates than do comparable DOLACs, which is consistent with tax-induced debt shifting to allow subsidiaries in high-tax countries to claim more tax deductions for interest expenses. In this case, the lender is likely to be a related party operating in a low-tax country so that the higher interest revenue is taxed at a low rate and the group as a whole achieves tax savings.

In fact, the similar levels of Leverage of ASFMs and DOLACs may be partially due to the strong cash positions of ASFMs. As subsidiaries of foreign MNEs, ASFMs may have strong incentives to keep their after-tax profits in the host country (Australia) instead of sending them back to the parent companies. With a substantial amount of cash especially in the case of distributors, debt financing may not be needed. Consider an Australian subsidiary of a US MNE as an example. The US adopted the worldwide approach to tax foreign profits in the sample year. Under the approach, the operating profit of a foreign subsidiary was subject to foreign income tax only unless and until it was repatriated, usually in the form of dividend payment. Upon profit repatriation, US income tax liability on the foreign profit was incurred, which was generally the difference between the US income tax payable as if the profit were sourced in the US and the foreign tax credit for the foreign tax paid. Therefore, the US income tax on the foreign profit can be indefinitely deferred if the foreign subsidiary did not repatriate profit to its US parent company. Consequently, US MNEs had incentives to retain their foreign subsidiaries' profits overseas. In fact, it has been reported that the majority of the over USD 2 trillion cash held by US MNEs are held by their foreign subsidiaries (Casselmann & Lahart, 2011). Foley et al. (2007) suggest that the high levels of US MNEs' foreign cash holdings could be partially attributable to the US repatriation tax rules. For example, Apple Pty Ltd, the Australian subsidiary of Apple Inc., held more than AUD 363 million cash and cash equivalents by September 2012, which constituted approximately 40% (30%) of the company's current assets (total assets).

Furthermore, as the Australian thin capitalisation rules specify debt limit but not the maximum interest expense that is deductible for tax purposes, adopting highly-g geared structures may place ASFMs in a risky position to be challenged by the tax authority. In comparison, borrowing from related parties within the limit but with relatively high interest rate provides an alternative way to reduce ASFMs' Australian tax liabilities.

In terms of the effectiveness of ASFMs' Australian tax avoidance via intra-group transfer pricing and thin capitalisation, Table 4 shows that ASFMs have lower Pre-Tax Profit Ratio and lower Income Tax Expense Ratio than do comparable DOLACs (0.086 versus 0.137, and 0.025 versus 0.034, respectively), and the differences are significant at the 1% and 10% levels, respectively, supporting H3A and H3B. These figures suggest that for every one dollar of sales revenue, ASFMs book 5.1 cents lower pre-tax profits and incur 0.9 cent lower income tax expenses than do comparable DOLACs. The findings imply that ASFMs effectively shift profits out of Australia thereby reducing their Australian tax liabilities.

The 6.3% significance level (higher than the conventional 5%) for the difference between ASFMs and DOLACs in Income Tax Expense Ratio is possibly due to the



inclusion of DOLACs with up to 20% foreign ownership among the top 20 shareholders in the sample. As discussed previously, Australian companies with foreign ownership have incentives to engage in tax avoidance, which may bring down their overall tax liabilities.<sup>27</sup> On the other hand, some ASFMs might have been subject to additional tax following tax audits that identified tax shortfalls due to cross-border profit shifting. For example, Chevron Australia Holdings Pty Ltd<sup>28</sup> borrowed USD 2.45 billion from a subsidiary in the US at an interest rate of approximately 9%, but the US subsidiary raised the money by issuing commercial paper in the US at an interest rate of about 1.2%. The dividends that Chevron received from the US subsidiary were regarded as non-assessable non-exempt income pursuant to section 23AJ of the *Income Tax Assessment Act 1936*. In 2012, the Commissioner of Taxation issued amended assessments under Division 815 of the *Income Tax Assessment Act 1997* for the 2006, 2007 and 2008 income years on the basis that the interest paid by Chevron to the US subsidiary was greater than it would have been in an arm's length dealing between independent parties. The assessments were held by the Full Federal Court to be valid.

## 4.2 Regression analyses

To triangulate the findings from the paired sample *t*-tests, Ordinary Least Squares (OLS) regression analyses are performed. For each of the six sub-samples, the outcome ratio is regressed on an ASFM indicator, along with the pertinent control variables. The equations below show the six OLS regression models.

$$\text{Gros Profit Ratio}_i = \alpha_0 + \beta_1 \text{ASFM}_i + \beta_2 \text{SIZE}_i + \beta_{3-21} \text{IND} + \varepsilon_i \quad (9)$$

$$\text{EBIT Ratio}_i = \alpha_0 + \beta_1 \text{ASFM}_i + \beta_2 \text{SIZE}_i + \beta_{3-21} \text{IND} + \varepsilon_i \quad (10)$$

$$\text{Interest Expense Ratio}_i = \alpha_0 + \beta_1 \text{ASFM}_i + \beta_2 \text{SIZE}_i + \beta_3 \text{CAPINT}_i + \beta_{4-22} \text{IND} + \varepsilon_i \quad (11)$$

$$\text{Leverage}_i = \alpha_0 + \beta_1 \text{ASFM}_i + \beta_2 \text{SIZE}_i + \beta_3 \text{CAPINT}_i + \beta_{4-22} \text{IND} + \varepsilon_i \quad (12)$$

$$\text{Pre-Tax Profit Ratio}_i = \alpha_0 + \beta_1 \text{ASFM}_i + \beta_2 \text{SIZE}_i + \beta_{3-21} \text{IND} + \varepsilon_i \quad (13)$$

$$\text{Income Tax Expense Ratio}_i = \alpha_0 + \beta_1 \text{ASFM}_i + \beta_2 \text{SIZE}_i + \beta_{3-21} \text{IND} + \varepsilon_i \quad (14)$$

Table 5 (pages 227 to 232) reports the regression results.<sup>29</sup> It should be noted that although firm size, industry affiliation dummy variables and capital intensity are already

<sup>27</sup> In the sample selection process, there is no restriction imposed on DOLACs' foreign operations. This is to ensure that the evidence for ASFMs' engaging in intra-group transfer pricing and thin capitalisation to shift profits out of Australia can be attributed to their strong incentives, rather than opportunities, to avoid Australia tax, as DOLACs may also have foreign operations hence opportunities to reduce Australian tax.

<sup>28</sup> *Chevron Australia Holdings Pty Ltd v Federal Commissioner of Taxation* [2017] FCAFC 62. Chevron is one of the ASFMs in the matched sample.

<sup>29</sup> Regression analyses are also performed on samples where ASFMs whose propensity score is higher than the maximum or lower than the minimum propensity score of DOLACs are excluded (i.e., regressions on common support). The results are similar to those reported in Table 4, except the coefficient for the ASFM indicator in the Income Tax Expense Ratio Sub-Sample which becomes negative and significant at the 5% level.

included in the propensity score matching logit models, they are still significant determinants of the six outcome ratios and need to be controlled for.

The regression analyses before and after the propensity score matching generate similar results. For simplicity, the discussion here focuses on the matched samples. In both the Gross Profit Ratio sub-sample and the EBIT Ratio sub-sample, the coefficient for the ASFM indicator is negative and significant at the 1% level. It implies that after controlling for firm size and industry affiliation, ASFMs generate lower gross profits and lower EBITs for every \$1 of sales revenue than do comparable DOLACs, supporting H1A and H1B. In the Interest Expense Ratio sub-sample, the coefficient for the ASFM indicator is positive and significant at the 1% level. It means that after controlling for firm size, industry affiliation and capital intensity, ASFMs incur higher interest expenses per dollar of sales revenue than do DOLACs, supporting H2A. In the Leverage sub-sample, the ASFM indicator is not significantly related to Leverage, meaning that ASFMs do not rely on debt financing to a greater extent than do DOLACs, after controlling for firm size, industry affiliation and capital intensity. In this sense, H2B is not supported. As discussed previously, such finding may be attributable to ASFMs' strong cash positions (especially in the case of distributors) as they may have incentives to keep their after-tax profits in Australia rather than sending them back to the foreign parent companies. In the Pre-Tax Profit Ratio sub-sample, the coefficient for the ASFM indicator is negative and significant at the 1% level, suggesting that after controlling for firm size and industry affiliation, ASFMs generate lower pre-tax profit for every \$1 of sales revenue than do DOLACs, lending support to H3A. In the Income Tax Expense Ratio sub-sample, the coefficient for the ASFM indicator is negative and significant at the 10% level, indicating that ASFMs incur lower income tax expense for every \$1 of sales revenue than do DOLACs, supporting H3B.

In summary, both the paired sample *t*-tests and the regression analyses on the matched samples provide supporting evidence that ASFMs engage in intra-group transfer pricing and pay high interest rates on intra-group debts to reduce their Australian profits hence Australian tax liabilities.

## 5. ROBUSTNESS CHECK

A robustness check is performed to exclude companies operating in industries with fewer than five ASFMs or five DOLACs. Such exclusion may help generate better matched samples, though results in smaller sample sizes. In total, 69 companies are excluded.<sup>30</sup>

Based on the reduced sample, the same paired sample *t*-tests and OLS regression analyses as those discussed in section 4 are performed. The results largely resemble those reported in the main test.<sup>31</sup>

<sup>30</sup> The excluded 69 companies include three ASFMs and 23 DOLACs operating in the Consumer Services sector, seven ASFMs and three DOLACs operating in the Food & Staples Retailing sector, four ASFMs and two DOLACs operating in the Household & Personal Products sector, one DOLAC operating in the Semiconductors & Semiconductor Equipment sector, for ASFMs and 13 DOLACs operating in the Telecommunication Services sector, and three ASFMs and six DOLACs operating in the Utilities sector.

<sup>31</sup> An exception is that in the paired sample *t*-tests, ASFMs do not have significantly lower Income Tax Expense Ratio than matched DOLACs.

## 6. CONCLUSION

This article investigates the tax-induced cross-border profit shifting, namely intra-group transfer pricing and thin capitalisation, engaged in by Australian subsidiaries of foreign multinationals (ASFMs) as compared to domestic-owned listed Australian companies (DOLACs). The comparison helps to reveal the tax avoidance practices of ASFMs because DOLACs, based on prior studies, do not have strong incentives for Australian tax avoidance and therefore can serve as the benchmark. This is because in the Australian dividend imputation system, shareholders of DOLACs, predominantly Australian residents, can enjoy the franking credit tax offset and hence do not view Australian corporate income tax as a cost to be minimised for after-tax wealth maximisation; in contrast, ASFMs have strong incentives to reduce Australian tax because the more Australian corporate income tax that the ASFMs can avoid, the higher the after-tax returns from the ASFMs will be.

To compare ASFMs with DOLACs on six financial measures of intra-group transfer pricing and thin capitalisation, paired sample *t*-tests using the propensity score matching technique are performed. The comparisons between ASFMs and DOLACs show that ASFMs have lower gross profit to sales revenue ratios and lower EBIT to sales revenue ratios than do comparable DOLACs. It indicates that ASFMs engage in intra-group transfer pricing: they charge depressed prices for the goods and services supplied to related parties, or pay inflated prices for the goods and services purchased from related parties. The comparison also shows that ASFMs have higher interest expense to sales revenue ratios, yet similar leverage, than do comparable DOLACs. The results suggest that ASFMs may pay high interest rates on intra-group debts to claim a high level of tax deductions for interest expenses. The differences in the intra-group transfer pricing measures between ASFMs and DOLACs are larger in absolute values than those in the thin capitalisation measures, indicating that intra-group transfer pricing has a more profound effect hence constituting the primary tax avoidance channel by ASFMs. Furthermore, the effectiveness of the tax avoidance activities engaged in by ASFMs is also evidenced in the sense that ASFMs have lower pre-tax profit to sales revenue ratios and lower income tax expense to sales revenue ratios than do comparable DOLACs.

Multivariate regression analyses on the matched sample triangulate the findings from the paired sample *t*-tests.

The study is subject to a number of limitations. First, since ASFMs do not have four-digit GICS codes readily available, coding for the industry classification is performed manually. The coding may not be precise because many companies engage in activities across multiple industries. Decisions have to be made as to which is the main industry based on the information available. Second, the sample size is relatively small compared with other studies using the propensity score matching approach. A larger sample may result in better matching between ASFMs and DOLACs. Third, five of the six outcome ratios are scaled by sales revenue which may be depressed by companies engaging in intra-group transfer pricing. Had the arm's length sales revenue of ASFMs been available and used for the scaling, the evidence that ASFMs engage in Australian tax avoidance via intra-group transfer pricing and thin capitalisation would have been even stronger.

The findings of this article should be of interest to both Australian and overseas policy-makers. At the national level, they indicate that the Australian transfer pricing rules before 2013 may not be as effective as expected. Prior to 2013, the Australian transfer

pricing rules imposed arm's length standards on MNEs' internal dealings, and the trading of property or services between separate legal entities under international arrangements. In 2013, the government introduced new transfer pricing rules which aligned the application of the arm's length principle in the Australian tax law with the international transfer pricing standards set by the OECD guidelines. Nevertheless, the inherent deficiencies in the arm's length principle, which involve the difficulty in identifying comparable transactions and the determination of arm's length prices, may still enable companies to circumvent the law.

The thin capitalisation rules prior to 2013 appeared to be effective in limiting the gearing ratios of companies, yet companies could still claim substantial tax deductions for interest expenses at high interest rates on intra-group debts. Although the government tightened the thin capitalisation rules in 2014, the new rules do not stipulate limitations on interest rates on debts. That said, interest rates on intra-group debts are now assessed under the arm's length principle following the *Chevron* case.

Moreover, the findings in this article also correspond with those in prior studies on the corporate tax avoidance-reducing effect of the dividend imputation system: Australian companies with significant foreign ownership have strong incentives to avoid Australian corporate income tax. Thus, improvement to the current imputation system to extend the imputation benefits to foreign shareholders may help broaden the corporate tax avoidance-reducing effect of the imputation system. However, this requires foreign tax authorities to recognise Australian corporate tax paid as tax offsets in their countries, which is outside the jurisdiction of the Australian tax system.

Future studies could investigate whether the newly introduced transfer pricing rules in Australia in 2013 help tackle cross-border tax avoidance more effectively, and consider whether the recommended 'fixed ratio approach' to deduction of interest expense by the OECD (2015b) is worth adopting. The decision of the full Federal Court in 2017 in the *Chevron* case confirms that transfer pricing rules can be used to tackle the non-arm's length interest rates charged on intra-group loans.

At the global level, the finding that DOLACs engage in intra-group transfer pricing and thin capitalisation to a lesser extent than do comparable ASFMs suggests that adopting the imputation system may form part of the solutions to corporate tax avoidance. Countries which have never adopted the system or have abolished the system in the past (e.g., some European countries) may consider adopting the system (again). International organisations and forums such as the OECD and the Group of Twenty (G20) have not considered the dividend imputation system to deal with tax avoidance via cross-border profit shifting. Their action plans and recommendations mainly address the requirement of more transparent disclosures by MNEs and the development of a multilateral instrument to deal with international tax matters. Based on the findings of this article, it appears that a global dividend imputation system with a central clearing house may be complementary to the international corporate tax avoidance countermeasures in the OECD BEPS Action Plan.

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**Table 3: Logit Model Results**

Panel A Gross profit ratio sub-sample					Panel B EBIT ratio sub-sample				
	Coef.	Std. Err.	z	P >  z		Coef.	Std. Err.	z	P >  z
Constant	-6.23512***	1.0376	-6.01	0.000	Constant	-3.31428***	0.84264	-3.93	0.000
SIZE	0.410738***	0.07262	5.66	0.000	SIZE	0.189239***	0.05973	3.17	0.002
Industry 1510	0.545731	0.49486	1.10	0.270	Industry 1510	0.34109	0.45633	0.75	0.455
Industry 2010	1.07836**	0.48634	2.22	0.027	Industry 2010	0.807486*	0.41537	1.94	0.052
Industry 2020	1.327119**	0.65545	2.02	0.043	Industry 2020	-0.0868	0.49577	-0.18	0.861
Industry 2030	2.178869*	1.19795	1.82	0.069	Industry 2030	0.0214	0.6169	0.03	0.972
Industry 2510	1.970901**	0.7804	2.53	0.012	Industry 2510	1.885001**	0.91329	2.06	0.039
Industry 2520	-0.01262	0.78883	-0.02	0.987	Industry 2520	0.5228	0.6769	0.77	0.440
Industry 2530	-0.47848	1.16326	-0.41	0.681	Industry 2530	-1.46641*	0.82499	-1.78	0.075
Industry 2540	1.482926*	0.84101	1.76	0.078	Industry 2540	0.37161	0.62193	0.60	0.550
Industry 2550	2.31104***	0.50449	4.58	0.000	Industry 2550	1.935115***	0.43507	4.45	0.000
Industry 3010	1.606386	0.98211	1.64	0.102	Industry 3010	1.14917	0.83521	1.38	0.169
Industry 3020	1.197658**	0.57585	2.08	0.038	Industry 3020	0.920768*	0.52575	1.75	0.080
Industry 3030	2.415148*	1.2416	1.95	0.052	Industry 3030	2.416611**	1.17755	2.05	0.040
Industry 3510	1.274622**	0.56055	2.27	0.023	Industry 3510	0.913059*	0.47964	1.90	0.057
Industry 3520	0.97501	0.80601	1.21	0.226	Industry 3520	0.66689	0.74999	0.89	0.374
Industry 4510	1.015743	0.64405	1.58	0.115	Industry 4510	0.31158	0.5195	0.60	0.549
Industry 4520	2.007115***	0.6258	3.21	0.001	Industry 4520	2.290025***	0.62849	3.64	0.000
Industry 4530	.	.	.	.	Industry 4530	.	.	.	.
Industry 5010	-0.03742	1.19035	-0.03	0.975	Industry 5010	-0.0038	0.70129	-0.01	0.996
Industry 5510	0	.	.	.	Industry 5510	0.07121	0.79926	0.09	0.929
<i>No. Obs.</i>	443				<i>No. Obs.</i>	580			
<i>Pseudo R-square</i>	0.1478				<i>Pseudo R-square</i>	0.1120			
<i>Caliper</i>	0.05				<i>Caliper</i>	0.04			



## Panel C Interest expense ratio sub-sample

	Coef.	Std. Err.	z	P >  z
Constant	-3.082482***	0.7800295	-3.95	0.000
SIZE	0.3607459***	0.0566898	6.36	0.000
CAPINT	-3.744285***	0.4210181	-8.89	0.000
Industry 1510	0.3016014	0.4202432	0.72	0.473
Industry 2010	-0.3810947	0.4194045	-0.91	0.364
Industry 2020	-0.4199125	0.475975	-0.88	0.378
Industry 2030	0.0097727	0.6377255	0.02	0.988
Industry 2510	0.696011	0.7369267	0.94	0.345
Industry 2520	-0.4893064	0.6673301	-0.73	0.463
Industry 2530	-1.209472	0.7441346	-1.63	0.104
Industry 2540	0.433796	0.5770326	0.75	0.452
Industry 2550	0.7207028	0.4389619	1.64	0.101
Industry 3010	0.2491008	0.8148224	0.31	0.760
Industry 3020	0.8723609*	0.5005532	1.74	0.081
Industry 3030	0.78076	0.9723727	0.8	0.422
Industry 3510	-0.3210669	0.5054451	-0.64	0.525
Industry 3520	0.5054552	0.761853	0.66	0.507
Industry 4510	-0.4300584	0.5179897	-0.83	0.406
Industry 4520	0.5528407	0.5754408	0.96	0.337
Industry 4530	.	.	.	.
Industry 5010	-0.1528223	0.7124769	-0.21	0.830
Industry 5510	0.5178821	0.8283052	0.63	0.532
No. Obs.	740			
Pseudo R-square	0.1997			
Caliper	0.06			

## Panel D Leverage sub-sample

	Coef.	Std. Err.	z	P >  z
Constant	-2.964881***	0.7910976	-3.75	0.000
SIZE	0.3658915***	0.0573097	6.38	0.000
CAPINT	-3.919044***	0.430622	-9.1	0.000
Industry 1510	0.1838983	0.425392	0.43	0.666
Industry 2010	-0.5048729	0.4265041	-1.18	0.237
Industry 2020	-0.52165	0.4817153	-1.08	0.279
Industry 2030	-0.0604196	0.6418211	-0.09	0.925
Industry 2510	0.5856304	0.7431657	0.79	0.431
Industry 2520	-0.5934107	0.6730673	-0.88	0.378
Industry 2530	-1.796721**	0.8569325	-2.1	0.036
Industry 2540	0.3510448	0.5832651	0.6	0.547
Industry 2550	0.5721754	0.446246	1.28	0.200
Industry 3010	0.127277	0.8198096	0.16	0.877
Industry 3020	0.7931213	0.5048564	1.57	0.116
Industry 3030	0.6657727	0.9777368	0.68	0.496
Industry 3510	-0.4505523	0.5134019	-0.88	0.380
Industry 3520	0.41946	0.7687026	0.55	0.585
Industry 4510	-0.5336203	0.5236659	-1.02	0.308
Industry 4520	0.4178096	0.5826875	0.72	0.473
Industry 4530	.	.	.	.
Industry 5010	-0.2265421	0.7168937	-0.32	0.752
Industry 5510	0.4692555	0.8315327	0.56	0.573
No. Obs.	736			
Pseudo R-square	0.2087			
Caliper	0.06			

Panel E Pre-tax profit ratio sub-sample

	Coef.	Std. Err.	z	P >  z
Constant	-3.27608***	0.86384	-3.79	0.000
SIZE	0.194468***	0.06147	3.16	0.002
Industry 1510	0.004516	0.46234	0.01	0.992
Industry 2010	0.718368*	0.41075	1.75	0.080
Industry 2020	-0.2487	0.49854	-0.50	0.618
Industry 2030	-0.08168	0.64888	-0.13	0.900
Industry 2510	1.782111**	0.91018	1.96	0.050
Industry 2520	0.420384	0.6727	0.62	0.532
Industry 2530	-1.57164*	0.8214	-1.91	0.056
Industry 2540	0.354628	0.62406	0.57	0.57
Industry 2550	1.816223***	0.42866	4.24	0.000
Industry 3010	1.037986	0.83215	1.25	0.212
Industry 3020	0.729809	0.53712	1.36	0.174
Industry 3030	2.315463**	1.17529	1.97	0.049
Industry 3510	0.847001*	0.47587	1.78	0.075
Industry 3520	0.566455	0.74682	0.76	0.448
Industry 4510	0.246022	0.51595	0.48	0.633
Industry 4520	2.389191***	0.66221	3.61	0.000
Industry 4530	.	.	.	.
Industry 5010	-0.109	0.69736	-0.16	0.876
Industry 5510	0.124331	0.81699	0.15	0.879
No. Obs.	557			
Pseudo R-square	0.118			
Caliper	0.04			

Panel F Income tax expense ratio sub-sample

	Coef.	Std. Err.	z	P >  z
Constant	-3.626718***	0.8073701	-4.49	0.000
SIZE	0.2340446***	0.0565895	4.14	0.000
Industry 1510	0.0955095	0.4285404	0.22	0.824
Industry 2010	0.4568116	0.4081295	1.12	0.263
Industry 2020	-0.269967	0.473631	-0.57	0.569
Industry 2030	0.0373363	0.6302021	0.06	0.953
Industry 2510	1.132133	0.7710237	1.47	0.142
Industry 2520	-0.2443084	0.7587767	-0.32	0.747
Industry 2530	-1.638004**	0.8253544	-1.98	0.047
Industry 2540	0.2444658	0.5927554	0.41	0.680
Industry 2550	1.644733***	0.4230924	3.89	0.000
Industry 3010	0.8380712	0.8382684	1.00	0.317
Industry 3020	0.6509597	0.4996294	1.30	0.193
Industry 3030	2.189984*	1.175518	1.86	0.062
Industry 3510	0.7560542	0.4784354	1.58	0.114
Industry 3520	0.5673591	0.769951	0.74	0.461
Industry 4510	-0.0630126	0.5197931	-0.12	0.904
Industry 4520	1.824372***	0.5507231	3.31	0.001
Industry 4530	.	.	.	.
Industry 5010	-0.5806135	0.7599553	-0.76	0.445
Industry 5510	-0.4689733	0.91615	-0.51	0.609
No. Obs.	612			
Pseudo R-square	0.1117			
Caliper	0.003			

Gross Profit Ratio is (sales revenue – cost of goods sold) / sales revenue. EBIT Ratio is (pre-tax accounting profit + interest expense) / sales revenue. Interest Expense Ratio is interest expense / sales revenue. Leverage is long-term borrowings / total assets. Pre-Tax Profit Ratio is pre-tax accounting profit / sales revenue. Income Tax Expense Ratio is income tax expense / sales revenue. SIZE is the natural logarithm of sales revenue. CAPINT is non-current assets / total assets.

\* indicates statistically significant at the 0.10 level (2-tailed); \*\* indicates statistically significant at the 0.05 level (2-tailed); \*\*\* indicates statistically significant at the 0.01 level (2-tailed).

**Table 4: Descriptive Statistics**

Variables	Panel A Gross profit ratio sub-sample						
	Full (unmatched) sample				Propensity-score matched sample		
	All Obs.	ASFMs	DOLACs	t-test	ASFMs	DOLACs	t-test
	Mean	Mean	Mean	t-statistic	Mean	Mean	t-statistic
	Std. Dev.	Std. Dev.	Std. Dev.	(p >  t )	Std. Dev.	Std. Dev.	(p >  t )
Gross Profit Ratio	0.333	0.269	0.394	-7.210	0.263	0.374	-5.010
	0.194	0.168	0.198	(0.000)	0.158	0.187	(0.000)
SIZE	12.229	12.699	11.780	6.260	12.490	12.616	-0.640
	1.618	1.233	1.806	(0.000)	1.190	1.795	(0.520)
Industry 1510	0.152	0.114	0.188	-2.180	0.180	0.180	0.000
	0.359	0.319	0.391	(0.030)	0.386	0.386	(1.000)
Industry 2010	0.161	0.155	0.166	-0.310	0.189	0.189	0.000
	0.368	0.363	0.373	(0.759)	0.393	0.393	(1.000)
Industry 2020	0.040	0.037	0.044	-0.380	0.057	0.041	0.590
	0.197	0.188	0.205	(0.701)	0.234	0.199	(0.556)
Industry 2030	0.011	0.018	0.004	1.400	0.008	0.008	0.000
	0.105	0.134	0.066	(0.162)	0.091	0.091	(1.000)
Industry 2510	0.027	0.037	0.017	1.250	0.025	0.033	-0.380
	0.162	0.188	0.131	(0.212)	0.156	0.179	(0.703)
Industry 2520	0.031	0.014	0.048	-2.090	0.025	0.016	0.450
	0.174	0.117	0.214	(0.037)	0.156	0.128	(0.653)
Industry 2530	0.018	0.005	0.031	-2.080	0.008	0.000	1.000
	0.133	0.068	0.173	(0.038)	0.091	.	(0.318)
Industry 2540	0.018	0.018	0.017	0.060	0.008	0.025	-1.010
	0.133	0.134	0.131	(0.949)	0.091	0.156	(0.315)
Industry 2550	0.167	0.260	0.079	5.300	0.139	0.148	-0.180
	0.374	0.440	0.270	(0.000)	0.348	0.356	(0.856)
Industry 3010	0.016	0.023	0.009	1.200	0.008	0.016	-0.580
	0.124	0.150	0.093	(0.230)	0.091	0.128	(0.563)
Industry 3020	0.063	0.068	0.057	0.510	0.082	0.098	-0.450
	0.242	0.253	0.232	(0.609)	0.275	0.299	(0.656)
Industry 3030	0.009	0.014	0.004	1.050	0.016	0.008	0.580
	0.094	0.117	0.066	(0.295)	0.128	0.091	(0.563)
Industry 3510	0.076	0.073	0.079	-0.220	0.090	0.082	0.230
	0.265	0.261	0.270	(0.825)	0.288	0.275	(0.820)
Industry 3520	0.022	0.018	0.026	-0.570	0.016	0.016	0.000
	0.148	0.134	0.160	(0.571)	0.128	0.128	(1.000)
Industry 4510	0.042	0.037	0.048	-0.600	0.033	0.033	0.000
	0.202	0.188	0.214	(0.547)	0.179	0.179	(1.000)
Industry 4520	0.049	0.064	0.035	1.420	0.041	0.066	-0.850
	0.216	0.245	0.184	(0.156)	0.199	0.249	(0.395)
Industry 4530	0.002	.	0.004	-0.980	0.000	0.000	.
	0.047	.	0.066	(0.329)	.	.	.
Industry 5010	0.013	0.005	0.022	-1.590	0.008	0.000	1.000

	0.115	0.068	0.146	(0.112)	0.091	.	(0.318)
Industry 5510	0.009	.	0.017	-1.970	0.000	0.000	.
	0.094	.	0.131	(0.050)			
<i>No. Obs.</i>	448	219	229		122	122	
<i>Pseudo R-square</i>					0.1478		

## Panel B EBIT ratio sub-sample

Variables	Full (unmatched) sample				Propensity-score matched sample		
	All Obs.	ASFMs	DOLACs	t-test	ASFMs	DOLACs	t-test
	Mean Std. Dev.	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )
EBIT Ratio	0.125 0.122	0.088 0.100	0.154 0.130	-6.740 (0.000)	0.095 0.099	0.142 0.121	-4.000 (0.000)
SIZE	12.490 1.577	12.705 1.172	12.316 1.823	2.980 (0.003)	12.587 1.202	12.847 1.854	-1.590 (0.113)
Industry 1510	0.098 0.298	0.081 0.273	0.112 0.316	-1.260 (0.207)	0.110 0.314	0.110 0.314	0.000 (1.000)
Industry 2010	0.169 0.375	0.177 0.382	0.162 0.369	0.480 (0.633)	0.203 0.404	0.236 0.426	-0.760 (0.449)
Industry 2020	0.079 0.270	0.046 0.210	0.106 0.308	-2.660 (0.008)	0.066 0.249	0.066 0.249	0.000 (1.000)
Industry 2030	0.033 0.178	0.023 0.150	0.041 0.197	-1.170 (0.241)	0.033 0.179	0.038 0.193	-0.280 (0.778)
Industry 2510	0.012 0.109	0.019 0.138	0.006 0.079	1.430 (0.154)	0.016 0.128	0.011 0.105	0.450 (0.654)
Industry 2520	0.022 0.148	0.019 0.138	0.025 0.156	-0.460 (0.645)	0.027 0.164	0.022 0.147	0.340 (0.737)
Industry 2530	0.041 0.199	0.008 0.088	0.069 0.253	-3.700 (0.000)	0.011 0.105	0.011 0.105	0.000 (1.000)
Industry 2540	0.031 0.173	0.023 0.150	0.037 0.190	-0.990 (0.323)	0.033 0.179	0.027 0.164	0.310 (0.760)
Industry 2550	0.151 0.359	0.246 0.432	0.075 0.263	5.890 (0.000)	0.137 0.345	0.126 0.333	0.310 (0.757)
Industry 3010	0.014 0.117	0.019 0.138	0.009 0.096	1.020 (0.310)	0.011 0.105	0.016 0.128	-0.450 (0.654)
Industry 3020	0.048 0.214	0.054 0.226	0.044 0.205	0.570 (0.568)	0.060 0.239	0.060 0.239	0.000 (1.000)
Industry 3030	0.009 0.092	0.015 0.123	0.003 0.056	1.590 (0.112)	0.000 .	0.005 0.074	-1.000 (0.318)
Industry 3510	0.072 0.259	0.077 0.267	0.069 0.253	0.390 (0.698)	0.082 0.276	0.082 0.276	0.000 (1.000)
Industry 3520	0.017 0.130	0.015 0.123	0.019 0.136	-0.300 (0.761)	0.022 0.147	0.022 0.147	0.000 (1.000)
Industry 4510	0.057 0.232	0.042 0.202	0.069 0.253	-1.360 (0.175)	0.060 0.239	0.049 0.217	0.460 (0.647)

Industry 4520	0.038	0.065	0.016	3.150	0.027	0.027	0.000
	0.191	0.248	0.124	(0.002)	0.164	0.164	(1.000)
Industry 4530	0.002	0.000	0.003	-0.900	0.000	0.000	.
	0.041	.	0.056	(0.369)	.	.	.
Industry 5010	0.024	0.015	0.031	-1.230	0.022	0.016	0.380
	0.153	0.123	0.174	(0.218)	0.147	0.128	(0.704)
Industry 5510	0.015	0.012	0.019	-0.690	0.016	0.033	-1.010
	0.124	0.107	0.136	(0.488)	0.128	0.179	(0.313)
<i>No. Obs.</i>	<i>581</i>	<i>260</i>	<i>321</i>		<i>182</i>	<i>182</i>	
<i>Pseudo R-square</i>						<i>0.1120</i>	

## Panel C Interest expense ratio sub-sample

Variables	Full (unmatched) sample				Propensity-score matched sample		
	All Obs.	ASFMs	DOLACs	<i>t</i> -test	ASFMs	DOLACs	<i>t</i> -test
	Mean Std. Dev.	Mean Std. Dev.	Mean Std. Dev.	<i>t</i> -statistic ( <i>p</i> >   <i>t</i>  )	Mean Std. Dev.	Mean Std. Dev.	<i>t</i> -statistic ( <i>p</i> >   <i>t</i>  )
Interest Expense Ratio	0.024	0.020	0.027	-1.850	0.029	0.017	2.560
	0.052	0.045	0.056	(0.065)	0.055	0.034	(0.011)
SIZE	12.297	12.670	12.016	5.410	12.561	12.575	-0.090
	1.662	1.195	1.895	(0.000)	1.163	1.956	(0.930)
CAPINT	0.478	0.359	0.568	-11.430	0.477	0.474	0.100
	0.267	0.268	0.229	(0.000)	0.257	0.235	(0.917)
Industry 1510	0.131	0.110	0.147	-1.490	0.158	0.163	-0.140
	0.338	0.313	0.354	(0.137)	0.366	0.371	(0.893)
Industry 2010	0.165	0.166	0.164	0.100	0.218	0.198	0.490
	0.371	0.373	0.370	(0.924)	0.414	0.399	(0.625)
Industry 2020	0.078	0.053	0.097	-2.210	0.079	0.079	0.000
	0.269	0.225	0.297	(0.028)	0.271	0.271	(1.000)
Industry 2030	0.026	0.019	0.031	-1.020	0.025	0.010	1.140
	0.158	0.136	0.173	(0.307)	0.156	0.099	(0.254)
Industry 2510	0.018	0.025	0.012	1.360	0.010	0.015	-0.450
	0.131	0.157	0.108	(0.175)	0.099	0.121	(0.654)
Industry 2520	0.024	0.016	0.031	-1.320	0.025	0.035	-0.580
	0.154	0.124	0.173	(0.186)	0.156	0.183	(0.559)
Industry 2530	0.035	0.009	0.055	-3.320	0.015	0.010	0.450
	0.184	0.097	0.227	(0.001)	0.121	0.099	(0.654)
Industry 2540	0.034	0.031	0.036	-0.310	0.030	0.035	-0.280
	0.181	0.175	0.185	(0.754)	0.170	0.183	(0.779)
Industry 2550	0.135	0.223	0.069	6.220	0.109	0.124	-0.460
	0.342	0.417	0.253	(0.000)	0.312	0.330	(0.643)
Industry 3010	0.013	0.022	0.007	1.730	0.015	0.015	0.000
	0.115	0.147	0.084	(0.083)	0.121	0.121	(1.000)
Industry 3020	0.051	0.063	0.043	1.220	0.059	0.050	0.440
	0.221	0.243	0.202	(0.221)	0.237	0.217	(0.662)
Industry 3030	0.008	0.013	0.005	1.170	0.005	0.010	-0.580

	0.090	0.111	0.069	(0.241)	0.070	0.099	(0.563)
Industry 3510	0.063	0.063	0.064	-0.070	0.069	0.054	0.620
	0.244	0.243	0.245	(0.943)	0.255	0.227	(0.537)
Industry 3520	0.016	0.016	0.017	-0.100	0.020	0.010	0.820
	0.126	0.124	0.128	(0.922)	0.140	0.099	(0.412)
Industry 4510	0.057	0.038	0.071	-1.950	0.054	0.054	0.000
	0.231	0.191	0.257	(0.051)	0.227	0.227	(1.000)
Industry 4520	0.040	0.066	0.021	3.060	0.020	0.035	-0.920
	0.197	0.248	0.145	(0.002)	0.140	0.183	(0.360)
Industry 4530	0.001	.	0.002	-0.870	.	.	.
	0.037	.	0.049	(0.385)	.	.	.
Industry 5010	0.023	0.013	0.031	-1.650	0.020	0.020	0.000
	0.150	0.111	0.173	(0.100)	0.140	0.140	(1.000)
Industry 5510	0.012	0.009	0.014	-0.590	0.015	0.025	-0.710
	0.110	0.097	0.119	(0.554)	0.121	0.156	(0.476)
<i>No. Obs.</i>	<i>741</i>	<i>319</i>	<i>422</i>		<i>202</i>	<i>202</i>	
<i>Pseudo R-square</i>					<i>0.1997</i>		

## Panel D Leverage sub-sample

Variables	Full (unmatched) sample				Propensity-score matched sample		
	All Obs.	ASFMs	DOLACs	t-test	ASFMs	DOLACs	t-test
	Mean Std. Dev.	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )
Leverage	0.101 0.146	0.080 0.152	0.116 0.139	-3.380 (0.001)	0.111 0.173	0.098 0.124	0.870 (0.386)
SIZE	12.301 1.664	12.677 1.197	12.020 1.895	5.400 (0.000)	12.601 1.222	12.493 1.985	0.650 (0.517)
CAPINT	0.477 0.267	0.355 0.266	0.569 0.228	-11.730 (0.000)	0.482 0.249	0.466 0.226	0.670 (0.503)
Industry 1510	0.130 0.337	0.108 0.310	0.147 0.355	-1.580 (0.114)	0.152 0.359	0.177 0.382	-0.680 (0.499)
Industry 2010	0.166 0.372	0.168 0.374	0.164 0.371	0.140 (0.890)	0.212 0.410	0.187 0.391	0.630 (0.531)
Industry 2020	0.079 0.269	0.054 0.226	0.097 0.297	-2.180 (0.030)	0.081 0.273	0.086 0.281	-0.180 (0.856)
Industry 2030	0.026 0.159	0.019 0.137	0.031 0.173	-1.010 (0.314)	0.025 0.157	0.035 0.185	-0.590 (0.559)
Industry 2510	0.018 0.132	0.025 0.157	0.012 0.108	1.370 (0.171)	0.015 0.122	0.010 0.100	0.450 (0.654)
Industry 2520	0.024 0.154	0.016 0.125	0.031 0.173	-1.310 (0.191)	0.025 0.157	0.025 0.157	0.000 (1.000)
Industry 2530	0.034 0.181	0.006 0.079	0.055 0.228	-3.610 (0.000)	0.010 0.100	0.005 0.071	0.580 (0.563)
Industry 2540	0.034 0.181	0.032 0.175	0.036 0.186	-0.300 (0.768)	0.035 0.185	0.025 0.157	0.590 (0.559)

Industry 2550	0.134	0.222	0.069	6.160	0.091	0.111	-0.670
	0.341	0.416	0.254	(0.000)	0.288	0.315	(0.506)
Industry 3010	0.014	0.022	0.007	1.750	0.015	0.015	0.000
	0.116	0.147	0.084	(0.081)	0.122	0.122	(1.000)
Industry 3020	0.052	0.063	0.043	1.250	0.076	0.056	0.810
	0.221	0.244	0.203	(0.213)	0.265	0.230	(0.418)
Industry 3030	0.008	0.013	0.005	1.180	0.010	0.010	0.000
	0.090	0.112	0.069	(0.238)	0.100	0.100	(1.000)
Industry 3510	0.064	0.063	0.064	-0.050	0.071	0.056	0.620
	0.245	0.244	0.245	(0.963)	0.257	0.230	(0.537)
Industry 3520	0.016	0.016	0.017	-0.090	0.020	0.030	-0.640
	0.127	0.125	0.128	(0.932)	0.141	0.172	(0.523)
Industry 4510	0.057	0.038	0.071	-1.930	0.056	0.061	-0.210
	0.232	0.191	0.258	(0.054)	0.230	0.239	(0.830)
Industry 4520	0.041	0.066	0.021	3.080	0.020	0.035	-0.920
	0.198	0.249	0.145	(0.002)	0.141	0.185	(0.360)
Industry 4530	0.001	.	0.002	-0.870	.	.	.
	0.037	.	0.049	(0.387)	.	.	.
Industry 5010	0.023	0.013	0.031	-1.630	0.015	0.020	-0.380
	0.150	0.112	0.173	(0.103)	0.122	0.141	(0.704)
Industry 5510	0.012	0.009	0.014	-0.580	0.015	0.015	0.000
	0.110	0.097	0.119	(0.561)	0.122	0.122	(1.000)
<i>No. Obs.</i>	737	316	421		198	198	
<i>Pseudo R-square</i>					0.2087		

## Panel E Pre-tax profit ratio sub-sample

Variables	Full (unmatched) sample				Propensity-score matched sample		
	All Obs.	ASFMs	DOLACs	t-test	ASFMs	DOLACs	t-test
	Mean Std. Dev.	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )
Pre-Tax Profit Ratio	0.112	0.079	0.139	-6.030	0.086	0.137	-4.060
	0.119	0.105	0.124	(0.000)	0.111	0.122	(0.000)
SIZE	12.511	12.725	12.338	2.910	12.639	12.853	-1.310
	1.570	1.190	1.805	(0.004)	1.220	1.758	(0.189)
Industry 1510	0.095	0.068	0.117	-1.960	0.098	0.109	-0.350
	0.293	0.252	0.322	(0.050)	0.298	0.313	(0.726)
Industry 2010	0.167	0.176	0.159	0.530	0.201	0.241	-0.900
	0.373	0.382	0.366	(0.595)	0.402	0.429	(0.367)
Industry 2020	0.079	0.044	0.107	-2.770	0.063	0.034	1.240
	0.270	0.206	0.310	(0.006)	0.244	0.183	(0.215)
Industry 2030	0.029	0.020	0.036	-1.110	0.029	0.023	0.340
	0.167	0.140	0.186	(0.269)	0.168	0.150	(0.736)
Industry 2510	0.013	0.020	0.006	1.430	0.017	0.011	0.450
	0.111	0.140	0.080	(0.155)	0.131	0.107	(0.653)
Industry 2520	0.023	0.020	0.026	-0.460	0.029	0.029	0.000

	0.151	0.140	0.159	(0.642)	0.168	0.168	(1.000)
Industry 2530	0.043	0.008	0.071	-3.710	0.011	0.011	0.000
	0.203	0.089	0.258	(0.000)	0.107	0.107	(1.000)
Industry 2540	0.030	0.024	0.036	-0.800	0.034	0.029	0.310
	0.172	0.153	0.186	(0.424)	0.183	0.168	(0.760)
Industry 2550	0.156	0.252	0.078	5.790	0.149	0.132	0.460
	0.363	0.435	0.268	(0.000)	0.358	0.340	(0.645)
Industry 3010	0.014	0.020	0.010	1.010	0.011	0.017	-0.450
	0.119	0.140	0.098	(0.312)	0.107	0.131	(0.653)
Industry 3020	0.045	0.048	0.042	0.330	0.063	0.057	0.220
	0.207	0.214	0.201	(0.743)	0.244	0.233	(0.823)
Industry 3030	0.009	0.016	0.003	1.590	0.000	0.006	-1.000
	0.094	0.126	0.057	(0.112)	.	0.076	(0.318)
Industry 3510	0.073	0.080	0.068	0.530	0.086	0.080	0.190
	0.261	0.272	0.252	(0.595)	0.281	0.273	(0.847)
Industry 3520	0.018	0.016	0.019	-0.310	0.023	0.023	0.000
	0.133	0.126	0.138	(0.758)	0.150	0.150	(1.000)
Industry 4510	0.057	0.044	0.068	-1.220	0.063	0.063	0.000
	0.233	0.206	0.252	(0.223)	0.244	0.244	(1.000)
Industry 4520	0.038	0.068	0.013	3.430	0.017	0.023	-0.380
	0.190	0.252	0.113	(0.001)	0.131	0.150	(0.704)
Industry 4530	0.002	.	0.003	-0.900	0.000	0.000	.
	0.042	.	0.057	(0.368)	.	.	.
Industry 5010	0.025	0.016	0.032	-1.240	0.023	0.029	-0.340
	0.157	0.126	0.178	(0.217)	0.150	0.168	(0.736)
Industry 5510	0.014	0.012	0.016	-0.420	0.017	0.011	0.450
	0.119	0.109	0.127	(0.676)	0.131	0.107	(0.653)
<i>No. Obs.</i>	558	250	308		174	174	
<i>Pseudo R-square</i>					0.1180		

## Panel F Income tax expense ratio sub-sample

Variables	Full (unmatched) sample				Propensity-score matched sample		
	All Obs.	ASFMs	DOLACs	t-test	ASFMs	DOLACs	t-test
	Mean Std. Dev.	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )	Mean Std. Dev.	Mean Std. Dev.	t-statistic (p >  t )
Income Tax Expense Ratio	0.031 0.042	0.025 0.041	0.037 0.042	-3.570 (0.000)	0.025 0.039	0.034 0.043	-1.870 (0.063)
SIZE	12.395 1.630	12.694 1.192	12.157 1.875	4.110 (0.000)	12.620 1.213	12.627 1.854	-0.040 (0.966)
Industry 1510	0.124 0.330	0.100 0.300	0.143 0.351	-1.630 (0.104)	0.117 0.322	0.104 0.306	0.360 (0.717)
Industry 2010	0.158 0.365	0.159 0.366	0.158 0.365	0.030 (0.979)	0.208 0.407	0.214 0.412	-0.140 (0.889)
Industry 2020	0.085	0.052	0.111	-2.630	0.078	0.084	-0.210



	0.279	0.222	0.315	(0.009)	0.269	0.279	(0.835)
Industry 2030	0.026	0.022	0.029	-0.550	0.026	0.045	-0.920
	0.160	0.147	0.169	(0.585)	0.160	0.209	(0.359)
Industry 2510	0.015	0.018	0.012	0.690	0.026	0.013	0.820
	0.120	0.135	0.108	(0.491)	0.160	0.114	(0.411)
Industry 2520	0.020	0.011	0.026	-1.350	0.013	.	1.420
	0.139	0.105	0.160	(0.177)	0.114	.	(0.157)
Industry 2530	0.036	0.007	0.058	-3.400	0.013	0.013	0.000
	0.186	0.086	0.235	(0.001)	0.114	0.114	(1.000)
Industry 2540	0.033	0.026	0.038	-0.840	0.039	0.045	-0.280
	0.178	0.159	0.192	(0.400)	0.194	0.209	(0.778)
Industry 2550	0.150	0.244	0.076	5.920	0.104	0.110	-0.180
	0.357	0.430	0.265	(0.000)	0.306	0.314	(0.854)
Industry 3010	0.013	0.018	0.009	1.050	0.019	0.013	0.450
	0.114	0.135	0.093	(0.295)	0.139	0.114	(0.653)
Industry 3020	0.054	0.059	0.050	0.510	0.071	0.065	0.822
	0.226	0.236	0.218	(0.612)	0.258	0.247	(0.230)
Industry 3030	0.008	0.015	0.003	1.620	.	.	.
	0.090	0.121	0.054	(0.106)	.	.	.
Industry 3510	0.065	0.074	0.058	0.760	0.065	0.084	-0.650
	0.247	0.262	0.235	(0.446)	0.247	0.279	(0.517)
Industry 3520	0.015	0.015	0.015	0.010	0.013	0.013	0.000
	0.120	0.121	0.120	(0.989)	0.114	0.114	(1.000)
Industry 4510	0.055	0.037	0.070	-1.790	0.065	0.052	0.480
	0.229	0.189	0.256	(0.074)	0.247	0.223	(0.628)
Industry 4520	0.047	0.077	0.023	3.150	0.045	0.039	0.280
	0.212	0.268	0.151	(0.002)	0.209	0.194	(0.778)
Industry 4530	0.002	.	0.003	-0.890	.	.	.
	0.040	.	0.054	(0.374)	.	.	.
Industry 5010	0.021	0.011	0.029	-1.550	0.019	0.013	0.450
	0.144	0.105	0.169	(0.121)	0.139	0.114	(0.653)
Industry 5510	0.011	0.007	0.015	-0.840	0.013	0.006	0.580
	0.106	0.086	0.120	(0.403)	0.114	0.081	(0.563)
<i>No. Obs.</i>	<i>613</i>	<i>271</i>	<i>342</i>		<i>154</i>	<i>154</i>	
<i>Pseudo R-square</i>					<i>0.1117</i>		

In Panel A, Gross profit ratio is (sales revenue – cost of goods sold) / sales revenue. SIZE is the natural logarithm of sales revenue. There are 448 observations for the full sample after excluding those with gross profit ratio being greater than 1 or smaller than 0. Propensity score matching based on the logit model in Equation (7) generates propensity scores with standard deviation of 0.2180 (rounded to four decimal places). Thus, the appropriate caliper is initially determined at 0.05. With the caliper of 0.05, there is no significant difference between the matched ASFMs and DOLACs.

In Panel B, EBIT ratio is (pre-tax accounting profit + interest expense) / sales revenue. SIZE is the natural logarithm of sales revenue. There are 581 observations for the full sample after excluding those with EBIT ratio being greater than 1 or smaller than 0. Propensity score matching based on the logit model in Equation (7) generates propensity scores with standard deviation of 0.1894 (rounded to four decimal places). Thus, the appropriate caliper is initially determined at 0.04. With the caliper of 0.04, there is no significant difference between the matched ASFMs and DOLACs.

In Panel C, Interest expense ratio is interest expense / sales revenue. SIZE is the natural logarithm of sales revenue. CAPINT is non-current assets / total assets. There are 741 observations for the full sample after excluding those with interest expense ratio being greater than 1 or less than 0. Propensity score matching based on the logit model in Equation (8) generates propensity

scores with standard deviation of 0.2471 (rounded to four decimal places). Thus, the appropriate caliper is initially determined at 0.06. With the caliper of 0.06, there is no significant difference between the matched ASFMs and DOLACs.

In Panel D, Leverage is long-term borrowings / total assets. SIZE is the natural logarithm of sales revenue. CAPINT is non-current assets / total assets. There are 737 observations for the full sample after excluding those with leverage being greater than 1 or less than 0. Propensity score matching based on the logit model in Equation (8) generates propensity scores with standard deviation of 0.2517 (rounded to four decimal places). Thus, the appropriate caliper is initially determined at 0.06. With the caliper of 0.06, there is no significant difference between the matched ASFMs and DOLACs.

In Panel E, Pre-tax profit ratio is pre-tax accounting profit / sales revenue. SIZE is the natural logarithm of sales revenue. There are 558 observations for the full sample after excluding those with pre-tax profit ratio being greater than 1 or less than 0. Propensity score matching based on the logit model in Equation (7) generates propensity scores with standard deviation of 0.1942 (rounded to four decimal places). Thus, the appropriate caliper is initially determined at 0.04. With the caliper of 0.04, there is no significant difference between the matched ASFMs and DOLACs.

In Panel F, Income tax expense ratio is income tax expense / sales revenue. SIZE is the natural logarithm of sales revenue. There are 613 observations for the full sample after excluding those with income tax expense ratio being greater than 1 or less than 0. Propensity score matching based on the logit model in Equation (7) generates propensity scores with standard deviation of 0.1891 (rounded to four decimal places). Thus, the appropriate caliper is initially determined at 0.04. With the caliper of 0.04, there are significant difference between the matched ASFMs and DOLACs. The caliper is further reduced to 0.003 when a matched sample of ASFMs and DOLACs is reached.

Table 5: OLS Regression Results

	Full (unmatched) sample (448 Obs.)				Propensity-score matched sample (244 Obs.)			
	Coef.	Std. Err.	t	P >  t	Coef.	Std. Err.	t	P >  t
Constant	0.6857***	0.0701	9.78	0.000	0.5984***	0.1123	5.33	0.000
ASFM	-0.1068***	0.0173	-6.16	0.000	-0.1191***	0.0201	-5.93	0.000
SIZE	-0.0247***	0.0052	-4.73	0.000	-0.0207***	0.0073	-2.85	0.005
Industry 1510	-0.0468	0.0349	-1.34	0.181	0.0186	0.0496	0.38	0.708
Industry 2010	-0.0940***	0.0348	-2.70	0.007	-0.0389	0.0497	-0.78	0.435
Industry 2020	-0.0347	0.0487	-0.71	0.477	0.0224	0.0639	0.35	0.727
Industry 2030	0.1156	0.0794	1.46	0.146	0.2381**	0.1175	2.03	0.044
Industry 2510	-0.0838	0.0559	-1.50	0.134	-0.0349	0.0753	-0.46	0.643
Industry 2520	0.0203	0.0525	0.39	0.699	0.0855	0.0819	1.04	0.298
Industry 2530	0.1951***	0.0650	3.00	0.003	0.0612	0.1614	0.38	0.705
Industry 2540	0.1339**	0.0651	2.06	0.040	0.2369***	0.0902	2.63	0.009
Industry 2550	0.0532	0.0353	1.50	0.133	0.1124**	0.0517	2.17	0.031
Industry 3010	-0.0401	0.0690	-0.58	0.561	-0.0585	0.0994	-0.59	0.557
Industry 3020	-0.0501	0.0425	-1.18	0.238	-0.0269	0.0553	-0.49	0.627
Industry 3030	0.1925**	0.0875	2.20	0.028	0.2552**	0.1000	2.55	0.011
Industry 3510	0.0729*	0.0406	1.80	0.073	0.1150**	0.0565	2.04	0.043
Industry 3520	0.1702***	0.0595	2.86	0.004	0.1774**	0.0891	1.99	0.048
Industry 4510	0.1212**	0.0476	2.55	0.011	0.1531**	0.0705	2.17	0.031
Industry 4520	-0.0346	0.0460	-0.75	0.453	-0.0193	0.0644	-0.30	0.764
Industry 4530	0.0585	0.1669	0.35	0.726	.	.	.	.
Industry 5010	0.0674	0.0732	0.92	0.358	0.4741***	0.1612	2.94	0.004
Industry 5510	-0.0271	0.0874	-0.31	0.757	.	.	.	.
<i>Adjusted R-square</i>	0.2827				0.2767			

## Panel B Dependent variable: EBIT ratio

	Full (unmatched) sample (581 Obs.)				Propensity-score matched sample (364 Obs.)			
	Coef.	Std. Err.	t	P >  t	Coef.	Std. Err.	t	P >  t
Constant	0.2760***	0.0413	6.68	0.000	0.2764***	0.0604	4.58	0.000
ASFM	-0.0473***	0.0100	-4.73	0.000	-0.0488***	0.0110	-4.44	0.000
SIZE	-0.0054*	0.0030	-1.78	0.075	-0.0056	0.0039	-1.46	0.146
Industry 1510	0.0226	0.0231	0.98	0.327	0.0028	0.0297	0.10	0.924
Industry 2010	-0.0987***	0.0211	-4.69	0.000	-0.1047***	0.0277	-3.78	0.000
Industry 2020	-0.0635***	0.0241	-2.63	0.009	-0.0436	0.0329	-1.33	0.186
Industry 2030	-0.0682**	0.0311	-2.19	0.029	-0.0451	0.0378	-1.19	0.234
Industry 2510	-0.0991**	0.0457	-2.17	0.030	-0.0795	0.0529	-1.50	0.134
Industry 2520	-0.0964***	0.0355	-2.72	0.007	-0.0961**	0.0430	-2.23	0.026
Industry 2530	-0.0236	0.0288	-0.82	0.413	-0.0122	0.0575	-0.21	0.831
Industry 2540	-0.0546*	0.0316	-1.73	0.085	-0.0517	0.0404	-1.28	0.201
Industry 2550	-0.0793***	0.0218	-3.64	0.000	-0.0660**	0.0296	-2.23	0.026
Industry 3010	-0.1174***	0.0435	-2.70	0.007	-0.1166**	0.0529	-2.21	0.028
Industry 3020	-0.1048***	0.0275	-3.81	0.000	-0.1091***	0.0335	-3.26	0.001
Industry 3030	-0.0578	0.0529	-1.09	0.275	-0.0449	0.1070	-0.42	0.675
Industry 3510	-0.1117***	0.0247	-4.52	0.000	-0.0939***	0.0315	-2.98	0.003
Industry 3520	0.0271	0.0393	0.69	0.491	0.0489	0.0449	1.09	0.277
Industry 4510	-0.0626**	0.0262	-2.39	0.017	-0.0758**	0.0342	-2.21	0.027
Industry 4520	-0.1143***	0.0300	-3.81	0.000	-0.1078**	0.0425	-2.54	0.012
Industry 4530	-0.0685	0.1123	-0.61	0.542	.	.	.	.
Industry 5010	-0.0350	0.0345	-1.01	0.311	-0.0158	0.0462	-0.34	0.732
Industry 5510	0.0468	0.0411	1.14	0.255	0.0495	0.0425	1.16	0.245
<i>Adjusted R-square</i>	<i>0.1802</i>				<i>0.1568</i>			

## Panel C Dependent variable: interest expense ratio

	Full (unmatched) sample (741 Obs.)				Propensity-score matched sample (404 Obs.)			
	Coef.	Std. Err.	t	P >  t	Coef.	Std. Err.	t	P >  t
Constant	0.0498***	0.0148	3.37	0.001	0.0381**	0.0187	2.04	0.042
ASFM	0.0121***	0.0039	3.08	0.002	0.0118***	0.0040	2.98	0.003
SIZE	-0.0044***	0.0011	-4.09	0.000	-0.0030**	0.0014	-2.18	0.030
CAPINT	0.0705***	0.0081	8.67	0.000	0.0605***	0.0101	5.97	0.000
Industry 1510	-0.0025	0.0079	-0.32	0.750	-0.0153	0.0096	-1.59	0.113
Industry 2010	-0.0143*	0.0080	-1.8	0.073	-0.0169*	0.0097	-1.74	0.083
Industry 2020	-0.0176**	0.0089	-1.99	0.047	-0.0155	0.0109	-1.43	0.155
Industry 2030	0.0038	0.0124	0.31	0.758	0.0024	0.0172	0.14	0.889
Industry 2510	-0.0199	0.0144	-1.38	0.168	-0.0212	0.0197	-1.08	0.282
Industry 2520	-0.0085	0.0126	-0.67	0.503	-0.0032	0.0142	-0.22	0.823
Industry 2530	-0.0063	0.0111	-0.57	0.569	0.0144	0.0196	0.74	0.462
Industry 2540	-0.0167	0.0112	-1.48	0.138	-0.0279**	0.0138	-2.02	0.044
Industry 2550	-0.0147*	0.0084	-1.76	0.079	-0.0185*	0.0102	-1.82	0.069
Industry 3010	-0.0156	0.0162	-0.97	0.333	-0.0271	0.0184	-1.47	0.142
Industry 3020	-0.0097	0.0099	-0.98	0.325	-0.0017	0.0118	-0.15	0.883
Industry 3030	-0.0137	0.0199	-0.69	0.492	-0.0046	0.0243	-0.19	0.850
Industry 3510	-0.0158*	0.0095	-1.66	0.098	-0.0161	0.0119	-1.36	0.175
Industry 3520	-0.0130	0.0147	-0.88	0.379	0.0130	0.0182	0.71	0.476
Industry 4510	-0.0206**	0.0096	-2.14	0.033	-0.0184	0.0119	-1.55	0.121
Industry 4520	-0.0146	0.0111	-1.32	0.187	-0.0169	0.0148	-1.14	0.256
Industry 4530	-0.0247	0.0463	-0.53	0.594	.	.	.	.
Industry 5010	-0.0364***	0.0128	-2.83	0.005	-0.0273*	0.0163	-1.68	0.095
Industry 5510	0.1056***	0.0167	6.33	0.000	0.0947***	0.0164	5.79	0.000
<i>Adjusted R-square</i>	<i>0.2168</i>				<i>0.2571</i>			

## Panel D Dependent variable: leverage

	Full (unmatched) sample (737 Obs.)				Propensity-score matched sample (396 Obs.)			
	Coef.	Std. Err.	t	P >  t	Coef.	Std. Err.	t	P >  t
Constant	-0.3036***	0.0390	-7.78	0.000	-0.2796***	0.0608	-4.60	0.000
ASFM	0.0109	0.0103	1.05	0.293	0.0060	0.0127	0.47	0.640
SIZE	0.0165***	0.0028	5.81	0.000	0.0166***	0.0043	3.84	0.000
CAPINT	0.2687***	0.0215	12.47	0.000	0.2925***	0.0343	8.53	0.000
Industry 1510	0.0556***	0.0210	2.65	0.008	0.0235	0.0329	0.72	0.475
Industry 2010	0.0763***	0.0211	3.61	0.000	0.0534	0.0333	1.60	0.110
Industry 2020	0.0678***	0.0234	2.91	0.004	0.0237	0.0366	0.65	0.517
Industry 2030	0.1110***	0.0325	3.41	0.001	0.0487	0.0466	1.04	0.297
Industry 2510	0.0339	0.0378	0.9	0.370	0.0302	0.0637	0.48	0.635
Industry 2520	0.1075***	0.0333	3.23	0.001	0.1084**	0.0495	2.19	0.029
Industry 2530	0.1178***	0.0295	3.99	0.000	0.0164	0.0785	0.21	0.834
Industry 2540	0.0630**	0.0295	2.14	0.033	-0.0335	0.0469	-0.71	0.476
Industry 2550	0.0577***	0.0222	2.6	0.009	0.0216	0.0355	0.61	0.543
Industry 3010	0.0352	0.0425	0.83	0.408	-0.0185	0.0595	-0.31	0.756
Industry 3020	0.1098***	0.0260	4.23	0.000	0.0688*	0.0379	1.81	0.071
Industry 3030	0.1165**	0.0523	2.23	0.026	0.1202*	0.0694	1.73	0.084
Industry 3510	0.0766***	0.0252	3.04	0.002	0.0366	0.0397	0.92	0.357
Industry 3520	0.0831**	0.0387	2.15	0.032	0.0623	0.0495	1.26	0.209
Industry 4510	0.0540**	0.0254	2.12	0.034	0.0128	0.0394	0.33	0.745
Industry 4520	0.0877***	0.0292	3.01	0.003	0.0232	0.0484	0.48	0.633
Industry 4530	0.1199	0.1214	0.99	0.324	.	.	.	.
Industry 5010	0.0280	0.0337	0.83	0.406	-0.0387	0.0557	-0.70	0.487
Industry 5510	0.2389***	0.0437	5.47	0.000	0.1485**	0.0591	2.51	0.012
<i>Adjusted R-square</i>	<i>0.3217</i>				<i>0.3025</i>			

## Panel E Dependent variable: pre-tax profit ratio

	Full (unmatched) sample (558 Obs.)				Propensity-score matched sample (348 Obs.)			
	Coef.	Std. Err.	t	P >  t	Coef.	Std. Err.	t	P >  t
Constant	0.2776***	0.0418	6.64	0.000	0.3737***	0.0613	6.10	0.000
ASFM	-0.0422***	0.0101	-4.18	0.000	-0.0525***	0.0115	-4.57	0.000
SIZE	-0.0061**	0.0031	-2.00	0.046	-0.0099**	0.0041	-2.39	0.017
Industry 1510	0.0206	0.0231	0.89	0.373	-0.0088	0.0284	-0.31	0.758
Industry 2010	-0.1007***	0.0209	-4.82	0.000	-0.1550***	0.0256	-6.05	0.000
Industry 2020	-0.0725***	0.0240	-3.02	0.003	-0.1036***	0.0344	-3.01	0.003
Industry 2030	-0.0958***	0.0325	-2.95	0.003	-0.1239***	0.0419	-2.96	0.003
Industry 2510	-0.1048**	0.0450	-2.33	0.020	-0.1416***	0.0528	-2.68	0.008
Industry 2520	-0.1160***	0.0350	-3.32	0.001	-0.1703***	0.0408	-4.18	0.000
Industry 2530	-0.0580**	0.0284	-2.04	0.042	-0.1190**	0.0576	-2.06	0.040
Industry 2540	-0.0682**	0.0318	-2.14	0.032	-0.1142***	0.0393	-2.90	0.004
Industry 2550	-0.0833***	0.0215	-3.88	0.000	-0.1167***	0.0274	-4.26	0.000
Industry 3010	-0.1178***	0.0428	-2.75	0.006	-0.1513***	0.0532	-2.85	0.005
Industry 3020	-0.1144***	0.0280	-4.08	0.000	-0.1588***	0.0323	-4.92	0.000
Industry 3030	-0.0618	0.0521	-1.19	0.237	-0.0997	0.1089	-0.92	0.360
Industry 3510	-0.1155***	0.0245	-4.71	0.000	-0.1538***	0.0300	-5.12	0.000
Industry 3520	0.0215	0.0388	0.55	0.580	-0.0378	0.0440	-0.86	0.391
Industry 4510	-0.0621**	0.0261	-2.38	0.017	-0.0938***	0.0320	-2.93	0.004
Industry 4520	-0.1107***	0.0300	-3.69	0.000	-0.1548***	0.0472	-3.28	0.001
Industry 4530	-0.0749	0.1106	-0.68	0.499	.	.	.	.
Industry 5010	-0.0405	0.0340	-1.19	0.234	-0.0802*	0.0418	-1.92	0.056
Industry 5510	-0.0656	0.0425	-1.54	0.123	-0.0755	0.0525	-1.44	0.151
<i>Adjusted R-square</i>	<i>0.1642</i>				<i>0.2031</i>			

## Panel F Dependent variable: income tax expense ratio

	Full (unmatched) sample (613 Obs.)				Propensity-score matched sample (308 Obs.)			
	Coef.	Std. Err.	t	P >  t	Coef.	Std. Err.	t	P >  t
Constant	0.0850***	0.0139	6.13	0.000	0.0815***	0.0211	3.86	0.000
ASFM	-0.0079**	0.0034	-2.33	0.020	-0.0079*	0.0045	-1.76	0.079
SIZE	0.0001	0.0010	0.05	0.958	-0.0003	0.0015	-0.17	0.869
Industry 1510	-0.0358***	0.0077	-4.68	0.000	-0.0294***	0.0105	-2.79	0.006
Industry 2010	-0.0613***	0.0074	-8.30	0.000	-0.0552***	0.0095	-5.84	0.000
Industry 2020	-0.0536***	0.0082	-6.50	0.000	-0.0491***	0.0113	-4.36	0.000
Industry 2030	-0.0607***	0.0115	-5.27	0.000	-0.0507***	0.0143	-3.53	0.000
Industry 2510	-0.0670***	0.0144	-4.67	0.000	-0.0555***	0.0180	-3.09	0.002
Industry 2520	-0.0625***	0.0128	-4.88	0.000	-0.0628**	0.0289	-2.18	0.030
Industry 2530	-0.0479***	0.0104	-4.62	0.000	-0.0489**	0.0211	-2.31	0.021
Industry 2540	-0.0426***	0.0107	-3.98	0.000	-0.0263*	0.0136	-1.94	0.053
Industry 2550	-0.0558***	0.0075	-7.40	0.000	-0.0458***	0.0106	-4.31	0.000
Industry 3010	-0.0673***	0.0151	-4.45	0.000	-0.0576***	0.0194	-2.96	0.003
Industry 3020	-0.0649***	0.0092	-7.06	0.000	-0.0599***	0.0118	-5.07	0.000
Industry 3030	-0.0476**	0.0184	-2.58	0.010	.	.	.	.
Industry 3510	-0.0630***	0.0088	-7.19	0.000	-0.0541***	0.0115	-4.69	0.000
Industry 3520	-0.0360**	0.0143	-2.51	0.012	-0.0389*	0.0212	-1.84	0.067
Industry 4510	-0.0519***	0.0091	-5.68	0.000	-0.0520***	0.0123	-4.23	0.000
Industry 4520	-0.0651***	0.0096	-6.76	0.000	-0.0595***	0.0136	-4.37	0.000
Industry 4530	-0.0450	0.0391	-1.15	0.250	.	.	.	.
Industry 5010	-0.0397***	0.0124	-3.20	0.001	-0.0158	0.0194	-0.82	0.414
Industry 5510	-0.0559***	0.0159	-3.52	0.000	-0.0340	0.0240	-1.41	0.159
<i>Adjusted R-square</i>	<i>0.1399</i>				<i>0.1152</i>			

Gross Profit Ratio is (sales revenue – cost of goods sold) / sales revenue. EBIT Ratio is (pre-tax accounting profit + interest expense) / sales revenue. Interest Expense Ratio is interest expense / sales revenue. Leverage is long-term borrowings / total assets. Pre-Tax Profit Ratio is pre-tax accounting profit / sales revenue. Income Tax Expense Ratio is income tax expense / sales revenue. SIZE is the natural logarithm of sales revenue. CAPINT is non-current assets / total assets. ASFM is an indicator which takes the value of 1 if the company is an ASFM, and 0 otherwise. \* indicates significant at the 0.10 level; \*\* indicates significant at the 0.05 level; \*\*\* indicates significant at the 0.01 level.



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