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Do multinationals pay less in taxes than domestic firms?

Evidence from the Swedish manufacturing sector*

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Abstract:

There is a strong general concern amongst policymakers worldwide that multinational enterprises engage in far-reaching tax-planning activities. It is generally thought that by using transfer pricing or other techniques to shift profits, multinational enterprises can avoid taxation and thereby erode tax bases. Several attempts have been made to tackle this problem, not least through the OECD/G20 initiated Action Plan on Base Erosion and Profit Shifting. It is hard, however, to empirically quantify the magnitude of tax-planning activities that takes place. In this paper, we rely on census data from tax return and income statements and balance sheets reported by Swedish manufacturing firms in the 1997-2007 time period to identify possible profit-shifting activities by multinational enterprises. We study systematic differences between multinational and comparable domestic firms in tax payments, profits, earnings before interest and taxes, and equity ratios using difference-in-differences estimations based on propensity score matching. The detailed data allow us to narrow down the empirical focus and investigate not only whether multinational pay less in taxes than domestic firms, but also how tax planning activities may take place through transfer pricing and/or internal debt set-ups.

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1. Introduction

In recent years there has been growing concern regarding multinational enterprises' (MNEs) tax-planning activities. Multinational enterprises are thought to have better means to avoid taxation by taking advantage of differences in tax regimes across countries in order to reduce taxable profits. In particular, multinationals can shift profits through transfer pricing or by setting up favorable debt structures between parent-subsidiary or between subsidiary firms. These global tax-planning strategies result in lost tax revenues and distorted competition vis-à-vis domestic firms.¹

In response to this, the G20 countries took an initiative in 2012 to restrain what they referred to in their declaration as base erosion and profit shifting. Since then, many countries have called for cooperation and coordination of international tax laws. In July 2013, OECD issued an Action Plan on Base Erosion and Profit Shifting (BEPS) outlining 15 actions to prevent tax erosion. Apart from this many individual countries are currently, or have already, taken action independently to restrain cross-border income-shifting behavior, typically by restricting interest deductions.²

The general perception that multinationals engage in global tax-planning strategies is confirmed in the research literature (see e.g., Heckemeyer and Overersch, 2013). However, it is difficult to empirically quantify the magnitude of tax-planning activities that takes place. First, it is hard to identify the effect. Most previous studies have estimated semi-elasticities based on corporate tax rate differences between host and home country, typically focusing on a tax rate reduction in the host country. This method entangles the possible tax shifting (due to the corporate tax rate difference) with the effect of a lower corporate tax rate on profitability.

¹ Individual countries can gain from multinationals' pursuit of global tax-planning strategies by attracting activities and, hence, gain revenues.

² Several countries, for example Belgium, Germany and Italy, have thin capitalization rules and other restrictions on inter-company interest deductions.

Second, data constraint regularly make researchers' link firms' tax behavior to production characteristics without taking account of accountancy-related factors. We address both of these shortcomings. Our empirical approach allows us to detect systematic differences between multinational and domestic firms without relying on changes in corporate tax-rate differentials. Also, our data, which cover tax return and income statements and balance sheets for all Swedish manufacturing firms between 1997 and 2007, include tax payments, profits, earnings before interest and taxes (EBIT), and equity ratios. Thus, by comparing differences in profits, including financial transactions, earnings before interest and taxes (excluding financial transactions), and equity ratios we get an indication of whether the potential tax-driven profit-shifting takes place through transfer pricing and/or debt strategies.

In order to identify tax-planning strategies of MNEs, we use a propensity score matching technique to find a relevant control group and then analyze whether there are systematic differences between multinational and domestic firms. The panel data also allows us to examine whether domestic firms that become multinational change behavior in ways that indicate that they undertake more far-reaching tax planning after the transition. In addition, we provide a supplementary investigation of whether the pattern differs for firms that engage in research and development (R&D) as it is commonly thought that these firms are more prone to engage in tax-planning activities.

Previous research has mainly focused on multinationals' tax-planning behavior in countries with high corporate tax rates like Germany and the US. Using Swedish firm data enable us to study such behavior in a country that provides a more competitive corporate tax rate as well as

more generous interest deductions.³ Thus, we believe our study can add important insights into how a better tax climate affects tax-planning activities.⁴

The paper is organized as follows. Section 2 provides an overview of how multinational firms can reduce taxes through profit shifting and reviews related research. In section 3, we describe and motivate the applied empirical approach and the data. The empirical results are presented and discussed in Section 4. The main conclusions are presented in section 5.

2. Taxes and profit shifting

There is mounting evidence that tax competition takes place and that investment and location decisions are affected by corporate tax rates (see, e.g., Devereux and Loretz, 2013). Corporations can avoid taxation without investing or locating operations in a low-tax country, however. They can shift profits between jurisdictions in order to lower their tax burden. Profits can be shifted in mainly two ways; by transfer pricing or by strategically structuring intra-company debt. Transfer pricing involves using intra-company sales that deviates from the arms' length principle in order to locate costs in high-tax countries and gains in low-tax countries. Multinationals can also set up internal debt structures to reduce company tax payments by allocating more debt in countries providing generous interest-rate deductions. For example, multinationals can set up intra-company debts borrowing in jurisdictions with generous interest deductions and channel interest payments to jurisdictions that tax interest payments at low or zero rates. The two forms of tax-shifting behavior are interrelated and work as substitutes (Schindler and Scheldrup, 2014).

³ During the period studied, the corporate tax rate was 28 percent in Sweden compared to an average rate of 29.9 in the EU and 31.3 in the OECD (OECD Tax Database, 2016). In addition, there were very few interest deduction limitations in Sweden (Thomann, 2014).

⁴ The Tax Foundation 2014 international tax competitiveness index rank Sweden number 3 when it comes to corporate tax rank, just after Estonia and Ireland. As a comparison Germany is ranked number 25 and the US 33 out of 34 countries.

Tax-motivated profit shifting has interested researchers since the late 1980s/early 1990s. Wheeler (1988) and Dworin (1990) observed that foreign-owned subsidiaries in the US reported lower profits than domestic firms. Grubert et al. (1993) investigated this further, showing that around 50 percent of the difference could be explained by foreign-owned firm characteristics (such as age), national discrepancies in write-off rules and other standard profit determinants. The remaining profit difference was attributed to profit shifting. Since then many studies have investigated the existence and extent of profit-shifting activities. The most common approach in the research field to date is to estimate a semi-elasticity of profit measuring the percentage change in profit due to a one percentage point change in the incentive to shift profits abroad. The incentive to shift profits abroad is usually identified as a reduction in the corporate tax differential between the home and host country, typically by a rate decline in the host country.

Most research in the field is based on US data and the general consensus is that profit shifting takes place. Earlier studies include Gruber and Mutti (1991) and Hines and Rise (1994), which rely on aggregate US data from the Bureau of Economic Analysis. Gruber and Mutti (1991) find that profits of US subsidiaries are higher in low-tax countries than in high-tax countries. Hines and Rise (1994) identify a profit semi-elasticity for EBIT of 3 percent, implying that a one percentage point increase in the host country's corporate tax rate reduces EBIT reported by US subsidiaries by 3 percent. For subsequent research investigating this semi-elasticity using aggregate US data, the estimates vary substantially depending on applied empirical approach. Recent studies by Clausing (2009) and Blouin et al. (2012) report semi-elasticities of 3.39 and 0.31 percent.

Many recent studies rely on firm data to estimate the extent of profit shifting. Several of these contributions employ European cross-country samples making use of the AMADEUS database that provides firm-level information on European multinationals. Huizinga and Laeven (2008), for example, estimate intra-European profit shifting among European

multinationals in the year 1999 and find a semi-elasticity of reported profits with respect to the top statutory tax rate of 1.3 percent. They conclude that there is substantial redistribution of corporate tax revenues within Europe and their results suggest that many small European countries gain revenues, mainly at Germany's expense. This result coincides with that obtained by Weichenrieder (2009), who investigates profit shifting using data on German inbound and outbound FDI. He provides evidence showing that a ten percentage point increase in the parent's home country tax rate leads to about half a percentage point increase in the reported profits of the German affiliation.

Dharmapala and Riedel (2013) estimate the existence and magnitude of tax-motivated profit shifting among European multinationals for the 1995-2005 time period using the AMADEUS database. Instead of corporate tax rate differentials, they use exogenous earning shocks at the parent company to identify the incentive to shift profit and analyze how these shocks disseminate across low- and high-tax affiliations. They find that a positive earning shock at the parent company leads to a significantly positive increase in pre-tax profit at low-tax subsidiaries compared to the change in pre-tax profit of high-tax subsidiaries. They conclude that the magnitude of profit shifting is substantial and that it is mainly driven by strategic use of debt structures among subsidiaries. However, their more targeted empirical approach results in smaller effects than found in previous studies.

Egger et al. (2010) analyze whether multinational firms' tax payments are lower than the payments made by domestic firms. Using the AMADEUS database for the years 1999-2006, they estimate that a foreign-owned subsidiary pays about 32 percent less in taxes than a comparable domestic firm in a high-tax country. The paper also shows that these tax savings mainly stem from multinational firms moving profits from high-tax to low-tax locations (for example through transfer pricing) rather than shifting debts to countries where taxes are relatively high. The authors address the endogeneity issue of tax payments and firm status (i.e.,

being domestic or multinational) by using a propensity score matching approach. This approach ensures comparability between multinational firms that are able to shift profits and the control group of domestic firms that are not. Finke (2013) uses the same technique when investigating differences in tax payments of German multinationals compared to domestic firms for the years 2007 and 2009. She finds that multinational firms pay significantly less in taxes but that the German tax reform in 2008 (that lowered the corporate tax rate from about 40 to 30 percent and introduced stricter anti-avoidance regulation) led to less profit shifting by these firms.

Heckemeyer and Overesch (2013) undertake a meta-analysis of 25 studies on tax-driven profit shifting. They obtain a semi-elasticity of pre-tax profit of about 0.8, implying that a one percentage point smaller tax rate differential – due to a cut in the host country tax rate - increases pre-tax profit in the subsidiary with 0.8 percent. Contrary to Dharmapala and Riedel (2013) they, however, find that two-thirds of the profit shifting stems from transfer pricing activities. This confirms the general consensus in the literature that transfer pricing is the dominant form of profit-shifting undertaken by multinationals.⁵ This view is in line with empirical and theoretical evidence that debt shifting based on tax differentials is modest (see, e.g. Desai et al., 2004, Mints and Smart, 2004, Büttner et al., 2009, and Schindler and Schjelderup, 2014).⁶

3. Empirical approach and data

To trace tax-driven profit shifting, we identify systematic differences between Swedish multinationals and domestic firms. We argue that this approach is superior to estimating a semi-elasticity, as many previous studies have done. Basing the magnitude of tax-shifting behavior on the change in the tax rate difference between home and host country also captures the effect

⁵ Further empirical evidence supporting this conjecture is presented by, e.g., Pak and Zdanowicz (2001) and Bartelsman and Beetsma (2003).

⁶ Empirical estimates of the semi-elasticity of internal debt are around 1 percent.

of a lower tax rate making investments more profitable, which introduces an upward bias in the identified tax shifting behavior by intertwining a profit increase with profit shifting. We avoid this by not looking at a tax rate differences but instead comparing multinational to domestic firms.

Our hypothesis is that multinational firms, due to better means to avoid taxation, pay less in taxes than domestic firms. To investigate our hypothesis we start out by examining whether multinational firm status affects tax payments while controlling for other factors. This is done by simply regressing the taxes paid by a firm (relative to its production size) on a dummy variable capturing whether the firm is a multinational enterprise (MNE) or not, and a set of control variables, including the firm's EBIT (relative to its production size) and equity ratio. Besides controlling for these accountancy-related factors, various other firm characteristics that may affect tax payments are taken into account. The regression model of taxes paid by firm i , in industry j , at time (year) t equals:

$$\begin{aligned} \ln TAX_{it} = & \alpha_j + \alpha_t + \beta_1 MNE_{it} + \beta_2 \ln EBIT_{it} + \beta_3 EQRAT_{it} + \beta_4 \ln PROD_{it} \\ & + \beta_5 \ln SIZE_{it} + \beta_6 \ln RCA_{it} + \beta_7 HCA_{it} + \beta_8 \ln WCOST_{it} + \beta_9 EXP_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

where α_j and α_t captures industry and time effects, $\ln TAX_{it}$ is firm i 's tax payment (relative to production size) at time t , MNE_{it} is a dummy variable taking the value one if the firm is a multinational at the time and zero otherwise, $\ln EBIT_{it}$ refers to the firm's earnings before interest and taxes (relative to production size) at the time, $EQRAT_{it}$ is the firm's equity ratio (the proportional equity share of total capital) at the time, $\ln PROD_{it}$ is the firm's productivity at the time, $\ln SIZE_{it}$ measures the firm's production size (relative to employment) at the time, $\ln RCA_{it}$ refers to the firm's real capital assets (relative to production size) at the time, HCA_{it} is the firm's human capital assets (relative to employment) at the time, $\ln WCOST_{it}$ measures wage costs (relative to employment) at the time, EXP_{it} is a dummy variable taking

the value one if the firm is an exporter at the time and zero if not, and finally ε_{it} is an error term. Equation (1) is estimated using OLS.

The β_1 parameter estimate captures whether MNE status influences firms' tax payments. The (positive) impact of higher earnings and lower debt financing (a higher equity ratio) on tax payments are captured by the β_2 and β_3 parameter estimates. The $\beta_4 - \beta_7$ parameter estimates capture tax effects related to different aspects of firm technology (broadly defined) as depicted by productivity, real and human capital assets, and production size. The β_8 parameter estimate captures the (negative) tax impact of wage costs while β_9 captures tax effects related to production for foreign market sales (such as higher product quality).

We underpin our tax findings by investigating whether profits of multinationals differ from domestic firms using the same regression technique. Firm profits (relative to production size), $\ln PROF_{it}$, is regressed on the set of remaining independent variables from equation (1). The MNE parameter estimate in the regression is used to pick up systematic differences in profits between MNEs and domestic firms. Parameter estimates of other firm characteristics capture their direct impact on taxable profits. If MNEs engage in transfer pricing to shift profits to foreign low-tax destinations, this could result in lower earnings and profits compared to domestic firms.

The regression results may be spurious if MNEs and domestic firms have different characteristics. This problem can occur even if such characteristics are controlled for in the estimation as their parameter estimates will be correlated with that of the MNE variable. Indeed, trade-theoretic evidence gives us grounds to believe that this type of bias affects the regression estimation results.⁷ To deal with this we utilize a standard technique to identify a counterfactual group of firms displaying the characteristics of multinational firms. Specifically, we use

⁷ Following Antràs and Helpman (2004) and Helpman et al. (2004), a large literature in the heterogeneous firm research field identify systematic differences in firm characteristics of MNEs and domestic firms.

propensity score matching to select comparable domestic firms based on the propensity score PS , which is the probability that a firm is multinational instead of domestic based on a vector of observable variables, $\mathbf{X}$, taking values characteristic of MNEs $\mathbf{x}$:

$$PS(\mathbf{x}) = \Pr(MNE = 1 | \mathbf{X} = \mathbf{x}). \quad (2)$$

The propensity score of a firm is obtained from a probit estimation representing the probability of MNE status given the variable vector $\mathbf{X}$, which includes the set of firm characteristics control variables, as well as time and industry effects used in the prior tax and profit regressions. We use kernel and radius matching algorithms to estimate counterfactual outcomes. The kernel matching uses weighted averages of all cases in a control group defined by a quartic (biweight) distribution function where closer matches to the propensity score of the depicted MNE receive larger weight. The radius matching uses all cases within a radius defined by a propensity score deviation of 0.01 to construct a control group.

Comparisons of MNEs' and matched firms' tax payments and profits are then based on difference-in-differences estimates. These estimates isolate the outcome variable difference between the category of interest (treated), i.e. multinationals, and the control group of matched firms, i.e. domestic firms. The obtained difference equals the mean outcome variable effect of MNE status, which is commonly referred to as the average treatment effect of the treated (ATT). We also use the same matching technique to compare earnings (before interest and taxes) and equity ratios for firms that are and are not multinational. If multinationals engage in profit shifting through transfer pricing, this could be reflected in earnings differences compared to domestic firms while equity ratio differences may reflect debt shifting. If MNEs have lower equity ratios and rely more on debt financing than domestic firms, their interest deductions result in lower taxable profits and tax payments but not lower EBIT. Thus, focusing on earnings and equity ratios allows us to disentangle what mechanism for profit shifting is used by MNEs.

Another way to investigate whether multinationals pay less in taxes than domestic firms and differ in terms of accountancy-related factors is to examine whether domestic firms that become multinational alter behavior. We identify these firms and categorize them by a time line starting one year before the change in MNE status, to infer whether firms that become multinational differ from firms that remain domestic, and end two years after the status change has taken place. The described propensity score matching technique is applied to identify control groups of comparable domestic firms for each year of the time line. Difference-in-differences estimates are then obtained for these years to compare tax payments, earnings, profits, and equity ratios for firms that become multinationals and matched firms that remain domestic.

To make the data representative of regular firm behavior and our results comparable to that of other studies, we restrict the data to a sample including Swedish privately owned manufacturing companies with more than 10 employees for the 1997 to 2007 time period. Swedish ownership is defined by at least 50 percent national shareholder value. MNE firms are incorporated into a multinational company identified by its foreign employment (of at least one employee). In the full firm-year sample, roughly 1 out of 10 observations are MNEs. Around 14 percent of these observations depict firms that became multinationals in the investigated time period. Firms are categorized into industries according to the 2-digit level Swedish classification (SNI2002), which corresponds to the EU industry classification NACE Rev 1.1. Observations for 1997 to 2002 have been reclassified to conform to this standard using concordance tables from Statistics Sweden. In total, there are 33,033 firms in the sample of which 3,266 are multinational.

In Table 1, some descriptive statistics are presented for all firms as well as those that are multinational in the manufacturing sector. Multinational firms are on average larger, more productive, employ more workers, and hire relatively more personnel with tertiary education attainment than domestic manufacturing firms. They on average incur higher production costs

(investment in real capital, wage costs), make larger earnings, and pay more in taxes than domestic firms. While 20 percent of the manufacturing firms are exporters, 64 percent of MNE manufacturing firms export. As can be seen in the table, the raw data standard deviations are large in relation to mean values. In the analysis, we construct relative levels to avoid outlier bias in these cases and take natural logarithms of variables that display large uneven variation to better comply with assumptions underlying applied estimation methods.

Turning to our explanatory variables, the equity ratio is measured as adjusted equity (the sum of equity and untaxed reserves) divided by the sum of adjusted equity and debt. Productivity is defined as total factor productivity using the Olley and Pakes (1996) method, which is estimated based on real capital assets, employment, and investment of the firm and other firms in the industry. Tax payments, profits, earnings before interest and taxes, and production size (net sales) are reported in corporate income statements. Real capital assets (fixed assets), investment, equity, untaxed reserves, and debt are reported in corporate balance sheets. Employment is reported in corporate annual reports. Human capital assets measured by the number of employees with tertiary education and wage costs defined by personnel income remuneration come from the MONA labor-market survey. Pecuniary data have been inflation-adjusted by industry producer price indices from Statistics Sweden. All firm data come from Sweden Statistics and were provided by Growth Analysis under a strict confidentiality agreement.

4. Estimation results

Table 2 reports the results for the tax and profit regressions. The tax regression results, which are presented in the first column, gives support to our conjecture that multinationals pay less in taxes than domestic firms. Specifically, the MNE coefficient, which is significant at a one percent significance level, indicates that multinational firms pay 10 percent less in taxes than

domestic firms of equivalent size.⁸ The results confirm that accountancy-related factors are important determinants of firm taxation. Tax payments increase by 0.72 percent with a one percent increase in earnings and by 3.0 percent with a 0.01 increase in the equity ratio.

The profit regression estimation in the second column shows that multinationals make larger profits than domestic firms of equivalent size. Specifically, the MNE parameter estimate, which is significant at the one percent level, indicates that multinationals run 9.7 percent larger profits. Again, the results are supportive of the importance of firm earnings and equity ratios in determining taxable profit. Profits increase by 0.91 percent with a one percent increase in earnings and by 3.33 percent with an equity ratio increase of 0.01. This indicates that multinationals pay lower taxes despite making larger profits.

Table 3 reports the MNE regression estimates that depict firm propensity scores. The results provide strong support that firm characteristics used as controls in prior estimations are highly correlated with a firm's MNE status. These findings are largely in line with general evidence on multinational firm characteristics, indicating that multinationals are larger, more (real and human) capital intensive and more prone to export. That multinationals are less productive is not in line with general evidence in the field. This result may be due to that firm productivity is captured by the (real and human) capital assets and exporting variables, so that the productivity variable reflects other factors such as profit shifting to foreign countries through transfer pricing.⁹ Since multinational firms differ with respect to firm characteristics, our prior comparisons between firms that are and are not multinationals are likely to be affected by this bias.

⁸ The dummy variable impact is adjusted to account for the semilogarithmic setup (Halvorsen and Palmquist, 1980).

⁹ For related evidence on negative productivity effects from multinational engagement with trade linkages taken into account, see Gullstrand et al. (2016).

In Table 4, we present difference-in-differences estimates for MNE and domestic firms' tax payments, profits, earnings, and equity ratios together with the obtained differences. These are reported for unmatched firms and for firms matched using described propensity score techniques. The discrepant estimates obtained using unmatched and matched firms reveal that the bias reduction attained through propensity score matching is important. Outcome variable differences linked to MNE status, which are supported at the one percent significance level without matching, are often not sustained with matching. Testing for this effect, we find that our propensity score matching reduces the parameter bias of firm characteristics with 75.2 to 99.8 percent using kernel matching and with 79.6 to 99.1 percent using radius matching.

The estimates for tax payments of multinational and domestic firms are presented in the first rows. The result for unmatched firms corresponds to that obtained in the prior tax regression in Table 2. Moreover, there is weak evidence that multinationals pay less in taxes than matched domestic firms. The treated firms pay 0.51 to 0.58 percent less taxes than domestic firms. However, the difference is only supported at the ten percent significance level for propensity score matching based on kernel weighting.

The profit estimates are provided in the following rows. The result for unmatched firms is similar to our previous finding in Table 2. The result that multinationals make larger profits vanishes with matching; the estimated differences are now negative and insignificant. Similarly, the estimated differences for EBIT are negative and insignificant, leaving no statistical support that MNEs engage in profit shifting through transfer pricing.

The final rows in Table 4 report the equity ratio estimates. The results strongly suggest that multinational firms have lower equity ratios than in firms in the control group. At the one percent significance level, equity ratios are 0.0079 to 0.0090 lower in firms that are multinational. This corresponds to around 2.2 to 2.5 percent larger leverage compared to

domestic counterparts. Lower equity ratios imply that MNEs rely more on debt financing, which results in lower taxable profits through interest deductions.

In Table 5, we report matched differences for tax payments, profits, earnings, and equity ratios of domestic firms that become multinational. The time line is reported along columns with year 0 representing the time of altered MNE status. Matched differences for tax payments are reported in the first rows. There is weak support that firms that will become multinational in the subsequent year pay less tax than firms in the control group. Namely, at the five percent significance level, firms that will become multinational pay 0.15 percent less in taxes than domestic firms that year based on radius matching. In the transition year, the estimated tax discrepancy is larger – equal to 0.20 percent - albeit only significant at the ten percent level. Stronger evidence that depicted firms make lower tax payments is obtained for the years following the change in MNE status. Once two years have passed, and behavioral adjustments have taken place, a new multinational firm pays 0.23 to 0.30 percent less in taxes than a domestic counterpart. This result, which is supported at the one percent significance level, provides us with supplementary evidence that multinational firms make lower tax payments than comparable domestic firms.

Matched differences for profits are negative the year before, during, and two years after the status change and positive one year after the firm has altered status. Though these results are not statistically significant, this pattern suggests that the status change temporarily raises firm profits. Such a change could reflect restructuring and/or higher sales resulting from a firm's incorporation into a streamlined production network as well as accountancy-related profit-raising activities pursued to raise dividends. The results for matched earnings (before interest and taxes) show that the difference is negative one year before the status change and mixed for subsequent years. The estimated differences cannot be statistically confirmed in line with our prior results and, again, there is no statistical support that MNEs utilize transfer pricing.

The final rows present matched equity ratio differences for firms that become multinationals. The results provide weak support that these firms have lower equity ratios one year before they become multinational. At the ten percent significance level, these firms have 0.011 – or around 3.21 percent - lower equity ratios than firms in the control group identified by radius matching. There is no statistical evidence that these firms that have lower equity ratios in the year they change MNE status. Possibly, this result reflects that companies invest in newly incorporated firms to reorganize and align their production with other firms in the production network. We find stark evidence, confirmed at the one percent significance level, that new multinational firms have lower equity ratios than their domestic counterparts after two years have passed. These firms' equity ratios are 0.018 to 0.0242 below that of comparable domestic firms, which corresponds to a 4.91 to 6.52 percentage reduction. The findings provide supplementary evidence that multinational firms are more prone to rely on debt financing than domestic firms.

Tax planning of R&D firms

Previous research suggests that multinational R&D firms are more prone to engage in tax planning and transfer pricing than other firms. One reason is that high-tech firms are more able to manipulate transfer prices since the market price of a differentiated product is more difficult to establish (see, e.g., Grubert, 2003, and Azémar and Corcos, 2009). In this section, therefore, we narrow down the focus to R&D firms that become multinational and examine whether these firms alter behavior when changing status. We repeat the previous exercise of propensity score matching and difference-in-differences estimations to investigate firms that have at least one research employee and become multinational.

In Table 6, we present matched tax payment, profit, earnings, and equity ratio differences for domestic R&D firms that become multinational for a period of four years starting one year before the change in MNE status. Matched differences in tax payments are reported in the first

rows. There is some weak support provided that selected R&D firms have lower tax payments than those in the control group before and under the transition. In particular, the result that R&D firms pay 0.22 to 0.23 percent less tax is significant at the 10 percent level with radius matching. After the transition, the result is strengthened. One year after transition, the difference in tax payments is conformingly significant at the one percent level and has increased to 0.38 to 0.53 percent. Two years after the transition, once adjustments have taken place, at the one to five percent significance level the selected firms pay 0.33 to 0.34 percent less in taxes than matched firms. The results indicate that R&D firms reduce their tax payments after becoming multinational, even though the reduction is modest. This evidence is similar to that obtained for (all) firms that become multinational in Table 5.

The profit differences between R&D firms that become multinational and matched firms are negative one year before and two years after the transition and otherwise positive though this pattern is not statistically confirmed. This leaves no statistical support that multinational R&D firms stand out among manufacturing firms. The earnings difference between R&D firms that become multinational and domestic firms is negative one year before and two years after the transition, mixed for intermediate years and always insignificant. Thus, we find no statistical support that multinational R&D firms engage in global tax-planning strategies that involve transfer pricing. In this respect, the results are similar to those previously obtained for (all) manufacturing firms that get MNE status.

As for matched equity ratio differences, there is weak evidence that R&D firms have higher equity ratios in the transition year compared to firms that remain domestic. Namely, at the 10 percent significance level, the difference is 0.014 with kernel matching. Some support is also provided that these firms have higher leverage compared to firms in the control group after adjustment has taken place – with radius matching the equity ratio difference of 0.026 is significant at the one percent level. This evidence provides some statistical support that

multinational R&D firms rely on debt financing to a larger extent than comparable domestic firms.

5. Conclusions

This paper investigates whether Swedish multinationals in the manufacturing sector make use of global tax-planning opportunities. Our results show that these firms pay less in taxes and are more leveraged than comparable domestic firms. Specifically, we find that the tax payments of multinationals are roughly 0.5 percent lower and their equity ratios around 2 percent lower, compared to domestic firms with similar characteristics. These results indicate that MNEs rely more on debt financing, which reduce their taxable profits and tax payments. However, we cannot confirm that these firms have statistically significant lower earnings before interest and taxes or total profits. To isolate the opportunities arising from multinational status, we also follow firms that change from domestic to multinational and compare them to firms that remain domestic. Once adjustments are made, we find the same pattern of lower tax payments and equity ratios. Firms that become multinational pay 0.23 to 0.30 percent less tax and have 4.91 to 6.52 percent lower equity ratios than domestic counterparts. Compared to previous studies, our results suggest quite moderate tax shifting by Swedish multinationals during the period studied. Partly, this discrepancy reflects our focus on national MNE and domestic firms that are compared using propensity score matching and difference-in-differences techniques, which we argue is preferable to commonly used empirical approaches that do not disentangle companies' profit-shifting and investment behavior. Our evidence is in line with the comparatively competitive tax climate in Sweden, which provides less incentives to shift profits compared to high-tax countries.

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Tables

Table 1. Descriptive firm statistics (year means)

	All firms		MNE firms	
Data	Mean	STD	Mean	STD
Earnings	$1.20 \cdot 10^6$	$2.27 \cdot 10^7$	$1.30 \cdot 10^7$	$1.03 \cdot 10^8$
Employees	52.92	186.81	161.86	519.46
- with tertiary education	10.16	47.46	34.17	132.79
Productivity	3.64	0.92	3.86	0.85
Profits	$3.12 \cdot 10^6$	$9.25 \cdot 10^7$	$2.98 \cdot 10^7$	$2.51 \cdot 10^8$
Real capital assets	$6.02 \cdot 10^7$	$8.18 \cdot 10^8$	$3.64 \cdot 10^8$	$2.34 \cdot 10^9$
Size (sales)	$3.36 \cdot 10^7$	$2.70 \cdot 10^8$	$2.98 \cdot 10^8$	$1.79 \cdot 10^9$
Tax payments	$3.14 \cdot 10^5$	$6.13 \cdot 10^6$	$3.40 \cdot 10^6$	$2.96 \cdot 10^7$
Wage costs	$4.09 \cdot 10^9$	$4.70 \cdot 10^{10}$	$3.07 \cdot 10^{10}$	$3.79 \cdot 10^{11}$

Notes: Pecuniary values in Swedish crowns. Earnings before interest and tax deductions.
Estimated productivity (in natural logarithms).

Table 2. Tax and profit regression results

INDVAR/DEPVAR	lnTAX	lnPROF
MNE	-0.105*** (0.0179)	0.0928*** (0.0221)
lnEBIT	0.7227*** (0.0066)	0.9130*** (0.0084)
EQRAT	3.015*** (0.0335)	3.331*** (0.0417)
lnPROD	-0.0174 (0.0111)	-0.0649*** (0.0138)
lnSIZE	-0.0312** (0.0132)	0.0254 (0.0165)
lnRCA	-0.0843*** (0.0057)	-0.1211*** (0.0071)
HCA	0.4738*** (0.0533)	0.5932*** (0.0664)
lnWCOST	-0.0343 (0.0227)	-0.0639** (0.0281)
EXP	-0.0807*** (0.0134)	-0.0959*** (0.0167)
Year dummy	X	X
Sector dummy	X	X
Nobs	35,739	35,510
Adjusted R ²	0.4631	0.4335

Notes: Standard errors within parenthesis. *, **, and *** denote significance at 10, 5 and 1 percent level.

Table 3. MNE regression results

INDVAR/DEPVAR	MNE
lnPROD	-0.136*** (0.011)
lnSIZE	0.529*** (0.015)
lnRCA	0.155*** (0.006)
HCA	1.162*** (0.052)
lnWCOST	0.071*** (0.027)
EXP	0.562*** (0.019)
Year dummy	X
Sector dummy	X
Nobs	64,839
Adjusted R ²	0.147
Log likelihood	-23231.985

Notes: Standard errors within parenthesis. *, **, and *** denote significance at 10, 5 and 1 percent level.

Table 4. Tax, profit, earning and equity ratio difference-in-differences estimates

DEPVAR	Method	MNE	Domestic	Difference
lnTAX	Unmatched	0.0079	0.0112	-0.0033(0.0018)*
	Kernel	0.0079	0.0137	-0.0058(0.0033)*
	Radius	0.0086	0.0137	-0.0051(0.0032)
lnPROF	Unmatched	0.0334	0.0131	0.0203(0.0120)*
	Kernel	0.0334	0.0336	-0.00021(0.0144)
	Radius	0.0278	0.0338	-0.0060(0.0141)
lnEBIT	Unmatched	0.0431	0.0370	0.0061(0.0104)
	Kernel	0.0431	0.0458	-0.0027(0.0081)
	Radius	0.0431	0.0463	-0.0032(0.0082)
EQRAT	Unmatched	0.3557	0.3382	0.0175(0.0024)***
	Kernel	0.3557	0.3636	-0.0079(0.0027)***
	Radius	0.3557	0.3647	-0.0090(0.0027)***

Notes: Difference based on t-test with standard errors in parenthesis. *, **, and *** denote statistical significance at 10, 5 and 1 percent level.

Table 5. Matched differences for domestic firms that become multinational

DEPVAR	Methods	Year -1	Year 0	Year 1	Year 2
lnTAX	Kernel	-0.00095 (0.00075)	-0.00112 (0.00099)	-0.00270*** (0.00075)	-0.00231** (0.00095)
	Radius	-0.00149** (0.00075)	-0.00199* (0.00111)	-0.00298*** (0.00076)	-0.00299*** (0.00096)
lnPROF	Kernel	-0.06432 (0.07074)	-0.01417 (0.02126)	0.01623 (0.01401)	-0.00811 (0.01582)
	Radius	-0.06799 (0.07081)	-0.02022 (0.02165)	0.01400 (0.01481)	-0.01216 (0.01712)
lnEBIT	Kernel	-0.06674 (0.06831)	0.00206 (0.00631)	0.00231 (0.00732)	0.00131 (0.00945)
	Radius	-0.06931 (0.06837)	-0.00218 (0.00743)	-0.00117 (0.00864)	-0.00141 (0.01135)
EQRAT	Kernel	-0.00572 (0.00583)	-0.00137 (0.00571)	-0.00731 (0.00630)	-0.0179*** (0.00700)
	Radius	-0.01141* (0.00590)	-0.00817 (0.00577)	-0.0127** (0.00639)	-0.0242*** (0.00709)

Notes: Transition in year 0. Differences based on t-test with standard errors in parenthesis.

*, **, and *** denote statistical significance at 10, 5 and 1 percent level.

Table 6. Matched differences for R&D firms that become multinational

DEPVAR	Methods	Year -1	Year 0	Year 1	Year 2
lnTAX	Kernel	-0.00118 (0.00123)	-0.00086 (0.00113)	-0.00382*** (0.00115)	-0.00329** (0.00134)
	Radius	-0.00228* (0.00123)	-0.00223* (0.00130)	-0.00531*** (0.00116)	-0.00344*** (0.00133)
lnPROF	Kernel	-0.13441 (0.14440)	0.01005 (0.00650)	0.02866 (0.02612)	-0.02541 (0.02725)
	Radius	-0.14106 (0.14442)	0.00118 (0.00842)	0.02273 (0.02691)	-0.02796 (0.02781)
lnEBIT	Kernel	-0.13898 (0.13940)	0.00222 (0.00682)	0.00049 (0.00791)	-0.01018 (0.00778)
	Radius	-0.14420 (0.13941)	-0.00559 (0.00854)	-0.00613 (0.00997)	-0.01149 (0.00922)
EQRAT	Kernel	0.00420 (0.00816)	0.01393* (0.00820)	0.00797 (0.00896)	-0.01386 (0.00976)
	Radius	-0.00646 (0.00823)	0.00220 (0.00827)	-0.00183 (0.00906)	-0.02565*** (0.00987)

Notes: Transition in year 0. Differences based on t-test with standard errors in parenthesis. *, **, and *** denote statistical significance at 10, 5 and 1 percent level.