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DEBT AND TAX PLANNING BY MULTINATIONALS

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By Stéphane Sorbe, Åsa Johansson and Øystein Bieltvedt Skeie

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ABSTRACT/RÉSUMÉ**Debt and tax planning by multinationals**

Multinational enterprises (MNEs) manipulate the location of their debts to reduce their corporate tax burden. Indeed, by locating debts in higher-tax rate countries, MNEs can deduct interest payments against a higher tax rate. This paper provides evidence of such manipulation of debt location. The analysis is based on a large sample of firm-level data from the ORBIS database. By comparing the indebtedness of MNE entities with similar characteristics but different debt shifting opportunities, the analysis suggests that a 1 percentage point higher tax rate is associated with 1.3% higher third-party debt. This is a lower bound estimate of debt manipulation, since it excludes the manipulation of internal debt. The analysis also shows that strict rules limiting interest deductibility (e.g. thin capitalisation or interest-to-earnings rules) can reduce debt manipulation. The possibility to locate debts in higher-tax rate countries reduces the effective cost of debt for MNE groups. The empirical analysis suggests that this can lead MNE groups to increase their overall external indebtedness, compounding the “debt bias” existing in most tax systems.

JEL classification codes: G32, H25, H26

Key words: Multinational tax planning, debt bias, capital structure, interest-to-earnings and thin capitalisation rules.

Dette et planification fiscale des multinationales

Les entreprises multinationales manipulent l'emplacement de leurs dettes pour réduire le montant de leur impôt sur les sociétés. En effet, en plaçant des dettes dans les pays à taux élevé d'impôt, les entreprises multinationales peuvent déduire les paiements d'intérêts contre un taux d'imposition plus élevé. Ce document fournit la preuve d'une telle manipulation de l'emplacement de la dette. L'analyse est basée sur un large échantillon de données d'entreprises de la base de données ORBIS. En comparant l'endettement des entités multinationales ayant des caractéristiques similaires mais différentes possibilités de manipuler l'emplacement leur dette, l'analyse suggère qu'un taux d'imposition de 1 point de pourcentage plus élevé est associé à une dette externe accrue de 1,3%. Ceci est une estimation de la limite inférieure de l'ampleur de la manipulation de la dette, car elle exclut la manipulation de la dette interne. L'analyse montre également que les règles strictes limitant la déductibilité des intérêts (par exemple des règles relatives à la sous-capitalisation ou de règles sur les ratios intérêts-bénéfices) peuvent réduire la manipulation de la dette. La possibilité de localiser les dettes dans les pays à taux d'imposition élevé réduit le coût effectif de la dette pour les groupes multinationaux. L'analyse empirique suggère que cela peut entraîner des groupes multinationaux à augmenter leur endettement global externe, ce qui aggrave le biais en faveur du financement par la dette existant dans la plupart des systèmes fiscaux.

Classification JEL: G32, H25, H26

Mots clés: planification fiscale internationale, biais pour la dette, structure du capital, règles sur les ratios intérêts-bénéfices et règles de sous-capitalisation.

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DEBT AND TAX PLANNING BY MULTINATIONALS

By Stéphane Sorbe, Åsa Johansson and Øystein Bieltvedt Skeie¹

KEY FINDINGS

- Multinational enterprises (MNEs) are found to locate debt preferentially in entities in higher-tax rate countries. By deducting interest payments from taxable income at a higher rate in these countries, they reduce their tax burden. On average, a 1 percentage point higher tax rate is associated with 1.3% higher third-party debt.
- Manipulation of debt location is found to account for at least 20% of overall profit shifting. This is a lower bound estimate since it leaves aside debt manipulation strategies relying on internal debt.
- Rules limiting interest deductibility above certain thresholds on debt-to-equity or interest-to-earnings ratios are associated with reduced manipulation of debt location. Introducing a “strict” rule could reduce manipulation of third-party debt by more than 80% as compared to a situation without a rule.
- The possibility to locate internal and external debt in higher-tax rate countries reduces the effective cost of debt for MNE groups. As a result, MNE groups are found to increase their overall external leverage. Even so, domestic firms have on average higher external leverage than MNE groups with similar characteristics.

1. Introduction and main findings

1. Debt plays an important role in tax planning strategies of multinational enterprises (MNEs). Interest payments are generally deductible from taxable income in most countries, which implies that locating debt in high-tax rate countries is a way for MNE groups to reduce their tax burden as interest payments are deducted at a higher rate. There is ample empirical evidence of such manipulation of debt location (also called debt shifting) among MNE groups, both for external and internal debt (see e.g. de Mooij, 2011 for a review; Buettner et al., 2012). Beyond its fiscal consequences, debt manipulation may also have economic implications. The possibility to locate debt in higher-tax rate countries lowers the marginal cost of debt for MNE groups, which could lead them to increase their overall leverage. This would intensify the “debt bias” present in most corporate tax systems (de Mooij, 2012; Fatica et al., 2012).²

2. The key contributions of this paper are: (i) to assess manipulation of debt location in OECD and G20 countries based on a broad sample of firms from the ORBIS database (740,000 observations of MNE

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2. Another potential issue is that manipulating the location of group debts may increase bankruptcy risks of the entities where debt is located if there is no perfect risk sharing within the group. This issue may be limited since MNE entities are generally thought to benefit from explicit or implicit guarantee from their parents (see Huizinga et al., 2008, footnote 9).

entity accounts). The main improvements upon existing research are a sophisticated procedure to identify MNE group members and an assessment of the effectiveness of rules limiting base erosion through interest deduction; (ii) to investigate whether the possibility to manipulate debt location leads MNE groups to have higher overall leverage, based on (consolidated account) group-level data from the ORBIS database (15,000 observations of group-level accounts). This question has not yet been explored in the empirical literature and the analysis contributes to the assessment of the potential economic efficiency effects of tax planning.

3. The empirical framework to assess manipulation of debt location draws on the existing literature and accompanying OECD work on assessing profit manipulation of MNEs (Johansson et al., 2016a). The idea is to compare the leverage of entities with different debt manipulation opportunities (in the form of different links to higher or lower-tax rate countries), after controlling for other determinants of leverage (size, industry, country, etc.). Leverage is measured as the debt-to-equity ratio from financial account data. The analysis focuses only on third-party debt (debt to credit institutions), since intra-group debt cannot be disentangled from tax liabilities (which could bias the results if included) in the available financial account data. As internal debt is also used to shift debt to higher-tax countries (Buettner et al., 2012; Buettner and Wamser, 2013), the focus on third-party debt means that the analysis provides a lower-bound estimate of debt manipulation. Furthermore, the analysis leaves aside the role of hybrid debt instruments (e.g. convertible bonds) in tax planning strategies. These instruments can be considered as debt in one country and equity in another, allowing firms to benefit from interest deductibility in one country and non-taxation of income (considered as dividend) in the other country and thus to reduce their tax burden (OECD, 2014).³

4. The results support the hypothesis that MNEs manipulate the location of debt and are robust to a number of variants. A 1 percentage point higher statutory corporate tax rate in the country of an entity as compared to the average in the countries where its MNE group operates is associated with a 0.9 percentage point higher debt-to-equity ratio. This represents 1.3% higher debt on average. This is about twice the average effect estimated in the literature, according to a meta-study by de Mooij (2011), but in line with recent estimates by Overesch and Wamser (2014). For the average MNE entity, this higher debt would translate into a 0.2% lower profit. Accompanying OECD work shows that the same difference in statutory corporate tax rate leads to a reduction in profits by 1% (see Johansson et al., 2016a). Combining these findings suggests that manipulation of debt location accounts for at least 20% of profit shifting, a lower bound estimate since it does not take into account schemes based on intra-group debt. Using German firm-level data, Møen et al. (2011) find evidence of both internal and external debt shifting and estimate that they are of about equal relevance.

5. The empirical analysis also provides evidence that rules limiting interest deductibility above certain thresholds on the debt-to-equity (thin capitalisation rules) or interest-to-earnings ratio are associated with a reduction in debt manipulation. For example, introducing a “strict” rule could reduce manipulation of third-party debt location by more than 80% as compared to a situation without a rule. This finding is consistent with previous studies showing that thin capitalisation rules can reduce debt manipulation (Overesch and Wamser, 2010 and 2014; Buettner et al., 2012).

6. To assess if manipulation of debt location leads MNE groups to increase their overall debt, the empirical strategy is to measure the sensitivity of MNE groups’ overall leverage to tax rate changes in different countries. Overall leverage is expected to be especially sensitive to rate changes in higher-tax rate countries, where debts are preferentially located in the context of tax planning strategies. The overall leverage of an average MNE group is found to react to changes in the average of the two highest tax rates among the countries where the group operates. On average, a 1 percentage point increase in this average

3. The implication of these hybrid instruments for effective tax rates are captured in the accompanying analysis of mismatches between tax systems (see Johansson et al., 2016a).

tax rate is associated with 2% higher debt for the MNE group as a whole. This sensitivity is reduced when these two countries have strict rules against debt manipulation. This suggests that MNE groups that are able to shift debt to higher-tax rate countries take advantage of the lower effective cost of debt in these countries to increase their overall leverage. The overall leverage of the average MNE group is also found to be sensitive (with a slightly lower elasticity) to tax rate changes in their country of headquarters, probably reflecting that groups locate an important share of their debt in their home country. In contrast, it is not sensitive to the lowest tax rates in the group.

7. These results, which are robust to a number of variants, provide tentative evidence that debt manipulation intensifies the debt bias existing in most tax systems. Still, it is difficult to assess if this leads to “excessive” leverage by MNE groups in terms of vulnerability to income shocks and bankruptcy risks, since there is no clear benchmark for the optimal debt level. The empirical analysis also shows, in line with the empirical literature, that MNE groups tend to be less leveraged than domestic firms with comparable characteristics, despite the fact that domestic firms have less diversified incomes and should thus aim at lower leverage than MNEs. Thus, the debt bias appears stronger for the average domestic firm than for the average MNE. This also suggests that debt manipulation is not a main determinant of MNE groups’ leverage, since otherwise MNE groups would tend to have higher average leverage than domestic firms.

2. Theoretical considerations and empirical strategy

8. Assuming complete markets, perfect information, no taxation and no bankruptcy costs, debt and equity financing would have the same cost for firms (Modigliani and Miller, 1958). In practice, corporate taxation induces a bias in favour of debt financing in most countries (Feld et al., 2011; Fatica et al., 2012; de Mooij, 2012). This is because interest on debt is generally deductible from taxable income, while dividends paid are not. However, higher leverage is also associated with higher bankruptcy and default risk. As a result, firms are expected to increase their leverage only up to the point where the associated tax savings is offset by the extra costs resulting from a higher risk of bankruptcy (Kraus and Litzenger, 1973; Gordon, 2010). In a world with imperfect information and imperfect markets, other factors can influence the choice of debt or equity as a source of financing. These include, among other, the tangibility of firms’ assets, corporate governance practices, financial sector characteristics and bankruptcy rules (Antonioni et al., 2008; Öztekin and Flannery, 2012; Kühnhausen and Stieber, 2014).

9. A bias in favour of debt financing can have adverse effects on economic efficiency (Weichenrieder and Klautke, 2008; de Mooij, 2012). By making balance sheets more vulnerable, high leverage increases bankruptcy risks. Bankruptcies can have social costs (e.g. lay-offs, loss of skills), although in some cases they may also facilitate the reallocation of capital to more productive firms. If widespread in an economy or an industry, high leverage (especially among financial firms) may also increase systemic risk and lead to higher macroeconomic volatility (Davis and Stone, 2004; Sutherland and Hoeller, 2012). Another consequence of the debt bias is that it can distort capital allocation in favour of certain firms or industries. For example, firms with more tangible assets have easier access to debt financing than firms whose assets are intangible (such as knowledge-based capital). This is due to asymmetries of information between lender and borrower and the fact that tangible assets can be used as collateral. As a result, the debt bias may lead capital to be insufficiently allocated to young and innovative firms whose assets are mostly intangible (OECD, 2009).

10. Taxation is only one of many factors influencing firm leverage (Kühnhausen and Stieber, 2014). Firm size is an important determinant of leverage, with an a priori non-linear effect. Leverage tends to be lowest among small firms, which can lack access to credit financing, and among very large ones, which have wider access to equity markets as a source of finance. In addition, a firm’s leverage is generally expected to increase with its growth prospects, with the tangibility and liquidity of its assets, and to decrease with profitability. This is because more profitable firms can finance more of their investments with retained earnings, but it may also reflect that high interest payments resulting from high debt reduce

profitability. Non-tax related industry and country-specific institutional characteristics (e.g. bankruptcy rules, financial sector characteristics) can also affect leverage (Öztekın and Flannery, 2012).

11. The empirical work is divided in two sections. The first section is devoted to assessing whether MNE groups locate preferentially debts in higher-tax countries. The second section investigates whether this debt manipulation leads MNE groups to increase their overall leverage.

2.1. *Manipulation of debt location*

12. Manipulating debt location allows MNEs to increase net interest payments in entities in higher-tax rate countries and to reduce them in lower-tax rate countries. This is a way to shift taxable profit from higher to lower-tax rate countries and thus to reduce the overall tax burden of the MNE group. Debt manipulation strategies can rely on internal or external debt and empirical analyses show evidence of both (Møen et al., 2011; Buettner and Wamser, 2013). A strategy based on internal debt is to set up a loan from an entity in a lower-tax rate country to an entity in a higher-tax rate country, for example as a substitute for an equity investment between the two entities. A strategy based on external debt is to take external debt preferentially in entities in higher-tax rate countries and use non-debt instruments (e.g. equity) to channel the funds to entities in lower tax rate countries (see Box 1 in OECD, 2015).

Baseline regression

13. The empirical strategy to assess manipulation of debt location is similar to Huizinga et al. (2008) and to the profit shifting analysis presented in Johansson et al. (2016a). The idea is that the observed debt of an entity is the sum of a “true” and a manipulated debt. Manipulated debt would generally be positive in higher-tax rate countries and negative in lower-tax rate countries. The strategy is to compare the leverage of MNE entities with different opportunities to manipulate (i.e. shift or receive) debt, controlling for other characteristics influencing “true” debt. Manipulation opportunities are assessed based on the location of the other firms in the group and the statutory tax rate in these locations. A lower tax rate than the group average is assumed to be associated with shifting of debt to higher-tax rate countries, while a higher tax rate would be associated with receiving debt. Reflecting this strategy, the baseline equation to assess debt manipulation is:

$$\frac{Debt}{Equity}_{f,g,c,i,t} = \alpha X_{f,g,c,i,t} + \beta (STAT_{c,t} - STAT_group_avg_{g,c,i,t}) + \delta_t + \delta_i \quad (1)$$

where $\frac{Debt}{Equity}_{f,g,c,i,t}$ is the leverage (i.e. debt-to-equity) ratio of MNE entity f , which is part of MNE group g and operates in country c and industry i , in year t . $(STAT_{c,t} - STAT_group_avg_{g,c,i,t})$ is the difference between the statutory tax rate in country c and the unweighted average of the statutory tax rates in the countries where the multinational group of f operates.⁴ A positive β would indicate that debt is preferentially located in higher-tax countries. $X_{f,g,c,i,t}$ is a vector of determinants of “true” debt. Some of these determinants are firm-specific, such as a firm’s size and position in the group (headquarters, other parent entity or non-parent entity), or group-specific, such as the number of countries where its MNE group operates. Other determinants are country or industry specific, such as GDP growth, value-added growth in the industry, development level (GDP per capita) and size of the credit sector (measured by

4. Using a weighted average is not straightforward due to data limitations and the lack of relevant non-endogenous weights. In particular, large debts may be shifted to locations where a MNE group has little real activity, which means that weights based on real activity are not always relevant to assess debt manipulation possibilities.

private credit as a share of GDP and the share of employment in the finance industry).⁵ δ_t and δ_i are respectively time and industry fixed-effects. Alternative specifications also include country fixed-effects and country-interacted-with-time fixed-effects, with broadly similar results. Country fixed-effects may capture some country-specific determinants of true debt, but at the same time, they may also absorb some debt manipulation behaviour, which would lead to underestimating debt manipulation.

14. Debt relates to all short and long-term debt owed to financial institutions, as reported in an entity's financial accounts. Importantly, it does not include intra-group debt, reflecting data limitations. In the available financial account data, intra-group debt is reported jointly with the entity's "other liabilities", which include tax liabilities and could (if included) bias the analysis. MNEs have been shown to manipulate both internal and external debt (Møen et al., 2011), therefore focusing only on external debt likely yield a lower-bound estimate of debt manipulation. The measure of leverage used in the analysis is expected to be higher than average among parent than non-parent companies, since a common financing strategy is to raise jointly all the external debt of a group at the headquarters and to distribute it within the group using internal debt. Equity is measured at book value, based on the data available in financial accounts. As a robustness check, the ratio of debt to total assets is used as dependent variable.

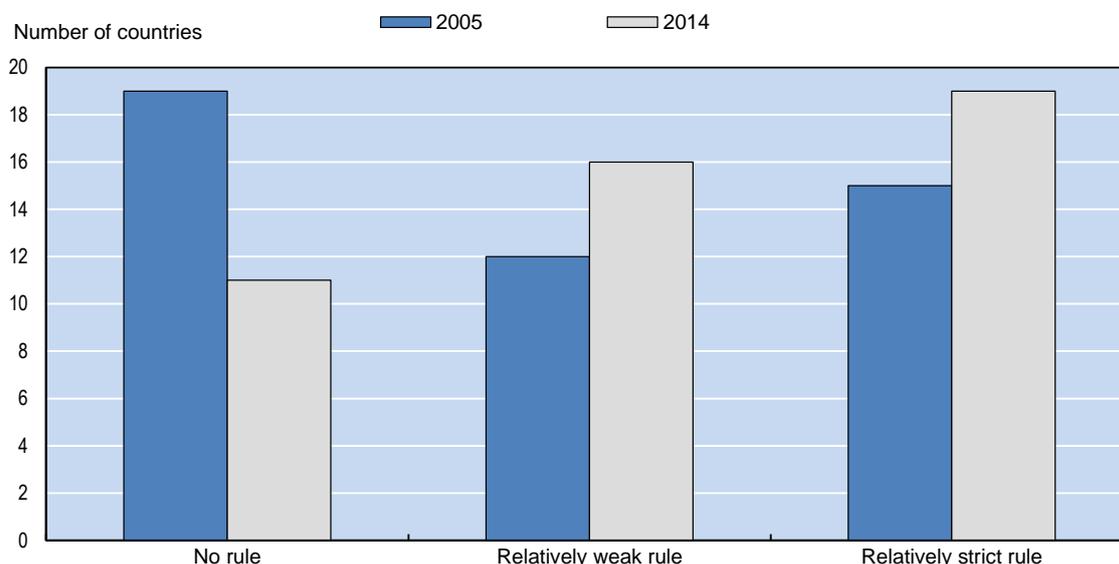
Effectiveness of rules against debt manipulation

15. A refinement is to assess the effectiveness of rules against debt manipulation, i.e. rules limiting interest deductibility above certain thresholds on debt-to-equity or interest-to-earnings. Such rules are frequent among the countries included in this study. A simple classification of these rules, building upon the detailed classification by Blouin et al. (2014), is presented in Figure 1 and Johansson et al. (2016b). The classification takes into account the existence of a rule and the debt-to equity or interest-to-earnings threshold above which interest deductions are denied as well as the type of debt (i.e. total or related party) the rule applies to. Admittedly, the classification does not reflect how the existing rules are enforced, which is difficult to measure. Over 2005-14, a number of countries have introduced a rule or made their rule stricter.

5. Other potential control variables have been considered but not included in the baseline regression. Profitability was not included because of potential endogeneity issues, since the purpose of debt manipulation is to shift profits to lower-tax countries. Tangibility of assets is another potential control variable, which was not included because intangible assets are poorly measured in financial accounts.

Figure 1. Strictness of rules against debt manipulation¹

Distribution of OECD and G20 countries by degree of strictness of rules against debt manipulation



1. The index reflects the existence and strictness rules limiting interest deductibility above certain ratios on debt-to-equity (thin capitalisation rules) or interest-to-earnings. For example, a “relatively strict” rule corresponds to a maximal debt-to-equity ratio of 3:1 or below. A broader measure of anti-avoidance is described in Johansson et al. (2016b).

Source: Secretariat calculations.

16. The idea is to assess if strict rules reduce debt manipulation, by interacting the tax variable with the classification of rule strictness. The effect of rules is assessed only for entities with a higher tax rate than the average in their group, i.e. for entities which are expected to receive debt from the rest of their group. Indeed, interest deductibility rules work by dis-incentivising debt accumulation in higher-tax countries. The estimated equation is as follows, with the same notations as in equation (1):

$$\begin{aligned} \frac{Debt}{Equity}_{f,g,c,i,t} &= \alpha X_{f,g,c,i,t} + \beta_1 (STAT_{c,t} - STAT_group_avg_{g,c,i,t})_{when\ negative} \\ &+ \beta_2 (STAT_{c,t} - STAT_group_avg_{g,c,i,t})_{when\ positive} + \beta_3 Rules_strictness_{c,2005} \\ &+ \beta_4 (STAT_{c,t} - STAT_group_avg_{g,c,i,t})_{when\ positive} \times Rules_strictness_{c,2005} + \delta_t + \delta_i \end{aligned} \quad (2)$$

17. $Rules_strictness_{c,2005}$ is the classification presented in Figure 1, in country c and year 2005.⁶ This variable can be equal to 0 (no rule), 1 (relatively weak rule) or 2 (relatively strict rule). β_1 and β_2 are expected to be positive and of the same magnitude as the coefficient β in equation (1). The coefficient β_4 is expected to be positive if strict anti-avoidance rules reduce profit shifting. The overall debt manipulation propensity, taking into account the strictness of rules against debt manipulation, corresponds to $(\beta_2 + \beta_4 Rules_strictness)$.

6. The classification was only compiled for 2005 and 2014. The classification for year 2005 is assumed to be broadly representative of the sample period (2000-2010), even though a number of countries have introduced or modified rules over the period.

2.2. Overall debt of MNE groups

18. Manipulating debt location can reduce the effective cost of debt for MNE groups. This is because deducting interest payments from taxable profits has more value in high-tax countries. This is illustrated by the following example. Let one consider a MNE group with a total debt of \$100 and activities distributed between country A, which has a 20% corporate tax rate, and country B, which has a 30% tax rate. Assuming a 10% interest rate on debt in each country, the gross cost of debt is \$10 per year. If entities of this MNE group are profitable and allowed to deduct interest payments from taxable profits, the net cost of debt is \$8 per year if all the debt is located in country A (a gross cost of \$10, minus a tax deduction of \$10 times 20%, i.e. \$2). If all the debt is located in country B, this net cost is only \$7. If debt is split evenly between the two countries, the cost is \$7.5 per year. As a result, if the MNE group enters a tax planning strategy involving shifting all debt to country B, it will save \$0.5 per year as compared to a situation where the debt was split evenly. This debt shifting would enable the MNE group to finance about \$7 of additional debt and thus to increase its total debt to \$107 without additional costs. This example illustrates how debt shifting possibilities can encourage MNE groups to increase their indebtedness.

19. This study relies on two strategies to assess the effect of manipulation of debt location on overall debt of MNE groups. The first is to test how MNE groups' overall leverage reacts to tax rate changes in high-tax countries, where debt is assumed to be shifted. The second is to compare the debt levels of MNEs and domestic groups, controlling for observable group characteristics.

Sensitivity of overall debt to tax rate changes

20. The approach is to assess the sensitivity of a MNE group's overall debt to changes in tax rates in the different countries where it operates. If the group has debt in these countries, changes in tax rates should affect the effective cost of debt for the group as a whole, and possibly leverage at the group level. For example, in the extreme case where all group debt would be located in the headquarters country, the effective cost of debt for the group would exactly correspond to the effective cost of debt in the headquarters country. As a result, one would expect group leverage to be sensitive only to changes in tax rate in this country. In contrast, if all debts were located in the country with the highest tax rate in the group (which would be optimal for the group from a tax minimisation point of view, but is generally not the case for a number of reasons including the constraints induced by rules against debt manipulation), group leverage would only be sensitive to changes in the tax rate in this country.

21. The estimated equation is as follows:

$$\frac{Debt}{Equity}_{g,c,t} = \gamma_1 STAT_{c,t} + \gamma_2 STAT_max_{g,c,t} + \rho Y_{g,c,t} + \delta_t + \delta_g \quad (3)$$

22. The fundamental difference with equation (1) is that the dependent variable is leverage at the group rather than entity level and thus is measured based on consolidated (i.e. group-wide) rather than unconsolidated (i.e. entity-wide) financial accounts. $\frac{Debt}{Equity}_{g,c,t}$ is the debt-to-equity ratio of the MNE group g , with headquarters in country c , in year t . γ_1 is the sensitivity of leverage to the statutory tax rate in the headquarters country ($STAT_{c,t}$). γ_2 is the sensitivity to the average of the two highest tax rates among the countries where the group operates ($STAT_max_{g,c,t}$), where debts are assumed to be preferentially located. Similar results are obtained when using only the highest tax rate in the group, or the average of the three highest rates. In alternative specifications, the sensitivity to the average and the lowest tax rates among all countries where the group operates are also assessed. These sensitivities are expected to be lower than for higher tax rates. $Y_{g,c,t}$ is a set of control variables, including group profitability and macroeconomic variables affecting leverage (e.g. GDP growth, inflation). δ_t and δ_g are respectively time

and MNE group fixed-effects, which control for all group characteristics that may influence leverage, such as size, industry, etc.

23. Strict rules against debt manipulation are expected to limit debt manipulation possibilities. Hence, overall group leverage should be less sensitive to tax rate changes in high-tax countries (i.e. the coefficient γ_2 should be lower) if these countries have strict rules against debt manipulation. This is assessed by estimating the following equation (4):

$$\frac{Debt}{Equity}_{g,c,t} = \gamma_1 STAT_{c,t} + \gamma_2 STAT_max_{g,c,t} + \gamma_3 STAT_max_{g,c,t} \times Rules_max_{g,c,t} + \gamma_4 Rules_max_{g,c,t} + \rho Y_{g,c,t} + \delta_t + \delta_g \quad (4)$$

where $Rules_max_{g,c,t}$ is the average strictness of rules against debt manipulation in the two countries with the highest tax rates where group g operates (i.e. the two countries used in the calculation of $STAT_max_{g,c,t}$).

Comparing the debt level of MNE groups and domestic firms

24. It is generally considered that MNEs can support higher leverage than domestic firms (Burgman, 1996). This is because MNEs' sources of revenue are generally more diversified, both geographically and in terms of products. As a result, they are less vulnerable to adverse income shocks, which would justify having higher leverage. Still, there are also reasons why MNEs may have lower leverage, such as greater exposure to international political risk and to exchange rate fluctuations, or greater agency costs reflecting creditors' lack of information on MNEs activities abroad.

25. Most empirical studies find that MNEs tend to have lower leverage than domestic firms, even after controlling for observable differences between them, such as size or industry (e.g. Burgman, 1996; Mansi and Reb, 2002). A recent study by Park et al. (2012) including additional control variables (profitability, tangibility of assets, etc.) finds no significant difference between the leverage of domestic firms and MNEs.

26. The following equation is estimated in order to compare the leverage of MNEs and domestic firms:

$$\frac{Debt}{Equity}_{g,c,i,t} = \theta MNE_g + \rho Z_{g,c,i,t} + \delta_t + \delta_i + \delta_c \quad (5)$$

where $\frac{Debt}{Equity}_{g,c,i,t}$ is the debt-to-equity ratio of corporate group g , with headquarters in country c , operating in industry i and year t . MNE_g is a dummy equal to one when group g is a multinational group, as opposed to a domestic (i.e. non multinational) firm. The coefficient θ corresponds to the difference in leverage between MNEs and non MNEs. A further refinement (not explored in this paper) would be to assess separately the leverage of different types of MNEs having different debt-manipulation opportunities. $Z_{g,c,i,t}$ is a vector of control variables, including firm size, profitability and presence of patents (as a measure of the tangibility of assets). δ_t , δ_i and δ_c are respectively time, industry and country fixed-effects.

3. Data

27. The source of financial account data is the ORBIS database. The ORBIS database contains financial account data, both at unconsolidated (i.e. entity-specific) and consolidated (i.e. group-wide) level, and ownership information of firms worldwide. The database is compiled by Bureau Van Dijk based on information from different sources (e.g. chambers of commerce, local public authorities or credit

institutions). It was processed to ensure consistency across countries by the OECD Statistics Directorate (Pinto Ribeiro et al., 2010; Ragoussis and Gonnard, 2012). An additional processing was implemented for this project to identify corporate groups (Appendix A2 of Johansson et al., 2016a, Menon, 2016) and to further remove reporting errors and implausible values (Appendix A3 of Johansson et al., 2016a). Firms in 46 countries (all OECD and G20 countries plus Colombia, Latvia, Malaysia and Singapore) are kept in the final sample, as well as information on links to countries outside of the sample. Data coverage and potential limitations are further discussed in Johansson et al. (2016a).

28. The sample for the debt manipulation analysis comprises about 740,000 observations of MNE entity accounts over 2000-10 (with coverage varying overtime). This is a much wider sample of firms and countries than in previous studies (e.g. Huizinga et al., 2008), even though coverage for certain countries in the sample (notably the United States) is limited (see Johansson et al., 2016a for details). Outliers in terms of the debt-to-equity ratio (top and bottom 2.5% of the distribution) have been eliminated from the sample to remove any noise from reporting errors and exceptional events. Observations with negative equity have also been eliminated from the sample. To account for the specificity of certain countries (e.g. the United States) or industries (e.g. the financial industry), robustness checks are performed by restricting the sample to EU countries or to manufacturing firms.

29. The sample for the analysis of overall group debt consists of about 14,000 observations of MNE group accounts over 2000-10. Since this sample is based on consolidated (rather than unconsolidated) accounts data, the sample size is much smaller, as there is only one observation by MNE group and by year. The representation of the United States is relatively better than in the unconsolidated account sample, reflecting that the limited coverage of financial account data in the United States is confined to unconsolidated accounts (Table 1). Similarly to the debt manipulation analysis, observations with extreme values of the debt-to-equity ratio are excluded from the sample. Since the analysis relies on changes in debt, only MNE groups with observations for at least three years are kept in the sample. In addition, MNE groups operating in only two countries are excluded. Indeed, for these groups, the average tax rate in the two highest tax rate countries is also the average for the whole group.

30. The main source of data on statutory tax rates is the OECD tax database. For federal countries, the tax rates are the sum of national and average sub-national rates. Information from the OECD tax database is complemented with data from the Zentrum für Europäische Wirtschaftsforschung (ZEW) and KPMG. Macroeconomic and industry-level data are sourced from World Bank and OECD databases as well as the World Input-Output Database (WIOD). The strictness of rules against debt manipulation is taken from the classification compiled in Johansson et al. (2016b).

Table 1. Consolidated debt analysis: data coverage

Number of observations by country (2000-10)

By country of headquarters	Number of MNE groups	Number of observations
Argentina	1	7
Austria	4	15
Australia	26	109
Belgium	146	784
Brazil	7	27
Canada	85	451
Switzerland	27	148
Chile	5	27
China	21	99
Germany	197	926
Denmark	5	15
Estonia	2	8
Spain	185	1 014
Finland	101	589
France	210	1 032
United Kingdom	99	526
Greece	32	171
Ireland	9	42
Israel	21	95
India	16	66
Iceland	1	3
Italy	146	748
Japan	262	1 226
Korea	9	40
Luxembourg	6	25
Latvia	5	34
Mexico	15	71
Malaysia	15	59
Netherlands	38	175
Norway	13	46
New Zealand	10	42
Poland	22	93
Portugal	12	53
Russia	6	22
Sweden	480	2 846
Singapore	27	106
Slovenia	1	4
Turkey	2	10
United States	458	2 543
South Africa	14	55
Total	2 741	14 352

4. Results

4.1. Manipulation of debt location

Baseline regression

31. The results strongly support the hypothesis that MNE groups locate their debts in higher-tax rate countries (Table 2). In all three specifications (with different fixed-effects structures), the tax variable of interest has a significantly positive coefficient. This means that, after controlling for other factors influencing leverage, entities having links to higher-tax rate countries tend to have lower leverage than entities without such links. The baseline estimate suggests that a 1 percentage point higher tax rate than the average in the MNE group is associated with a higher debt-to-equity ratio by about 0.9 percentage point. Evaluated at the average debt-to-equity level in the sample (about 70%), this corresponds to 1.3% higher debt. This is about twice higher than the estimated tax elasticity of debt (0.5-0.7%) in a meta-study by de Mooij (2011), but in line with recent estimates (0.8-1.7% depending on the specification) by Overesch and Wamser (2014) based on detailed bilateral debt and tax differentials.

32. In turn, this higher debt (and thus higher interest payments) would reduce profits by 0.2% for the average MNE entity in the sample.⁷ This reduction by 0.2% can be compared to the overall effect of all combined profit shifting channels (including transfer price manipulation and location of intangible assets), which is estimated by accompanying OECD work to be about 1% (see Johansson et al., 2016a). This suggests that manipulation of debt location accounts for at least 20% of profit shifting. This is a lower bound estimate, since it only takes into account the location of third-party debt as a tax planning channel and leaves aside debt manipulation schemes involving internal debt, which have also been shown to be a significant tax planning channel (Møen et al., 2011; Buettner et al., 2012). In addition, the estimate does not account for effects of hybrid debt instruments.

33. The estimated coefficients in front of control variables are in line with expectations. Leverage is found to increase with entity size, up to a certain point where it slightly declines, possibly because very large firms have easier access to equity markets. The number of countries where a group operates has a negative effect on leverage, which may capture a size effect (it is a measure of group size rather than entity size). As expected, leverage is found to be higher among headquarters and other parent entities than among non-parent firms. Finally, leverage tends to decrease with GDP per capita (which may reflect that richer countries have more developed equity markets) and to increase with the size of the credit and finance sectors.

34. Results are robust to restricting the sample to entities in EU countries or to manufacturing firms, or to including loss-making firms in the sample (Table A1.1). Similar results are also obtained with the debt-to-total-assets ratio instead of debt-to-equity as the dependent variable. In this case however, the estimated tax sensitivity of debt is about halved and only significant in the specifications with country and country-interacted-with-time fixed-effects (Table A1.2).⁸

7. This is based on the fact that the average ratio of interest paid to pre-tax profit is about 16% among MNE entities in the sample.

8. The average debt-to-total-assets ratio is about 12% for the MNE entities in the sample. Thus, the coefficient estimated in Table A1.2 (0.06-0.07 depending on the fixed-effect structure) implies that a 1 percentage point increase in the tax variable is associated with an increase in debt by $0.01 \times 0.06 / 12\% = 0.5\%$ for the average firm. This is less than half the sensitivity estimated with the debt-to-equity ratio (1.3%).

Table 2. Manipulation of debt location: baseline regression results

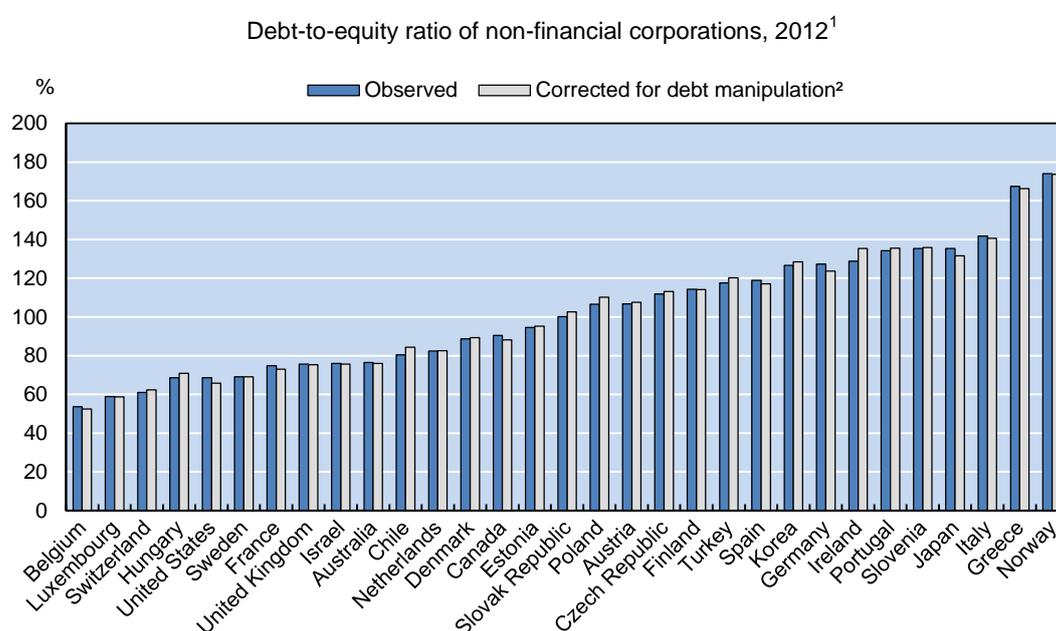
Dependent variable	(1)	(2)	(3)
	No country fixed-effects	Country fixed-effects	Country×year fixed-effects
	Debt-to-equity ratio (entity level)		
Year fixed-effects	yes	yes	yes
Industry fixed-effects	yes	yes	yes
Country fixed-effects	no	yes	yes
Country×year dummies	no	no	yes
Tax variable (difference to the average tax rate in the group)	0.919*** [0.287]	0.677*** [0.179]	0.762*** [0.122]
Micro (<10 employees) - base level	0	0	0
Small (10-49 employees)	0.189*** [0.026]	0.204*** [0.027]	0.200*** [0.028]
Medium (50-249 employees)	0.284*** [0.036]	0.297*** [0.037]	0.290*** [0.037]
Large (250-999 employees)	0.256*** [0.044]	0.280*** [0.045]	0.266*** [0.046]
Very large (1,000-9,999 employees)	0.200*** [0.055]	0.255*** [0.057]	0.235*** [0.059]
Huge (10,000+ employees)	0.217*** [0.068]	0.271*** [0.067]	0.249*** [0.069]
Number of countries where the group operates	-0.005*** [0.000]	-0.003*** [0.000]	-0.003*** [0.000]
Headquarters dummy	0.134*** [0.024]	0.118*** [0.017]	0.115*** [0.018]
Other parent entity dummy	0.095*** [0.013]	0.069*** [0.012]	0.071*** [0.012]
Value added-growth (at country-industry level)	0.220* [0.133]	0.008 [0.079]	0.006 [0.080]
GDP growth	-0.015 [0.011]	-0.002 [0.005]	
Log(GDP per capita)	-0.219*** [0.079]		
Credit to private sector (% of GDP)	0.002*** [0.000]		
Share of finance in employment	0.099*** [0.018]		
Observations	743,005	743,005	743,005
R-squared	0.029	0.042	0.045
AdjR2	0.029	0.0422	0.045

All regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of MNE entities (unconsolidated financial accounts) in 46 countries over 2000-10.

Aggregate effect of debt manipulation on average leverage

35. Debt manipulation results in artificially higher debt levels in higher-tax rate countries and lower levels in lower-tax rate countries. This may distort the measure of “real” debt levels. Using the estimated debt manipulation elasticity, one can estimate and correct for the effect of debt manipulation on the average debt-to-equity ratio in different countries (Figure 2). The estimation is based on the average of the tax variable (difference between statutory tax rate and average in the group) in each country, computed from ORBIS. As a simplifying assumption, it assumes a constant share of MNEs (as opposed to domestic firms) of 55% in each country (average from ORBIS). The correction for debt manipulation is underestimated to the extent that debt manipulation through the use of internal debt is not included. Overall, the effect of debt manipulation on leverage appears limited in comparison with the existing cross-country differences in leverage.

Figure 2. Effect of debt manipulation on average leverage



1. Data for Switzerland refers to 2011.

2. The correction for debt manipulation is based on the estimated debt manipulation elasticity (0.919) reported in Table 2, the country averages of the tax variable (difference between statutory tax rate and average in the group) computed from ORBIS and an average share of MNEs (55%). The correction is a lower bound since it does not include debt manipulation through internal debt.

Source: OECD Financial Dashboard, Secretariat calculations

Effectiveness of rules against debt manipulation

36. The results suggest that strict rules against debt manipulation are associated to reduced debt manipulation. The estimated elasticities imply that introducing a “relatively strict” rule could reduce third-party debt manipulation by more than 80% as compared to a situation with no rule (Table 3). This finding appears consistent with existing studies. Based on German firm-level data, Buettner et al. (2012) show that introducing a tight thin capitalisation rule can reduce the tax sensitivity of internal debt by about half as compared to a situation without a rule. Likewise, a recent study by Overesch and Wamser (2014), also

based on German data, shows that thin capitalisation rules reduce the tax sensitivity of debt.⁹ However, the magnitude of the effect is difficult to compare with this study due to differences in the empirical setting and the measure of rules strictness.

Table 3. Effectiveness of rules against debt manipulation: regression results

	(1)	(2)
	Baseline	With rules against debt manipulation
Dependent variable	Debt-to-equity ratio (entity level)	
Year fixed-effects	yes	yes
Industry fixed-effects	yes	yes
Tax variable (difference to the average tax rate in the group), when positive	0.720** [0.338]	1.825*** [0.596]
Tax variable (difference to the average tax rate in the group), when negative	1.271** [0.531]	1.139** [0.501]
Strictness of rules against debt manipulation		0.015 [0.036]
Tax variable, when positive x Strictness of rules against debt manipulation		-0.713** [0.361]
Other control variables (as in Table 2) are omitted for space-saving reasons		
Observations	743,005	743,005
R-squared	0.029	0.029
AdjR2	0.029	0.029

Both regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of MNE entities (unconsolidated financial accounts) with headquarters in 40 countries over 2000-10.

4.2. Overall debt of MNE groups

Baseline regression

37. The results suggest that the overall leverage of a MNE group is sensitive to tax rate changes: (i) in the country of headquarters and (ii) in the countries with the highest tax rates among those where the MNE group operates (Table 4). A one percentage point increase in the statutory tax rate in the country of headquarters is associated with a 1.2 percentage point higher debt-to-equity ratio (or, on average, 1.7% higher debt) for the MNE group as a whole. A one percentage point increase in the average of the two highest tax rates in the group is associated with a 1.4 percentage point higher debt-to-equity ratio (or, on average, 2% higher debt) for the group. In contrast, there is no significant effect on leverage of changes in the average (unweighted) tax rate among the countries where the group operates, or the lowest tax rates (lowest, or average of the two or three lowest) (see Appendix 2, Table A2.1). This suggests that debt is concentrated in higher-tax countries, in line with existing evidence of debt shifting (section 4.1), and that it is the effective cost of debt in these countries that determines the overall leverage of the group.

9. Buslei and Simmler (2012) and Dressler and Scheuering (2012) also show that the 2008 tightening of rules against debt manipulation in Germany led to lower indebtedness.

38. These results are robust to a number of variants, such as adding control variables for macroeconomic developments or restricting the sample to non-financial firms (see Appendix 2, Table A2.2). When restricting the sample to MNE groups with their headquarters in EU countries or to manufacturing industries, the sensitivity of leverage to high tax rates remains almost unchanged but becomes respectively marginally significant and non-significant, possibly because of the smaller sample size (Appendix 2, Table A2.2). Results similar to the baseline are obtained when replacing the average of the two highest tax rates in the group by the highest or the average of the three highest tax rates in the group (Appendix 2, Table A2.1).

Including strictness of rules against debt manipulation

39. The sensitivity of group-wide leverage to tax rate changes in high-tax countries is lower when these countries have strict rules against debt manipulation (Table 4, column 2). The sensitivity is reduced by two-thirds in countries having relatively strict rules against debt manipulation as compared to countries having no rules. This confirms the earlier finding that MNE groups locate debt in high tax countries and supports the hypothesis that debt manipulation can lead to higher leverage of MNE groups by reducing the effective cost of debt for them. According to these results, strict rules against debt shifting could reduce the bias of MNE groups towards debt financing.

Table 4. Overall MNE debt: baseline regression results

Dependent variable	(1)	(2)
	Baseline	Strictness of rules against debt manipulation
	Group-wide debt-to-equity ratio	
Group fixed-effects	yes	yes
Year fixed-effects	yes	yes
Statutory tax rate: country of headquarters	1.271** [0.519]	1.401*** [0.507]
Statutory tax rate: highest rates in the group (average of the two highest rates)	1.429** [0.610]	3.024*** [0.942]
Strictness of rules against debt manipulation (average of the two highest-rate countries)		0.042 [0.044]
Strictness of rules against debt manipulation × highest tax rates in the group		-1.088** [0.472]
Profitability	-3.423*** [0.295]	-3.425*** [0.293]
Observations	14,352	14,352
R-squared	0.038	0.039
AdjR2	0.037	0.038
F	26.76	23.62

Both regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of multinational groups (consolidated financial accounts) in 42 countries over 2000-10. The strictness of rules against debt manipulation is taken from Johansson et al. (2016b). Profitability is defined as the ratio of after-tax profit to total assets.

Comparing MNE groups and domestic firms

40. In line with the empirical literature (e.g. Burgman, 1996), MNE groups are found to have lower leverage than domestic groups after controlling for other differences potentially affecting leverage (Table 5). The difference in the debt-to-equity ratio is about 15 percentage points (i.e. 21% lower debt) on average among all firms and 10 percentage points among large firms.

Table 5. Leverage of MNEs and domestic firms: regression results

	(1)	(2)
	All firms	Large firms (250+ employees)
Dependent variable	Debt-to-equity ratio	
Year fixed-effects	yes	yes
Country fixed-effects	yes	yes
Industry fixed-effects	yes	yes
MNE dummy	-0.154*** [0.012]	-0.102*** [0.017]
Profitability	-7.325*** [0.095]	-5.938*** [0.162]
Patenting firm dummy	-0.037** [0.019]	-0.029 [0.021]
Small (10-49 employees)	0 (base level)	
Medium (50-249 employees)	-0.165*** [0.018]	
Large (250-999 employees)	-0.269*** [0.020]	0 (base level)
Very large (1,000-9,999 employees)	-0.253*** [0.023]	0.015 [0.016]
Huge (10,000+ employees)	-0.067** [0.034]	0.197*** [0.030]
Observations	100,794	40,037
R-squared	0.116	0.129
AdjR2	0.115	0.126

Both regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of multinational and domestic groups (consolidated financial accounts) in 46 countries over 2000-10. The MNE dummy is equal to one for multinational groups and zero for domestic groups. Profitability is defined as the ratio of after-tax profit to total assets.

5. Conclusion

41. This study provides evidence that MNE groups locate their debts preferentially in higher-tax rate countries to reduce their tax burden. Combined with the results from Johansson et al. (2016a), it suggests that such manipulation of debt location accounts for at least 20% of profit shifting. This is a lower bound estimate since it only takes into account the location of third-party debt and leaves aside debt manipulation strategies relying on internal debt. “Anti-avoidance” rules against debt manipulation (thin capitalisation and interest-to-earnings rules) are associated with lower debt manipulation. For example, introducing a “relatively strict” rule could reduce third-party debt manipulation by more than 80% as compared to a situation without a rule.

42. This study also provides evidence that this manipulation of debt location can lead MNE groups to increase their overall leverage. Indeed, the effective cost of debt is lower in higher-tax rate countries and debt manipulation allows MNE groups to benefit from this lower cost of debt on a larger scale. Anti-avoidance rules against debt manipulation are found to play a role in this area as well, as they mitigate the increase in overall leverage induced by debt manipulation.

43. Still, it is difficult to assess if such debt manipulation leads to “excessive” leverage by MNE groups, in the sense that they would be disproportionately vulnerable to income shocks. Indeed, there is no clear benchmark of optimal leverage, since it depends on many firm, industry and country characteristics (de Mooij, 2012). As an illustration, this study provides a comparison between the leverage of MNEs and domestic groups. It shows that despite tax planning, the leverage of domestic firms tends to be higher than MNEs with comparable characteristics, in line with the existing literature. Given that MNEs generally have more diversified incomes and thus are generally considered able to support higher debt levels than domestic firms, this finding suggests that the bias towards debt financing is stronger for the average domestic firm than for the average MNE. This would mean that tax planning is not a predominant factor among the determinants of firm leverage, as it does not increase the average leverage of MNEs above the average of domestic firms.

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APPENDIX 1: DEBT MANIPULATION: ROBUSTNESS CHECKS

Table A1.1. Debt manipulation: robustness checks

	(1)	(2)	(3)	(4)
	Baseline	Manufacturing	EU countries	Including loss-making firms
Dependent variable	Debt-to-equity ratio (entity level)			
Year fixed-effects	yes	yes	yes	yes
Industry fixed-effects	yes	yes	yes	yes
Country fixed-effects	no	yes	yes	yes
Countryxyear dummies	no	no	yes	yes
Tax variable (difference to the average tax rate in the group)	0.919*** [0.287]	0.764*** [0.271]	1.075*** [0.309]	0.753*** [0.287]
Micro (<10 employees) - base level	0	0	0	0
Small (10-49 employees)	0.189*** [0.026]	0.173*** [0.029]	0.187*** [0.029]	0.208*** [0.024]
Medium (50-249 employees)	0.284*** [0.036]	0.189*** [0.043]	0.265*** [0.041]	0.298*** [0.034]
Large (250-999 employees)	0.256*** [0.044]	0.116** [0.046]	0.263*** [0.048]	0.270*** [0.042]
Very large (1,000-9,999 employees)	0.200*** [0.055]	0.033 [0.057]	0.302*** [0.062]	0.211*** [0.054]
Huge (10,000+ employees)	0.217*** [0.068]	-0.093 [0.063]	0.348*** [0.088]	0.277*** [0.079]
Number of countries where the group operates	-0.005*** [0.000]	-0.005*** [0.001]	-0.004*** [0.000]	-0.005*** [0.000]
Headquarters dummy	0.134*** [0.024]	0.125*** [0.027]	0.167*** [0.025]	0.128*** [0.025]
Other parent entity dummy	0.095*** [0.013]	0.132*** [0.013]	0.056*** [0.010]	0.095*** [0.013]
Value added-growth (at country-industry level)	0.220* [0.133]	0.511*** [0.128]	0.000 [0.111]	0.192 [0.131]
GDP growth	-0.015 [0.011]	-0.036*** [0.013]	-0.015 [0.014]	-0.015 [0.011]
Log(GDP per capita)	-0.219*** [0.079]	-0.080 [0.070]	-0.378*** [0.107]	-0.207*** [0.080]
Credit to private sector (% of GDP)	0.002*** [0.000]	0.001* [0.000]	0.002*** [0.001]	0.002*** [0.000]
Share of finance in employment	0.099*** [0.018]	0.070*** [0.019]	0.108*** [0.016]	0.104*** [0.019]
Observations	743,005	198,340	619,860	845,986
R-squared	0.029	0.019	0.033	0.027
AdjR2	0.029	0.0184	0.0327	0.0270

All regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of MNE entities (unconsolidated financial accounts) in 46 countries over 2000-10.

Table A1.2. Debt manipulation: debt to total assets

	(1)	(2)	(3)
	No country fixed-effects	Country fixed-effects	Countryxyear fixed-effects
Dependent variable	Debt-to-total-assets ratio (entity level)		
Year fixed-effects	yes	yes	yes
Industry fixed-effects	yes	yes	yes
Country fixed-effects	no	yes	yes
Countryxyear dummies	no	no	yes
Tax variable (difference to the average tax rate in the group)	0.070 [0.047]	0.059** [0.026]	0.066*** [0.020]
Micro (<10 employees) - base level	0	0	0
Small (10-49 employees)	0.031*** [0.004]	0.033*** [0.004]	0.032*** [0.004]
Medium (50-249 employees)	0.053*** [0.006]	0.055*** [0.007]	0.053*** [0.007]
Large (250-999 employees)	0.051*** [0.007]	0.055*** [0.007]	0.052*** [0.007]
Very large (1,000-9,999 employees)	0.050*** [0.008]	0.059*** [0.008]	0.056*** [0.009]
Huge (10,000+ employees)	0.062*** [0.011]	0.070*** [0.011]	0.066*** [0.011]
Number of countries where the group operates	-0.001*** [0.000]	-0.001*** [0.000]	-0.001*** [0.000]
Headquarters dummy	0.064*** [0.004]	0.061*** [0.003]	0.061*** [0.003]
Other parent entity dummy	0.027*** [0.002]	0.025*** [0.002]	0.025*** [0.002]
Value added-growth (at country- industry level)	0.036** [0.018]	0.007 [0.008]	0.009 [0.008]
GDP growth	-0.001 [0.002]	-0.001 [0.001]	
Log(GDP per capita)	-0.038*** [0.014]		
Credit to private sector (% of GDP)	0.000*** [0.000]		
Share of finance in employment	0.017*** [0.003]		
Observations	786,713	786,713	786,713
R-squared	0.080	0.107	0.113
AdjR2	0.079	0.107	0.113

All regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of MNE entities (unconsolidated financial accounts) in 46 countries over 2000-10.

APPENDIX 2: OVERALL DEBT: ROBUSTNESS CHECKS

Table A2.1. Overall debt: alternative tax variables

Dependent variable	(1) Baseline (two highest rates)	(2) Highest rate	(3) Three highest rates	(4) Average rate	(5) Two lowest rate
	Group-wide debt-to-equity ratio				
Group fixed-effects	yes	yes	yes	yes	yes
Year fixed-effects	yes	yes	yes	yes	yes
Statutory tax rate: country of headquarters	1.271** [0.519]	1.350*** [0.510]	1.349** [0.529]	1.279** [0.517]	1.335** [0.536]
Statutory tax rate: highest rates in the group (average of the two highest rates)	1.429** [0.610]			1.438** [0.621]	1.230* [0.693]
Statutory tax rate: highest rate in the group		1.047*** [0.389]			
Statutory tax rate: highest rates in the group (average of the three highest rates)			1.247* [0.687]		
Statutory tax rate: average rate in the group				0.392 [0.838]	
Statutory tax rate: lowest rates in the group (average of the two lowest rates)					-0.054 [0.538]
Profitability	-3.423*** [0.295]	-3.428*** [0.295]	-3.429*** [0.295]	-3.423*** [0.294]	-3.423*** [0.295]
Observations	14,352	14,352	14,352	14,352	14,352
R-squared	0.038	0.039	0.038	0.037	0.038
AdjR2	0.037	0.038	0.037	0.0365	0.0366
F	26.76	24.21	25.62	24.58	24.85

All regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of multinational groups (consolidated financial accounts) in 46 countries over 2000-10. The strictness of rules against debt shifting is taken from Johansson et al. (2016b). Profitability is defined as the ratio of after-tax profit to total assets.

Table A2.2. Overall debt: robustness checks

	(1)	(2)	(3)	(4)	(5)
	Baseline	With macro-economic controls	Excluding financial firms	Manufacturing	EU countries
Dependent variable	Group-wide debt-to-equity ratio				
Group fixed-effects	yes	yes	yes	yes	yes
Year fixed-effects	yes	yes	yes	yes	yes
Statutory tax rate: country of headquarters	1.271** [0.519]	1.500*** [0.568]	1.225** [0.539]	1.804*** [0.623]	0.904 [0.578]
Statutory tax rate: highest rates in the group (average of the two highest rates)	1.429** [0.610]	1.455** [0.620]	1.666*** [0.639]	1.436 [0.942]	1.237* [0.747]
GDP growth (country of headquarters)		0.007 [0.008]			
Inflation		-0.825 [0.912]			
Long-term interest rate on sovereign debt		0.005 [0.010]			
Exchange rate (dollars per LCU)		0.142 [0.126]			
Profitability	-3.423*** [0.295]	-3.496*** [0.305]	-3.477*** [0.309]	-3.867*** [0.501]	-3.695*** [0.374]
Observations	14,352	13,974	13,857	5,899	9,134
R-squared	0.038	0.039	0.038	0.043	0.048
AdjR2	0.0367	0.0377	0.0374	0.041	0.0462
F	26.76	24.21	25.62	12.25	18.66

All regressions are ordinary least squares (OLS). *** indicates significance at the 1% level, ** at the 5% level and * at the 10% level. Robust standard errors corrected for clustering at the country-year level are presented under brackets. The sample consists of multinational groups (consolidated financial accounts) with headquarters in 40 countries over 2000-10. The strictness of rules against debt manipulation is taken from Johansson et al. (2016b). Profitability is defined as the ratio of after-tax profit to total assets.