Interest Limitation Rules and Business Cycles: Empirical Evidence

Olli Ropponen

ETLA Economic Research, Finland
olli.ropponen@etla.fi

Abstract

This paper studies the performance of interest limitation rules during business cycles. It employs register data on Finnish affiliates of multinational enterprises (MNEs) to study both thin-capitalization rules (TCRs) and earnings-stripping rules (ESRs). Both types of rules are found to become tighter in economic downturns: TCRs due to higher debt-to-equity ratios and ESRs due to lower company profits. Among equally tight interest limitation rules, TCRs are found to provide less variation and less pro-cyclical outcomes by increasing the company tax burden less than ESRs in an economic downturn. While ESRs increase the tax burden of Finnish companies by 17.5%-19.3% following the 2008 global financial crisis, for TCRs the increase is less than 10%. Among the ESRs, we find that an EBIT rule induces tighter tax treatment in economic downturns than an EBITDA rule. However, the differences between ESRs remain very small.

Tiivistelmä

Suhdanteiden vaikutus korkovähennys-rajoituksiin ja yritysten verokohteluun

Tässä tutkimuksessa tarkastellaan suhdanteiden vaikutuksia sekä yritysten korkovähennysrajoitusten kireyksiin että monikansallisiin konserneihin kuuluvien suomalaisten yritysten verokohteluun. Tarkasteluissa keskitytään kahdentyyppisiin korkojen vähennysoikeutta rajoittaviin säännöksiin. Toiset näistä perustuvat yrityksen velan ja oman pääoman suhteeseen, toiset yrityksen voittoon. Kaikkien tarkasteltujen rajoitusten havaitaan kiristyvän taloudellisissa matalasuhdanteissa. Velan ja oman pääoman suhteeseen perustuva rajoite kiristyy, koska velkojen osuus lisääntyy matalasuhdanteessa, voittoon perustuvat rajoitteet kiristyvät puolestaan pienempien voittojen vuoksi. Rajoitteiden kiristymisen myötä yritysten verotus kiristyy sellaisina aikoina, jolloin niiden voitot ovat pienimmillään, eli korkovähennysrajoitukset tekevät verotuksesta myötäsyklisempää. Vertailemalla yhtä kireitä korkovähennysrajoituksia havaitaan, että velan ja oman pääoman suhteeseen perustuva rajoitus tuottaa vähemmän myötäsyklisen verokohtelun ja vaihtelee vähemmän vuosien välillä kuin voittoihin perustuvat rajoitukset. Siinä missä voittoihin perustuvat rajoitukset olisivat korottaneet yritysten verotaakkaa keskimäärin 17.5 %–19.3 % vuoden 2008 finanssikriisin jälkeisenä aikana, velan ja oman pääoman suhteeseen perustuva rajoite olisi korottanut sitä alle 10 %.

PhD (Economics) **Olli Ropponen** is a Chief Research Scientist at ETLA Economic Research, Senior Researcher at VATT Economic Research and a Chief Research Scientist in Statistics Finland.

VTT **Olli Ropponen** on Elinkeinoelämän tutkimus-laitoksen tutkimuspäällikkö, Valtion taloudellisen tutkimuskeskuksen erikoistutkija ja Tilastokeskuksen tutkimuspäällikkö.

1 Introduction

Corporate tax differences across countries provide multinational enterprises (MNEs) with well-known opportunities to reduce their tax burden by shifting profits from high-tax countries to low-tax countries (Hines 1999, Devereux 2006, Dharmapala 2016). They have also been found to utilize these opportunities in line with their financial incentives (Huizinga and Laeven 2008, Buettner and Wamser 2013, Dharmapala 2014, Heckemeyer and Overesch 2017, Beer et al. 2020). While profit-shifting reduces the cost of capital and therefore increases investment incentives, its adverse effects, such as lower overall tax revenue, distorted tax allocation between countries, increased tax competition between countries and distorted competition between companies, are considered to overrule the positive effects, thereby making profit-shifting something to be limited (OECD 2013a). One way to reduce profit-shifting possibilities is via interest limitation rules designed to reduce profit-shifting taking place via financial instruments. This paper focuses on these particular anti-tax avoidance rules by comparing the performance of interest limitation rules during business cycle fluctuations.

As a response to the adverse effects of profit-shifting activity, both governments and organizations have proposed and introduced a large variety of anti-tax avoidance measures, including interest limitation rules. The Base Erosion and Profit Shifting (BEPS) package of the OECD and both the Anti-Tax Avoidance Directive (ATAD) and the Common Consolidated Corporate Tax Base (CCCTB) Directive of the European Union (EU) each include rules for limiting base erosion in cases that involve interest deductions and other financial payments (OECD 2013a,b, EU 2016a,b,c). In line with the OECD and the EU initiatives, many countries have implemented interest limitation rules, for instance Finland in 2014.

Increased interest in anti-tax avoidance measures combined with reforms in countries' tax codes have boosted both theoretical and empirical research into these measures. There is a body of evidence showing that interest limitation rules reduce both debt-to-asset ratios and debt-related profit-shifting by companies (Webber 2010, Buettener et al. 2012, Blouin et al. 2014, Wamser 2014, Harju et al. 2017). However, there is also evidence that they negatively affect foreign direct investments, because they increase the tax burden on investments (Buettner et al. 2018, Merlo et al. 2019, Leszczyłowska and Meier 2021). The effects of interest limitation rules on investment and other unintended effects of interest limitation rules have not been studied much in the literature. This paper aims to reduce this gap by studying one unintended effect of interest limitation rules, namely their dependence on business cycle fluctuations.

This paper employs register data on Finnish affiliates of multinational enterprises (MNEs) to study both thin-capitalization rules (TCRs) and earnings-stripping rules (ESRs). Both types of rules are found to become tighter in economic downturns: TCRs due to higher debt-to-equity ratios and the ESRs due to lower company profits. Among equally tight interest limitation rules, TCRs are found to increase the company tax burden less than ESRs in an economic downturn.

The paper proceeds as follows. The follow-up section reviews the related literature. Section 3 then discusses the different types of interest limitation rules and how countries have implemented these rules. Section 4 describes the data and the analysis is provided in Section 5. Section 6 concludes.

2 Related Literature

Tax avoidance by MNEs is a well-documented subject in the economic literature. A large number of studies show that the corporate group profit distribution follows tax incentives across countries, indicating that low-tax countries attract profits from high-tax countries. According to consensus estimates, a ten percentage point decrease in a country's tax rate increases the profits of companies in its territory by 8-10%. The literature also acknowledges a number of adverse effects resulting from profit-shifting. In addition to lower global tax revenue, the tax revenue allocation between countries becomes distorted towards low-tax countries. Competition between MNEs and national companies becomes distorted as national companies do not have profit-shifting possibilities. Moreover, profit-shifting possibilities may affect tax morale. Furthermore, they foster tax competition between countries. (Hines and Rice 1994, Hines 1999, Desai et al. 2004, Devereux 2006, Devereux et al. 2008, Huizinga and Laeven 2008, Devereux and Loretz 2013, Dharmapala 2014, Heckemeyer and Overesch 2017, Riedel 2018, Doerrenberg and Peichl 2018, Viertola 2019, Beer et al. 2020)

The literature identifies the three best-known profit-shifting channels as being intra-group interest expenses (debt-shifting), mispricing of intra-group transactions (transfer pricing) and strategic location choices for the intangible assets of a corporate group across its affiliates. In debt-shifting, an MNE exploits the possibility to strategically provide a loan from a company in a low-tax country to a company in a high-tax country, and profit-shifting occurs in the form of interest paid to a company in a low-tax country. Debt-shifting by MNEs is clearly documented in the literature (Huizinga et al. 2008, Moen et al. 2012, Buettner and Wamser 2013). The prices of intra-group sales are also found to be distorted in line with the tax incentives as the prices of comparable commodities are found to be lower in countries with lower tax

rates (Clausing 2003, Cristea and Nguyen 2016, Davies et al. 2018). Regarding the relative magnitudes of the various channels, the transfer pricing channel has been considered to account for a bigger fraction of profit-shifting than the debt-shifting channel (Heckemeyer and Overesch 2017). Regarding the locations of intangible assets both overall intangible assets and patents, as a component of these are shown to follow their tax incentives (Dishinger and Riedel 2011, Karkinsky and Riedel 2012, Beer and Loeprick 2015).

Awareness of profit-shifting activity of MNEs has both encouraged countries to introduce anti-tax avoidance rules and the economic literature to study the implications of these. The literature on interest limitation rules identifies two main types of rules: thin-capitalization rules (TCRs) and earnings-stripping rules (ESRs), or interest barriers (IBs). While TCRs limit the deductibility of interest expenses based on the debt-to-equity ratio of a company, IBs base their restriction on some profit-related measure, like earnings before interest and taxes (EBIT) or earnings before interest, taxes, depreciation and amortization (EBITDA).

There is a large empirical literature on the effects of TCRs showing that companies respond to these rules in line with their objectives. TCRs have been shown to reduce both the debt-to-asset ratio of companies and debt levels within corporate groups. Blouin et al. (2014) investigate the impact of TCRs on the capital structure of the foreign affiliates of U.S. multinationals. They show that TCRs reduce an affiliate's debt-to-asset ratio. Buettner et al. (2012) employ a firm-level panel data set on the OECD country affiliates of German multinationals to analyze the impact of TCRs. As a result they find that while TCRs reduce the incentive to use internal loans for tax-planning, they also lead to higher external debt.[1] A reduction in leverage is observed in several other studies as well (Weichenrieder and Windischbauer 2008, Overesch and Wamser 2010, Merlo and Wamser 2014, Wamser 2014, Buettner et al. 2016).

IBs have also been shown to have desired effects as they reduce the debt levels of companies, and thereby most likely also debt-shifting. Buslei and Simmler (2012), Dressler and Scheuering (2012) and Alberternst and Sureth-Sloane (2016) exploit the German implementation of an IB to study the effects of the reform. They find that companies reduced their debt ratios, which is in line with their incentives. Ruf and Schindler (2015) provide a review of empirical evidence on German TCRs and IBs. Harju et al. (2017) study the effects of a Finnish IB introduced in 2014. They find that the interest expenses of Finnish MNEs decreased compared to the Swedish and Danish MNEs that serve as a control group in their study.

The baseline message from the literature is that, as intended, both TCRs and

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[1]This increases the cost of capital via both tighter taxation and higher interest rates.

IBs have been shown to reduce debt-shifting.[2] However, these rules are also likely to increase administrative and compliance costs (Collier et al. 2018).[3] In addition the literature also identifies unintended effects of interest limitation rules as they reduce investments (Buettner et al. 2018, Merlo et al. 2019, Leszczyłowska and Meier 2021).[4] This study contributes to the literature on the unintended effects of anti-tax avoidance rules by studying the performance of interest limitation rules during business cycles.

3   Interest Limitation Rules

Interest limitation rules work by placing an upper limit on the deductibility of interest expenses. TCRs base their limitation on the debt-to-asset ratio, while IBs base it on some profit-related measure. By imposing a limitation, these rules reduce the possibilities for MNEs to separate their tax responsibility from their economic activity. It makes profit-shifting activity via financial instruments more difficult.[5]

TCRs function by placing an upper limit based on a company's debt-to-equity ratio as follows: if a country has a TCR with a limiting criterion based on a debt-to-equity ratio of 4:1, the company is allowed to deduct all its interest expenses if its debt-to-equity ratio is at most 4:1. This amount is called a safe harbor (and the rule the safe harbor rule, SHR). If the debt-to-equity ratio exceeds the threshold value, only part of the interest expenses remain deductible, which makes debt-shifting more costly. As TCRs use the relative amount of debt as a criterion, they may be considered to target not only debt-shifting, but also the debt bias.

IBs base their restriction on company profits and limit the deductibility of either all interest expenses or only those within the corporate group (see Table 1). Even if the country-specific implementation differs in several ways, these rules mostly still share a similar structure.[6] They typically allow company interest payments to be deducted at least up to received interest payments, meaning that the basis for the limitation is net interest expenses. The rules also typically include the so-called "de minimis" rule, the aim of which is to exclude relatively small interest payments. The reasoning for exclusion is that small interest payments are not as prone to be used for profit-shifting activity and due to the relatively large compliance costs.

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[2]While we focus on empirical findings, theoretical studies have also been conducted on interest limitation rules, see e.g. Mardan (2017).

[3]Gresik et al. (2017) study welfare implications and find that TCRs are inferior to ESRs in this respect.

[4]Unintended effects are also observed with transfer pricing regulations (De Mooij and Liu 2020).

[5]In addition to reducing profit-shifting-related interest expenses, they are also likely to hit interest expenses related to companies' regular business activity.

[6]For the general structure of an IB, see Figure 1 in Harju et al. (2017).

In addition, IBs usually include carry-forward or carry-back of disallowed interest capacity. (OECD 2013b, 2015, EC 2016a)

Some exceptions to the general structure of IBs exist. IBs often include a group rule whereby the rule is not applied if a large enough amount of company capital consists of equity instead of debt. One typical way to implement the rule is not to apply the interest limitation rule if the equity-to-asset ratio of a company is higher than the corresponding ratio for the whole corporate group (group rule). Under this condition, the company is considered to be less likely to participate in debt-shifting than in the other case. However, interest limitation rules may also be considered to target the debt bias, which refers to the different tax treatment of debt and equity.[7] If the only purpose was to reduce the debt bias, the role of the group rule would be smaller than if the target was profit-shifting, in which case the relative magnitude of the ratio within the group would be more important. Therefore, depending on the target of the rule, the group rule may or may not have a large role. Another exception to the baseline case is that companies in some specific industries, like banking or insurance, are excluded from the limitation, because of their business activity being based on interest.

The reasoning for deductibility being based on a profit-related measure is that a company with more economic activity is likely to have more interest expense-related activity in its regular business and is therefore allowed to deduct more interest expenses. While profits are an imperfect measure of economic activity, which could be measured more precisely by turnover, they are not as manipulable and are not likely to be as driven by industry-specific profitabilities as is turnover. Since they employ a profit measure, ESRs are also more likely than TCRs to capture companies with high interest expenses and little economic activity, which are more likely to engage in debt-shifting than other companies. However, the profit-based definition also makes deductibility, and therefore taxation, dependent on the economic conditions. The tax burden is likely to be higher when economic activity is low and vice versa, possibly making business cycles more volatile.

In the following subsections we derive the notation and show the information on the variables that we have from company tax records.

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[7]Note that if the objective is to reduce the debt bias, there are measures that remove this bias completely. Both the allowance for corporate equity (ACE) model and the comprehensive business income tax (CBIT) model place debt and equity on the same footing, while interest limitation rules still leave a gap between the two financing forms. The ACE model allows the corresponding deduction to be made also for equity, while the CBIT model disallows the deductibility of interest expenses completely.

3.1 Thin-Capitalization Rules (TCRs)

Our data includes both long-term debt (B) and equity (E) for each company. With this information we simply derive the debt-to-equity ratio (DE) for each company (c) for all sample years (y)

$$DE_{cy} = \frac{B_{cy}}{E_{cy}} \tag{1}$$

If in a given year the company debt-to-equity ratio DE_{cy} remains below a country-specific threshold $\overline{DE_{cy}}$, all the interest expenses are deductible and no change in the taxable income of the company (TI_{cy}) occurs that year. Otherwise part of the interest expenses becomes non-deductible. In this case the TCR means that taxable income increases and is higher by the amount of non-deductible interest expenses compared to what it would be without it.

3.2 Interest Barriers (IBs)

We focus on two types of IBs, one that restricts the deductibility of interest expenses based on EBIT and another based on EBITDA. Both of these rules typically base their limitation on net interest expenses, the difference between interest expenses and interest income $(NIE = IE - II)$. They also disregard net interest expenses below a threshold value $(\overline{NIE}$, for example 3MEUR). If this threshold is exceeded, the deductibility of all expenses still remains if an EBIT or EBITDA-based threshold is not exceeded, for instance 30% of EBITDA.

EBIT is derived from taxable income (TI)[8] and net interest expenses (NIE) for each company (c) in all years (y)

$$EBIT_{cy} = TI_{cy} + NIE_{cy} \tag{2}$$

The derivation of EBITDA requires additionally information on depreciations (D) and amortizations (A), both of which we have in our data.[9] EBITDA is defined as follows:

$$EBITDA_{cy} = TI_{cy} + NIE_{cy} + D_{cy} + A_{cy} \tag{3}$$

When the profit-related measure (EBIT-based or EBITDA-based) is exceeded some of the net interest expenses become non-deductible and therefore increase the taxable income of the company due to the IB.

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[8]We derive taxable income from net-of-tax profits (PR) and corporate taxes (T).

[9]It is worth noting that both depreciations and amortizations may be chosen in a strategic manner as neither of these represents the true underlying condition, but are simply employed in the firm's accounts.

3.3   Country Implementations

This section reviews how the OECD countries have adopted rules limiting the deductibility of interest expenses. Table 1 shows three things for each country: whether its limitation is based on TCR or IB (or both), what is the detailed limiting criterion and whether the limitation covers interest expenses related to total debt or to some part of it. Of the 33 countries in the table, 17 have an IB, 11 have a TCR, and 6 have more than one rule in place. Most of the TCRs use a limiting criterion of a debt-to-equity ratio of 3:1 or 4:1. For the IBs, the limiting criterion often includes a de minimis threshold, which in many cases is 3MEUR. In several cases the profit-related threshold is 30% of EBITDA.[10] While some of the country implementations restrict all interest expenses exceeding the threshold, others limit exceeding interest expenses only partially. Some restrictions also have other elements, like a group rule or exemptions for companies in particular industries. These are not shown in the table.

4   Data

We employ a panel dataset of Finnish affiliates of multinational corporate groups in 2004 - 2013.[11] The time period is a decade preceeding the implementation of the Finnish interest barrier in 2014 and includes previous global financial crises, which provides variation in economic activity and thereby also for the interest limitation rules. We focus on the affiliates of corporate groups for two reasons: the aim of interest limitation rules is to reduce debt-related profit-shifting by multinational companies, and these rules are mainly implemented such that they limit deductibility for affiliates of corporate groups only. We furthermore rule out companies in the banking and insurance sectors due to the particular nature of their business activity being based on interest. Restricting the analysis to those companies that remain in the dataset in all years between 2004 and 2013, we end up with the final sample size of 13,620. Thus we have a panel dataset for 10 years for 1,362 companies that belong to some multinational corporate group. Table 2 shows the descriptive statistics for our dataset.

Table 2 shows the averages and minimum and maximum values of our variables. It first shows that the yearly average turnover of the companies in the sample is 99.7MEUR and varies between zero and 32,210MEUR. Average yearly net-of-tax profits are 6.9MEUR and corporate taxes 1.6MEUR, constituting average tax-

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[10]The ATAD includes both of these thresholds: 3MEUR and 30% of EBITDA.

[11]We employ panel data so that the results are not be driven by changes in the distribution of companies (entries and exits). The data come from Statistics Finland.

Table 1: Interest Limitation Rules in OECD Countries (TCRs and IBs)

Country	Limit Type	Limiting Criterion	Interest Expenses Limited from
Australia	TCR	Debt-to-equity ratio 1.5:1	Total debt
Belgium	TCR	Debt-to-equity ratio 5:1	Related party debt
	IB	30% of EBITDA or 3MEUR	Total debt
Canada	TCR	Interest-bearing debt < 1.5*equity	Nonresident total debt
Chile	TCR	Debt-to-equity ratio 3:1	Related party debt
Czech Republic	TCR	Loan/credits ratio 4:1*.	Total debt
Denmark	TCR	Debt-to-equity ratio 4:1	Total debt
	Asset test	Interest < 2.7% of assets	Total debt
	IB	30% of EBITDA	Total debt
Estonia	IB	30% of EBITDA or 3MEUR	Total debt
Finland	IB	25% of EBITD or 500,000EUR	Related party debt
France	Rate	Interest rate limitation	Related party debt
	TCR	Debt ratio interest paid	Related party debt
Germany	IB	30% of EBITDA or 3MEUR	Total debt
Greece	IB	30% of EBITDA or 3MEUR	Total debt
Hungary	IB	30% of EBITDA or 3MEUR	Total debt
Iceland	IB	30% of EBITDA or 100MISK	Related party debt
Italy	IB	30% of EBITDA**	Total debt
Japan	TCR	Debt-to-equity ratio 3:1	Total debt
	IB	50% of adj. taxable income or 10MYEN	Related party debt
Korea	TCR	Debt-to-equity ratio 3:1	Total debt
Latvia	TCR	Debt-to-equity ratio 4:1	Total debt
	IB	30% of EBITDA or 3MEUR	Total debt
Lithuania	TCR	Debt-to-equity ratio 4:1	Related party debt
	IB	30% of EBITDA or 3MEUR	Total debt
Luxembourg	TCR	Debt-to-equity ratio 85:15	Total debt
Mexico	TCR	Debt-to-equity ratio 3:1	Related party debt
Netherlands	IB	30% of EBITDA or 1MEUR	Third party vs related party debt
New Zealand	TCR	60% in NZ, 110% globally (inbound)	Debt percentage
		60% in NZ, 110% globally (outbound)	Debt percentage
Norway	IB	25% of EBITDA	Related party debt
Poland	IB	30% of EBITDA	Total debt
Portugal	IB	30% of EBITDA or 1MEUR	Total debt
Slovak Republic	IB	25% of EBITDA	Related party debt
Slovenia	TCR	Debt-to-equity ratio 4:1	Total debt
Spain	IB	30% of EBITDA or 1MEUR	Total debt
Sweden	IB	30% of EBITDA	Total debt
Switzerland	TCR	Receivables 85% debt-financed	Total debt
Turkey	TCR	Debt-to-equity ratio 3:1	Related party debt
United Kingdom	IB	30% of EBITDA	Total debt
United States	IB	30% of adjusted taxable income	Total debt

Source: Bunn et al. (2019)
* 6:1 when debtor is a bank or insurance company
** 30% of EBITDA plus financial leasing installments

Table 2: Descriptive Statistics

Variable	Mean (MEUR)	Min (MEUR)	Max (MEUR)	Observations
Turnover	99.7	0	32,210	13,620
Net-of-Tax Profits (PR)	6.9	-1,519	6,683	13,620
Corporate Taxes (T)	1.6	0	1,348	13,620
Taxable Income (TI)	8.5	-1,514	7,706	13,620
Interest Expenses (IE)	3.9	0	1,683	13,620
Interest Income (II)	6.1	0	4,859	13,620
Net Interest Expenses (NIE)	-2.3	-4,468	637	13,620
EBIT	6.2	-2,108	5,068	13,620
Depreciation (D)	2.9	0	359	13,620
Amortization (A)	0.2	0	474	13,620
EBITDA	9.3	-1,748	5,154	13,620
Long-Term Debt (LTB)	27.8	0	8,070	13,620
Short-Term Debt (STB)	44.7	0	21,030	13,620
Overall Debt (B)	72.5	0	21,030	13,620
Equity (E)	61.3	0.01	11,110	13,620
Variable	Mean	Min	Max	Observations
Tax Year		2004	2013	13,620
Debt-to-Equity Ratio (1; DE)	0.453	0.369	0.530	13,620
Debt-to-Equity Ratio (2; DE)	0.834	0	614	13,620

Notes: The mean for Debt-to-Equity Ratio (1) is calculated by taking the ratio between Long-Term Debt and Equity on a yearly basis, while Debt-to-Equity Ratio (2) calculates the mean of individual debt-to-equity ratios. The minimums and maximums are also calculated in a corresponding way.

able income of 8.5MEUR. Interest expenses of 3.9MEUR and interest income of 6.1MEUR imply net interest expenses of -2.3MEUR which, combined with taxable income, implies EBIT of 6.2MEUR.[12] EBITDA (9.3MEUR) is calculated from EBIT (6.2MEUR), depreciation (2.9MEUR) and amortization (0.2MEUR). The long-term and short-term debt levels are 27.8MEUR and 44.7MEUR, implying average overall debt level of 72.5MEUR. Company equity is 61.3MEUR on average in our sample.[13] The debt-to-equity ratio (1) is based on the ratio between long-term debt and equity, and is 0.453 on average. Another measure for the debt-to-equity ratio (2) is arrived at by taking the means of individual ratios as opposed to debt-to-equity ratio (1), which calculates the ratio of averages. The differences between debt-to-equity ratios (1) and (2) shows that the debt-to-equity ratios of companies vary a lot.

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[12] As interest income is on average both higher and exhibits more variation than interest expenses this suggests that some affiliates have a lot of cash funds and serve as internal banks for a corporate group, and therefore collect large amounts of interest income. Chen et al. (2017) study the evolution of the net lending positions of companies. They show that the global corporate saving rate has increased by 8.5 percentage points between 1980 and 2013 and that about two thirds of global investments are funded by the corporate sector, making the corporate sector a net lender.

[13] We exclude companies whose equity is less than EUR 10,000 in order to avoid very large debt-to-equity ratios.
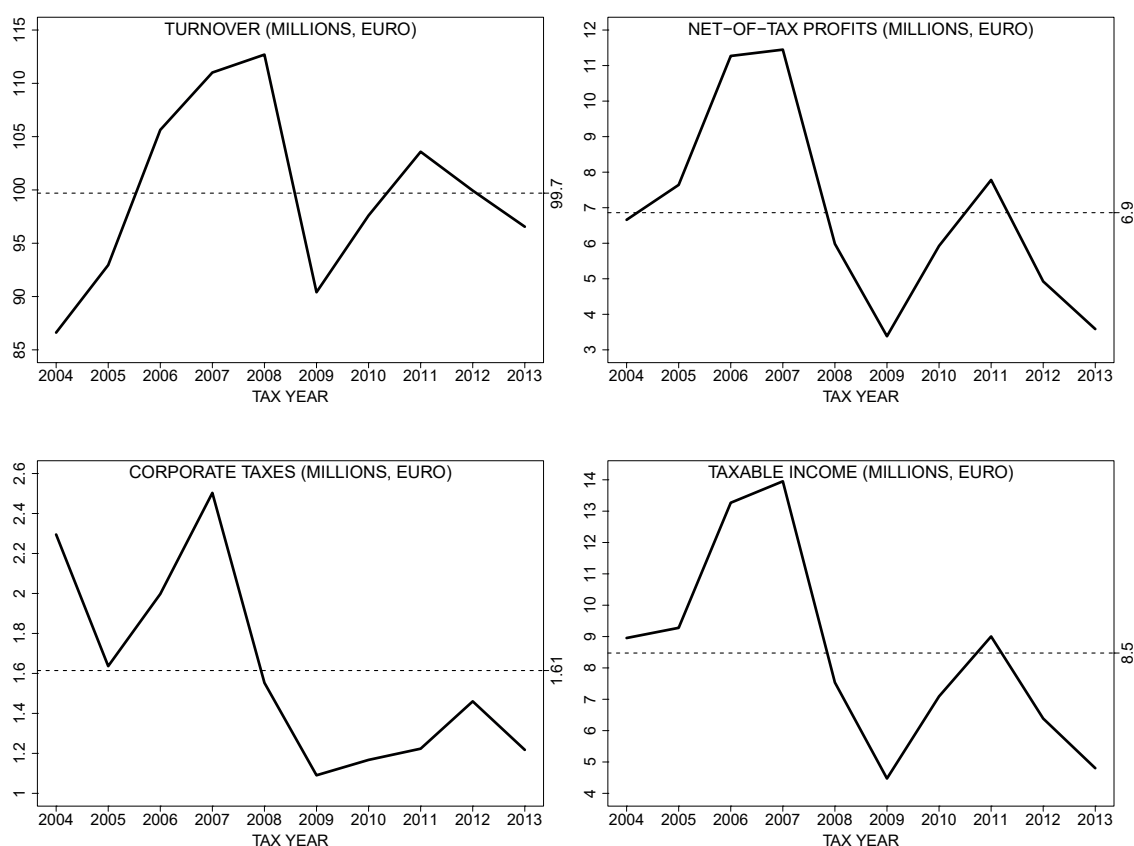
Figure 1: Time evolution of Turnover, Profits, Taxes and Taxable Income in years 2004 - 2013

Figures 1 - 4 illustrate the time evolution of our variables. Figure 1 shows the time evolution of turnover, net-of-tax profits, corporate taxes and taxable income between the years 2004 and 2013. The upper left graph of Figure 1 shows that turnover increased until 2008, where it peaked at 112.7MEUR and decreased rapidly thereafter to 90.4MEUR at the time of the economic downturn in 2009. Another peak is observed in 2011. The average turnover in our sample is 99.7MEUR (dashed line in the graph; see also Table 2). The upper right graph depicts the evolution of yearly company net-of-tax profits. It also shows a large reduction as net-of-tax profits decrease from 2007 to 2009 from 11.4MEUR to 3.4MEUR, while being on average 6.9MEUR. A dramatic drop in economic activity is also observed both in corporate taxes[14] (lower left graph) and taxable income (lower right graph). Average corporate taxes decrease between 2007 and 2009 from 2.5MEUR to 1.1MEUR and taxable income from 14MEUR to 4.5MEUR. On average, taxable income is 8.5MEUR in our data (dashed line in the lower right graph). The figure also shows

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[14]The corporate tax rate is not responsible for the drop, because it remained the same between 2007 and 2009. It was 29% in 2004, 26% between 2005 and 2011, and 24.5% in 2012 and 2013.

Figure 2: Time evolution of Interest Expenses, Interest Income, Net Interest Expenses and the EBIT in years 2004 - 2013

that even if taxable income is based on turnover, the exact trends differ from each other. This follows from differences in company profitability. Overall, Figure 1 describes a very clear picture of the economic conditions: turnover, net-of-tax profits, corporate taxes and taxable income all decreased dramatically between 2007 and 2009 as a consequence of the global economy facing the financial crisis.

Figure 2 describes the time evolution of interest expenses, interest income, net interest expenses and EBIT. The upper left graph shows that interest expenses increased until 2008, peaking at 6.2MEUR and after which they decreased in 2009 to 4.2MEUR and further in 2010.[15] On average, the interest expenses in our sample are 3.9MEUR. Interest income (upper right graph) in turn started to decrease already

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[15]Interest expenses depend both on debt levels and interest rates, each of which could drive the changes observed in the graph. However, corporate interest rates have remained relatively stable in Finland. From June 2010, when the Bank of Finland started to report monthly average interest rates on new corporate loans, to December 2013 these interest rates remained between 1.79% and 2.81% and are therefore unlikely to explain the fluctuations observed in the graph. More details on corporate interest rates in Finland can be found at: https://www.suomenpankki.fi/en/Statistics/mfi-balance-sheet/tables/rati-taulukot-en/talletusten_ja_lainojen_korot_en/
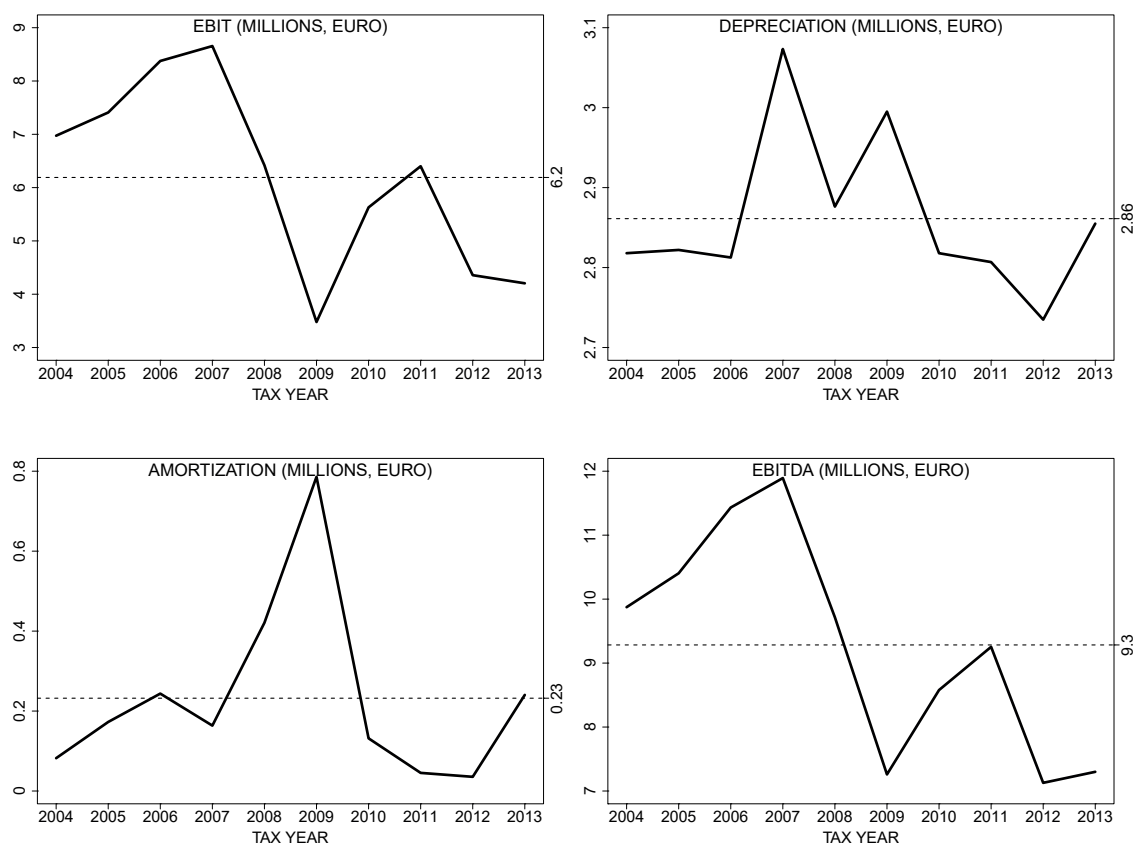
Figure 3: Time evolution of the EBIT, Depreciations, Amortizations and the EBITDA in years 2004 - 2013

in 2008, decreasing further in 2009 and 2010, and is 6.1MEUR on average in our sample. Combining interest expenses and interest income implies that net interest expenses (lower left graph) increased from -5.3MEUR in 2007 to -1.1MEUR in 2008. Adding together taxable income (shown in the lower right graph of Figure 1) and net interest expenses gives us the time evolution of EBIT (lower right graph of Figure 2). EBIT shows a very similar pattern as company profits: it drops heavily between 2007 and 2009 and peaks again in 2011. On average EBIT is 6.2MEUR in our sample.

Figure 3 shows the information employed to construct EBITDA from EBIT (reproduced in the upper left graph of the figure). The upper right graph shows that the yearly average of depreciations was highest between 2007 and 2009 and has varied between 2.7MEUR and 3.1MEUR over the sample period. Amortizations (lower left graph) started to increase in 2008 and peaked in 2009 at 0.79MEUR, decreasing in 2010 to 0.16MEUR. The lower right graph shows the time evolution of EBITDA. It follows the pattern of EBIT, yet the relative decrease of EBITDA between 2007 and 2009 is smaller than that of EBIT: average EBIT decreased between these years
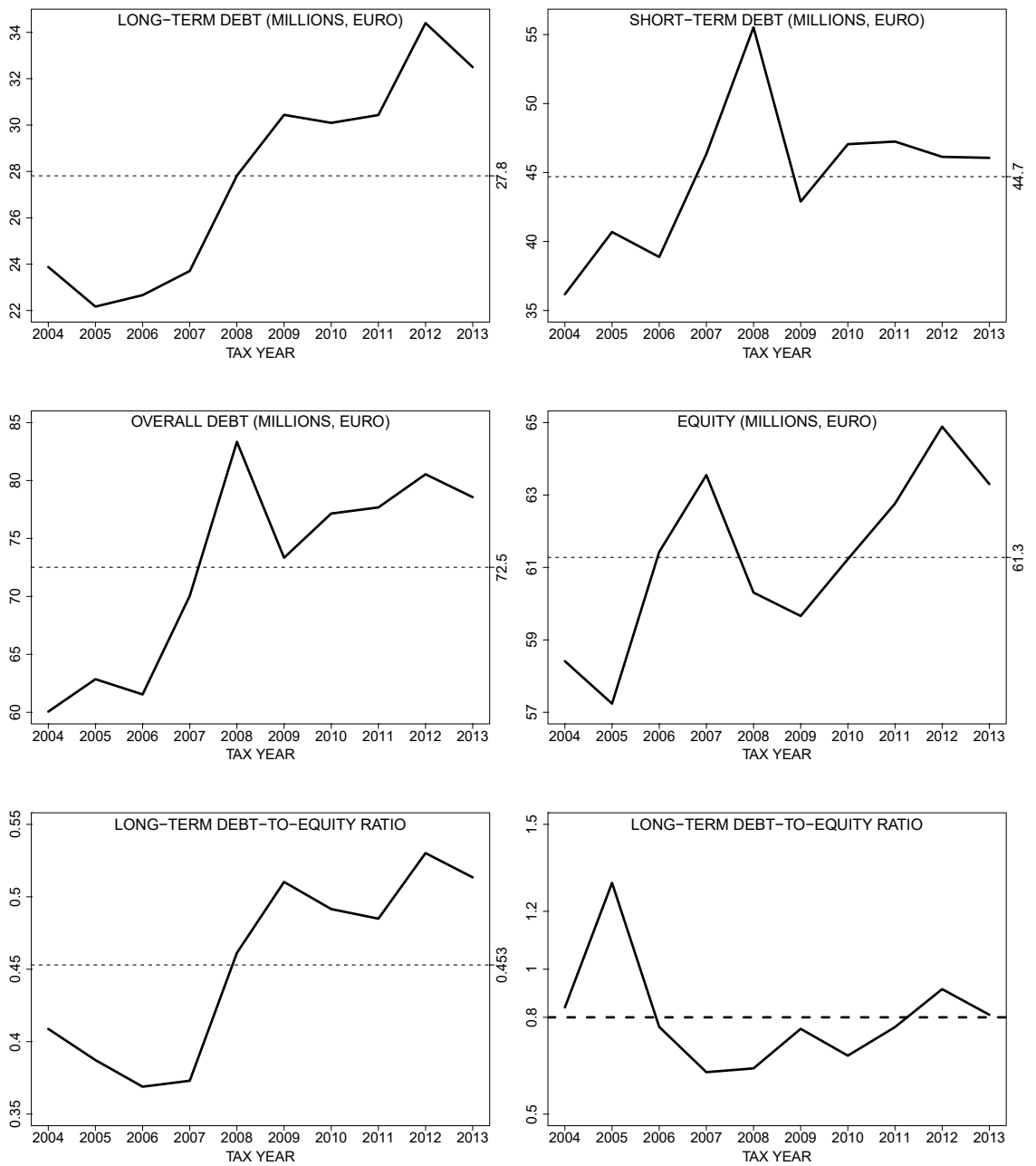
Figure 4: Time evolution of Long-Term Debt, Short-Term Debt, Overall Debt, Equity and Debt-to-Equity Ratio in years 2004 - 2013

from 8.7MEUR to 3.5MEUR (by 59.8%), while at the same time EBITDA decreased from 11.9MEUR to 7.3MEUR (by 38.7%). Regarding their roles in determining the tightness of ESRs, the decreases in EBIT and EBITDA between 2007 and 2009 suggest that ESRs became tighter between these years. While EBIT and EBITDA serve as profit-related measures and therefore provide a basis for ESRs, TCRs base their limitations on companies' debt-to-equity ratio, something we will focus on next.

Figure 4 illustrates the time evolutions of long-term debt, short-term debt, overall debt, equity and debt-to-equity ratio in our dataset. The upper left graph shows that companies' long-term debt mostly increased during the sample period and this increase was especially rapid between the years 2007 and 2009. Short-term debt (upper right graph) in turn peaked in 2008 and decreased in 2009. Overall debt (middle left graph) shows a clear increase between 2007 and 2009. The middle right graph shows that companies' equity decreased between 2007 and 2009, but the relative change (6.0%) is much less than that of long-term debt (28.3%). The lower left graph describes the time evolution of the debt-to-equity ratio (long-term debt/equity) calculated on a yearly basis. The figure shows that the debt-to-equity ratio increased from 2007 to 2009, suggesting that TCRs became tighter in this time period. The lower right graph shows the time evolution of the debt-to-equity ratio in cases where it is calculated on individual company basis. On average it remains at a higher level and provides a quite different pattern than that calculated on yearly basis. This follows from the heterogeneity of the ratios.[16]

5 Analysis

The performance of interest limitation rules over the business cycle is studied by comparing equally tight interest limitation rules, by which we mean such limitations whereby the government collects an equal additional amount of tax revenue over the time period. The performance is in turn measured by two measures. The first measure compares the additional variation that the interest limitation rules imply for taxable income. The second measure studies how much each rule produces in pro-cyclical movements with the business cycle, that is how much the interest limitation rule increases the tax burden in economic downturns and how much it loosens it in upturns. The rule is considered to be better the less additional variation it implies and the less pro-cyclical effect it has with the business cycle. We compare the EBITDA-based interest limitation rule (EBITDA-IB), the EBIT-based interest

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[16]And the fact that $\sum(x_i/y_i) \neq \sum(x_i)/\sum(y_i)$.

limitation rule (EBIT-IB) and the thin-capitalization rule (TCR), which bases its limitation on companies' debt-to-equity ratio.

5.1   Benchmark Interest Limitation Rule

As a benchmark interest limitation rule we consider an EBITDA-based IB with a fixed ratio of 30% and de minimis rule of 3MEUR, which means that net interest expenses exceeding both 3MEUR and 30% of EBITDA are non-deductible.[17]   The introduction of an IB tightens taxation by increasing companies' taxable income and therefore also the government's tax revenue.
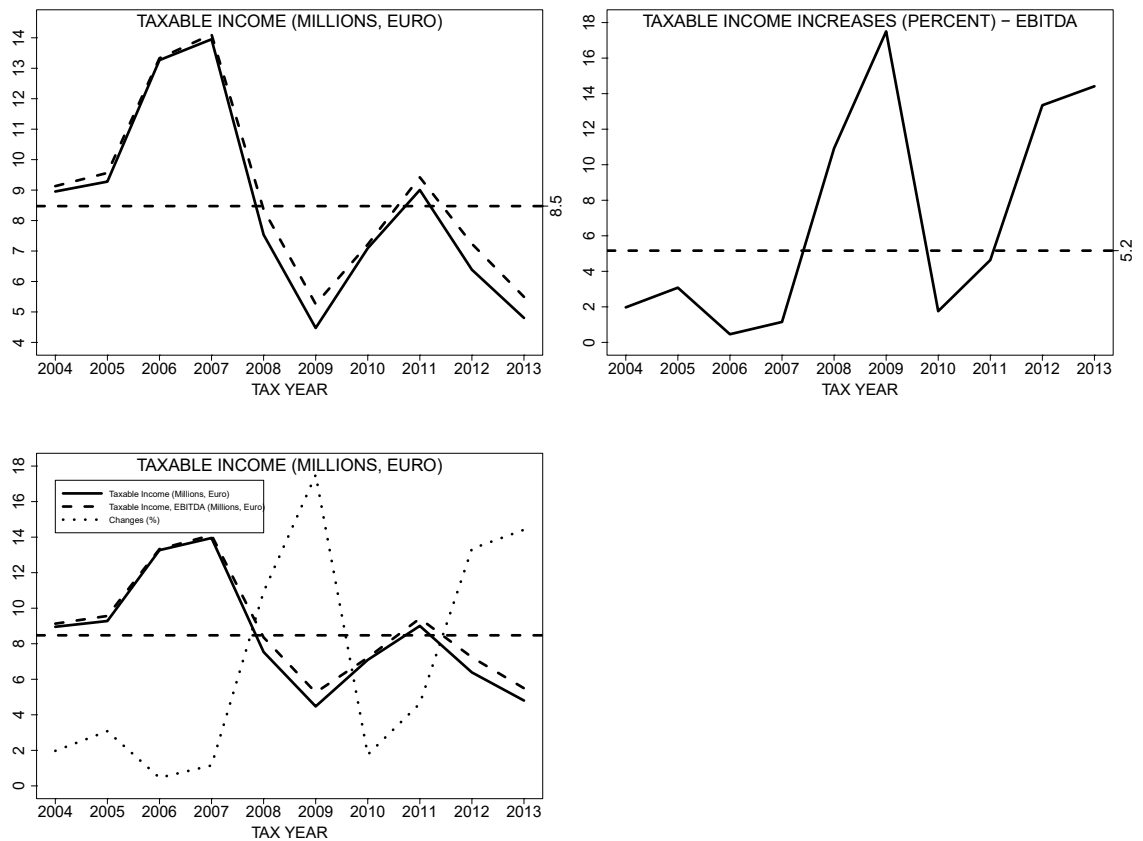

Figure 5: Taxable income and taxable income increases with benchmark EBITDA interest barrier in 2004 - 2013.

The upper left graph of Figure 5 shows both taxable income without any interest limitation rules (solid line) and with our benchmark IB (dashed line). With the IB taxable income is always larger than without it, yet the difference varies across years.

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[17]This is in line with the ATAD (EC 2016a). Due to the data limitation we consider a case where the restriction takes place for overall net interest expenses instead of a case where it is restricted only to expenses within a corporate group. The corporate group rules are not accounted for in our calculations due to the data limitation.

The upper right graph of the figure shows as a percentage how much taxable income increases each year due to the benchmark IB compared to no interest limitation rule at all. The graph shows that the introduction of an EBITDA-based IB with the given limitations increases taxable income by 5.2% on average.[18] Moreover, it shows hefty variation across years and particularly that the increase was largest in the very same year when taxable income was lowest, in 2009. That year the increase in taxable income is 17.5%, while for instance in 2007 the increase is much smaller, only 1.2%. The lower graph of Figure 5 combines the upper graphs into a single graph. It shows that the increases in taxable income as a result of EBITDA were larger in those years when taxable income was lower and vice versa. The figure therefore shows highly pro-cyclical tax treatment of companies across business cycle fluctuations.

5.2 The Performance of Interest Limitation Rules in Comparison

Let us next consider how two other interest limitation rules, an EBIT rule and a TCR, compare to the benchmark case. First, to make these rules equally tight as the benchmark rule we find out the fixed ratio for the EBIT rule. This is found to be 57%.[19] Regarding the equally tight TCR, we find the safe harbour rule with a debt-to-equity ratio of 1:1.33.[20] Figure 6 illustrates the yearly taxable income increases for each interest limitation rule: EBITDA-based IB (solid line), EBIT-based IB (dashed line) and TCR (dotted line) between the years 2004 and 2013.[21]

Regarding the financial crisis, the upper graph of the figure shows that compared to 2007 the taxable income increases are much larger in 2009 under each rule. This is because the IBs become tighter due to decreased profit measures, and the TCR becomes tighter due to increased debt-to-equity ratios. Another thing we observe is that the ESRs imply that the largest increases in taxable income are from 2007 to 2009. While the EBITDA-IB implies an increase of 17.5% and EBIT-IB 19.3%, the

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[18]Over the 10-year time window taxable income is on average 596MEUR higher per year than it would be without any interest limitation rule. The difference comes from 323 observations and 143 separate companies. Of these 143 companies, 31 become unprofitable at least once over the time period due to the benchmark rule. The descriptive statistics for the companies affected are given in Table 3 in the Appendix.

[19]With this fixed ratio the average increase in taxable income per year is 598MEUR. This comes from 340 observations and 146 separate companies, 35 of which become unprofitable at least once over the time period due to the EBIT rule. The same de minimis rule of 3MEUR as in the benchmark case is also applied in this case.

[20]Now the taxable income increases are 588MEUR per year on average. The change comes from 464 observations and 130 separate companies, 48 of which become unprofitable at least once over the time period due to the TCR. The de minimis rule also applies for the TCR.

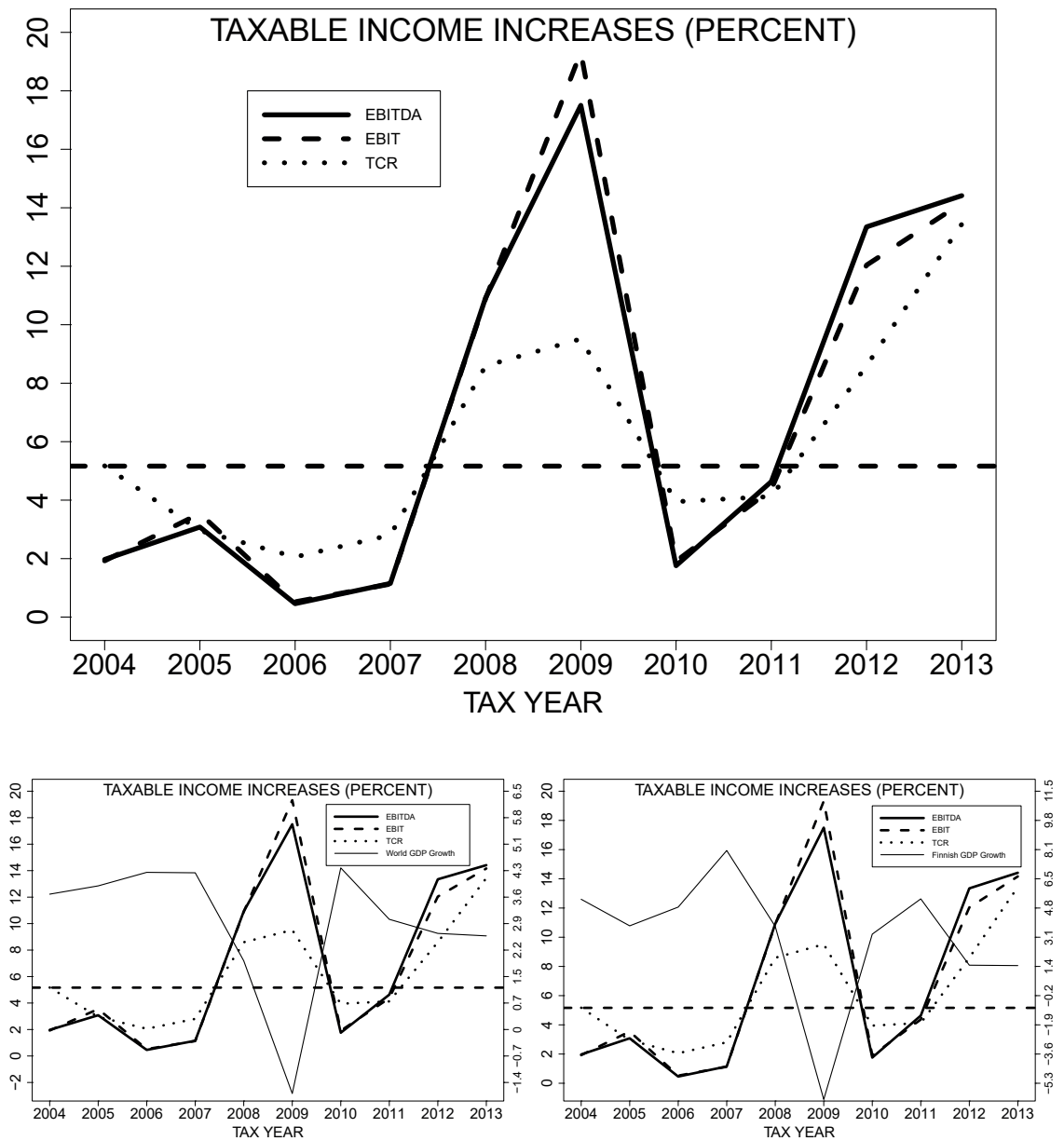[21]Each of these is shown separately in Figure 7 in the Appendix.

Figure 6: Taxable income increases from EBITDA, EBIT and TCR. The lower graphs also depict world GDP growth (lower left graph; right axis) and Finnish GDP growth (lower right graph; right axis).

TCR implies a 9.5% increase. The ESRs also exhibit more variation than the TCR. The standard deviations (illustrating the variability of the interest limitation rules) for EBITDA, EBIT and TCR are: 0.064, 0.066 and 0.037 respectively.

The lower graphs in the figure include the evolutions of world GDP growth and Finnish GDP growth.[22] They show that increases in taxable income have strong negative correlation with GDP growth rates. The correlation between world GDP growth and the EBITDA-induced taxable income increase is -0.81, with EBIT it is -0.85 and with the TCR it is -0.62. With Finnish GDP growth the corresponding correlations are -0.85, -0.89 and -0.635 respectively. Thus the ESRs imply more pro-cyclical tax treatment than the TCR.

5.3   Caveats

There are some important caveats to bear in mind when interpreting the results. First, we do not have information separately on intra-group interest expenses, but only on the overall interest expenses of each company. This allows us to study the implications of the business cycle fluctuations on companies' tax burden in those cases where the interest limitation rules limit overall interest instead of intra-group interest expenses, while the latter might have different outcomes. Second, the nature of our calculations is static, which means that we cannot take into account the possible behavioral responses of companies, something which may affect the results, particulary if the interest limitation rules have very different behavioral implications. Third, due to the data limitations we cannot account for the group rules, which again might have implications for the results. Fourth, we treat profit and loss accounts on a year-by-year basis, which does not take into account carrying forward of losses by companies. Including these might have implications for the results. Finally, the largest Finnish mobile company, Nokia, bought Siemens out in 2013 to take control of networks business.[23] This might have an effect on the results if Nokia is one of the affected companies and its implications would be very different for different interest limitation rules.[24]

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[22]The levels of world GDP and Finnish GDP are shown in Figure 8 in the Appendix. These are given in trillions of US$ and billions of euros (current LCU) respectively.

[23]Source: https://www.theguardian.com/technology/2013/jul/01/nokia-buys-siemens-mobile-networks

[24]However, we cannot identify whether or not Nokia is among the affected companies.

6 Conclusions

This paper contributes to the literature on anti-tax avoidance rules by studying the performance of interest limitation rules during business cycles. While the earlier literature has shown these rules to reduce profit-shifting, to increase compliance costs, and to reduce investments, this paper studies how the tax treatments of these rules vary as a response to economic conditions and thereby shows one new aspect of the undesired effects that they have.

While the common feature of each of the EBITDA, EBIT and TCR rules is that they all imply tighter tax treatment in recessions and thereby show pro-cyclicality with the economic conditions, which in turn may imply more bankruptcies[25] and more pronounced liquidity problems, they also have some clear differences. The ERSs are shown to increase the tax burden by 17.5%-19.3% following the 2008 financial crisis, while for the TCR the increase is much less, 9.5%. The TCR also exhibits less yearly variation. While the 10-20% increases in taxable income may turn out to be a severe problem for company profitability, the 2008 financial crisis showed some exceptional business cycle movements, and these numbers may therefore possibly be considered to be close to the upper bound for how much interest limitation rules are likely to tighten the taxation of companies in the short run.

In many instances ESRs are considered to be the leading option to limit debt-shifting, and of those the EBITDA rule is considered to be the primary option and the EBIT rule an accepted but secondary option, as in the EU's Anti-Tax Avoidance Directive (ATAD). Regarding the pro-cyclicality of the rules, our results show that of the ESRs the EBITDA performs better in this respect. However, the TCR is shown to provide the least pro-cyclical tax treatment with the business cycle. Moreover, TCRs may be considered to reduce both the debt bias and debt-shifting, while the ESRs mostly tackle profit-shifting.

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[25] EBITDA-IB makes 2.3% of companies unprofitable at least once in the time period. The corresponding numbers for the EBIT-IB and TCR are 2.6% and 3.5% respectively.

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Appendix

Table 3 focuses on those companies whose taxation changes due to the interest limitation rules. For comparison, the first column first reproduces the means of the variables in Table 2. The second column shows the corresponding numbers for those companies whose taxation changes due to the EBITDA-IB. The companies affected clearly have more economic activity than the other companies. Their turnover is about three times, and their net-of-tax profits, corporate taxes, taxable income, EBIT and EBITDA are all about twice the size of all companies reported in the first column. The debt levels of the affected companies are even more pronounced: they are about five times those of all companies. At the same time the equity of these companies is only less than half of that of all companies.

Table 3: Means for Affected Companies

Variable (MEUR)	All Companies	EBITDA Binding	EBIT Binding	TCR Binding
Turnover	99.7	297.6	331.4	536.8
Net-of-Tax Profits (PR)	6.9	13.4	11.1	44.9
Corporate Taxes (T)	1.6	3.1	2.8	9.1
Taxable Income (TI)	8.5	16.6	13.9	54.0
Interest Expenses (IE)	3.9	22.7	20.5	25.6
Interest Income (II)	6.1	25.6	22.3	42.4
Net Interest Expenses (NIE)	-2.3	-2.9	-1.8	-16.8
EBIT	6.2	13.7	12.1	37.2
Depreciation (D)	2.9	10.8	12.1	37.2
Amortization (A)	0.2	1.8	1.8	1.2
EBITDA	9.3	26.2	26.0	53.9
Long-Term Debt (LTB)	27.8	145.1	140.9	223.1
Short-Term Debt (STB)	44.7	192.3	190.5	275.6
Overall Debt (B)	72.5	337.4	331.4	498.7
Equity (E)	61.3	25.1	22.0	20.5
Debt-to-Equity Ratio (1; DE)	0.453	0.585	0.590	0.709
Debt-to-Equity Ratio (2; DE)	0.834	1.744	1.781	2.365
Observations	13 620	1 430	1 460	1 300
Companies	1 362	143	146	130

Notes: The mean for Debt-to-Equity Ratio (1) is calculated by taking the ratio between Long-Term Debt and Equity on a yearly basis, while Debt-to-Equity Ratio (2) calculates the mean of individual debt-to-equity ratios. The minimums and maximums are also calculated in a corrsponding way.

The third and fourth columns of Table 3 show the corresponding numbers for the companies affected by the EBIT-IB and the TCR, respectively. Compared to the EBITDA rule, the EBIT rule shows very similar numbers. The companies affected by the TCR in turn differ from those affected by the EBITDA rule as they have more

economic activity in terms of turnover, net-of-tax profits, corporate taxes, taxable income, EBIT and EBITDA. Regarding their asset structure they have more debt and slightly less equity than those affected by the EBITDA rule.
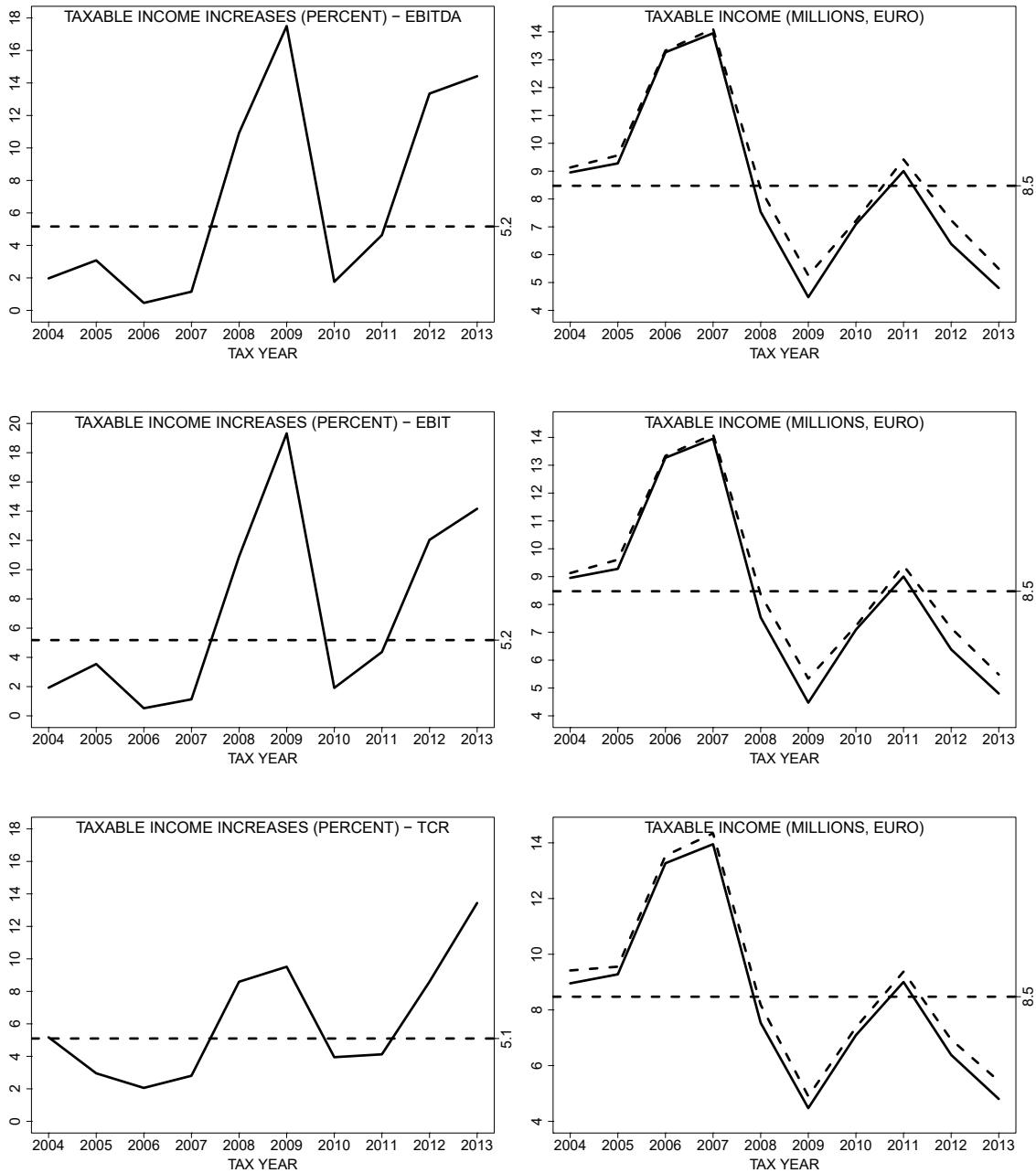

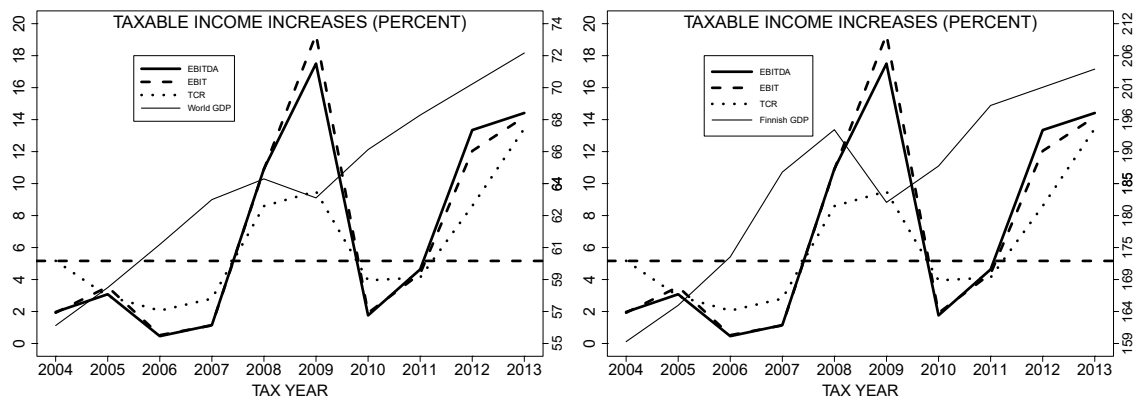Figure 7: Increases in taxable income separately for EBITDA, EBIT and TCR.

Figure 8: Increases in taxable income for EBITDA, EBIT and TCR together with world GDP (in trillions of US$) and Finnish GDP (in billions of euros).

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