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Working Papers 27 September 2011

VATT WORKING PAPERS

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Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
Helsinki 2011

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Acknowledgements: We are grateful to Essi Eerola, Vesa Kanniainen, Tuomas Kosonen, Niku Määttänen, Jukka Pirttilä, Olli Ropponen and Martin Ruf and participants at the FDPE's public economics seminar, the VATT seminar, the Finnish Economic Association conference 2010 and the IIPF conference in 2010 for their useful suggestions and comments. Harju would also like to thank the Nordic Tax Research Council, the Yrjö Jahnsson Foundation and the Alfred Kordelin Foundation for their financial support.

ISBN 978-952-274-003-8 (nid.)
ISBN 978-952-274-004-5 (PDF)

ISSN 1798-0283 (nid.)
ISSN 1798-0291 (PDF)

Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
Arkadiankatu 7, 00100 Helsinki, Finland

Oy Nord Print Ab
Helsinki, September 2011

Graphic design: Niilas Nordenswan

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Abstract

We explore how a firm-level tax on redistributed foreign profits affects the choices of a multinational enterprise (MNE) using evidence from a recent tax reform in Finland. The so-called equalization tax (EQT) used to be a regular element of European imputation systems, designed to ensure that dividends were not paid out of un-taxed profits. Theoretical analyses have suggested that EQT may distort several choices of MNEs. We find a 23 per cent increase in dividend payments and a similar increase in repatriated foreign profits after the repeal of EQT. The reported profits of foreign subsidiaries of Finnish MNEs also increased, which indicates an effect on profit shifting. No change in investment was detected.

Key words: Dividend taxation, financial decisions, multinational enterprise, tax reform

JEL classification numbers: H25, F23, H32

Tiivistelmä

Tässä tutkimuksessa arvioidaan miten Suomessa vuonna 2005 poistunut täydennysvero vaikutti monikansallisten yritysten päätöksiin. Täydennysvero oli tärkeä osa eurooppalaisia yhtiöveron hyvitysjärjestelmiä. Sen tavoitteena oli turvata kotimainen yhteisöverotuotto. Aiemman teoreettisen kirjallisuuden perusteella täydennysvero aiheutti vääristymiä monikansallisten yhtiöiden voitonjakopäätöksiin. Empiiristen tulosten perusteella monikansallisten yritysten emoyhtiöt lisäsivät osingonjakoa noin 23 prosenttiyksiköllä ja samalla myös tytäryhtiöiltä kotiutettujen osinkojen määrä lisääntyi täydennysveron poistumisen jälkeen. Lisäksi tytäryhtiöiden ulkomailla raportoimat voitot lisääntyivät, mikä viittaa muutokseen peitellyssä voiton siirrossa konsernin sisällä. Investointivaikutuksia ei havaittu.

Asiasanat: Yhtiöveron hyvitysjärjestelmä, monikansalliset yritykset, täydennysvero, voitonjakopäätökset, verouudistus

JEL-luokittelu: H25, F23, H32

1 Introduction

In recent decades multinational enterprises (MNEs) have notably increased their role in the world economy. There is also widening evidence of the remarkable ability of MNEs to exploit cross-country differences in tax systems. These developments have led to a growing interest in international tax design issues among policymakers and academics.

Therefore it is no surprise that several OECD countries have reformed their corporate tax systems in recent years. A common trend in Europe has been to switch from an imputation system to classical corporate tax with reduced tax rates.[1] This includes the four largest EU Member States as well as Ireland, Norway and Finland. The European trend can be explained at least partly by a series of rulings by the European Court of Justice (ECJ), where imputation systems were found to be inconsistent with the EU Treaties.[2] The case against them turned on discrimination against either foreign shareholders or foreign corporations.[3]

One of the challenged features of European imputation systems was the so called equalization tax (EQT) and its counterparts.[4] The aim of these measures was to protect domestic tax revenues by ensuring that no dividends can be distributed from profits, which are not subject to domestic corporate tax. EQT served this goal by levying an extra corporate-level tax if dividends were financed from tax-exempt (or leniently taxed) profits. An EQT liability was especially

[1]The imputation system is a method to relieve double taxation of distributed corporate profits. It gives the shareholders a credit for taxes paid by the company,which can be offset against income tax on dividends. Imputation systems are still applied in several OECD countries such as Australia, Canada and New Zealand.

[2]See European Commission (2003). See also the ruling by the ECJ on the so-called Manninen case (Case C-319/02), issued on 7 September 2004. The ruling held that the Finnish imputation system, which limited imputation credits to domestic source dividends, violated the free movement of capital principle in the EC Treaty. This ruling was an important factor behind the Finnish government's decision to abolish the imputation system as from 2005.

[3]A further reason for the repeal of imputation systems might have been the non-optimality of personal-level double tax reliefs in open economy claimed by Boadway and Bruce (1992).

[4]The main alternative to EQT was the system of differentiated credit. Under this method, redistribution of tax exempt foreign profits did not trigger EQT. However, such dividends did not give entitlement to imputation credit either. In mid1990s both Germany and the UK switched from EQT to differentiated credit.

common in cases where a company had foreign source income which was tax-exempt to relieve international double taxation. The consequent extra tax burden on foreign profits and its potential harmful effects on economic activity were recognized in the European tax coordination debate (Ruding Committee, 1992), but also by national governments who soon implemented amendments to their tax rules.[5]

Given the growing role of MNEs and the difficulties in designing their taxation, there has been surprisingly little research establishing causal evidence between taxes and the behavior of MNEs. In this study we use the Finnish tax reform of 2005, which abolished EQT, as a natural experiment to examine the behavioral responses of MNEs to taxes.[6] Because of the opportunity to use valid policy evaluation methods, we believe that our study offers a novel contribution to this field of public economics.

Our main interest lies in the effects of EQT on dividends, investments and the use of alternative channels to repatriate foreign profits from abroad. The unique firm-level data based on tax returns allow us to examine closely various decisions by companies. In considering profit shifting responses we apply data for Swedish and Finnish based corporate groups included in the Amadeus database.

We also aim to contribute to the empirical analyses of the Finnish 2005 tax reform. The reform involved a substantial rise in personal-level taxes of dividends. Kari et al. (2008) observed a strong anticipation effect in dividends among both listed and non-listed companies before the reform. Kari et al. (2009) found a clear negative effect on dividends in non-listed companies but no effect among listed firms after the reform. Both papers focused on personal-level changes in dividend taxation and ignored the changes in company-level tax structures such as EQT. As theoretical analyses suggest, however, EQT may have had important effects on incentives among firms with foreign operations. Thus one of the goals of our paper is to add to the earlier literature on the reform.

How should we expect taxes on dividend payments to affect choices? Public economics literature includes two well known opposite hypotheses on the effects of dividend taxes. The "new view" claims that these taxes will capitalize into share prizes, but have no effects

[5]See for example Weichenrieder, (1994), for Germany and Freeman and Griffith, (1993), for the UK.

[6]Other aspects of TR2005 have been analyzed by Kari et al. (2008, 2009) and Korkeamäki et al. (2009).

on investment or dividend payments. The "old view" predicts that dividends and investment are dependent on dividend taxes. The so-called Hartman-Sinn hypothesis is an application of the "new view" to the international environment. It suggests that a subsidiary's long-run capital stock and dividend repatriations are independent of a potential tax liability due on repatriation of the profits (see Sinn, 1987)[7].

Besides traditional dividend tax issues, previous literature has also addressed several aspects of imputation systems. Freeman and Griffith (1993) provide a policy discussion on the effects of 'surplus ACT', the British variant of EQT. Devereux and Freeman (1995) analyze how imputation systems affect international investment flows. Weichenrieder (1994, 1998) constructs a dynamic MNE model in the "new view" tradition to investigate incentive aspects of the German system of differentiated credit and shows that it affects dividends and lowers the parent company's cost of capital for investments. Kari and Ylä-Liedenpohja (2005) analyze EQT in a similar MNE model and argue that it has identical implications for dividend and investment policies as differentiated credit. They further show that EQT tends to increase incentives to shift foreign profits to the home country using transfer pricing.

Empirical literature on the effects of imputation systems on the behavior of MNEs is scant and focuses solely on the UK application. Bond et al. (1996) examine the effects of the tax cost of paying dividends resulting from surplus ACT in the UK. They report a negative effect on dividend payments. Bond et al. (2007) examine the effects of the abolition of repayable imputation credits for UK pension funds in July 1997 and report an increase in dividend payments among firms benefiting most from the reform. Neither study finds evidence of changes in investment. The implications of imputation systems for the international allocation of profits have not been studied empirically.[8]

[7]Subsequent research has tried to challenge and test this view. Desai et al. (2001, 2007) and Bellak et al. (2010) analyze the effects of repatriation taxes empirically and argue that they have an influence on dividends, but nevertheless repatriations are fairly persistent and seem to follow a target pay-out ratio. Desai et al. (2007) refer to information asymmetries and monitoring motives as major determinants of repatriation policies.

[8]However, a growing empirical literature studies the effects of taxes on international profit shifting more generally, see for example Hines and Rice (1994), Clausing (2003), Bartelsman and Beetsma (2003) and Huizinga and Laeven

Our estimation method is a simple linear difference-in-differences approach. It allows us to evaluate the causal effect of the abolition of EQT on firms which faced a high risk of being liable to pay EQT on distributed dividends (MNEs). Our control group is formulated from other large firms which were not at risk of EQT liability before the reform. Consistent with theory, the empirical results suggest that affected firms increased their dividend payments considerably, by approximately 23 per cent. We also find that repatriation of foreign profits in the form of intra-company dividends increased after the repeal of EQT. Furthermore, we observe an increase in the reported profits of foreign subsidiaries of Finnish MNEs, suggesting a decrease in profit-shifting. However, we cannot observe statistically significant changes in the level of real or financial investments. Our results emphasize the sensitivity of dividend decisions to taxes both outside and inside an MNE and hence they provide similar evidence as the previous empirical literature, including the study by Bond et al. (1996). The natural experiment approach concerning the effects on profit-shifting is generally novel and especially so in the literature dealing with imputation systems.

The paper proceeds as follows. Section 2 introduces an overview of the elements of the tax system in question. Section 3 presents the theoretical background and the hypotheses to be tested in our empirical analysis. Section 4 is devoted to empirical analysis and Section 5 summarizes.

2 The taxation of dividends in Finland

We briefly summarize the main elements of dividend taxation before and after the 2005 tax reform. A full imputation system was adopted as a part of a larger base-broadening and tax rate-cutting tax reform, as from 1990. After the reform, corporation tax was fully credited against the tax liability of a shareholder paid by the company on distributed profits. Following its European predecessors in France, Germany and the UK, EQT was an elementary part of the system.

This regime operated for 15 years until 2004. As from the beginning of 2005 the imputation system (including EQT) was repealed and a partial double tax of dividends introduced. The main rule was that 70 per cent of dividends were recognized as taxable capital

(2008).

income. Substantial reliefs for dividends from non-listed companies were maintained. Corporate tax was cut from 29 to 26 per cent and the flat tax rate on personal-level capital income from 29 to 28 per cent.[9] An exemption method was introduced for the taxation of capital gains from the sale of shares and for taxation of dividends received by corporations. The exemption for dividends was ruled not to apply to the investment assets of financial sector firms.

The operational principle of EQT is to make sure that no dividends which are entitled to imputation credit are distributed out of profits not subject to the full domestic corporate tax. The ways of implementing this idea varied somewhat in different countries but the goals were very similar. In Finland EQT liability was due if the so called minimum corporate tax (MT) exceeded preliminary corporate tax (CT). MT was equal to the imputation credit granted to the shareholder and it was calculated $MT = sG/(1-s)$, where G is dividends and s is the rate of imputation credit. Henceforth we depict $\tau_e = s/(1-s)$ and call τ_e the rate of EQT. In Finland corporate tax was fully credited to shareholders and therefore s was equal in size to the rate of corporate tax, τ, implying $\tau_e = \tau/(1-\tau)$. Preliminary corporate tax was defined $CT = \tau * \hat{\Pi}$, where $\hat{\Pi}$ is taxable profit. The amount levied as EQT was calculated $EQT = max\,(MT - CT,\, 0)$.

Two additional complicating aspects must be mentioned. The first is an inter-temporal smoothing mechanism. Due to the volatility of profits some considered it not reasonable to levy EQT if dividend distribution exceeds annual taxable profits in a year when profits are exceptionally low. Thus the tax system allowed taxed domestic profits from previous years to be taken into account. To implement this idea a concept of tax surpluses was introduced. It was defined as taxes paid on retained profits from a time interval which was initially five years and later ten years. Hence tax surpluses (TS) were calculated as follows:

$$TS_t = \sum_{t-10}^{t-1} max(CT_s - MT_s,\, 0),$$

where t refers to the current fiscal year. Where old tax surpluses

[9]Since 1993 Finland had operated a dual income tax where tax rate on capital income is proportional. Earlier analyses on the 2005 tax reform include Kari et al. (2008) and Korkeamäki et al. (2010).

were required to reduce the equalization tax liability, the oldest unused tax surpluses were used first (first-in-first-out rule).

As from 1996, a relief was introduced in the case of dividends repatriated from abroad and redistributed to foreign shareholders (flow-through dividends). Introduction of this relief reflected the problems of an imputation system in an open economy with cross-border ownership. The relief was calculated as:

$$A = min(G,\, D^*),$$

where G^F depicts dividends distributed to foreign shareholders and D^* foreign profits repatriated as tax-exempt dividends under the exemption method operated by Finland. The relief was deducted from dividends G when calculating the minimum tax, i.e.

$$MT = \tau_e(G - A).$$

Taking into account these two qualifications the EQT liability was calculated as follows:

$$EQT = max(MT–(CT + TS),\, 0).$$

Next we illustrate how EQT works by means of an example. Assume an MNE consisting of a parent company resident in Finland and a subsidiary resident in Germany. The parent's pre-tax profit is 100 of which 50 is a result of foreign-source dividends. These dividends are tax-exempt because of the exemption method applied to relieve international double taxation. The rest of the pre-tax profit, 50, is earned from business operations in Finland and is subject to corporate tax at rate 29 %. Hence, the MNE's corporate tax liability is 14,5.

To consider the potential tax implications of dividend distributions, assume that the parent has no tax surpluses from previous years and that the dividend recipients are domestic individuals and institutions. If the MNE distributes no more than 35,5, i.e. it distributes its taxable domestic profit after taxes, no EQT liability is due. However, if its dividend exceeds 35,5, it pays 29 cents in EQT for every euro exceeding the threshold. If the MNE distributes its entire after-tax profit, its EQT liability is 14,5. The MNE can avoid this extra tax cost on dividend distributions simply by cutting its dividends so that only domestic after tax profit is distributed and

by investing the rest in the parent's home country. The next section examines the incentive effects of EQT using a formal model.

3 Theoretical predictions

We will draw the hypotheses for our empirical analysis by considering EQT in an infinite-horizon dynamic MNE model.[10] We show that EQT creates an extra tax cost for dividend payments financed from foreign source profits, which leads to changes in the MNEs dividend, investment and repatriation policies. The conclusions on the effects of the repeal of EQT are judged by comparing the optimal choices of the firm with and without EQT. We begin by laying out the model framework and then move to the analysis and discussion. The presentation draws much on Kari and Ylä-Liedenpohja (2005).

3.1 The dynamic MNE model with EQT

Consider a value maximizing MNE that consists of a parent company, resident in the home country (h-country), and a subsidiary, operating in a foreign country (f-country). The parent produces at home using capital K as the only production factor. Let $\Pi(K)$ be operating profits with standard properties $\Pi' > 0$ and $\Pi'' < 0$. The parent's budget constraint is[11]

$$\Pi(K) + Q + D^* + C = G + I + T, \tag{1}$$

where the sources of funds are domestic profits $\Pi(K)$, proceeds from new share issues Q, foreign source intra-company dividends D^*, and profits of foreign origin C, shifted from the subsidiary for the parent. We leave out debt finance to simplify the analysis. Funds are spent on dividend distributions G to shareholders, h-country investment I and h-country taxes T.

The subsidiary's budget constraint is

[10] The model builds on the "new view" theory developed by King (1974) and others, extended to the international context by Hartman (1985), Sinn (1984, 1993), Alworth (1988) and Keen (1991). Weichenrieder (1995, 1998) and Kari and Ylä-Liedenpohja (2005) have used the set-up to analyze elements of imputation systems. Altschuler and Grubert (2002) discuss the limitations of the standard model, particularly they focus on a narrow set of financial flows between the parent and its single affiliate.

[11] The starred variables refer to the f-country.

$$\Pi(K^*) = D^* + I^* + C + c(C) + T^*. \tag{2}$$

The source of funds is operating profit $\Pi(K^*)$ earned on investments located in the f-country. The funds are used for dividend repatriations D^* for the parent, local physical investment I^*, profit-shifting via transfer pricing C and f-country taxes T^*. Profit-shifting is assumed to cause administrative and efficiency costs $c(C)$ with the properties $c' > 0$, $c'' > 0$, borne by the subsidiary.

The MNE chooses dividends, investments at home and abroad, equity issues, intra-company dividends and shifted profits to maximize the present value of the after-tax cash flow from the company to its owners:

$$\underset{\{G,Q,C,D^*\}}{max} V = \int_{t_0}^{\infty} (\gamma G - Q) e^{-\rho(t-t_0)} dt, \tag{3}$$

where γG with $\gamma = (1 - \tau_p)/(1 - s)$ denotes after-tax dividends received by the shareholder. τ_p is the tax rate on capital income and s is the rate of imputation credit. For full imputation $s = \tau$ and for partial imputation $0 < s < \tau$, where τ is the rate of corporate tax. We assume $\tau_p \geq \tau$, which implies $\gamma \leq 1$. $\rho = (1 - \tau_p)r$ is the after-tax discount rate. To simplify, we assume no owner-level capital gains taxation.

The first step to model EQT in this framework is to split dividends G into two parts

$$G = D + D_e, \tag{4}$$

where D denotes dividends financed from after-tax domestic profits (normal dividend) and D_e refers to that part of dividends which exceeds the amount of domestic profits and thus triggers an equalization tax payment (excess dividend).

We constrain normal dividend D to the h-country taxable profit after taxes:

$$D \leq (1 - \tau)\hat{\Pi} \quad with\ \hat{\Pi} = [\Pi(K) + C]. \tag{5}$$

Observe that $\hat{\Pi}$ includes C, i.e. profits earned in the f-country but shifted to the h-country using transfer pricing. If the firm distributes more than the after tax profit, it must set $D_e > 0$ and is then liable to pay EQT.

The parent's and the subsidiary's taxes T and T^* are defined as

$$T = \tau[\Pi(K) + C] + \tau_e D_e, \quad T^* = \tau^*[\Pi(K^*) – C – c(C)], \qquad (6)$$

where T consists of the domestic corporation tax at rate τ and EQT at rate τ_e. The h-country is assumed to grant international double-tax relief using the exemption method. Hence, repatriated dividend D^* is tax-exempt and does not show up in T. The subsidiary's taxes T^* consist of the f-country corporation tax, the base of which is profits from local production less income shifted to the parent, including costs.

3.2 The MNE's optimal policy

Consider now the MNEs optimal policy in the presence of EQT. It makes sense to start with the financing choices of the parent and then move to investment and repatriation policies. We use a heuristic approach here to demonstrate the effects of EQT. A formal derivation is given in Appendix 1.

In our model with no debt there are three sources from which the parent may finance additional h-country investments: domestic profits (normal dividends), repatriated foreign profits (excess dividends), and new share issues. A useful way to consider the effects of tax rules on financing choices is to compare the costs of small increases in financing while keeping the effect on investment constant.[12] If the parent decides to retain one euro of its domestic profits after corporate taxes, the shareholder foregoes $(1-\tau_p)/(1-s)$ after taxes. The owner's income is only reduced by owner-level income tax (τ_p) net of imputation credit (s).

The corresponding cost for retaining one euro of foreign profits is $(1-\tau_p)/[(1-s)(1+\tau_e)]$. Now the owner's income is again reduced by owner-level taxes but also by EQT.[13] Finally, the cost for new equity is 1 since equity capital can be invested in and withdrawn from a corporation without tax implications.

Using the assumption $(1-\tau_p)/(1-s) \leq 1$, we may draw the following "pecking order" for the alternative financing forms:

[12] More formally, compare the partial differentials of the Lagrangean in respect of dividend variables and new equity, see Appendix 1.

[13] If the one euro is spent on dividends, the firm pays $\tau_e/(1+\tau_e)$ in EQT and distributes the rest $1/(1+\tau_e)$. The owner's net income after personal taxes is then $(1-\tau_p)/[(1-s)(1+\tau_e)]$.

$$foreign\,profits \succ domestic\,profits \gtrsim new\,equity$$

Foreign profits are unambiguously the most preferred form of financing while domestic profits are preferred or equal to new equity depending on the sizes of s and τ_p.[14] The position of foreign profits as the most favoured source is solely determined by EQT.[15]

Consider next the effects of EQT on the parent's investment. This can be accomplished by deriving the cost of capital of real investment financed from foreign repatriated profits (marginal source of finance). As demonstrated above, the cost of retaining one euro of foreign profits is $(1-\tau_p)/[(1-s)(1+\tau_e)]$. On the other hand, investing the retained one euro internally gives the parent an income flow of $(1-\tau)\Pi$' after corporate tax. Assuming the net return is distributed as dividends, the owner receives a net income flow of $(1-\tau)\Pi'(1-\tau_p)/(1-s)$. Using the owner's after-tax interest rate, $\rho=(1-\tau_p)r$, as the discount rate, we may calculate its present value to be $(1-\tau)\Pi'/[r(1-s)]$. This gives the contribution of the investment to the market value of the MNE. In equilibrium the costs and benefits (the present value of the returns) of the investment equal. By solving the marginal return on capital, we may draw the MNEs long-run cost of capital in the presence of EQT:

$$\Pi'(K)=\frac{1-\tau_p}{(1-\tau)(1+\tau_e)}r. \tag{7}$$

Observe first that the cost of capital in (7) is not affected by the imputation rate s. This neutrality result follows from the new view of dividend taxation. However, the denominator of the expression on the right-hand side of (7) includes τ_e, reflecting the effect of EQT.

Without EQT but retaining other features of the tax system, the cost of capital is $\Pi' = (1-\tau_p)r/(1-\tau)$. We conclude that EQT lowers the h-country cost of capital below the benchmark level and hence increases investments. In fact, the tax rate condition $\tau_p \geq \tau$ ensures that the cost of capital is always lower than the market rate of interest r. In the case of a full imputation system

[14] In a partial imputation system ($s<\tau$) domestic profits are strictly preferred to new equity. In full imputation ($s=\tau$) with $\tau_p=\tau$ indifference occurs.

[15] Observe that without the imputation system ($s=\tau_e=0$), but retaining other aspects of the model, the pecking order becomes $foreign\,profits \approx domestic\,profits \succ new\,equity$.

($\tau_p = \tau/(1-\tau)$) condition (7) becomes $\Pi' = (1-\tau_p)r$. Now the cost of capital corresponds to the owner's after-tax interest rate which reflects strong investment incentives.

The intuition of these results is straightforward: EQT affects the costs and returns of investment differently. It reduces the costs, but leaves, unlike a standard dividend tax, the returns on investment intact. Therefore its effects do not cancel out but rather lead to a rise in incentives to invest.

Kari and Ylä-Liedenpohja (2005) extend the model to include the parent's investments in financial assets, F, yielding a return at a fixed rate $i = r$. In this case the firm does not accept a return on real investments lower than the market interest rate. The optimal stock of real capital is determined by the condition $\Pi'(K) = r$. After this size of K is reached, all repatriated foreign profits are invested in financial assets $dF/dt = D^*$. Only h-country profits are distributed, and these now include the returns on financial investments, $G = D = \Pi(K) + iF$.[16]

Observe that dividends D distributed by the parent grow in this regime. This is because the growth in financial assets leads to an increase in domestic profits and this relieves the upper limit of D. Hence, by investing the repatriated foreign profits in the h-country, the parent, in a way, transforms these profits into domestic profits which can be paid out without EQT liability (Kari and Ylä-Liedenpohja 2005, Altschuler and Grubert 2002). Only domestic profits are distributed. The constraint in (5) binds permanently. Hence, EQT effectively establishes an upper limit on the parent's dividends which is gradually relieved when financial assets accumulate.

The MNE has two alternative ways to repatriate foreign profits, intra-company dividends, D^* and profit shifting using transfer pricing, C. We disregarded the latter alternative but we now perform an analysis of it. The incentives to use transfer pricing rather than dividends can again be examined by considering the costs and benefits of a policy change where intra-company dividends before foreign corporate tax are reduced by one euro and the transfer-priced profit increased correspondingly.

[16] Adding debt into the model would produce a similar steady-state regime where EQT generates incentives to pay back debt accumulated earlier to finance the stock of real capital. Weichenrieder (1998) elaborates this solution in the case of the German system of differentiated credit.

If the MNE reduces foreign-source pre-tax dividends by one euro, the shareholder foregoes a dividend net of tax of $(1-\tau^*)(1-\tau_p)/[(1-s)(1+\tau_e)]$. In this expression the owner's income is reduced first by foreign corporate tax (τ^*), then by EQT after the foreign-source dividend is redistributed (τ_e), and, finally by personal-level dividend taxes (τ_p) net of imputation credit (s). The reduction in foreign dividends enables the MNE to increase the profit shifted to the h-country by one euro. This raises the shareholder's net income by $(1-\tau)(1-\tau_p)/(1-s)$. The dividend only is subject to h-country corporate tax (τ) and owner-level dividend tax (τ_p) net of imputation credit (s). No f-country corporate tax or EQT is paid because the profit, even if earned abroad, is reported in the h-country. There is a further source of costs caused by the policy change, namely administrative and efficiency costs from profit-shifting $c(C)$, assumed to grow at an increasing rate. It is useful first to assume that this cost is close to zero for the very small change in shifted profits. Hence we focus on the first two components of costs and benefits. We obtain the following condition:

$$\frac{1-\tau^*}{1+\tau^e}\left\{\begin{array}{c}<\\=\\>\end{array}\right\}(1-\tau) \iff D^*\left\{\begin{array}{c}\prec\\\approx\\\succ\end{array}\right\}C \tag{8}$$

The left-hand side of the tax rate condition gives the relative value of distributed profit when the profit is reported abroad and repatriated as intra-company dividends D^* and the right-hand side is the value when profit is transferred to the h-country using profit-shifting and reported there. If the right-hand side is greater than the left-hand side, then the transfer pricing channel is preferred and vice versa.

Without EQT the condition is $(1-\tau) > (1-\tau^*)$. The MNE chooses transfer pricing if the h-country tax rate is lower than the f-country rate. Profits will be reported in the country with the lowest tax burden. With EQT the relative sizes of τ and τ^* still matter but now EQT increases the probability of profit-shifting being used. In the case of full imputation the transfer pricing always dominates since $(1+\tau_e) = 1/(1-\tau)$.

Recall that profit shifting causes costs and assume that it is the preferred repatriation policy ("$<$" holds in eq. 8). Now, if the marginal costs and benefits of transfer pricing balance at a level of C

lower than foreign profit after costs, $C < \Pi(K^*) - c(C)$, an internal equilibrium occurs where foreign profit is channelled using transfer pricing up to an equilibrium amount $\hat{C}$ and the rest is repatriated as intra-company dividends $\hat{D}^*$. In this equilibrium, the mature MNE invests the latter amount in financial assets and distributes the after-tax h-country profit as dividends. Two ways to avoid EQT are in use, transfer pricing and re-investing foreign-source dividends in financial assets. Observe that foreign intra-company dividends are still the marginal source of financing and therefore the above considerations concerning the effects of EQT on investment incentives still hold.

The results derived above from the standard MNE model[17] provide us with the following behavioral hypotheses for the empirical analysis. Because of the repeal of EQT as from 2005 we expect Finnish MNEs to have:

- increased their dividends to shareholders,
- decreased h-country real or financial investments,
- increased intra-company dividends and decreased profit-shifting as a way of repatriating profits from abroad.

4 Empirical analysis

4.1 Method

We apply a standard difference-in-difference (DD) method to estimate the changes in the behavior of firms in response to the abolition of EQT in 2005. The treatment group consists of all Finnish MNEs operating during 2000-2002. In our main estimations the control group consists of other large listed Finnish corporations. Since the abolition of EQT affected these relatively large corporations (MNEs) in particular, we exclude small firms from our sample to make the groups more comparable to each other. When we investigate profit-shifting responses, we use Swedish multinationals and their subsidiaries as our control group.

[17] Altschuler and Grubert (2002) extend the simple standard model to include several subsidiaries, investments in financial assets abroad and investments between subsidiaries of the MNE. While such extensions are important to understand MNEs' decisions more generally, we believe that our model is sufficient to demonstrate the central incentive effects on the parent's decisions.

The estimated DD equation is the following

$$Log(Y_{it}) = \alpha_i + \beta controls_{it} + \delta after_t + \gamma treat_i * after_t + \eta_i + \varepsilon_{it}, \quad (9)$$

where Y refers to the dependent variable in firm i at time t. We have several dependent variables in our analysis: dividend payments, real investments, financial investments, repatriated profits and reported profits at home and abroad, which are all in a logarithmic form to deal with the skewed outcomes.[18] The variable $treat$ is a dummy variable with a value of one if the firm is a Finnish MNE and zero otherwise, and $after$ is a time dummy with a value of zero before and one after the reform. In some specifications we also replace $after$ by year dummies to investigate the yearly responses. $Controls$ include the number of employees, sales and equity in natural logarithmic form. ε is the i.i.d. error term.

The main interest lies in the coefficient γ of the interaction variable ($treat * after$) in equation (9). This describes the impact of the reform on treated firms relative to the control group (average treatment effect for the treated, ATT), if the DD assumptions hold. The main assumption of the DD method is the parallel time trends assumption meaning that the variable of interest should behave exactly the same in the treatment and control groups if the policy change had not been introduced. The method also requires no self-selection to the groups and no differences in transitory shocks during the examination period. If these assumptions hold, we are able to write the DD estimator as follows:

$$\hat{\gamma} = (\bar{Y}_{1a} - \bar{Y}_{1b}) - (\bar{Y}_{0a} - \bar{Y}_{0b}),$$

where $\bar{Y}_{gt}$ is the log of average outcome value over group g at time t.[19] The policy impact γ in equation (9) is the expected value of parameter $\hat{\gamma}$.[20]

We use a firm fixed-effect strategy. In our case, the fixed-effect model can be seen as a better option than, for example, the random

[18] Naturally, the logarithmic model cancels out the zero values. However, the share of firms distributing zero dividends is rather small in our sample, only 15 %, including both treatment and control firms.

[19] Here a and b refer to the post- and pre-reform periods and 1 and 0 to the treatment and control groups respectively.

[20] See Blundell and Costa Dias (2009).

effect model or pooled OLS because it allows correlation between the firm component (η_i) and the regressors.[21] Additionally, all models assume that the error term is not correlated with the regressors and there is no perfect multicollinearity of regressors (full rank condition).

4.2 Data and descriptive statistics

Our primary data come from the Finnish Tax Administration and includes information on the financial statements and taxation of Finnish corporations for the period 2000-2007. We use data in an unbalanced panel form. The unique characteristic of that they contain all Finnish corporations and it allows us to examine closely various decisions of companies. We also make use of the Amadeus database. Amadeus provides unconsolidated financial accounting data on European firms and includes information on ownership relationships between firms. In this study Amadeus data are used to identify Finnish MNEs and to investigate the changes in profit-shifting because the main data do not include information on foreign subsidiaries of Finnish based MNEs. As the abolition of EQT mainly affected large firms with international operations, we exclude small firms from our analysis.

Table 1 presents some descriptive statistics of the most important variables of the main data set we use in the estimations. All variables are in logarithmic form. Divid represents the log of distributed dividends calculated for each individual firm. The variable $Invest$ refers to real investments, $Profit$ represents taxable profits, $F - Invest$ refers to financial investments, $Divid - Inc$ is for profits repatriated by firms during the financial year, $Equity$ is the sum of fixed assets held at the end of the tax year, $Employees$ is the number of employees and $Sales$ represents the turnover during the fiscal year. Real investments refer here to investments made by firms in fixed assets during the fiscal year and financial investments represent investments in liquid assets, including bonds and stocks. As can be seen, the firms in the control and treatment groups are broadly of equal size, which is important for our analysis.[22] It seems,

[21] We also offer test results supporting the fixed-effect strategy later on. Estimates of other methods are also available upon request.

[22] In Appendix 2 we plot the means of main control variables during our examination period to further emphasize that the groups are relatively similar

however, that the mean of employees is higher in the control than in the treatment group.

Treatment								
Stats	Divid	Invest	Profit	F-Invest	Divid-Inc	Equity	Employees	Sales
Mean	14.519	13.085	14.028	14.229	12.490	16.011	4.682	16.482
Median	14.499	13.128	14.127	14.493	12.591	16.001	4.714	16.500
Sd	2.281	2.434	2.672	2.845	3.220	2.377	1.820	2.245
Min	6.579	3.296	-4.605	-1.783	-2.207	7.203	0.000	6.310
Max	22.070	20.866	22.573	21.092	22.304	24.433	10.449	24.154
N	1731	3076	2598	700	3383	3272	3348	3163
Control								
Stats	Divid	Invest	Profit	F-Invest	Divid Inc	Equity	Employees	Sales
Mean	14.089	13.210	14.090	14.366	12.054	15.960	5.442	16.812
Median	14.123	13.437	14.262	14.725	12.357	16.158	5.768	17.152
Sd	1.890	2.359	1.986	2.509	2.546	1.896	1.587	2.052
Min	2.813	5.182	4.257	5.974	-0.020	8.172	0.000	4.739
Max	22.110	19.585	22.118	19.432	20.614	23.593	9.361	23.208
N	1455	1806	1620	502	1901	1860	1909	1832

Table 1: Descriptive statistics for the data 2000-2007: treatment and control groups

We introduce Figure 1 to illustrate that there was considerable bunching at the tax threshold of EQT before the reform. The Figure plots the share μ of minimum tax divided by the sum of corporate tax and tax surpluses in our sample of Finnish MNEs in 2000-2003. The variable μ can be interpreted as the ratio of distributed dividends to undistributed profit from current and previous years. The distribution of μ allows us to examine the burden of EQT: the firm was obliged to pay EQT if $\mu > 1$ otherwise not. The Figure shows a noticeable spike around the tax kink ($\mu = 1$) in the otherwise smooth distribution. This may imply that a considerable number of firms adjusted their dividend payments at precisely the level where they can avoid the extra tax burden of EQT. We interpret this as giving initial evidence that firms responded to the incentives created by the EQT.

to each other.

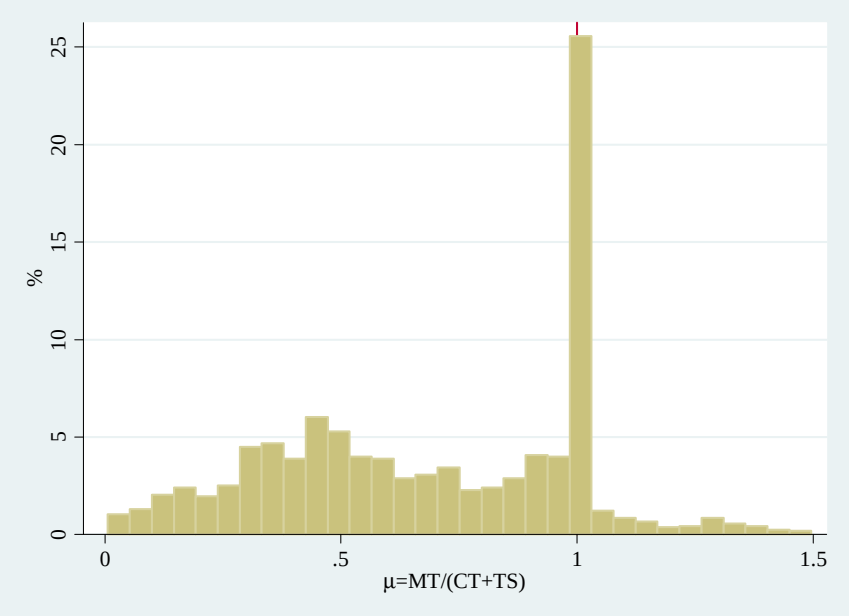

Figure 1: The liability of firms to pay EQT (years 2000-2003)

4.3 Identification issues

We recognize four issues which might hamper our identification. The first is the potential anticipation responses of firms to the announcement of a reform before its actual implementation. In this case the before-after setting of our analysis is less clear cut. The second potential worry is that the firms in the treatment and control groups responded differently to the other changes of TR2005. The third worry is that the reform may not have been exogenous but rather an endogenous response to economic conditions. The last issue relates to the selection of firms in the control and treatment groups. The next few paragraphs argue that these issues are not too serious to destroy our identification.

Anticipation could be a problem because TR2005 was announced already in November 2003. In Figure 2 we plot the average annual log of dividends in the control and treatment groups from 2000 to 2007 to describe how well our main identifying assumption holds in practise. The Figure shows that there was an increase in means in both groups in 2003, which, in line with the study by Kari et al. (2008) reflects the expected general tightening of personal dividend

taxes. Kari et al. (2008) found clear anticipation in dividend payments among small firms in 2003 and 2004, but in 2003 alone among large (listed) firms.

The difference in means of dividends appears to be relatively stable until 2003. However, the means seem to diverge in 2003 and the difference is even larger in 2004. This suggests that some anticipation happened before implementation of the reform. Right after the reform in 2005, the difference between the means of dividend payments is already statistically significant.

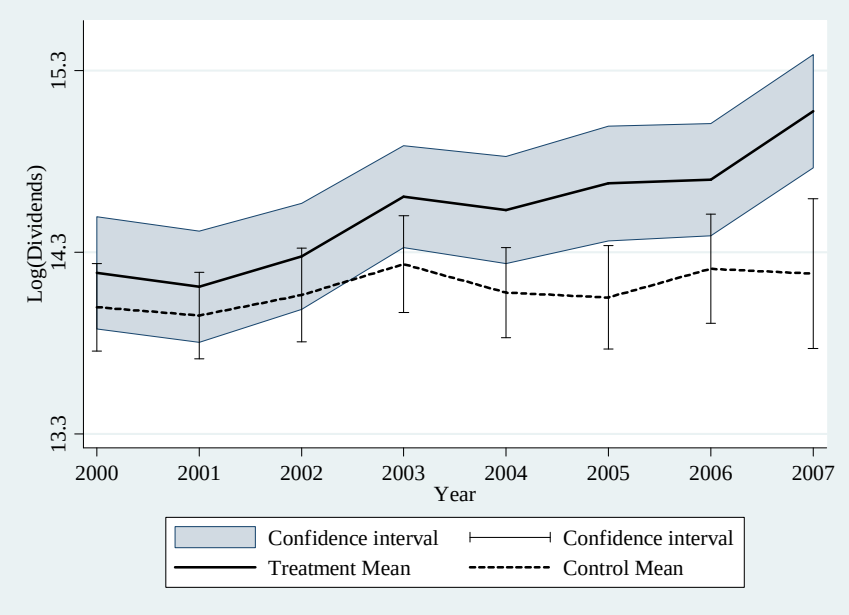

Figure 2: Mean of Log(Dividends): treatment and control groups

We suggest two options to solve the anticipation question. The first approach is to test whether or not the parallel time trend assumption holds by considering yearly responses before the reform implementation. Alternatively we may drop the observations of 2003 and 2004 from our data and use 2000-2002 as the pre-reform period, and thus examine how robust our main results are. We consider the issue by using both approaches in our result section.

As to the second issue, we believe that the control and treatment groups faced these other changes in TR2005 apart from the aboli-

tion of EQT in a broadly similar manner. Support for this view is received from the paper by Kari et al. (2009), which did not find any response after 2005 among large listed firms. Thus we believe that the abolition of EQT was the major element of the reform that affected large firms.[23]

Thirdly, the DD method assumes that the policy change is exogenous to economic agents. Otherwise the method would offer biased impact estimates. Thus, the reform should not have been implemented on the grounds of economic conditions (for example to boost MNEs economic activity). In our case, the repeal of the imputation system was a response to an ECJ ruling which held the full imputation system to be inconsistent with EU legislation. Therefore, the tax reform was not driven by Finnish economic conditions.

The fourth possible identification problem is the choice of the control group. The DD method assumes that the control group is chosen exogenously. According to the descriptive statistics, the control and treatment groups seem to be relatively equal in size. Besides, we use pre-reform (years 2000-2002) information to identify the treatment and control groups. Thus we believe that the control group, in the form we have defined it, is a good counterfactual for the treatment group.

To assess the robustness of our results, we will use Amadeus data to investigate behavioral changes by subsidiaries with different control group assumptions. However, our primary data do not allow us to perform similar robustness checks.

4.4 Results on dividend payments

We use the DD method to analyse the effects of the abolition of the EQT on MNEs' behavior compared to other large Finnish firms. The estimations are made using an unbalanced panel for the years from 2000 to 2007 and the estimation strategy used is a fixed-effect model.[24]

[23] As mentioned in Section 2, an additional change in the tax system was the special tax treatment of dividends received by financial institutions. However, it is not a relevant change as we consider present outcome variables. It would be relevant, for example, if we were interested in the composition of investments after the reform.

[24] We also perform estimations using a balanced panel. These results are not statistically different from the estimates with an unbalanced panel. The Hausman test suggests using the firm-level fixed effect model instead of the

The results concerning dividend payments are shown in Table 2. While the first two columns capture the total effect of the reform on log of dividend payments, columns 3 and 4 present the possible anticipation responses using year dummies for 2003 and 2004 multiplied by the treatment dummy.[25] The coefficients in columns 5 and 6 are estimated similarly as those in columns 1 and 2, but excluding the years 2003 and 2004 from the data. The odd columns give the results without any control variables and the even columns for the estimates with the full set of controls.

In accordance with theoretical predictions, the results suggest that the firms in the treatment group increased their dividend payments relative to the control group after the reform. We find that the estimate of the interaction term 'after' (refers here to years 2005, 2006 and 2007) multiplied by the treatment group dummy variable is positive and significant with or without control variables (at the 5 per cent level). As the dependent variable is in a logarithmic form and we are using a linear model, the estimate of the interaction variable can be interpreted directly as a percentage change among the treated firms. The estimate suggests that the average increase in dividend payments by MNEs was approximately 23 per cent.

As stated above, there are reasons to believe that some MNEs may have anticipated the repeal of EQT in 2004 and even in 2003. In columns 3 and 4 of Table 2 we include the interaction terms of the treatment and year dummies 2003 and 2004 in the model. The coefficients of interaction would be statistically different from zero if there were differences in dividend payments between the treatment and control groups already before 2005. This could be interpreted as anticipation of the reform and upset our main identifying assumption. In both years we find positive interaction coefficients that are nevertheless not even close to being statistically significant and the quantitative values of the estimates are rather small.

Another way to test this issue is to perform robustness checks by excluding the years 2003 and 2004 from the data. The estimates

random effect model. At the level of 899.22 (chi 2(5)), the null hypothesis of firm-specific effects uncorrelated with the regressors is rejected. However, it seems that the coefficient of interest is not very sensitive to the method used. In addition, the results with pooled OLS are also very much in line with the baseline fixed-effect estimates. The results using random effect estimations and pooled OLS are available upon request.

[25]The results in columns 3 and 4 are made using data only for the period 2000-2004.

in columns 5 and 6 of Table 2 without data for the years 2003 and 2004 are larger than our main results in columns 1 and 2. However, the estimates are not statistically different from the base case estimates. Hence we conclude that we do not observe clear anticipation effects even though Figure 2 previously suggested otherwise. This underpins our main identification assumption of parallel time trends. Notice also that our baseline estimates rather underestimate the response of MNEs if anticipation occurred.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Log(D)	Log(D)	Log(D)	Log(D)	Log(D)	Log(D)
After*Treatment	0.233**	0.231**			0.251**	0.243*
	(0.103)	(0.102)			(0.121)	(0.118)
Treatment *2003			0.025	0.002		
			(0.078)	(0.075)		
Treatment *2004			0.056	0.066		
			(0.089)	(0.100)		
Firm effects	X	X	X	X	X	X
Year	X	X	X	X	X	X
Full control set		X		X		X
Observations	2,835	2,835	1,923	1,923	2,069	2,069
R-squared	0.022	0.057	0.073	0.116	0.045	0.066
Number of groups	548	548	502	502	534	534

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Estimation results: dependent variable the log of dividend payment

4.5 Results on investments

Our predictions in Section 3 suggest that EQT may increase investments by MNEs in the parent's h-country. Thus we expect to see a decrease in investments after the repeal of EQT among Finnish MNEs. This prediction applies for both real and financial investments.

The estimates for the real investment impacts are in Table 3. The dependent variable, log of real investments, describes here the firm's yearly investments in machinery, equipments and buildings. The estimation applies the same method and also the set of controls is the same as previously, see equation (9). The estimate in the first column is performed without controls and the one in the second

column is with the full set of control variables.

The estimated coefficient of the interaction variable is positive without controls and negative after including controls. Both estimates are clearly statistically insignificant. The small size of the point estimates further stress the conclusion that the abolition of EQT did not change the real investments of Finnish MNEs.

	(1)	(2)
VARIABLES	Log(Invest)	Log(Invest)
After*Treatment	0.053	-0.024
	(0.095)	(0.089)
Firm effects	X	X
Year	X	X
Full control set		X
Observations	4,364	4,364
R-squared	0.000	0.068
Number of groups	670	670

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Estimation results: dependent variable the log of real investments

Another way to use repatriated foreign profits with a similar effect on EQT liability was to invest in financial assets in the parent's home country, implying a decrease in investments after the repeal of EQT. We estimated these effects with several different definitions for financial assets and using the same approach as above. The estimations did not give any responses among the treated firms.[26] Therefore, we conclude that in contrast to theoretical predictions EQT seems not to have affected Finnish MNEs' investment decisions.

4.6 Results on repatriation decisions - dividends and profit shifting

In Section 3 we discussed the incentive effects of EQT on intra-company dividends and profit-shifting by MNEs. The analysis suggested an increase in dividend repatriations and a decrease in profit-shifting after the repeal of EQT in 2005.

[26]The results are available upon request.

To investigate the effects on intra-company dividends we are forced to use a variable describing all dividend income received from domestic and foreign subsidiaries as well as minority shareholdings. Therefore, this variable measures repatriated dividends from foreign subsidiaries imprecisely. However, the tax reform did not change the taxation of domestic dividends or foreign dividends from minority holdings. And even if there had been some changes we have no reason to believe that that they would have affected our treatment and control groups differently. We use the same estimation strategy as before. The dependent variable is now the log of dividend income and we use the same set of control variables as previously.

The results are in Table 4. In both columns 1 and 2 the coefficients are positive and statistically significant without and with control variables. Thus it seems clear that dividend income to parents increased among the treated companies compared to the control group after the reform. The magnitude of this response is high, an increase of approximately 23 per cent.

	(1)	(2)
VARIABLES	Log(Divid_inc)	Log(Divid_inc)
After*Treatment	0.261**	0.228**
	(0.106)	(0.103)
Firm effects	X	X
Year	X	X
Full control set		X
Observations	4,645	4,645
R-squared	0.045	0.128
Number of groups	681	681

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Estimation results: dependent variable the log of dividend income

Our final question is to study the effects on profit-shifting by examining the changes both in subsidiary and parent company profits. The empirical literature on tax-motivated profit-shifting includes several different approaches to identify the effects on profit-shifting. While one group of studies follows an indirect strategy by measuring the impact of tax rate differences on the profitability of foreign subsidiaries (e.g. Hines and Rice, 1994, and Huizinga and Laeven, 2008), various studies examine more directly the effects of taxes

on transfer prices and financial structures (e.g. Bartelsman and Beetsma, 2003; Clausing, 2003).

In this section we use the Amadeus database for the years 2000-2006. The data include financial information on national enterprises and MNEs, including their subsidiaries and parent companies. The profit variable used in our analysis is earnings before interest and taxes (EBIT), which is commonly used in related studies (e.g. Huizinga and Laeven, 2008). Our estimation strategy is as earlier, see equation (9). Controls includes the cost of employees, fixed assets, turnover and sales. The variable after refers to the years 2005 and 2006.

First we estimate the reform's effects on the profits of subsidiaries of Finnish MNEs. As noted in the theory section, we expect to detect an increase in subsidiaries' profits because the reform abolished the tax incentive to shift profits from f-country to h-country. To offer credible estimates we use two different groups of firms as controls. The first group comprises European subsidiaries of Swedish based MNEs. The second control group is formed from domestic subsidiaries of Finnish corporate groups which do not have overseas operations. The variable treat equals one if the foreign (European) subsidiary is owned by a Finnish MNE and zero otherwise. Again the main identifying assumption is that the control and treatment groups have parallel trends before intervention, see discussion in the Method section.[27]

The results are in Table 5. The first two columns contain the results for the estimations using the subsidiaries of Swedish MNEs as the control group and the last two columns give the results for the estimations with Finnish subsidiaries as the control group. Again, the first and third columns contain the results for models without controls and the second and fourth columns provide estimates for models with a full set of controls.

The estimates imply that the profits of subsidiaries of Finnish MNEs rose significantly compared to profits in the control groups. The increase in profits is in the range of 10 to 12 per cent being seemingly stable irrespective of the control group applied. This suggests the conclusion that, in the pre-reform regime, Finnish MNEs

[27]Figure 4 in Appendix 2 describes the mean of log EBIT in the treatment and two control groups. The parallel time trend assumption seems to hold relatively well.

did use intra-firm transactions to lower their overseas profits as a response to the threat of an extra tax burden in the form of EQT.

	(1)	(2)	(3)	(4)
VARIABLES	Log(EBIT)	Log(EBIT)	Log(EBIT)	Log(EBIT)
After*Treatment	0.109*	0.106*	0.118*	0.119*
	(0.065)	(0.063)	(0.067)	(0.065)
Firm	X	X	X	X
Year	X	X	X	X
Full control set		X		X
Observations	13350	13350	12537	12537
R-squared	0.035	0.626	0.038	0.407
Number of groups	3196	3196	2706	2706

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimation results: dependent variable the log of EBIT (subsidiary)

We are also interested in the impact of the reform on the parent companies' profits. However, we cannot make a clear prediction of the sign of the response. In our empirical analysis the outcome variable is again EBIT, including both profits from sales and dividend income. If MNEs used intra-firm transactions to shift profits to Finland before the reform, this should be reflected in the profits of the parent companies in decreasing EBIT after the reform. On the other hand, if we observe, as we did, an increase in parents' dividend income, this would increase EBIT. Now if both changes were somewhat equal in size, the response in terms of the total profits of MNEs' parents would be zero. Therefore, the prediction of the effect of the reform on the parents' EBIT is that the change was close to zero. Unfortunately the Amadeus data do not allow us to distinguish between these two possible channels.

To estimate the change in parent companies' profits we apply the same method as above and use EBIT from the Amadeus database to measure profits. Swedish MNEs are used as the control group. The results are given in Table 6 where the first column is without and the second is with control variables.

The estimates are positive even though neither of them is statistically significant. Hence there is no evidence of a change in the accounting profits reported by the parent companies of Finnish MNEs

after the reform. The most valid point estimate, in column 2, is quantitatively very close to zero and the clustered standard error is large, implying that the 95 per cent confidence interval captures a lot of both negative as well as positive values. This result is in line with the theoretical prediction and suggests the conclusion that the increase in dividend income received by the parent and the decrease in profit-shifting were largely comparable in size.

	(1)	(2)
VARIABLES	Log(EBIT)	Log(EBIT)
After*Treatment	0.169	0.013
	(0.187)	(0.074)
Firm	X	X
Year	X	X
Full control set		X
Observations	5943	5943
R-squared	0.020	0.229
Number of groups	1304	1304

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Estimation results: dependent variable the log of profits (parent)

To sum up, we only observe changes in financial decisions (dividends and reported profits) and no responses in real decisions. This is in line with many earlier empirical studies and also with the idea of a hierarchy of behavioral responses to taxation suggested by Slemrod (1992). According to this model, the timing choices of economic transactions are the most sensitive to taxes. The second tier contains financial and accounting decisions like dividend and profit-shifting responses and at the bottom of the hierarchy with the least response are real decisions like investments and labor supply.

4.7 Calculation of standard errors

As we use a standard simple linear difference-in-difference estimation procedure to estimate the effect of the reform, there is a possible problem of inconsistent standard errors caused by the serial correlation problem. This problem was emphasized by Bertrand et al. (2004). They propose several options to help to solve this problem. When simple parametric econometric corrections work poorly, non-

parametric correction by bootstrapping works well if the number of states (in our case firms) is high enough. There are also two simpler methods which Bertrand et al. propose: first, aggregation of data into two separate periods: pre and post groups, and, second, one can allow a different covariance structure for errors within firms at different times.

We already applied the latter two methods in our estimations above when we clustered standard errors, and estimated the effects on the post period only without distinguishing year effects. We also performed estimations with parametric econometric corrections using AR(1) structure for errors. However, this did not change the results considerably. Since we have at least 500 firms per year, depending on the specification and data in use, we are able to calculate standard errors using the block bootstrap method. Table 7 offers the results of the pre/post examinations for all our dependent variables. It seems that in our case the standard errors are not very sensitive to the way we calculate them. Therefore, we can trust our baseline results with fairly high confidence.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log(D)	Log(In)	Log(D_I)	Log(EB)	Log(EB)
After*Treatment	0.231**	-0.024	0.228**	0.106*	0.013
	(0.106)	(0.090)	(0.108)	(0.065)	(0.085)
Number of groups	548	670	681	3196	1304

Block bootstrapped standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The dependents are by columns: 1) Finnish firms' Log of dividend payments, 2) Finnish firms' Log of real investments, 3) Finnish firms' Log of dividend income,4) Finnish MNEs' subsidiaries' Log of EBIT, and 5) Finnish and Swedish MNEs' Log of EBIT.

Table 7: Estimation results with the full set of controls: dependents are all presented in the paper – standard errors calculated by block bootstrapping

5 Conclusions

We analyze the effects of a company-level tax on dividend payments, which treats differently the foreign and domestic-source profits of a multinational enterprise (MNE). This tax, the so-called equalization tax (EQT), was a common element of European imputation systems until 2005. The systems were largely repealed because the European

Court of Justice considered them to be inconsistent with the EU Treaties.

Theoretical analyses have pointed out that EQT establishes a kink in a firm's tax rate on dividend distributions and tends to affect various financial decisions by an MNE. Dividend distributions above the kink are subject to extra tax costs. Therefore the tax may decrease dividend payments compared to a tax with a linear structure. Other predictions made by theoretical models are that EQT increases investments in the MNE's home country and strengthens incentives to repatriate foreign profits using transfer pricing rather than intra-company dividends.

We estimated the effects of EQT using a recent tax reform in Finland as an experiment. In line with our theoretical hypotheses we found substantial evidence of the effect on dividend distributions. We estimate that the reform caused dividends to increase by an average of 23 per cent in affected firms. This result is in line with earlier empirical observations that have found dividends to be sensitive to taxes (e.g. Chetty and Saez, 2005, and Poterba, 2004, for general dividend taxes and Bond et al., 1996, for EQT).

We also observe an increase in foreign intra-company dividends as well as a modest increase in the profits of foreign subsidiaries of Finnish MNEs. Both results are in line with the predictions of the theoretical model and seem to indicate a switch from profit-shifting to openly distributed intra-company dividends.

Contrary to theoretical predictions, we do not perceive any evidence for a drop in home-country real or financial investments after the repeal of EQT. In this respect our results support the hierarchy of behavioral responses to taxation suggested by Slemrod (1992). According to this view, timing effects and financial choices are the most sensitive to tax changes and the least sensitive are real economic choices such as investments.

Our results also add to the previous studies on the 2005 tax reform in Finland (Kari et al., 2008 and 2009). Their results suggest that large listed companies did not alter their dividend payment behaviour after the reform. They focus on personal-level dividend taxes and ignore the changes in company-level tax structures such as EQT. Our estimations show instead clear impacts on the dividend payments among firms affected by the EQT in the pre-reform regime.

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Appendix 1

This technical appendix presents the solution to the model set up in Section 3.1 of the main text. The interpretation of results is given in Section 3.2. The stylized model considers financial decisions of a MNE operating in two countries, the h-country and the f-country. The analysis focuses on the parent's decisions in a long-run equilibrium. Section 3.1 defines the MNEs goal, budget constraints and technological restrictions. The equations of motion for the stocks of capital at home and abroad are as follows:

$$\dot{K}(t) = I(t), \quad K(0) = K_0$$

$$\dot{K}(t) = I^*(t), \quad K^*(0) = K_0^*.$$

The current-value Lagrangean for the model is

$$L = H + q_1\{(1-\tau)[\Pi(K) + C] - D\} + q_2 D + \\ q_3 D_e + C + q_4 Q + q_5 D^* + q_6 \tag{A1}$$

$$with\ H = \gamma(D + D_e) - Q + \lambda_1\{(1-\tau)[\Pi(K) + C] + D^* + Q - \\ D - (1+\tau_e)D_e\} + \lambda_2\{(1-\tau^*)[\Pi(K^*) - C - c(C)] - D^*\},$$

where H is the Hamiltonian for the problem, λ_1 and λ_2 are the shadow prices of the domestic and foreign stocks of capital K and K^* respectively, q_1 is the Lagrange multiplier of the upper constraint for D and q_i, i=2, ...,6, are the Lagrange multipliers of the non-negativity constraints of control variables. We define $\gamma \equiv (1 - \tau_p)/(1 - s)$, $\rho \equiv (1 - \tau_p)r$ and assume $0 < s \leq \tau$ and $\tau_p \geq \tau$, which imply $\gamma \leq 1$.

The first-order necessary conditions are

$$\partial L/\partial D = \gamma - \lambda_1 - q_1 + q_2 = 0 \tag{A2}$$

$$\partial L/\partial D_e = \gamma - (1 + \tau_e)\lambda_1 + q_3 = 0 \tag{A3}$$

$$\partial L/\partial D^* = \lambda_1 - \lambda_2 + q_5 = 0 \tag{A4}$$

$$\partial L/\partial C = (1 - \tau)\lambda_1 - (1 + c^{'})(1 - \tau^*)\lambda_2 + (1 - \tau)q_1 + q_6 = 0 \tag{A5}$$

$$\partial L/\partial Q = -1 + \lambda_1 + q_4 = 0 \tag{A6}$$

$$\dot{\lambda_1} = \rho\lambda_1 - (1 - \tau)\Pi^{'}(K)[\lambda_1 + q_1] \tag{A7}$$

$$\dot{\lambda_2} = \rho\lambda_2 - (1 - \tau^*)\Pi^{'}(K^*)\lambda_2 \tag{A8}$$

plus a complementary slackness condition for each of the six control constraints. The transversality condition of the problem requires that

$$\lim_{t\to\infty} \lambda_1(t)K(t)e^{-\rho t} = \lim_{t\to\infty} \lambda_2(t)K^*(t)e^{-\rho t} = 0. \tag{A9}$$

We will start from financing choices and then move on to investment and repatriation decisions. Assume that no profit-shifting occurs ($C = 0$). The budget constraints of the parent and subsidiary, defined in section 3.1, imply that, in the steady state where $\dot{K} = \dot{K^*} = 0$, the MNE repatriates $D^* = (1 - \tau^*)\Pi(K^*)$ and distributes $G = (1 - \tau)\Pi(K) + (1 - \tau_e)D^*$. The latter equation implies $D_e > 0$ and $q_3 = 0$. The steady state value of λ_1 is now obtained from condition (A3):

$$\lambda_1 = \gamma/(1+\tau_e). \tag{A10}$$

Hence $\lambda_1 < 1$. Using (A10) and (A2) we conclude that $q_1 > 0$ implying that the upper constraint for D is binding, $D = (1-\tau)\Pi(K)$. The value of the shadow price q_1 is:

$$q_1 = \tau_e\gamma/(1+\tau_e). \tag{A11}$$

The MNE's financing preferences are evaluated by using pairwise comparisons investigating the costs and benefits of a change in the financing structure while keeping the capital stock constant. The preferences between new share issues and retained foreign-source profits can be found out by measuring the profitability of substituting new share issues for retained foreign-source profits, which is given by $\partial H/\partial Q$.[28] Using (A1) and (A3) we obtain:

$$\frac{\partial H}{\partial Q} = \frac{\tau_e\gamma}{1+\tau_e} - 1 < 0. \tag{A12}$$

The negative sign implies that foreign source profits strictly dominate new share issues. Next, consider the benefits from a policy change that substitutes foreign-source profits for domestic profits while keeping investments and new share issues constant. Formally this is obtained as follows

$$\frac{\partial H}{\partial D} - \frac{\partial H}{\partial D_e} = \frac{\tau_e\gamma}{1+\tau_e} > 0. \tag{A13}$$

Since $\tau_e > 0$, the net benefit is positive implying that the foreign-source dividends is the preferred form of financing.

The cost of capital for h-country investment can be derived by inserting (A10) and (A11) into (A7). This gives

$$\Pi'(K) = \rho/[(1+\tau_e)(1-\tau)]. \tag{A14}$$

In a combination of a full imputation system with $\tau_e = \tau/(1-\tau)$ and a uniform rate on capital income and corporate profits, $\tau_p = \tau$, we obtain $\Pi'(K) = (1-\tau)r < r$.

The net benefits from using transfer pricing can be analysed by calculating $\partial L/\partial C$ as in (A5). Assume that the MNE is in a steady

[28] See Sinn (1987), ch. 4.2.

state and has $D^* > 0$ implying $\lambda_1(t) = \lambda_2(t)$ by (A4). By inserting (A10), (A11) and (A4) into (A5) and rearranging, we obtain:

$$c'(C) = (1 + \tau_e)\frac{(1 - \tau)\gamma + q_6}{(1 - \tau^*)\gamma} - 1. \qquad \text{(A15)}$$

Assume $C > 0$ implying $c' > 0$ and $q_6 = 0$ and obtain the following condition $(1 + \tau_e)(1 - \tau) > (1 - \tau^*)$ for the profitability of a policy of increasing C by one euro and financing this from a corresponding reduction in intra-company dividends (before taxes). In a full imputation system with $\tau_e = \tau/(1-\tau)$, the condition always applies.

Consider briefly the extension of the model which adds the parent's financial investments F with a constant rate of return $i = r$. This can be accomplished by including investments in financial assets $E = \dot{F}$ and interest income net of domestic corporate tax $(1-\tau)iF$ in the parent's budget constraint. Additionally an equation of motion for F and a non-negativity constraint for F are needed. Assume first no income shifting.

Combining the equations of motion for the shadow prices of K and F gives the condition for the steady-state stock of real capital: $\Pi' = i = r$. Assume a uniform tax rate on capital $\tau_p = \tau$ to simplify. Substituting it and the condition $\Pi' = i = r$ into (A7), yields $q_1 = 0$. Now (A2) and (A3) give $q_3 > 0$ implying $D_e = 0$ by the complementary slackness conditions. From the budget constraint we obtain $E = D^* > 0$. In this steady state solution, the parent distributes the domestic profits as dividends and invests all repatriated foreign profits in financial assets. The relevant transversality condition corresponding to (A9) is satisfied despite the continuous growth of the firm's stock of financial assets (the shadow prices and the stocks of real capital K and K^* are constants and the stock of financial capital F grows at a decreasing rate implying that the transversality condition holds, see Kari - Ylä-Liedenpohja 2005).

Allowing both income shifting and investment in financial assets provides the following steady-state solution in the case of an internal equilibrium for transfer pricing: the firm shifts from the f-country an amount satisfying (A15), denote $C = \hat{C} < \Pi(K^*) - c(\hat{C})$. The rest is repatriated as intra-company dividends $D^*/(1 - \tau^*) = \Pi(K^*) - c(\hat{C}) - \hat{C}$. The parent's stock of real capital K is determined by the condition $\Pi' = r$. It distributes all profits taxed in the h-country

$D = (1 - \tau)(\Pi + \hat{C} + iF)$, and invests repatriated intra-company dividends in financial assets $E = D^*$. Foreign-source dividends are never redistributed and EQT is never paid.

Appendix 2

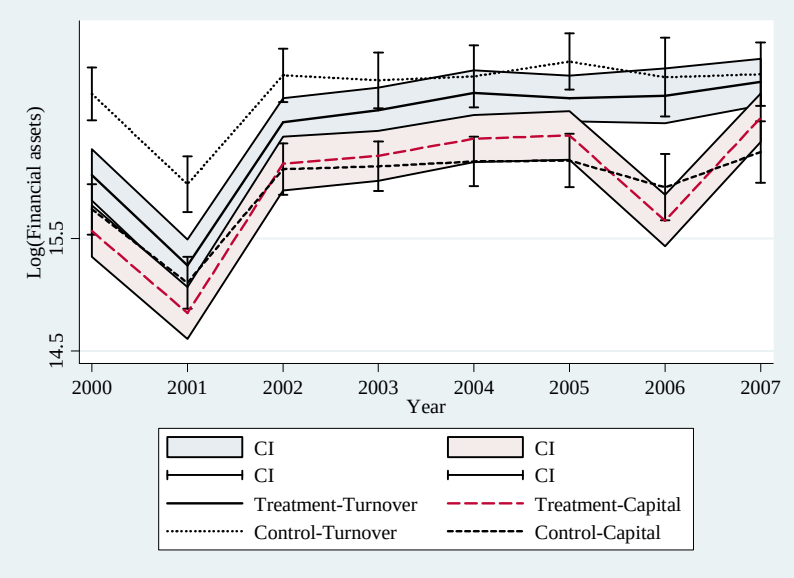

Figure 3: Mean of Log(turnover) and Log(capital) from 2000 to 2007: treatment and control groups

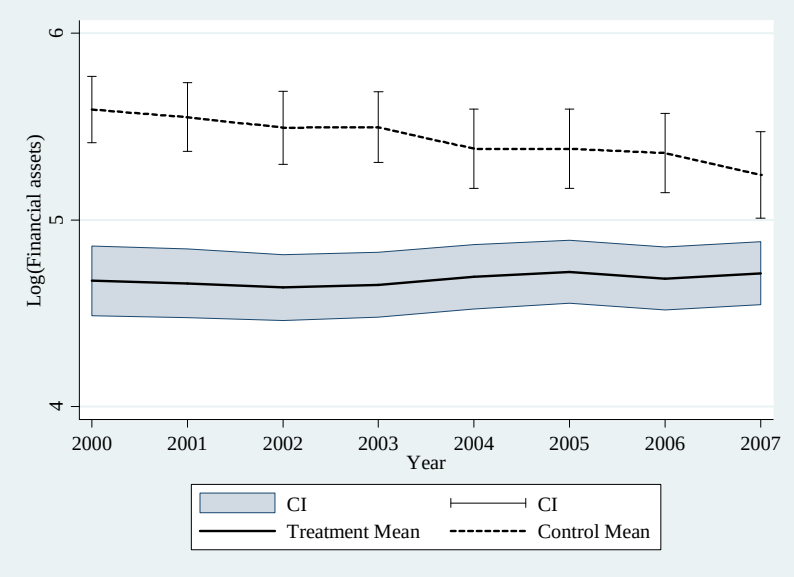

Figure 4: Mean of Log(employees) from 2000 to 2007: treatment and control groups

Appendix 3

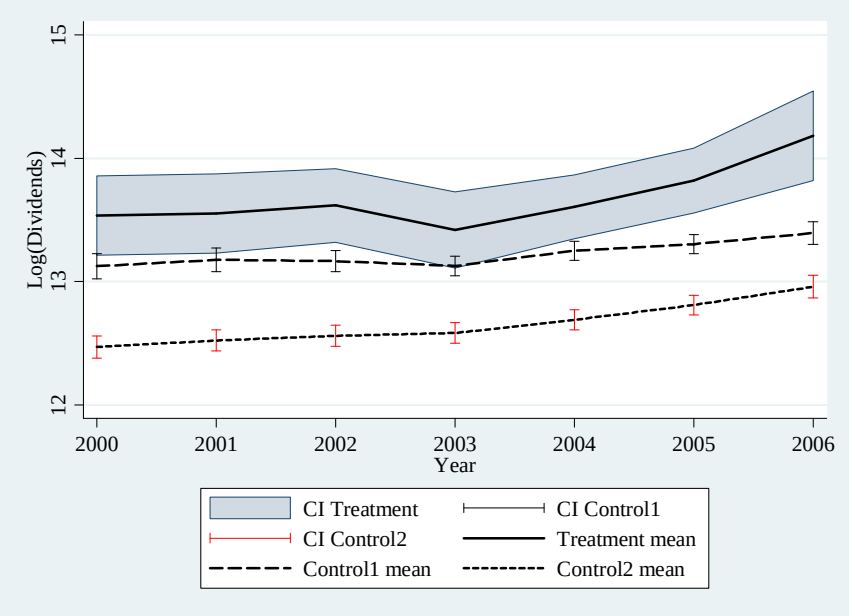

Figure 5: Mean of Log(EBIT) from 2000 to 2006: treatment and two control groups

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ISBN 978-952-274-003-8
ISSN 1798-0283