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Abstract

This dissertation consists an introductory chapter and four empirical essays on the taxation of firms and individuals. The first essay concentrates on how the Finnish tax reform of 2005 affected voluntary pension plan savings in Finland. The main objective is to examine whether or not the coverage and/or the amount of savings in voluntary pension plans changed as their tax treatment changed from progressive labor income taxation to being subject to a flat-rate capital income taxation regime. The results imply that high-income individuals who faced a decrease in their tax incentive to save in these plans reduced their voluntary savings. Savings coverage also decreased in this group but increased among low-income individuals whose incentives to save increased. It also seems that all of the responses were due solely to a change in men's behavior.

The second essay studies tax planning activity among business owners. The study uses a corporate and dividend tax reform in Finland in 2005 as an exogenous source of tax rate variation. The reform increased the marginal tax rate on dividends, thus increasing the incentives for business owners to pay personal compensation in the form of wages rather than dividends. The results support the view that business owners are active in income-shifting. The welfare loss calculations show that the responses have notable consequences for welfare. Also, the size of the change in the tax incentive and the monetary gains from tax optimization seem to affect the behavioral income-shifting response.

The third essay examines the abolition of equalization tax in Finland in 2005. The aim of the equalization tax was to protect domestic tax revenues by ensuring that no dividends could be distributed from profits that were not subject to domestic corporate tax. Equalization tax served this goal by levying an extra corporate-level tax if dividends were financed from tax-exempt (or leniently taxed) profits and MNEs were

particularly affected by this tax. We find that MNEs increased their dividend payments after the repeal of the equalization tax. Also, the repatriation of foreign profits in the form of intra-company dividends increased among MNEs. Furthermore, the results imply an increase in the reported profits of foreign subsidiaries of Finnish MNEs, suggesting a decrease in profit-shifting. However, there are no changes in the level of real or financial investments due to the abolishment of EQT.

In the fourth essay we analyze the effects of a reduction in the value-added tax rate for restaurants in Finland on consumer prices, demand for meals and employment. The value-added tax rate was cut from 23% to 13% in July 2010. The results show that the VAT cut reduced restaurant meal prices only a little, by 2% on average. The reduction we found was only a fourth of the full pass-through. The consumer-weighted price response is higher, over half of the full pass-through, implying that larger restaurants reduced their prices more than smaller establishments. There is also substantial heterogeneity in price responses by restaurant type as restaurants that are part of a chain lowered their prices more often than those that do not belong to a chain. The results suggest that the VAT reduction led to no increase in the quantity of restaurant meals supplied and no increase in employment. Also, we do not find that the reform led to any changes in the number of exits from the industry or new businesses being set up.

Keywords: Taxation, Tax reforms, Firms, Individuals

Tiivistelmä

Tämä väitöskirja sisältää johdantoluvun ja neljä itsenäistä artikkelia verotuksen vaikutuksista yritysten ja yksilöiden käyttäytymiseen. Ensimmäisessä artikkelissa tutkitaan, miten vuonna 2005 Suomessa toteutettu verouudistus vaikutti vapaaehtoiseen eläkevakuutussäästämiskäyttäytymiseen. Päätavoitteena on selvittää, muuttuiko säästämisaktiivisuus ja keskimääräiset talletukset eri ryhmissä säästöjen verokohtelun muuttuttua progressiivisesta ansiotuloverojärjestelmästä suhteelliseen pääomatuloverojärjestelmään. Tulokset osoittavat, että suurituloiset vähensivät säästöjään vapaaehtoisiin eläkevakuutustileihin uudistuksen jälkeen. Lisäksi suurituloisten säästämisaktiivisuutensa laski, kun taas pienituloisten säästämisaktiivisuus nousi hiukan. Tulosten perusteella muutokset koskivat yksinomaan miesten säästämiskäyttäytymistä.

Toisessa artikkelissa tarkastellaan listaamattomien osakeyhtiöomistajien tulonmuunnon aktiivisuutta. Tutkimuksessa keskitytään tarkastelemaan Suomessa vuonna 2005 toteutetun yritys- ja osinkoverouudistuksen vaikutuksia omistajien tulolajin valintaan osinkojen ja palkkojen välillä. Uudistus kasvatti selvästi omistajien kannustimia maksaa palkkaa osinkojen sijaan. Tulosten perusteella verouudistus vaikutti selvästi tulolajin valintaan. Tämänkaltaisella käyttäytymisellä arvioidaan olevan merkittäviä vaikutuksia hyvinvointiin. Tulosten perusteella myös verokannustimen muutoksen suuruudella ja siitä saatavalla rahallisella säästöllä on vaikutus verosuunnittelun laajuuteen.

Kolmannessa tutkimuksessa tarkastellaan ns. täydennysveron poistamisen vaikutuksia monikansallisten yhtiöiden toimintaan. Täydennysveron tavoitteena oli varmistaa, että osinkoa ei voi jakaa voitoista, jotka eivät kuulu kotimaan yhtiöveron piiriin. Yritys joutui maksamaan täydennysveroa, jos osinkoja rahoitettiin verovapailla voitoilla. Täydennysvero poistui käytöstä vuonna 2005, kun yhtiöveronhyvitysjärjestelmästä luovuttiin. Tulosten mukaan monikansalliset yritykset kasvattivat osingonmaksuaan

täydennysveron poistuminen jälkeen. Myös kotiutettujen ulkomaisten voittojen määrä kasvoi sisäisten osinkojen muodossa. Lisäksi tulokset osoittavat, että suomalaisten monikansallisten yritysten ulkomaisten tytäryhtiöiden voitot kasvoivat täydennysveron poistamisen jälkeen, mikä viittaa siirtohinnoittelun pienenemiseen. Mitään muutoksia investoinneissa ei kuitenkaan havaittu.

Neljännessä artikkelissa tutkitaan ravintoloiden arvonlisäverokannan alennuksen vaikutuksia kuluttajahintoihin, aterioiden kysyntään ja työllisyyteen. Ravintoloiden arvonlisävero alennettiin 23 prosentista 13 prosenttiin heinäkuusta 2010 alkaen. Tulokset osoittavat, että arvonlisäveron alentaminen laski ravintola-aterian hintaa vain vähän, keskimäärin noin 2 prosenttia. Liikevaihdolla painotettu hintavaikutus oli suurempi, mikä tarkoittaa, että suuremmat ravintolat alensivat hintojaan enemmän kuin pienemmät. Ravintolan tyyppi vaikutti myös vahvasti hintamuutokseen, sillä ravintolat, jotka kuuluivat ketjuun alensivat hintojaan huomattavasti useammin kuin ketjuun kuulumattomat ravintolat. Tulokset osoittavat, että aterioiden kysyntä ei lisääntynyt eikä työllisyys kasvanut veronalennuksen seurauksena. Myöskään poistuvien ravintoloiden tai uusien ravintoloiden määrissä ei havaittu muutoksia.

Asiasanat: Verotus, verouudistukset, yritykset, yksityishenkilöt

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Helsinki, December 2013

Jarkko Harju.

Contents

CHAPTER 1

Introduction

This dissertation comprises four empirical essays on the taxation of firms and individuals. In particular, this study analyzes the effects of various tax reforms. The first essay studies the effects of taxes on the decisions of individuals concerning voluntary pension savings. The second essay evaluates the effects of tax incentives on income-shifting between tax bases among business owners. The third essay concentrates on the responsiveness of multinational enterprises to taxes. The fourth essay examines the effectiveness of consumption taxes levied on restaurants. Thus the essays in this dissertation are highly policy-relevant and contribute to the field of empirical public economics.

This chapter is organized as follows. First I make some general remarks about taxation in section 1.1. Section 1.2 briefly discusses efficiency and equity aspects in tax design and section 1.3 offers a view of how we should analyze the effects of taxation empirically. In section 1.4 I discuss the interpretation of the empirical observations. Finally, in section 1.5 I present a summary of each article.

1.1. Taxation: general remarks

Public spending needs to be funded by taxes. At the very minimum, public spending guarantees national defense and the maintenance of law and order in a state. However, in many countries public spending includes various other expenses, e.g. health care, schooling and retirement benefits, which are, at least, partly funded by government, therefore increasing the need for more tax revenue. Although public spending sets

a level for tax revenue, these two are not completely independent from each other. For example, government's high emphasis on redistributing income in spending side certainly also affects the structure of tax system. In this dissertation I do not focus on the combined structure of public spending and taxation, as I take the level of spending given.[1]

In general, tax revenue is mainly collected by taxing consumption and capital, corporate and personal income, which are all relevant from the point of view of this dissertation. Taxes can be divided into two categories: indirect and direct taxes. The former are taxes that are collected in the production process, and not levied directly on income. The latter, on the other hand, are levied directly on income. Consumption taxes offer an example of indirect taxes, whereas capital, corporation and personal income taxes are examples of direct taxes.

1.2. Designing a tax system

The question of how to collect tax revenue to fund public spending is at the core of public economics and leads to considerations of how to design a tax system. The design of a tax system essentially raises issues concerning the efficiency and equity of the system.[2]

As regards efficiency, traditional economics textbooks will say that the market offers efficient outcomes (Myles (1995)). However, there are many different markets operating in the real world. Thus it is hard to find an efficient outcome for each and every market. In some cases markets may even generate market failures. In such cases, government intervention may actually increase efficiency. However, the standard approach to examining the efficiency of taxes is to offer insights into how taxes could cause as little inefficiency as possible.

[1] Tanzi and Schuknecht (2000) offer a nice review of historical trends in taxation and public spending.
[2] Administrative costs and the transparency of a tax system, for instance, are also important when designing a tax system.

Taxes alter relative prices in a market and create a wedge between the price paid by the buyer and the price received by the seller. In this dissertation the clearest example of this is given in chapter 5, where the VAT on restaurant meals represents the wedge. Consequently, this clearly creates costs for both consumers and firms compared to a case without VAT. This leads to considerations of how and to what extent economic agents respond to these price changes and how large the costs of these price changes are for agents.[3]

In general, to be able to design a tax system we should have information on how taxes affect the behavior of individuals and firms. Theory provides mechanisms and predictions which are then tested empirically. In a good and credible empirical study the aim should be to estimate the behavioral parameters produced by the theory. In this way we can gain an understanding of the real causes and the extent of the effects. Empirical results with an adequate theory provide information about the effects, which then offers us a framework in which to design tax systems. In this dissertation I estimate the effects of various tax reforms on the behavior of individuals and firms which are then applicable in designing a tax system.

Nevertheless, equity reasons are also important. Although private markets may offer efficient outcomes, they may not always be distributionally optimal or socially desirable. A government may want to adjust the distribution of income through taxes and subsidies, although this could cause inefficiencies in the economy. This leads economists to study the equity aspects of tax reforms.

The design of a tax system is complicated as there is commonly a trade-off between the two perspectives of equity and efficiency: the objective of creating a more equal tax system causes more inefficiency, and vice versa. Consider, for example, that the objective is to obtain a more equal income distribution through income taxation or

[3]A recent and very comprehensive book on tax design is the Mirrlees review (2010 and 2011).

subsidies to the poor. Such an objective requires an increase in the progressivity[4] of the tax code. This creates detrimental incentives in the economy which could then lead to an increase in inefficiency due to changes in the behavior of economic agents.

The focus in this dissertation is solely to investigate the efficiency, and not the equity, aspects of various taxes.

1.3. Methods: seeking credible evidence

There is a clear tension in the field of empirical reseach in economics between so-called 'structural' and 'reduced-form' approaches (see Chetty (2009a)). The structural approach tries to model the complete economy from economic behavior and then estimate the effects of the policy on behavior and welfare. The reduced-form approach instead tries to estimate the effects of a certain exogenous shock on behavior. Proponents of the structural approach claim that there is only little we can learn from the results of reduced-form studies in terms of welfare analysis. Then again, proponents of the reduced-form approach say that the identification in structural studies is often too suspicious, for example because of the strong assumptions, omitted or unobservable variables and selection problems.

There is also a middle ground between these two approaches called the 'sufficient statistic' view (Chetty (2009a)). This view derives welfare formulas in which estimates from program evaluation can be used. My study builds on the reduced-form way of thinking but I also discuss the welfare consequences of the results in each chapter.

In recent years, an increasing number of empirical economics studies in various subfields have concentrated on estimating the effects caused by government interventions on economic outcomes using micro data. Angrist and Pischke (2010) present a description of developments in empirical research in economics. Over the last couple of

[4]Progressivity means that the tax rate on a marginal increase in income is higher than the average tax rate. Thus, the average tax rate increases as income rises.

decades the micro-based empirical methods have been vastly expanded. Experimental research designs have mostly replaced previous methods mainly based on correlations. Although the aim in economics has always been to estimate causal effects, nowadays identification is usually taken more seriously than before. Economists are keen to use methods concentrating on how we can identify the effects of certain changes, e.g. in government policy. In a way this is also what separates empirical economics from other social sciences, as identification is much more the focus in economics than in other social sciences. Much of this development in the field of empirical research in economics is due to the increase in academic interest in policy-relevant questions, especially in the field of public economics. This has led to a concentration on the design of empirical work.

The most promising way for economists to be able to solve the effect of one variable on another is to organize random trials. In this case, a randomly chosen group faces a treatment, while another group does not (i.e. the latter is used as a control group). It is then possible to compare the outcomes of these two groups. In such randomized trials, the 'internal validity' of the results is commonly good, meaning that the empirical design determines cause-and-effect relationships. However, there are also some problems in randomized trials. One, perhaps the greatest, of the challenges in randomized trials is the 'external validity' of the results: how well the results are applicable to other groups. Some studies of this type use small and very specific populations of people which give clear effects for those individuals, but the results may not necessarily offer insights for wider interpretation. Thus, one can see a trade-off between internal and external validity. The critics have claimed that the focus is too much on details, and not enough on generally important topics. Surely this may be true in various cases, but nevertheless a small and narrowly defined population could offer new insights which could then be extended, with certain assumptions, to broader populations.

Empirical public economics literature has also progressed in recent years. However, clean-cut random trials are rare in the public economics literature. This is natural as, for example, it is hard to get policy makers to randomize tax rates for people.[5] Thus a much more common research design in the field of empirical public economics is natural experimental methods, utlizing government interventions as an exogenous variation. These methods are closely related to randomized experimental designs. However, in natural experimental designs the conditions of the exogenous experiment are determined naturally, whereas in randomized experiments the experimentalist determines the conditions. In natural experimental designs the external validity is usually good, but often it can be hard to demonstrate the internal validity convincingly. In this dissertation I use natural experimental methods as I analyze the effects of tax reforms.

The methods that economists use in natural experimental studies are commonly instrumental variables, regression discontinuity methods and difference-in-differences.[6] The last, differences-in-differences, is the one that is used the most in this thesis with panel data. The intuition of the method is to have two groups of firms or individuals, one confronting a specific treatment (treatment group) and one being left untreated (control group). The outcomes of these groups are compared over time, before and after the treatment. The main identifying assumption is that, in the absence of the treatment, the average outcomes of the treatment and control groups would have developed along parallel trends over time. Also, the composition of the agents in the two groups should remain the same over time. If convincingly demonstrated, the difference-in-differences method shows the causal effect of a treatment.

[5]However, this does not mean that there is no room for random trials in public economics. In the US, the government randomized negative tax rates for individuals already in the late 1960s (Moffitt (2004)). Also, many subfields in public economics have gained their strongest evidence based on randomized experiments, e.g. tax evasion literature (Slemrod et al. (2001), Kleven et al. (2011)).

[6]Imbens and Wooldridge (2009) offer an extensive review of recent developments in empirical econometrics.

In chapters 2, 4 and 5 the method I apply is the difference-in-differences approach. In chapter 2 I construct the treatment group based on the information from the pre-reform characteristics of individuals that had an incentive to change their voluntary pension plan saving behavior as a result of the tax reform. The control group contains individuals who did not face changes in the taxation of their savings. Similarly in chapter 4, the treatment group contains multinational firms that faced an incentive change due to the tax reform. Those firms are compared to similar firms that did not have a change in their tax incentives. In chapter 5 the comparisons are between industries and countries that resemble each other. In this essay, restaurants in Finland are compared over time in particular to Estonian restaurants, and also to Finnish hotels. In chapter 3 the method applied is the first-difference model, which is closely related to the difference-in-differences method. In this chapter we see that tax incentives following the reform changed differently for similar business owners, which enables us to apply the first-difference model. In this chapter we also apply another natural experimental method, the instrumental variable approach.

In addition to developments in experimental research design, the literature on statistical significance has progressed considerably over the last decade. Many papers have found that the way the standard errors are calculated when using experimental designs is definitely not trivial (Bertrand et al. (2004), and Cameron et al. (2008)). This is important in order to credibly conclude the statistical significance of the results.

Also, the sensitivity of the results is taken into account more seriously in current research than it was a decade or two ago. Robustness checks and placebo treatments are more thorough nowadays and articles without these are not likely to fulfill academic standards. I also discuss these issues in every chapter separately. Also, many academic journals have recently started to require the data on which the analysis is made, in order to allow anyone to replicate the results. This further guarantees the trustworthiness of the analysis.

In addition to developments in the methods of microeconometrics, the amount and quality of data available have also increased a lot in recent years. In particular, register-based micro-level data sets have become available to researchers. This offers exact precision, which, with new innovative ways to examine the responses to agents' behavior, increases the overall quality of the empirical research.

In this dissertation the data sets are always based on registers. In the first essay I apply individual-level data produced by Statistics Finland, including basically all relevant tax variables from the register and also many important categorical variables. The data are a representative sample of the Finnish population. In all the other chapters the main data come from the Finnish Tax Administration. The unique characteristic of the data is that they basically include all Finnish firms and they contain all relevant information on the financial statements and taxation of firms. In addition, the second essay makes use of owner-level data for business owners, including personal level information, which are used together with the firm level information. In addition, all the data sets used in this dissertation are in panel form, containing observations for the same individuals or firms over time. These data sets offer very precise information which will produce results that are representative for the whole population.

1.4. Behavioral responses - what matters?

Generally the costs of taxes are greater than the increase in revenue from the taxes. The difference between these is often called the deadweight loss or the excess burden of the tax, which measures the efficiency of the tax. The deadweight loss of a tax is commonly analyzed by comparing distortionary tax to non-distortionary lump-sum tax, which does not by definition offer any incentives for behavioral changes. The magnitude of the deadweight loss depends on the extent to which agents change their behavior due to the tax. Subsequently, for efficiency analysis, it is very important to know the elasticity of the response to the tax change.

In general, there are two channels of responses: the substitution effect and the income effect. The substitution effect means that, in the case of income taxes for example, the income earned per working hour is smaller, and thus makes it less attractive for consumers to work as much as without taxes. On the other hand, the income effect goes in the opposite direction, the loss in income from taxes encouraging consumers to work more to guarantee a certain income level. The income effect is also present with lump-sum taxes, but the substitution effect is not. Empirical studies have found the substitution effect to be the dominant channel of the two.

The history of economics shows that economists have claimed taxes to have different effects at different times. Previously it was common for economists to be certain that, for example, income taxation creates greatly harmful behavioral responses. Income taxation was found to be very detrimental especially for work incentives (Feldstein (1995)). Recently, this conclusion has been challenged by the view that income taxation has a much smaller effect on real economic variables for most individuals (Saez et al. (2012)). This is mostly related to the development of empirical methods and data availability.

However, even though the change in thinking in many fields and the developments in empirical methods have happened very recently, already two decades ago Slemrod (1992) offered an interesting view of how we should construct our thinking on the effects of taxes. He analyzes the evidence from the 1980s tax reforms in the US and constructs a view of what we can learn from these responses.

Taxes may have complex effects. According to Slemrod, the relative price changes due to tax changes can affect various outcomes. In addition to real responses, there are also other relevant margins of response which should be separated. Examples of these are misreporting of income, the structure of financial claims, the legal form of organizations, transactions over time, etc. Based on these, Slemrod creates a hierarchy structure of behavioral responses to taxation. The first tier is the timing of transactions.

This concerns the question of whether there are opportunities over time to realize tax savings that outweigh the costs. This could be seen as a reaction to the change in tax law with only a temporary change in behavior.

The second tier is financial and accounting responses. Evidence that supports the rearrangement of economic claims falls under this category. This could be possible e.g. where there are two tax bases only one of which is changed. In chapters 3 and 4 we find evidence supporting this type of behavior.

The third channel is the real economic decisions of economic agents. These are, for instance, decisions regarding hours of work by individuals, investment decisions by firms etc. This is also the most fundamental channel of response. These responses are analyzed especially in chapters 4 and 5.

However, it is also essential to consider the costs caused by taxes together with the channel of response. Costs resulting from time transactions or the restructuring of financial claims are different e.g. to those related to real economic decisions regarding hours of work. If, for example, the elasticity with respect to the income tax on work participation or hours of work is large, the deadweight loss could also be large. But if the response to taxes is only in transactions over time or the restructuring of financial claims, the deadweight loss can be very different and much lower even if the response in these margins is large. Therefore it is not only relevant to know the different margins of response, as Slemrod noted, but it is also important to know the extent of the costs caused by taxes in order to be able to analyze the welfare effects of the taxation (Chetty (2009a and 2009b)). This could lead to very different conclusions about the efficiency of the tax system. I offer interpretations of my findings from the efficiency perspective at the end of each subsection in section 1.5 after I present the main observations of each paper.

1.5. Summary of essays

1.5.1. Voluntary pension plan savings. Many western countries face increasing difficulties in financing their current social security programs due to the decreasing proportion of the working-age population. In response they have been cutting the future scope of their public pay-as-you-go pension systems. In order to guarantee an adequate level of old-age income, they have tried to encourage individual pension savings by granting tax allowances.

The most common reason for encouraging tax-deferred voluntary pension plans (VPP) is to increase the aggregate savings rate and secure the income of retired persons. The paternalistic argument in favor of preferential tax treatment is that savers are myopic and they start to provide for pension savings too late and save too little. Also, the huge heterogeneity in people's saving behavior, with some saving too much and some not enough, could be a reason for governments to allow tax preferred pension schemes (Banks and Diamond (2010)).

However, there are counter-arguments too. Only a small part of the increased pension funds are new savings. Most are actually transfers from other savings instruments to tax-preferred instruments (see e.g. Attanasio et al. (2005), Chung et al. (2008) and Disney et al. (2010)). In addition, many front-loaded VPP instruments are problematic in countries where certain subpopulations can get larger tax advantages than others. This is especially true if the taxation is progressive.

The purpose of this paper is to analyze empirically how the Finnish tax reform of 2005 affected the behavior of VPP savers in Finland. The main objective is to examine whether or not the coverage and/or the amount of savings in VPPs changed. The reform altered the savings tax incentives as the tax treatment of VPPs changed from progressive labor income taxation to a flat-rate capital income taxation regime. In the

previous tax schedule it was problematic as individuals faced different savings incentives depending on their taxable income.

According to the results, it seems obvious that the reform of 2005 affected the VPP savings behavior of individuals. High-income individuals who faced a decrease in their tax incentive to save in VPPs reduced their savings. Also the savings coverage among such persons decreased but increased among low-income individuals whose incentive to save in VPPs increased. It seems that all of the responses were solely due to a change in men's behavior. Thus women did not change their behavior at all as a result of the reform.

However, much of the responses could come from individuals' reallocation of savings and not from changes in total savings, as many previous studies have indicated. Unfortunately, due to the lack of micro data on total savings, this study cannot answer how aggregate savings were affected by the reform. For this reason it is hard to offer a conclusive analysis of the effectiveness of the taxes on savings based on the results of this paper.

1.5.2. Income-shifting between tax bases. Behavioral responses to income taxation decrease the efficiency of a tax system. One source of this kind of inefficiency is tax avoidance activity. Income-shifting between differently taxed tax bases is a common example of a tax avoidance channel. Income-shifting is generally recognized in the economic literature, but only a few studies have offered credible empirical estimates of the extent of it (Gordon and Slemrod (2000), Fjaerli and Lund (2001), Sivadasan and Slemrod (2008), Pirttilä and Selin (2011)).

Income-shifting is especially relevant for entrepreneurs and the owners of privately held businesses. Compared to wage earners, entrepreneurs and business owners have greater legal possibilities to engage in income-shifting, as they can more easily apply

different types of income as a source of personal compensation. Income-shifting possibilities created by the tax code are especially pronounced within a so-called dual income tax system, in which the effective marginal tax rate schedules for labor income and capital income differ significantly from one another.

Finland applies the principle of dual income taxation for individuals, under which a business owner's wages and dividends from the firm are taxed differently. The article uses the extensive corporate and dividend tax reform of 2005 as an exogenous source of tax rate variation. The reform increased the marginal tax rate on dividends, thus increasing the incentives for business owners to pay wages instead of dividends as a form of personal compensation.

The results support the view that business owners are active in income-shifting. Increased dividend taxation following the 2005 tax reform led owners to adjust the composition of their income by significantly increasing wage compensation at the expense of dividends. From the welfare loss point of view, the income-shifting response was notable. In addition, there was not much heterogeneity in the income-shifting response between different entrepreneurs or firms. However, the size of the tax incentive change and the monetary gains from tax optimization seemed to affect the behavioral income-shifting response.

The results imply a welfare loss due to the income-shifting responses. Nevertheless, the welfare effect of income-shifting depends strongly on the marginal resource cost. If it is very small, the welfare loss is also small (see Chetty (2009b)). The costs are very difficult to approximate as we do not have any direct data for them. Although these costs are not necessarily great, the results suggest that costs have an effect on the estimate of income-shifting. Thus the costs are certainly not negligible. From that perspective income-shifting still creates inefficiencies in the economy. The inefficiency caused by income-shifting might be mitigated by simply re-designing and adjusting the tax code and regulations.

1.5.3. Equalization tax. The role of multinational enterprises (MNEs) has increased in the world economy in the last couple of decades. MNEs operate in various countries which offer them possibilities to exploit cross-country differences in tax systems. This development has increased interest in international tax design issues among both policymakers and academics. Therefore it is no surprise that several OECD countries have reformed their corporate tax systems very actively in recent years. A common trend in Europe has been to reduce tax rates on corporate profits. The European trend can be explained at least partly by a worry that firms might increasingly move their operations to other countries. MNEs also exploit variations in tax rates across countries, thus lowering the tax bases in high tax rate countries.

Given the importance of MNEs and the difficulties in designing the taxation applying to them, there has been surprisingly little empirical research establishing natural experimental evidence between taxes and the behavior of MNEs (Bond et al. (1996), Bond et al. (2007), Hines and Rice (1994), Clausing (2003), Bartelsman and Beetsma (2003) and Huizinga and Laeven (2008)).

This article studies the abolition of equalization tax (EQT) in Finland in 2005. It is used as a natural experiment to examine the behavioral responses of MNEs to taxes. The aim of EQT was to protect domestic tax revenues by ensuring that no dividends can be distributed from profits that are not subject to domestic corporate tax. EQT served this goal by levying an extra corporate-level tax if dividends were financed from tax-exempted (or leniently taxed) profits, and MNEs were particularly affected by this tax. The main interest lies in the effects of the abolishment of EQT on dividends, investments and the use of alternative channels to repatriate foreign profits.

The empirical results suggest that affected firms increased their dividend payments. Also, the repatriation of foreign profits in the form of intra-company dividends increased after the repeal of EQT. Furthermore, the results imply an increase in the reported profits of foreign subsidiaries of Finnish MNEs, suggesting a decrease in profit-shifting.

However, there are no changes in the level of real or financial investments. The results emphasize the sensitivity of dividend decisions to taxes both outside and inside an MNE.

Nevertheless, it seems that taxes do not affect the real decisions of MNEs as their investments do not change. The only channels of response seem to be between the financial accounts of firms across countries, the second tier in the Slemrod (1992) article mentioned before. Thus, even though there are clear responses to taxes in the behavior of MNEs, efficiency is not necessarily affected much as real economic responses, in terms of changes in investments, are not detected.

1.5.4. Consumption tax. In many countries the share of consumption taxes of total tax revenues has increased significantly in recent years. In addition, many governments have tried to stimulate certain industries by allowing them to have reduced consumption tax rates. These policy changes have been targeted at labor-intensive industries. The main objective was to stimulate employment, but also to reduce the incentive for these businesses to operate in the black economy (CD Directive 1999/85/EC).

Despite the vast theoretical literature (e.g. Ramsey (1927), Atkinson and Stiglitz (1976), Myles (1989)), currently there is surprisingly little empirical literature concerning the effects of consumption taxes on prices, demand and employment (Carbonnier (2007), Doyle and Samphantharak (2008), Kosonen (2010), Marion and Muehlegger (2011)). Also, many previous studies focus solely on price responses. However, price responses are not sufficient statistics for efficiency analysis. It is more important to know the demand elasticity.

According to theory, goods with less elastic demand should be taxed more than goods with high elasticity (Ramsey (1927)). Therefore it is important to study to what extent consumption tax affects consumer prices and demand. This paper tests these impacts with an analysis of the effect of a cut in the value added tax (VAT) rate on

restaurants in Finland when the VAT rate was cut from 23% to 13% from July 2010. Also, the paper analyzes the effects of the reform on employment as the main objective was to stimulate job creation.

The results show that the VAT cut reduced restaurant meal prices by approximately 2% for a representative restaurant in Finland. The implied full pass-through would have been a 7.4% decrease in consumer prices. Thus the reduction we found was a fourth of the full pass-through. The consumer-weighted price response is higher, over half of the full pass-through, implying that larger restaurants reduced their prices more than smaller establishments. There is substantial heterogeneity in the price responses by firm-level characteristics. Restaurants that are part of a chain lowered their prices more often than those not belonging to a chain. The results suggest that there was no quantitative increase in demand for restaurant meals and that employment did not increase as a result of the VAT reduction. Also, there was no change in the number of exits from the industry or new businesses established in the industry due to the reform.

The results imply that the VAT reduction for restaurants did not manage to accomplish its main objective, which was to increase employment in the industry. Also, the reform reduced prices only a little and the demand for restaurant meals did not change. This leads to the conclusion that demand for restaurant meals is inelastic and that the VAT reduction for restaurants was not very efficient.

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CHAPTER 2

Voluntary Pension Savings and Tax Incentives: Evidence from Finland[1]

ABSTRACT. This paper studies empirically savers' behavioral responses to the Finnish tax reform of 2005 by using a comprehensive panel data. The tax schedule of voluntary pension savings changed from progressive to proportional, changing the saving incentives in different subgroups. The results indicate that the reform altered saving behavior by reducing voluntary pension saving coverage among high income-earners by 4 percentage points and increasing it among low income-earners by 2 percentage points. The reform also reduced annual saving contributions among high income-earners by over 20 percent. The estimated effects result entirely from the changed saving behavior of men.

Keywords: Voluntary pension savings, Tax reform, Tax incentives

JEL classification codes: H24, H31

2.1. Introduction

Many western countries face increasing difficulties in financing their current social security programs due to the decreasing proportion of the working-age population. In response they have been cutting the future scope of their public pay-as-you-go pension systems. In order to guarantee an adequate level of old-age income, they have tried to encourage individual pension savings by granting tax-allowances. Well known examples of tax-favored individual pension savings plans are the IRAs[2] and 401(k) plans in the USA, Personal and Stakeholder pensions, and ISAs and TESSAs in the UK and Riester

[1]This paper has been published in FinanzArchiv Public Finance Analysis, Vol 69, March 2013, 3-29.

[2]List of abbreviations in the order of appearance in the paper: IRA, Individual Retirement Arrangement; ISA, Individual Savings Account; TESSA, Tax-Exempt Special Savings Account; EET, Exempt Exempt Taxable; TEE, Taxable Exempt Exempt; TR2005, Finnish Tax Reform on voluntary pension savings in 2005; VPP, Voluntary Pension Plan; TyEL, earnings-related pension; GDP, Gross Domestic Product; DIT, Dual Income Tax; METR, Marginal Effective Tax Rate; MTR, Marginal Tax Rate; OLS, Ordinary Least Squares.

pensions in Germany. Most OECD countries provide special tax treatment for some sort of individual saving plans (OECD 2005). A common system is EET (exempt-exempt-tax) which allows the saving to be deductible from the income tax base, the earnings of pension accumulations are tax-free, and the pensions, when withdrawn, are taxable income. Another widely used system is TEE (tax-exempt-exempt) where contributions are taxed but accrued interest and benefits are untaxed.

The most common motivation for tax-deferred voluntary pension plans is to increase the aggregate saving rate and secure the income of retired persons.[3] The paternalistic argument in favor of preferential tax treatment is that savers are myopic and they start to provide for pension savings too late. Some economists also argue that the illiquidity of pension savings makes their elasticity differ from that of precautionary savings. This would justify preferential tax treatment for pension savings (Fehr et al. 2008, p. 193). In the recent Mirrlees review, Banks and Diamond (2010) discuss why tax-favored pension savings are important. Their most fundamental argument for tax-favored treatment is the huge heterogeneity in people's saving behavior: some save too much and some do not save enough. They also argue that other methods should be thought of than just exemptions from tax bases. For example, it would be possible to increase the role of employers or financial institutions in the private pension saving markets.

However, there are some counter-arguments too. Only a small part of the increased pension contributions are new savings. Most is actually transfers from other savings instruments to tax-preferred instruments.[4] In addition, many front-loaded voluntary pension plan instruments are problematic in countries where certain subpopulations

[3]Bernheim (2002) presents a comprehensive analysis concerning taxation and savings.

[4]General equilibrium models are used to estimate the effects of voluntary pension plan savings on the capital stock and incremental savings. Imrohoroglu et al. (1998) have concluded that there are increases in national net savings, capital stock and additional savings but the effects are not extensive. Fehr et al. (2008) estimated the additional savings to be 22% higher than in the Imrohoroglu et al.

can get larger tax advantages than others. This is especially true if the deductions are made based on progressive taxation.

The purpose of this paper is to analyze empirically how the Finnish tax reform of 2005 (TR2005) affected the behavior of voluntary pension plan (VPP) savers in Finland. The main objective is to examine whether or not the coverage and/or the amount of savings in VPPs changed. Before the reform, savings were deducted from labor income and the benefits were taxed as labor income, subject to a steeply progressive tax rate schedule[5]. TR2005 changed the tax treatment to a flat-rate capital income taxation regime. The previous tax schedule was seen as being problematic as the individuals faced different saving incentives depending on their taxable income.[6] The most drastic incentive change was among high income earners who were close to retirement age. Among young and middle income individuals the change in the incentives was very moderate, if any. Due to this variation, the reform seems to open up an interesting opportunity to estimate the effects of the tax change on different income groups.

This paper applies the TR2005 as a natural experiment using a difference-in-difference method. In the analysis, the control group is formulated for middle income individuals, who are compared to high and low income individuals who faced the largest changes in their saving incentives.

The questions examined by Attanasio et al. (2005), Chung et al. (2008) and Disney et al. (2010) are closest to that of this paper. Attanasio et al. (2005) studied the effect of tax deductions on saving behavior in the UK. They examined the tax reform of 1999 and found that the amount of tax-exempted savings increased in all age groups due to the reform. Particularly young people saved more. However, at the same time,

[5]Finnish income taxation follows the Nordic dual income tax system in which labor income is subject to a progressive tax schedule whereas capital income is taxed using a flat tax rate. (See Sørensen (1994), (2005)).

[6]Kari and Lyytikäinen (2004) and Määttänen (2005) have drawn attention to this incentive aspect of TR2005.

the amount of aggregate savings decreased in all age groups and the largest decreases were among the young and low-income groups. Chung et al. (2008) and Disney et al. (2010) studied the UK tax reform of 2001. Chung et al. did not find any significant growth in new private savings after the reform. However, in the case of low labor incomes the amount of savings increased. Another focus in their study was the changes in the coverage of having a retirement plan before and after the reform. There was no evidence indicating any increase in the coverage. Disney et al. argued that the associated change in the contribution ceiling benefited low and zero-earners; this group added the coverage of savings in voluntary pension accounts. The results also provided evidence that women added coverage. In contrast to the rest of the sample, the level of contributions among those who benefiting from the higher contribution limit did not fall.[7]

According to my results, it seems obvious that TR2005 affected the VPP saving behavior of individuals. The coverage of high income earners decreased after the reform by 4 percentage points and contributions went down by 20 percent compared to middle income earners. Low income earners increased their participation rate by 2 percentage points but their level of savings did not change. These results seem to be consistent with the theoretical results. In addition, it seems that all of the responses were due to a change in men's behavior. Thus, women did not change their behavior at all. However, much of the responses could come from individuals' reallocation of savings and not from the changes in total savings, as many previous studies have indicated. Unfortunately, due to the lack of micro data on total savings, this study cannot answer how aggregate savings were affected by the reform.

[7]There is also a comprehensive previous literature about the effects of tax-deductible savings on aggregate savings in the US (see e.g. Engen et al. (1994), Venti and Wise (1992, 1995), Attanasio and DeLeire (2002), Benjamin (2003), Chernozhukov and Hansen (2004).

The paper proceeds as follows. In the second section, I present a short introduction to the Finnish VPP savings scheme and the tax system related to it, and I will also describe the model for assessing the effective tax rate for savers before and after TR2005. The third section contains empirical analysis where I introduce the hypotheses and explain the econometric method used, in addition to which I present the data set and offer the estimates of the responses to TR2005. Finally, in the fourth section I present my conclusions.

2.2. Voluntary pension plans in Finland

In the international literature it is common to describe pension systems in terms of three 'pillars'. In Finland the pension system[8] is based on a public first pillar which is divided into two parts. First, the national pension is the basic tier which is a flat-rate benefit, financed through taxes and contributions. The second part is the earnings-related pension (TyEL), which is financed from compulsory contributions paid by employees and employers[9]. The second pillar complements the first pillar and includes voluntary collective industry-specific or employer-specific schemes. The third pillar comprises voluntary pension plans (VPPs).

The public pension provision is comprehensive in Finland, representing over 10 per cent of GDP. This share is expected to grow in the future. Total pension expenditure consists approximately of 95 percent statutory pensions and 5 percent VPPs. However, VPP savings have gradually grown in popularity in recent decades, but these instruments still have only a minor role compared to the other saving options.

[8]The Finnish Centre for Pensions (Handbook 2007:6) offers a comprehensive description of the Finnish pension system.

[9]In 2005 there were reforms in earnings-related pensions. The main changes in the reform were that earnings over persons' entire working career were taken into account, a flexible retirement age between 63 and 68 was introduced, higher accumulation rates for older workers were applied, and increased life expectancy started to matter for pensions with being lowered as life expectancy increases. At the same time there was a wide debate about the sustainability of the public pension system.

Figure 1 depicts the increase in the coverage and in the amount of VPP savings from 1995 to 2007. The data set is from Statistics Finland. It is a representative sample of Finnish people, including approximately 28,000 individuals per year. By weighting the data to represent the whole population of Finland, we can calculate the sum of VPPs and the number of savers per year. The sum of savings is in millions of euro and at 1995 prices. The grey pillars are the sum of deductions per year (left vertical axis) and the thick line shows the number of savers (right vertical axis).

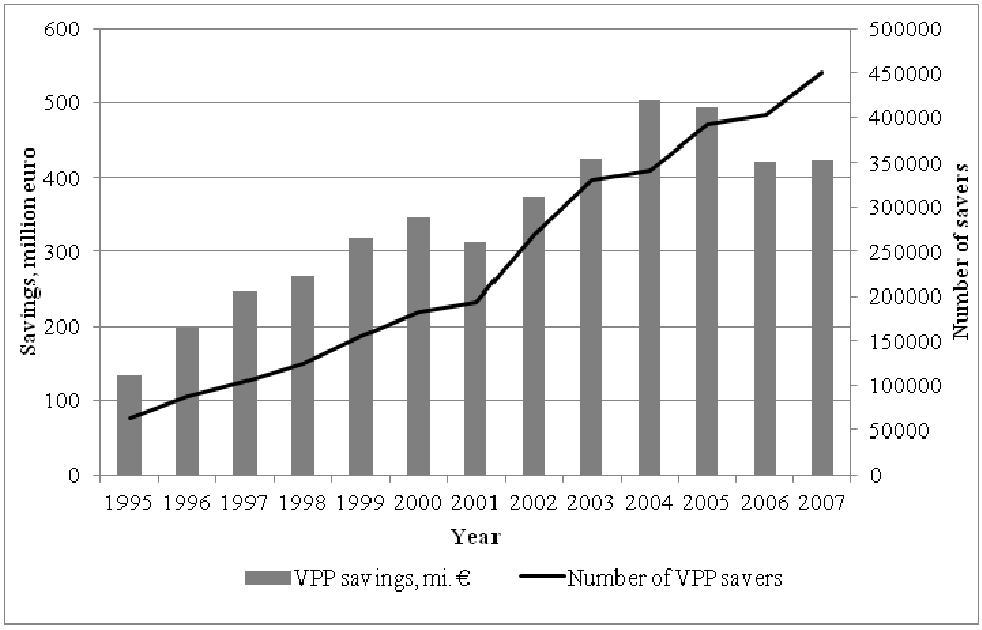

FIGURE 1. The sum of VPPs and the number of savers from 1995 to 2007 (Source: Income Distribution data 1995–2007 (Statistics Finland))

The number of savers has increased considerably. Growth was stable until 2001 but thereafter the number of savers exceeded the average trend growth. In 2004 and 2006 there was just a small increase, which might be explained by the overall uncertainty regarding the new tax system. However, the number of pension savers rose by almost 50,000 savers from 2004 to 2005 and from 2006 to 2007.

The sum of savings has increased over the last decade. The annual growth in savings has been fairly linear, except for 2001 and after the reform, in 2005 onwards. The poor economic cycle could also have affected the subnormal growth in savings in 2001. However, savings growth picked up from 2001 to 2005. In 2006 the aggregate amount of savings dropped approximately to the 2003 level and seemed to stay there in 2007 too. One explanation is that the decline in the sum of savings is simply reallocation of savings from VPPs to other types of saving options, leaving aggregate savings unaffected. Unfortunately, due to the data limitations it is not possible to evaluate the changes in aggregate savings caused by TR2005.

2.2.1. Tax scheme for VPPs. A notable feature of the Finnish income tax system is the Nordic-type dual income tax (DIT), which combines a steeply progressive taxation of labor income and a flat-rate taxation of capital income. Interestingly, although this has received little attention in tax literature, the DIT system offers two alternative ways to tax private pension savings in EET system. The first way is to apply a progressive labor income tax schedule and the other is to impose flat-rate capital income taxation on both contributions and withdrawals. The differences in tax rates will have different implications for saving incentives.

Tax literature has paid some attention to progressive taxation applying an EET model (OECD (1994), (2005)), which is the model applied to VPPs in Finland. According to the literature, a progressive tax scheme can lead to a wide variation of incentives between different contributors and may end up favoring savers in high income classes. A solution to these heterogeneous incentives under DIT could be to tax VPPs with flat rates of tax on capital income.

Tax reform of 2005

The Finnish law on VPPs was based on labor income taxation until 2004. Deductions were made from labor income and tax on withdrawals was paid as on labor income. After the reform deductions are made from capital income and withdrawals from these savings are taxed according to the flat tax rate on capital income (Ministry of Finance (2005)). VPP contributions are deducted from capital income after natural deductions[10], interests and losses. If the total amount of contributions is higher than the total amount of capital income, the taxpayer is entitled to deduct the deficit from the labor income taxes.

Before the reform, deductions were applicable if the saver had undertaken to keep his/her savings in the plan until the age of 60. This contractual limit was also increased to 62 years after 2005. In addition, the maximum deductable amount decreased considerably from 8,500 to 5,000 euro under to the reform.[11]

Transitional rules

The new law came into force at the beginning of 2005. However, it included the following transitional regulations. Firstly, in 2005 it was still possible to apply the old rules to contracts concluded before the government's first proposal (6 May 2004). Secondly, the tax rules on pension plans included transitional provisions for savers entering into a contract between the government's first reform proposal and the end of 2004. Savers making their first contributions in that period deducted their contributions from labor income and their future withdrawals will be taxed on the basis of capital taxation. This means that persons with high marginal labor income tax rates had a

[10]According to Finnish tax law, natural deduction refers to a taxpayer's right to deduct from investment income all expenses incurred in acquiring and maintaining such income (Ministry of Finance (2005).
[11]The Finnish government reformed the VPP system again from the beginning of 2010 by introducing a new pension saving instrument. It was aimed to increase competition and lower the saving expenses of savers. Only insurance companies were allowed to provide pension savings plans until the end of 2009, but after 2010, for instance, all banks were allowed to offer VPPs.

major incentive to save in pension plans in 2004. Thirdly, the contractual age remained at 60 years (or lower, depending on which age limit was valid when the contract was made) until 2009 if the contract with the insurance company was made before the first government proposal. Since 2006, all deductions have been made from capital income and withdrawals are taxed at the capital tax rate.

2.2.2. Measuring tax incentives of VPP savings. A common way to compare tax incentives to save in a particular instrument is to calculate the marginal effective tax rate (METR), as was done in the OECD (1994) report. The METR represents the tax burden of an investment option better than the nominal tax rate because it allows one to take into account many other factors which interact with taxes (OECD (1994), p. 62). For example, inflation, tax base regulations and overlapping taxes can be included in the formula of the METR.

Kari and Lyytikäinen (2004) introduced a simple way to measure the tax burden of different private investments in Finland and applied also the METR approach to VPPs in the EET system. The method of Kari and Lyytikäinen is simpler than the OECD (1994) version, and under their approach the METR can be presented in just one formula.[12] The pattern of the METR is based on[13]

$$METR = \frac{1}{rT} ln \left(\frac{1 - \tau_t}{1 - \tau_{t+1}} \right) \tag{2.2.1}$$

where r is the real interest rate, T is the saving period, τ_t is the marginal tax rate (MTR) for income from which deductions are made and τ_{t+1} is the MTR for pensions.

The model relies on the following assumptions. The contribution is one euro out of the saver's disposal income in a private pension plan at time $t = 0$. The holding period

[12]Wakefield (2009) also used a similar method to calculate effective tax rates for different assets under the UK tax system.
[13]The notation is slightly different from Kari and Lyytikäinen (2004).

is T years and the withdrawal is made in the form of a lump sum. The real interest rate r is fixed and positive. The model assumes perfect competition in the insurance market and that there are no management or other expenses.

The lower the $METR$, the better it is for the saver. The expression 2.2.1 is negative if $(1-\tau_t)/(1-\tau_{t+1})$ is between zero and one, and positive if $(1-\tau_t)/(1-\tau_{t+1})$ is larger than one. The saving incentive is affected by two different factors when the interest rate is fixed: first, the difference between MTRs on contribution and withdrawal periods and, second, the holding period of the savings. If the MTR is higher for the contribution period (τ_t) than for the withdrawal period (τ_{t+1}), the tax authorities do not collect all the tax deductions back as tax income. In a progressive tax scheme it is likely that some savers could benefit from this. Therefore, some savers, especially those in the highest tax brackets, could have a substantial tax incentive by saving in VPPs.

Hence

$$METR \begin{cases} > \\ = \\ < \end{cases} 0 \Longleftrightarrow \tau_t \begin{cases} < \\ = \\ > \end{cases} \tau_{t+1} \tag{2.2.2}$$

Secondly, the length of the holding period of savings (T) affects the extent of the incentives. The $METR$ on retirement savings approaches zero in the holding horizon, as Kari and Lyytikäinen point out. Before the reform the effective tax rate could have been very low for short holding periods (T), for example the $METR$ can be as low as -150% if the holding period is only 3 years but it increases to -15% if the holding period is 20 years and further increases to over -10% when the holding period is over 30 years. Therefore, it is clear that holding period affects the $METR$ but still does not

eliminate the incentives totally. In the new system, where the flat tax rate is applied, the effective tax rate is zero and the incentives are equal between different savers.

Kari and Lyytikäinen (2004) illustrate in more detail the effect of the reform by simulating $METR$s at different fixed labor income levels (Figure 2)[14]. The Figure illustrates that persons with low annual labor income (20,000 €) and low annual pension income (below 15,000 €) had very high positive $METR$s. Therefore, it was not very profitable for them to invest in the pension plans. Persons with higher annual labor income (40,000 € and 60,000 €) could benefit from below-zero $METR$s. For example, if the annual pension level is half of annual wages, the $METR$s for wages of 20,000 €, 40,000 € and 60,000 € are 28%, -20% and -54%. After the reform, in the capital taxation model, the $METR$ equals zero and thus the incentives are the same independent of their income levels.

As TR2005 considerably changed saving incentives for VPPs depending on individuals' wage levels, how individuals reacted to these changes is an empirical question. The natural way to study the effects of the reform is to evaluate the changes in contributions and the rate of participation of different subgroups. To summarize, due to the changes in tax incentives, the empirical analysis is based on the following predictions that we observe

- a decrease in VPP savings and participation among high labor income individuals and especially those close to the retirement age, and;
- an increase in VPP savings and participation among low labor income and young individuals.

[14]In their analysis they applied the TUJA micro simulation model which is in use at VATT (Government Institute for Economic Research). The calculations are made assuming a 4% interest rate and a 10-year investment horizon.

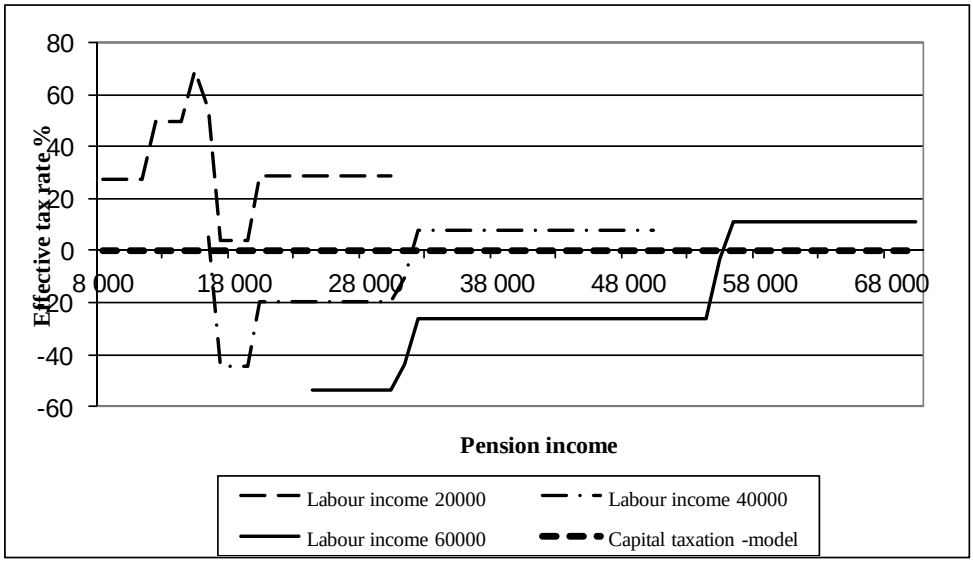

FIGURE 2. The marginal effective tax rates on pension savings for different labor and pension income (the interest rate is assumed to be 4% and the saving period is 10 years)

2.3. Empirical analysis

2.3.1. Methods. The following empirical strategy is based on the assumption that the reform of 2005 was exogenous for individuals and that incentives changed differently in different subgroups. Thus, it provides an opportunity to estimate the effects of the reform on the saving coverage and the amount of savings by using a difference-in-difference strategy. This method requires individuals to be divided to those who were affected by the reform (treatment) and to those who were not affected (control).

The difference-in-difference model can be written as follows

$$P_{i,t} = \alpha + \delta Treat_i + \gamma Treat_i D + \beta X_{i,t} + \eta_i + \varepsilon_{i,t}, \tag{2.3.1}$$

where $P_{i,t}$ is an outcome variable that is the annual (t) amount of VPP savings as a logarithm per individual i or a dummy variable with a value of one if the individual

saves in a VPP and zero otherwise. *Treat* is a treatment status equaling zero for the control group and one for the treatment group, D represents an indicator of the post-reform period and X is a vector of control variables. In most cases the estimation strategy is a fixed-effect method in which the parameter η_i can be separated from the error term. The vector of control variables includes individuals' age, capital income, debt, labor income and tax payments when the fixed-effect model is used. In the case of the random effect or probit model, the control vector also includes other characteristics like marital status, place of residence, type of residence and socioeconomic status. In addition, all the specifications include year dummies for controlling the time trend and a flexible linear time trend for the treatment group.

Ideally, a difference-in-difference method would be used if the treatment and control groups could be selected randomly. However, the 2005 reform in Finland does not offer a random division into treatment and control groups. Thus, it is necessary to use a natural experimental approach and formulate the control and treatment groups carefully. The natural starting point is to consider the MTRs on pension and wages, as showed in the theoretical section. Individuals are aware of the MTR on their wages but not the MTR on pensions. To be able to use equation (2.2.1) in formulating the hypotheses, we need to assume that individuals expect the MTR on pensions to follow the current tax code for pensions. This is a sensible assumption since there is no clear reason why individuals would have any better information about the future tax scheme than the current tax schedule. Especially individuals with continuous work biographies generally fulfill this assumption; however, for workers with a fragmented work history this would not necessarily hold very well. Thus, after the main econometric results in Section 2.4, I perform a battery of robustness checks to show that the main results are not affected by the formulation of the control and treatment groups.

As stated in the Section 2.2.2, the incentives to invest in VPPs depend on the MTRs on wages and pensions. Figure 3 presents the MTRs both on annual pensions

and wages in 2003 to point out the incentive differences depend on income levels.[15] There are at least four important aspects in Figure 3. First, the MTRs are much higher for pensions between 7,500 and 16,000 euros than for wages, which is a result of differences in deductions between wages and pensions. Second, for the highest wage bracket the MTR is always higher than the MTRs on pensions if the pension income is lower than 55,000 euros (pensions higher than 55,000 euros are very rare in Finland). Therefore, individuals in this tax bracket had clear incentive to save in VPPs before the reform. Third, individuals in the second-highest wage bracket (wages between 33,000 and 58,000 euros) did not have such a clear incentive to save in VPPs, assuming that their pension income will not be below 7,500 euros (which is a very low annual pension level in Finland). Fourth, individuals in the wage band from 7,500 to 22,000 euros faced higher a MTR on pensions than on wages and therefore had a positive METR, implying no clear incentive to save in VPPs (again, assuming that their pension income will not be below 7,500 euros).

Both the control and treatment groups are formulated based on the tax schedule for wages and pensions presented in Figure 3. Using the marginal tax rate schedule for 2003, the highest bracket in the tax schedule constitutes a first treatment group (taxable labor income higher than 58,000 euros in 2003)[16]. The subgroup that saw an increase in incentives to save due to the reform is low income earners. Following the reform their positive METR went to zero.[17] Therefore, a second treatment group is for low earners which had taxable labor income between 7,500 and 22,000 euros in 2003. The second highest tax bracket acts as a control group (taxable labor income from 33,000 to 58,000 euros) and is not assumed to experience any change in incentives.

[15]To be clear, wages refer here to the total sum of annual taxable labor income and pensions are the total sum of annual pensions taxed as labor income.
[16]The information for 2002 is used similarly in the robustness checks.
[17]If we assume that after the reform the capital tax rate is the same in the contribution and withdrawal period. However, this is not a huge assumption, at least in the sense of savers' expectations.

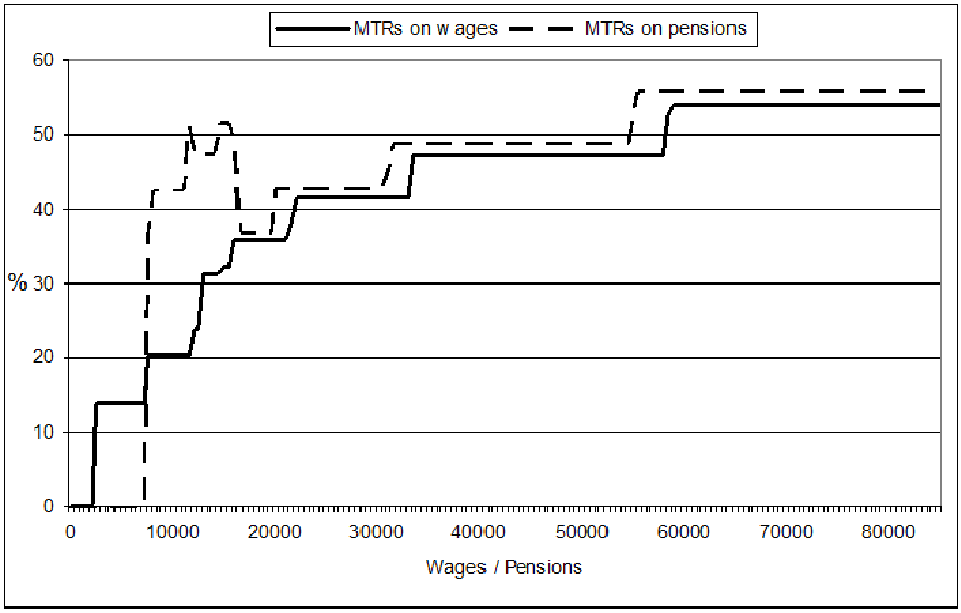

FIGURE 3. Marginal tax rates on pensions and wages in Finland in 2003

The main assumption of the difference-in-difference method is the parallel time trends between the control and treatment groups before the policy change. Thus, the time effects must be common for the control and treatment groups. In addition, the composition of the treatment and control groups must remain stable over time. If these assumptions hold, the model identifies the coefficient γ in equation (2.3.1), which is the average treatment effect on treated individuals.

Until now, I have ignored the effect of the investment horizon which was discussed in the previous section. For a short investment horizon, the benefits for high income earners might have been considerable before the reform. This is taken into account in the regressions by introducing a new dummy (G), which is one if the individual is over 50 years old in 2003 and zero otherwise. By using this dummy it is possible to investigate if the effects of the reform are different among older treated individuals

than younger. This can be done by using a triple-difference strategy and the estimated equation is now

$$P_{i,t} = \alpha + \delta Treat_i + \phi G_i + \iota Treat_i G_i + \gamma Treat_i D + \lambda G_i D + \theta G_i Treat_i D + \beta X_{i,t} + \eta_i + \varepsilon_{i,t}, \tag{2.3.2}$$

where G is one if the individual is over 50 years old in 2003 and zero otherwise. The other variables in equation (2.3.2) are the same as in equation (2.3.1). Naturally, the parallel trend and the composition of the group assumptions must hold both in this case and in the standard difference-in-difference model. The parameter θ reveals the triple difference estimate, and therefore tells us whether older high earning savers saved differently from others after the reform.

One additional point to be taken into account is that the provision allowed existing savers to use the former system until the end of 2005. People could choose to make contributions up to the upper limit and gain the tax benefits. It was also possible to deduct contributions from labor income in 2004 and pay capital tax if the contract between the saver and the insurance company was signed between 6 May 2004 and the end of 2004; in other words, it was possible to receive an extra tax benefit in those years. These special provisions created a clear incentive to anticipate the reform. Thus, to make sure that this does not bias the estimates, the estimations are also performed without the years 2004 and 2005. Then years 2000-2003 represent the before period and 2006 and 2007 the after period. Otherwise the years from 2000 to 2004 are used as the before period and the years from 2005 to 2007 as the after period.

2.3.2. Data. The data set is from Statistics Finland. It is a panel-stratified sample of approximately 53,000 annual observations. The data set is a representative sample of the Finnish population and covers the period from 2000 to 2007. The analysis is

made by examining two outcome variables: the coverage of savers (participation) and the amount of VPP contributions deducted from the income tax bases as a logarithm (labor and capital). The data set contains many other relevant continuous variables including labor income, capital income and age, which are used as control variables. There are also many important dummy variables like gender, place of residence, marital and socioeconomic status. Unfortunately, the data has no variable representing the private wealth of a person, thus it is impossible to analyze the changes in total wealth of individuals because of the reform.

The descriptive statistics of the main variables used in the estimations are given in Table 1 below. These descriptive statistics are calculated for the subsample which includes only the control and the two treatment groups described above.[18] All the euro values are given in current prices for each year. "VPP savings" represents annual savings in the accounts. In the control group the mean VPP savings are over 300 euros but in the high treatment group the mean is over 900 euros. VPP savings coverage is also much higher in the high treatment groups. In the low treatment group the mean savings amount in VPPs is below 80 euros and 8 per cent of population save.

[18]The descriptive statistics for the whole data set are presented in the Appendix, Table A1.

Variables	Control	Treatment - high	Treatment - low
VPP savings coverage	0.1726	0.2589	0.0784
	0.3779	0.4381	0.2687
VPP savings	326.4	921.5	79.5
	1052.5	2102.2	463.4
Labor income	39284.3	72519.8	15233.7
	11641.6	45360.6	6953.3
Debts	25893.1	35268.0	11053.3
	40196.3	64909.6	22768.0
Capital income	2860.9	10460.8	928.1
	35222.8	58348.3	7686.4
Home ownership	0.7307	0.8293	0.4057
	0.4436	0.3763	0.4910
Taxes paid	14274.9	33955.9	3594.1
	11587.4	31058.5	3397.4
Male	0.7483	0.8532	0.4194
	0.4340	0.3539	0.4935
Age	47.9	49.8	50.5
	11.5	9.9	17.5
Number of observations	28727	6608	175917

Note: Table contains mean (uneven rows) and standard deviation (even rows) values of variables categorized by control and treatment status.

TABLE 1. Descriptive statistics by groups, data from 2000 to 2007

2.3.3. Descriptive analysis of the treatment and control groups. Figure 4 shows the coverage of VPP savers in two separate treatment groups and in the control group. The low-income treatment group increased its coverage over the whole examination period. The increase is almost linear, starting from under 5 per cent in 2000 and culminating at approximately 13 per cent in 2007. The high-income treatment group increased its coverage from 2000 to 2004, but after that the share decreased. The coverage in the control group increased from 2000 until 2003 but thereafter the share is relatively constant. The coverage of pension savers in the high-income treatment group seems to be similar to the control group before the reform, which is essential to the analysis, since the difference-in-difference model assumes common trends between

groups. The pre-reform trends also seem to be relatively similar in both the low-income treatment group and the control group, although coverage increased a bit faster in the control group. Figure 4 provides descriptive support for our hypotheses: individuals in the high labor income treatment group lowered their participation rate and those in the low labor income treatment group increased their participation rate.

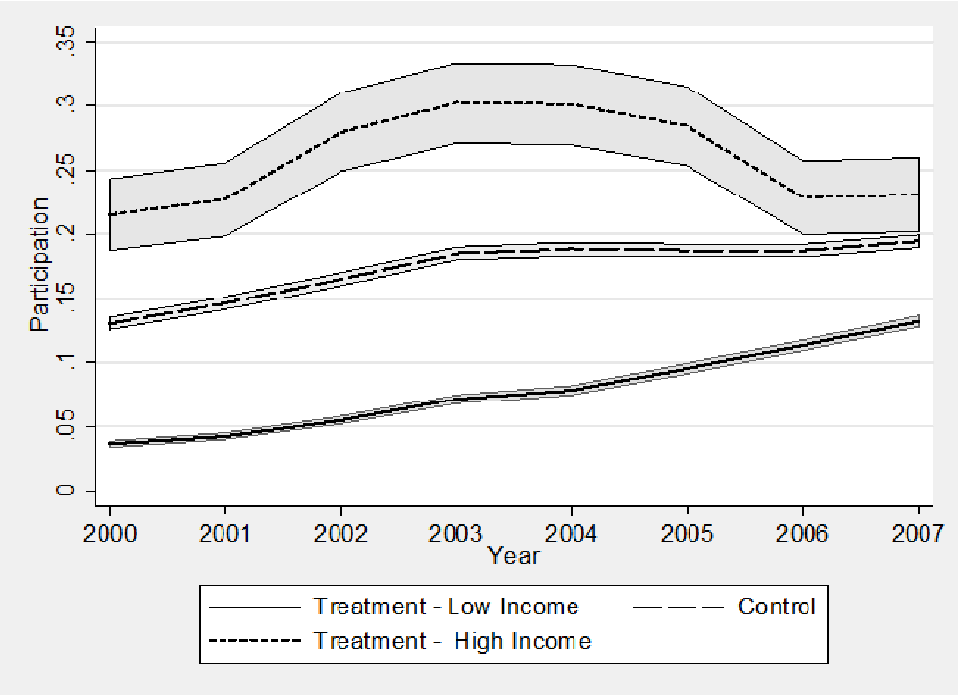

FIGURE 4. Participation rate and 95% confidence intervals in the treatment and control groups from 2000 to 2007

Figure 5 represents the mean of annual VPP savings in the treatment and control groups for those who saved in VPP accounts. Thus all those who did not save are excluded from this descriptive analysis. There seems to be a downward trend in mean payments after the reform. In all groups the mean amount of VPP savings decreased clearly from 2005 onwards. The mean savings amount in the high labor income treatment group declined much more than in the control group after the reform. The mean in

the high labor income treatment group is 2,500 euros after the reform, whereas before it was approximately 4,000 euros. On the other hand, it seems that the mean savings amount in the low income treatment group did not change much after the reform compared to the pre-reform years.

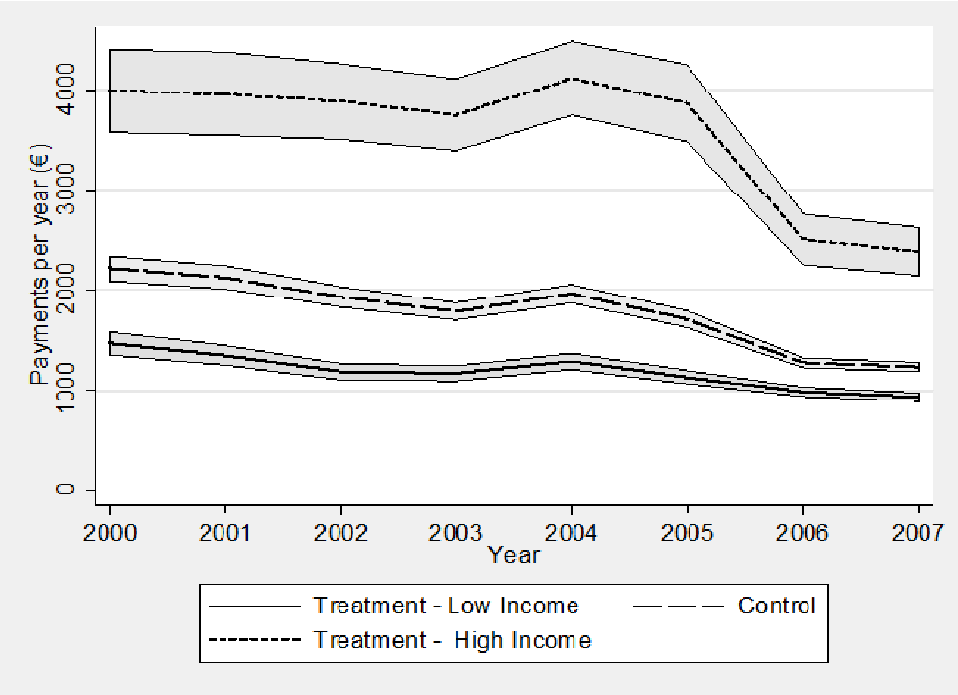

FIGURE 5. Mean savings amount and 95% confidence intervals in the treatment and control groups from 2000 to 2007

All in all, the descriptive analysis indicates that the trends in the mean savings amount are similar between groups before the reform, and the main assumption of common time trends between groups, identifying the effect of the reform, seems to be reasonable. In addition, it is possible to control for possible trend differences in the econometric specification by introducing separate time trends for the groups. This further strengthens the identification strategy.

As mentioned above, the actual reform was announced already in 2004 and this enabled individuals to anticipate the reform in 2004. Also, the mixed system in 2005 causes problems for the identification. Figure 5 reveals that there might have been some anticipation before the reform, at least in 2004 in the high-income treatment group. Thus, to figure out the effect of the reform, the results are presented using the years from 2000 to 2003 as a before period and the years 2006 and 2007 as an after period.

2.4. Econometric results

The dependent variables are the dummy variable with a value of one if the individual has saved in VPPs and zero otherwise, and the logarithm of the annual amount of VPP savings for an individual. The main control variables are age, labor income, capital income, debts and tax payments. The control vector including gender, residence area, education and marital status is also added to the specification as a dummy when a method other than fixed effects is used. In addition, all the specifications include flexible time trends. The most interesting coefficient is the interaction term of the after-dummy and treatment variables. Changes in behavior in the treatment groups due to the reform are detected if these interaction terms produce a statistically significant coefficient.

As mentioned in the descriptive analysis section, only a relatively small fraction of individuals save in VPPs in Finland, thus there are many observations with a value of zero VPP savings in the data set. Therefore, when the analysis concerns the savings amount, the dependent variable is a combination of discrete and continuous distributions. In this case, it would be difficult to find a very credible estimator if only cross-section data were available. However, the ability to use panel data methods eases this difficulty. In line with Angrist (2001), the starting point is simply to use a fixed-effect OLS model to estimate changes in both coverage and the savings amount of treated individuals. There are at least two major benefits in using this method: first,

the calculation of the average treatment effects or standard errors is not computationally demanding and second, the interpretation of the results is easy. However, I also estimate the coverage changes using a probit model to compare them to the base case result of the fixed-effect model.[19]

Table 2 presents the fixed-effect OLS and probit[20] results of the participation effects in both the high and low labor income treatment groups.[21] The results imply that the coverage of VPP savers decreased in the high income treatment group and increased in the low income treatment group. The results indicate that high-income earners decreased their participation by approximately 4 percentage points. Among low-income earners, coverage increased from 1 to 2 percentage points because of the reform. However, the change in participation is not statistically very clear because the changes are significant only at the 10 per cent level.

	High income = Treat		Low income = Treat	
Variable	Fixed effect	Probit	Fixed effect	Probit
After*Treat	-.034***	-.046***	.012*	.022**
	(.012)	(.015)	(.007)	(.008)
Treat		.062***		-.032***
		(.009)		(.002)
N	31 790	31 790	197 357	197 357
R2	0.047	0.062	0.046	0.144
Log likelihood		-14458.4		-49135.3

Note: The table reports the effects of the reform on the probability of saving in voluntary pension saving plans. All the estimates are marginal effects of the reform. All the models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, and in the probit models residence area, gender, education, marital status and residence type were added as dummy variables. The robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 2. Results for the participation estimation

[19]This part of the analysis is similar to the analysis of Disney et al. (2010).
[20]The marginal effects of the interaction terms are calculated as Blundell et al. (2004) proposed.
[21]The results of the fixed-effect models with all the control variable coefficients are presented in the Appendix, Table A2.

Table 3[22] reports the estimates of the changes in the log of savings amounts among the treated groups due to the reform. In the high-income treatment the savings amount declined on average by 24 per cent. This can be seen as a relatively significant change. However, the estimate of the low-income treatment group is not statistically significant and the estimate value is financially minor - a change of only approximately 3 per cent on average.[23]

	High income = Treat		Low income = Treat	
Variable	Random effect	Fixed effect	Random effect	Fixed effect
After*Treat	-.255***	-.242***	.132*	.035
	(.088)	(.092)	(.070)	(.076)
Treat	.533***		-.365***	
	(.093)		(.044)	
N	6 273	6 273	16 205	16 205
R2	0.120	0.046	0.112	0.043

Note: The table reports the effects of the reform on the log of the savings amount in voluntary pension saving plans. The estimation is made using panel methods, random and fixed-effect models. Both models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, labor income and tax payments, and in the random effect model residence area, gender, education, marital status and residence type were added as dummy variables. The robust standard errors are presented in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3. Results for the log of savings

As a robustness check, the division into control and treatment groups is also performed by using taxable labor income and MTR schedules for 2002. Otherwise the

[22]The Hausman test suggests that the fixed-effect model should be used instead of random effects because, for instance, in the high-income treatment case the null hypothesis of firm-specific effects uncorrelated with the regressors is rejected at the level of 494.89 (chi 2(5)). However, the coefficient of interest is not very sensitive to the model. Also, including municipality-level controls in the model does not affect the main results. These results are available upon request.

[23]The estimation is also performed using regression discontinuity design (RDD) for the high-income treatment group. The RDD result is approximately a 17 per cent decrease in the savings of high-income treated individuals, which is not statistically different from the base case result of a 24 per cent decrease. These results are available upon request.

groups are formed similarly, as presented in Section 2.3.1. The results are not statistically different from the base case results, see Appendix, Table A6. This gives support to the base case estimates and further strengthens the conclusion that the reform affected individuals' saving decisions.[24]

Another way to test the robustness of the results is to check the existence of trends before the reform with a placebo intervention. I assume now that the reform was implemented in 2002 and use the years 2000 and 2001 as a pre-reform period and 2002 and 2003 as post-years. When low income treatment coverage is compared to the control group, the trend seems to be slightly different between groups, but after introducing a linear time trend for low income treatment the difference vanishes. The results are not statistically significantly different from zero between the groups in any other comparisons with coverage or the amount of savings. This test offers further support to my identification strategy.

The transitional provisions and the anticipation of the reform can have an effect on the results for the years 2004 and 2005; the results may be biased because of these reasons. If there was anticipation the base case results would be downward-biased. Both anticipation and transitional provisions need to be considered. One possible way to overcome the problem is to delete the years 2004 and 2005 from the data set. Then, 2000-2003 are used as a pre-reform period and 2006-2007 are used as a post-reform period. The results of the estimations are presented in the Appendix, Table A4 and A5. According to these results the estimates are larger than in the base case. However, the estimates are not statistically different from the base case results, and thus the anticipation effect is not very clear.

[24]Mean labor income for 2000-2003 was also used for formulating the treatment and control groups. The estimates are not statistically different from the base case results. These and the results arrived at using 2002 labor income are available upon request.

More comprehensive analysis of anticipation suggests no changes before the reform: neither of the treatment groups changed behavior in 2004 or 2005 in a statistically significant way. The results imply that there was no statistically or economically significant difference in the behavior of individuals in these years. Thus, the base case results seem to offer robust estimates of the reform on the behavior of low and high-income earners.[25]

According to the METRs, the hypothesis is that older individuals had a greater incentive to change their behavior even more than other individuals in the treatment group. The triple difference model with a fixed-effect strategy estimated according to equation 2.3.2 does not offer statistically significant estimates of interest where people over 50 years old in 2003 were multiplied with the high-income treatment group. Thus, we can conclude that savings coverage did not change differently among older treated individuals due to the reform[26]. One possible explanation is that older people are not well informed (or are not interested) in their pensions and incentives to save. This has been observed previously in the empirical literature[27]. The results from the estimations are parallel with this conclusion. Another explanation for the results could be that older people's contributions to VPPs have a larger discounted value than those of younger people and they do not change their behavior even though the tax incentive to save in VPPs decreased after the reform.

A further examination of responses by gender reveals that only males reacted to the reform. The two first columns in Table 4 represent the results for the divided sample by gender. The results indicate that the total response comes solely from the male treated

[25]As told before, the reform reduced the upper limit of tax deductions from 8,500 euros to 5,000 euros. This could, for example, solely explain the reduction in high-income earners voluntary pension savings. However, I have done a robustness check by substituting all observations higher than 5,000 euros VPP savings before the reform by 5,000 euros, and the estimates are not statistically different from the base case results.

[26]These results are presented in the Appendix, Table A6.

[27]See for example Lusardi (2008).

group. Thus high-income males are less likely to be VPP savers after the reform than before, and also the savings of high-income males are much lower because of the reform. Moreover, the result implies that savings behavior did not change among high-income females at all. All the responses come from men's changed behavior in the high-income treatment group. It is also noticeable that the estimates for females' participation and savings amount are positive, which would imply increased savings. Nevertheless, these estimates are not statistically different from zero.

The third and fourth column in Table 4 contains the estimates for the low-income treatment group by gender. The effects of the reform for the low-income treatment group offer similar results: coverage changed statistically significantly only among males. The estimates imply that only males responded to the reform in the low-income treatment group by being more active in saving in VPPs. As can be expected from the base case results, the amount of savings did not change, either for males or females.

The results suggest that high-income savers seemed to change their behavior actively because of the reform by both lowering their saving activity and lowering the amount of savings. On the other hand, the results imply that low-income individuals increased their activity to save in VPPs but did not change the amount of savings. It also seems clear that gender is important role for the responses; all of the changed behavior is made by males. These results support the view that males respond more actively than females to changes in saving incentives.

However, there are additional caveats which should be emphasized. The effects of added marketing of voluntary pension plans and the effect of the reform of earning-related pensions cannot be fully controlled in the estimations. It is also possible that the reform of earnings-related pensions has indeed changed younger VPP savers' behavior but it has hardly changed savings in different income groups. These effects cannot be ignored and might cause bias in the observed results.

	High-income treatment				Low-income treatment			
	Participation		Savings		Participation		Savings	
Variable	Male	Female	Male	Female	Male	Female	Male	Female
After*Treat	-.033**	.019	-.265**	.076	.010*	.003	-.074	.043
	(.017)	(.042)	(.106)	(.169)	(.006)	(.014)	(.093)	(.121)
N	25,718	7,726	4,564	1,709	88,569	99,845	7,349	8,856
R2	0.047	0.059	0.067	0.143	0.041	0.053	0.224	-0.161

Note: The table reports the effects of the reform on the probability of saving and the amount of savings in voluntary pension saving plans. The estimation is made using fixed-effects OLS. All the estimates are marginal effects of the reform. All the models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, labor income and tax payments. Robust standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4. The differences in responses between male and female treated individuals: changes in participation and savings amount

2.5. Conclusion

The Nordic-type dual income taxation offers two alternatives for taxing VPPs. The first option is the progressive labor income taxation and the second is to apply the proportional capital income taxation. In 2005 the taxation of VPP instruments changed from labor income to capital income taxation in Finland. The reform changed the tax incentives to save in VPPs differently in different subgroups.

The empirical analysis of this reform was conducted by using micro data and econometric methods in a before-after framework. Before the reform, high income individuals had a clear tax incentive to save in VPPs, but the reform abolished these incentives. In addition, the reform increased the incentives of low-income individuals to save in VPPs. Therefore, subpopulations faced the tax change differently, and it is reasonable to examine the effects of this reform on savers' behavior by using a difference-in-difference strategy.

The results imply both economically and statistically significant estimates. Firstly, the results imply that high labor income savers lowered their savings amounts and the

coverage in VPPs. The probability to save in voluntary pensions declined by approximately 4 percentage points and savings decreased by 24 per cent on average, among high earners. Low income earners' probability to save increased from 1 to 2 percentage points but their savings amounts did not change. Gender seems to have a remarkable role in explaining the responses since the results indicate that only males changed their behavior.

With the proportion of working-age populations declining, governments are facing huge budgetary pressure, especially in countries such as Finland, where pensions are mostly government-funded. The results of this analysis show that tax incentives have an influence on private pension savings although the responses are heterogeneous.

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Appendix

Variable	Mean	SD	N	Min	Max
VPP savings coverage	0.067	0.249	424304	0	1
VPP savings	97.3	576.1	424304	0	14780.3
Labor income	14827.2	15539.0	424304	0	1014499
Debts	10664.9	30860.7	424304	0	4412886
Capital income	1034.2	13455.9	424304	0	4652870
Home ownership	0.333	0.471	424304	0	1
Taxes	4245.3	7770.3	424304	0	1334057
Male	0.417	0.493	424304	0	1
Age	38.9	22.3	424304	0	103

TABLE A1. Descriptive statistics, data from 2000 to 2007

	High-income treatment		Low-income treatment	
VARIABLES	Savings	Coverage	Savings	Coverage
Labor income•	-0.005	0.002	0.007**	0.015***
	(0.006)	(0.002)	(0.002)	(0.002)
Debts•	-0.002*	-0.001*	-0.008	0.005***
	(0.001)	(0.001)	(0.007)	(0.001)
Capital income•	0.001**	0.001	-0.003***	-0.002***
	(0.001)	(0.002)	(0.001)	(0.000)
Tax payments	0.051	0.014**	-0.019	-0.006***
	(0.045)	(0.007)	(0.026)	(0.002)
Age	0.331***	0.075***	0.302***	0.037***
	(0.051)	(0.005)	(0.029)	(0.001)
Age square	-0.003***	-0.001***	-0.003***	-0.000***
	(0.001)	(0.000)	(0.000)	(0.000)
Year 2001	0.042	-0.002	0.035	-0.000
	(0.040)	(0.003)	(0.040)	(0.003)
Year 2002	-0.052	0.021***	-0.066	0.024***
	(0.044)	(0.004)	(0.044)	(0.004)
Year 2003	0.038	0.037***	0.021	0.040***
	(0.038)	(0.004)	(0.037)	(0.004)
Year 2004	0.138***	0.030***	0.113***	0.032***
	(0.043)	(0.004)	(0.043)	(0.004)
Year 2005	0.139***	0.027***	0.062*	0.023***
	(0.035)	(0.004)	(0.033)	(0.004)
Year 2006	-0.015	-0.000	-0.049***	-0.002
	(0.024)	(0.003)	(0.017)	(0.001)
Year 2007	-0.017	0.000	-0.055*	-0.001
	(0.024)	(0.002)	(0.038)	(0.004)
Treat*After	**-0.242*** **	**-0.034*** **	**0.035**	**0.012***
	(0.092)	(0.012)	(0.076)	(0.007)
Observations	6,273	33,444	16,205	188,414
R-squared	0.046	0.047	0.043	0.047

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

• In thousands of euros

TABLE A2. Fixed-effect results with full set of control variables

	High income = Treat		Low income = Treat	
Variable	Participation	Savings	Participation	Savings
After*Treat	-0.045***	-0.242**	0.018**	0.143*
	(0.019)	(0.116)	(0.007)	(0.080)
N	31,790	6,009	197,357	16,784
R2	0.046	0.046	0.047	0.043

Note: The table reports the effects of the reform on the probability of saving in voluntary pension saving plans. The estimation is made using a fixed-effect method. All the estimates are marginal effects of the reform. All the models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, labor income and tax payments.
Robust standard errors in parenthesis.
*** p<0.01, ** p<0.05, * p<0.1.

TABLE A3. Results for participation and savings as groups defined by 2002 data

	High income = Treat	Low income = Treat
Variable	Fixed effect	Fixed effect
After*Treat	-0.056***	0.025***
	(.014)	(.005)
N	25 605	144 256
R2	0.050	0.056

Note: The table reports the effects of the reform on the probability of saving in voluntary pension saving plans. All the estimates are marginal effects of the reform. All the models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, labor income and tax payments, and in the probit models residence area, gender, education, marital status and residence type were added as dummy variables. Robust standard errors in parenthesis.
*** p<0.01, ** p<0.05, * p<0.1.

TABLE A4. Results for the participation estimation: pre-reform period 2000-2003 and after period 2006-2007

	High income = Treat		Low income = Treat	
Variable	Random effect	Fixed effect	Random effect	Fixed effect
After*Treat	-.393***	-.355***	.158***	.096*
	(.088)	(.093)	(.035)	(.049)
N	4 561	4 561	11 829	11 829
R2	0.234	0.121	0.268	0.211

Note: The table reports the effects of the reform on the log of the amount of savings in voluntary pension savings plans. The estimation is made using panel methods using random and fixed-effects models. All the models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, labor income and tax payments, and in the random effect model residence area, gender, education, marital status and residence type were added as dummy variables.
Robust standard errors in parenthesis.
*** p<0.01, ** p<0.05, * p<0.1.

TABLE A5. Results for the log of savings: pre-reform period 2000-2003 and after period 2006-2007

	Participation	Savings
Variable	FE OLS	FE OLS
DDD	-.005	-.068
	(.024)	(.203)
DD	-.031**	-.202***
	(.014)	(.051)
Age*After	-.042***	-.181*
	(.010)	(.110)
N	34,088	34,088
R2	0.049	0.137

Note: The table reports the effects of the reform on the probability of saving in voluntary pension saving plans. The estimation is made using a fixed-effect method. All the estimates are marginal effects of the reform. All the models are estimated with a full set of control variables and controlling for separate linear time trends for treatment individuals. The personal-level controls are capital income, age, age square, debts, labor income and tax payments.
Robust standard errors in parenthesis.
*** p<0.01, ** p<0.05, * p<0.1.

TABLE A6. Triple-difference model for high-income and treated individuals over 50 year old: change in participation and amount

CHAPTER 3

Business Owners and Tax Avoidance: Empirical Evidence from a Finnish Tax Reform[1]

ABSTRACT. This study examines the extent of tax avoidance through income-shifting between tax bases among the owners of privately held businesses. The dual income tax system in Finland offers noticeable incentives for income-shifting between wages and dividends for business owners. The dividend tax reform of 2005 enables us to study how this particular form of tax avoidance reacts to an exogenous change in tax rates. Our results support highly active income-shifting, and the apparent tax avoidance behavior has noteworthy welfare effects. We also find evidence that costs related to tax avoidance significantly affect the income-shifting behavior.

Keywords: Income taxation, Tax avoidance, Income-shifting

JEL Classification Codes: H21, H25, H32

3.1. Introduction

It is well known in public finance literature that behavioral responses to income taxation decrease the efficiency of a tax system. One source of inefficiency is tax avoidance behavior. Income-shifting between differently taxed tax bases is a common example of a tax avoidance channel. This behavior directly decreases tax revenue and might increase the deadweight loss of income taxation. Income-shifting is generally recognized in the literature, but only a few studies offer credible empirical estimates of its size. Our aim is to provide new evidence on the extent and significance of income-shifting behavior.

Income-shifting is especially relevant for the owners of privately held businesses. Compared to wage earners, business owners have a wider scope of legal possibilities to engage in income-shifting, as they can more easily apply different types of income

[1]This essay is joint work with Tuomas Matikka. A version of this paper is published in the VATT Working Papers series, 43, December 2012.

as a source of personal compensation[2]. Income-shifting possibilities and tax incentives are pronounced within a so-called dual income tax system (DIT). In a typical DIT, the marginal tax rate schedules for labor income and capital income differ significantly from one another.

Our study contributes to the literature in several ways. First, we carefully quantify the extent and significance of income-shifting between different tax bases among the owners of privately held corporations in Finland[3]. We then use these results to approximate the marginal deadweight loss due to this form of tax avoidance behavior. In addition, we analyze the heterogeneity of tax avoidance among different types of firms and owners. We also study how the costs and benefits of tax avoidance affect the extent of the income-shifting response. These issues are rarely studied in the literature. The potential effects of these factors offer evidence for both researchers and policy makers that the inefficiency caused by income-shifting can be mitigated by re-designing the tax system.

We exploit the extensive corporate and dividend tax reform of 2005 in Finland as an exogenous source of tax rate variation. In general, the reform increased the marginal tax rates on dividends by abolishing the single taxation of dividends. Thus the reform increased incentives to pay wages instead of dividends as a form of personal compensation for many owners. Importantly, income-shifting incentives changed differently among the owners based on the net assets position (assets−liabilities) of the firm. For some owners there were only small changes in tax rates, whereas some owners faced large changes in income-shifting incentives.

[2]In addition to many tax bases, income-shifting can also occur in other forms. A well-known example is intertemporal income-shifting, for example in the form of anticipating the forthcoming tax rate change (see for example Goolsbee (2000)). This paper focuses on the longer run effect of income-shifting between tax bases.

[3]Privately held corporations are defined as corporations that are not listed on a public stock exchange. In the Finnish tax system, dividends from listed and privately owned corporations are taxed at different tax rates and tax regulations.

This variation combined with the total tax record data and the opportunity to link tax record information from the owner level to the firm level create an interesting starting point to analyze income-shifting responses. The extensive data allow us to precisely define the tax-optimal composition of total gross income for each owner before and after the reform. Analyzing how changes in the tax-optimal income composition affects the changes in the realized income composition provides us credible empirical evidence on the extent and significance of income-shifting behavior.

We find clear support for the view that the owners of privately held corporations are active in income-shifting. Tax-optimal income composition has a clear and robust effect on the realized income composition of business owners. Using standard approaches in the excess burden literature (see Chetty (2009b)), we assess the welfare loss stemming from the income-shifting response to be notable. In addition, we do not observe much heterogeneity in the income-shifting response between different owners or firms. However, the size of the tax incentive change and the monetary gains from tax optimization affect the income-shifting behavior.

Earlier empirical studies concerning tax avoidance among corporate owners and entrepreneurs have been rather rare. Gordon and Slemrod (2000) offer an overview of the income-shifting literature and show evidence of tax-motivated income-shifting between personal and corporate tax bases among corporate owners in the US. Gordon and Slemrod conclude that distinctive income-shifting effects need to be taken into account in the efficiency analysis of the tax system. Also, Sivadasan and Slemrod (2008) find that a decrease in the effective tax rate on wages led to a significant increase in managerial wage compensation for partners of partnership firms in India.

Income-shifting responses are closely related to the analysis of the elasticity of taxable income (ETI). The ETI captures tax avoidance behavior, along with all other forms of behavioral responses to income taxation (see Feldstein (1999)). The ETI is usually estimated to be much larger among top-income earners and business owners

than regular wage earners (see a survey by Saez et al. (2012)). This suggests that business owners might be active in tax avoidance.

Also, Saez (2010), Chetty et al. (2011) and Bastani and Selin (2012) show that the self-employed bunch at the kink points of the tax schedule much more than laborers. This suggests that the self-employed have more opportunities to react to the piecewise structure of the income tax code and are more aware of the details of the tax schedule. In addition, concentrated ownership structure is shown to increase tax planning among business owners in the US (Chetty and Saez (2010)).

Earlier Finnish studies provide some evidence of tax avoidance. Pirttilä and Selin (2011) show that the relative share of capital income increased among entrepreneurs after the implementation of the Finnish DIT system in 1993. Kari et al. (2008 and 2009) use the Finnish tax reform of 2005 as an exogenous shock for privately held corporations. They report clear-cut results of how higher dividend taxation after the reform increased dividend payments before the reform (anticipation effect), and decreased it afterward. Within other Nordic Countries, Alstadsæter and Jacob (2012) discuss different tax avoidance channels within the Swedish DIT system, and find evidence for income-shifting between tax bases. Fjaerli and Lund (2001) find support for the hypothesis of active income-shifting among entrepreneurs in Norway. In Denmark, le Maire and Schjerning (2012) provide evidence of income smoothing and intertemporal income-shifting among the self-employed.

The rest of the paper is organized as follows: Section 3.2 presents the institutional background of the Finnish DIT schedule and describes the main attributes of the 2005 tax reform. Section 3.3 depicts the theoretical background for our empirical analysis. Section 3.4 presents the empirical model and descriptive statistics. Section 3.5 presents the results. Section 3.6 presents extensions to our baseline model, including the instrumental variable estimation and the analysis of the costs and benefits in income-shifting behavior. Section 5.6 concludes.

3.2. Finnish income tax system and the tax reform of 2005

Since 1993 Finland has applied the principle of Nordic-type dual income taxation (DIT). In DIT, earned income (wages, pensions, fringe benefits etc.) is taxed at a progressive tax rate schedule, whereas personal capital income (interest income, capital gains, dividends from listed corporations etc.) is taxed at a flat tax rate. A distinctive feature of the DIT system is that the flat tax rate on capital income is set much lower than the highest marginal tax rates on earned income. The lower flat tax rate for capital income was motivated for various reasons, for example broadening the tax base, decreasing the scope for tax arbitrage, and increased global capital mobility which all argue in favor of taxing capital income more leniently.[4]

Within the DIT system, the wide gap between the marginal tax rates on capital income and earned income creates a tricky task for the legislator: How to formalize the taxation of business owners in such a manner that it prevents income-shifting from heavily taxed earned income to more leniently taxed personal capital income? At the same time, the lawmaker needs to assure that the return on invested capital is not overtaxed.

In the Finnish system, this issue is arranged by limiting the amount of flat-taxed dividends. Dividends are split into two parts according to the net assets (assets-liabilities) of the firm. The amount of dividends taxed at the capital income tax rate is based on computational normal rate of return on net assets of the firm. This imputed rate of return (9%) is set to be the same for all owners of privately held corporations. Dividends *less* than the computational normal return are flat-taxed, and any dividends *exceeding* this amount are taxed with the progressive tax rate schedule.[5]

[4]A more detailed discussion on the Nordic type DIT can be found for example in Nielsen and Sørensen (1997) and Sørensen (2005).

[5]For example, with assets of 500,000 € and liabilities of 100,000 €, the maximum amount of dividends taxed at the flat tax rate is 36,000 € when the imputed return is set to 9%. In other words, any dividends received from the firm below 36,000 € are effectively taxed at the flat tax rate, and any

The Finnish dual income tax system until 2005

Until 2005, Finnish DIT applied a full imputation system of corporate taxes to remove the double taxation of dividends, in which dividend income is taxed both as corporate profits and personal income. In the full imputation system, dividends were exempt from corporate taxes. Thus all dividends were effectively single taxed before 2005. To sum up, taxation of wages and dividends from privately held corporations was organized according to the following rules and principles:

- Dividends:
  - Dividends up to the imputed normal return on the net assets of the firm (assets−liabilities) were subject to the flat capital income tax rate of 29%.
  - Dividends exceeding the imputed normal rate of return were taxed with the progressive tax rate schedule.
  - Corporate taxes were fully credited against the dividend tax liability of a shareholder, resulting in single taxation of both flat taxed and progressively taxed dividends.
- Wages were subject to the progressive tax rate schedule (0-56% in 2002). Wages were single-taxed as they were deductible from firm profits.
- Wages and progressively taxed dividends were not taxed with similar tax rules. Some tax deductions and tax credits were only allowed on wage income. In contrast, progressively taxed dividends were not subject to firm-level social security contributions.[6]

dividends above this amount are subject to progressive taxation with top marginal tax rates above the flat rate. The value of net assets is calculated based the asset and debt values of the firm in the previous year. The individual net asset share of the owner is calculated based on the ownership share of the firm. Also, there are some individual adjustments to the net assets. For example, if the owner or her family members live in a dwelling which is owned by the firm, the value of this dwelling is not included in net assets when calculating the imputed return.

[6]Firm-level social security contribution rate is 2–6% of wages, depending on the level of total wages paid and the depreciations made by the firm.

The dividend tax reform of 2005

From 2005 onward, the full imputation system was abolished, and Finland switched to a system with double taxation of dividends. After the reform, dividends and wages are taxed according to the following principles:

- Dividends:
  - All dividends became subject to a corporate tax of 26%.
  - The splitting rule of dividends according to the imputed rate of return on firm net assets was maintained[7].
  - The flat-tax dividends below the imputed return and under 90,000 € remained single-taxed, and are only subject to the flat corporate tax rate of 26%.
  - 70% of all other dividend income is taxable in individual taxation, which results in partial double taxation of dividends.
- There were no large changes in wage taxation at the time of the reform.
- Wages and progressively taxed dividends are still taxed differently.

The taxation of dividend income below the amount corresponding to the imputed return on net assets (9%) did not change significantly in the reform. Effectively, the flat dividend tax rate for dividends below the imputed return and under 90,000 € decreased from 29% to 26%. In general, this means that for owners with large net assets and small dividends the 2005 tax reform did not induce a notable change in income-shifting incentives. In contrast, the double taxation rule increased the dividend tax rate for dividends above the imputed return. In general, the abolition of single taxation significantly increased dividend taxes for owners with low firm net assets. In addition to individual-level progressive taxation, progressively taxed dividends became subject to the flat corporate tax rate of 26%. Thus after the reform of 2005, the minimum effective

[7]However, the imputed rate of return decreased slightly from 9.6% to 9%.

tax rate for progressively taxed dividends is 26%, compared to 0% before the reform. Furthermore, the flat tax rate increased from 29% to 40.5% for flat-tax dividends over 90,000 €. However, this concerns only a relatively small number of owners.

For example, consider an owner who withdraws 50,000 € of dividend income both before (2002) and after (2007) the reform. For simplicity, assume the owner has no wage income in either of the periods. With firm net assets of 600,000 €, the owner faces a 3 percentage point decrease in the marginal tax rate of dividends. This is due to the fact that the withdrawn dividends are below the imputed return in both years, and dividends below the imputed return on net assets of the firm are single taxed at the flat tax rate both before and after the reform. In contrast, with lower firm net assets of 400,000 €, the owner faces a 8.3 percentage point increase in the effective marginal dividend tax rate, as the marginal tax rate for dividends exceeding the imputed return became partly double taxed after 2005. We discuss the changes in income-shifting incentives created by the reform in more detail in the next subchapter.

In addition, one important aspect of the reform was its primary motive. According to the European Union Court of Justice, the pre-reform Finnish system of full corporate tax imputation was not in accordance with European Union legislation. Full imputation was given only to domestic shareholders. Also, the imputed tax credit was not granted to Finnish shareholders whose firms operate abroad. These violated EU regulations on equal tax treatment of all EU citizens. Therefore Finnish legislators were more or less forced to change the tax system towards a more unified tax treatment. This procedure has important implications for our study. As the reform was not driven by the economic and fiscal conditions in Finland, the tax reform of 2005 can be considered exogenous from the point of view of the owners of privately held corporations.

Finally, the content of the 2005 tax reform was made public already in late 2003. This enabled the owners to anticipate the changes induced by the reform[8]. Also, special

[8]For evidence of anticipation effects, see Kari et al. (2008).

transition rules were applied in 2005 to temporarily alleviate the double taxation of dividends. For these reasons, we focus on analyzing the income-shifting effect by using a longer time period of 2002–2008.

Tax incentives for income-shifting

There are many possibilities for tax avoidance within the Finnish DIT system. For example, the owners of privately held corporations may seek to minimize taxes by dynamically optimizing the level of net assets, and in a static year-to-year context, by choosing an optimal combination of wages and dividends as their personal compensation from the firm. In this paper we focus on the latter case. In general, the Finnish DIT system induces notable incentives to minimize taxes each year by choosing wages and dividends optimally with respect to the tax schedule. We focus on the decision to divide total income into dividends and wages, as these are the actual decision variables for the owners[9]. This definition is important. The dividend tax rate schedule comprises of both flat-tax and progressive regions, which depend on the net assets of the firm. In addition, progressively taxed dividends and wages are not taxed by the same rules neither before nor after the reform, which makes the combination of dividends and wages the relevant choice variable for the owners.

The tax-optimal division of total income between wages and dividends is relatively complex within the Finnish system. The amount of flat-tax dividends can be simply calculated based on the net assets position of the firm. However, wage taxes depend on the level of progressively taxed dividends, and vice versa. Wages and progressively

[9]There are only a few minor legal limitations on whether income is withdrawn as wages or dividends from a privately held corporation in Finland. A corporation cannot distribute dividends more than it holds distributable assets. These include, for example, accumulated profits and non-tied equity. With some firms this might limit the scope for income-shifting. Wages cannot be paid when there is no work contribution to the firm. Otherwise wages may be regarded as a veiled distribution of profits. However, this is a minor issue in our analysis since our sample of corporate owners hold an executive position in the firm, and are thus by default assumed by the tax authorities to work for the firm.

taxed dividends are part of the same tax base even though they are effectively taxed with different tax rates. This complicates the optimization process. When optimizing the income composition, the owner needs to simultaneously consider both the effect of net assets and wage income on the tax rate of dividends. We discuss this issue in the light of our empirical analysis in Section 3.4.2.

The dividend tax reform of 2005 changed the income-shifting incentives differently among the owners of privately held corporations. Owners with high level of net assets faced only modest changes in their dividend tax rates. In contrast, owners with relatively low net assets faced large dividend tax increases.

Figure 1 illustrates the changes in income-shifting incentives due to the tax reform of 2005. The Figure presents the marginal tax rates (MTR) on wages and dividends before (2002) and after (2007) the reform with both zero firm-level net assets and with net assets of 170,000 € (median net assets in the data set). Wage tax rates and progressive dividend tax rates include central government taxes, average municipal taxes, applicable individual social security contributions and all automatic deductions and tax credits on either dividend income or wage income or both. In addition, MTR on wages includes firm-level social security contributions. MTR on dividends includes the corporate taxes paid on dividends after the reform.

From Figure 1 we can see that wages and dividends were almost equally taxed before the reform for owners with no firm net assets (upper left graph). Differences in tax rates come from the differences in social security payments and tax deductions between wage and dividend income. Dividend taxes increased significantly for this group after 2005 (upper right graph). The double taxation of dividend income increased the MTR of dividends, making the MTR on dividends higher than the MTR on wages. Thus for the owners with low net assets, the reform induced incentives to shift income from dividends to wages. However, as only 70% of dividends are taxable in individual taxation after the reform, the difference between marginal tax rates decrease at large income levels.

There were no significant changes in the taxation of flat-tax dividends below 90,000€. Before the reform, dividends were in general taxed more leniently than wages for owners with median-level net assets (lower left graph). The reform of 2005 increased dividend taxes for dividends above the flat-taxed region, which brings the MTR on wages and dividends closer to each other (lower right graph).

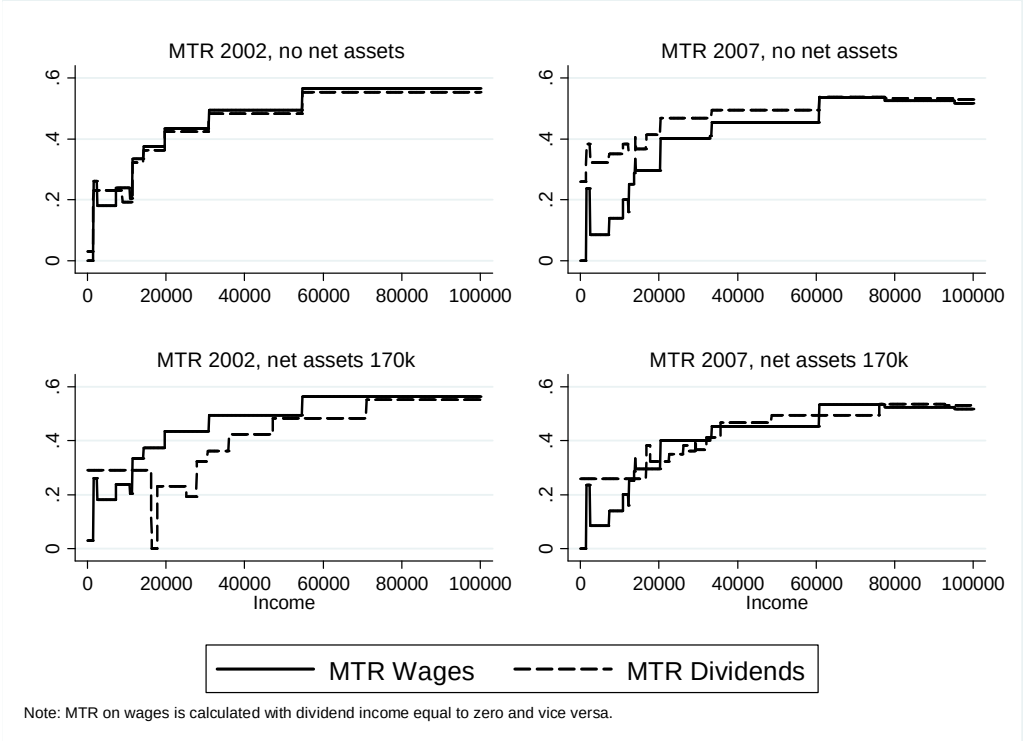

FIGURE 1. Marginal tax rates (MTR) on wages and dividends: Years 2002 (left) and 2007 (right). Above no net assets, below net assets of 170,000 € (in nominal euros each year)

In general, the reform did not induce significant changes in income-shifting incentives for owners with very large net assets. However, high-income owners with flat-tax dividends above 90,000 € faced a large change in the MTR on dividends (from 29% to 40.5%). Table A1 in the Appendix presents the marginal tax rates on wages and

dividends in numbers for the years 2002 and 2007 and for firm net assets of 0 €, 170,000 € and 1,000,000 €.

We do not include mandatory pension and health insurance contributions as a tax on wages in this study. Our empirical analysis is limited to owners who own at least 50% of the firm alone or together with immediate family members, and hold an executive position in the firm. These owners are termed YEL owners in the Finnish tax legislation. YEL owners are subject to special pension insurance rules. YEL owners report a so called YEL income to the insurance company from which insurance payments are accumulated from. Importantly, YEL income does not need to coincide with actual wages paid for the owner. In other words, YEL income can be above or below actual wages paid without implications or sanctions. Thus mandatory insurance contributions have no direct effect on the decision to divide total income into wages and dividends, and are therefore excluded from the income-shifting analysis.[10]

However, annual wages might be correlated with the reported YEL income. Some owners might report the actual wage income withdrawn from the firm as the YEL income. For these owners, pension and health insurance contributions increase or decrease one-to-one with changes in actual wage income. If insurance contributions are regarded as taxes, this reduces the incentives to pay out more wages. Therefore, insurance contributions might mitigate incentives to pay more wages as a response to increased dividend taxation, which would decrease our income-shifting estimate. We further discuss this in Sections 3.4.4 and 3.5. Finally, there were no relevant changes in contribution rates or other regulation on insurance payments for YEL owners in the

[10]There are regulations for both the lower and upper limits of YEL income, which are, however, also independent of actual taxable wage income. Insurance payments determine pensions when retired, as well as the amount of many income-bound social benefits before retirement (e.g. public health insurance). Thus owners have incentives to report a realistic YEL income which reflects the actual income earning potential.

time period we study. The overall average rate of insurance payments on YEL income was 21.1% in 2002 and 20.8% in 2007.

3.3. Theoretical framework

3.3.1. ***Tax optimization model.*** The following theoretical model is intended to clarify our empirical strategy to measure the level and significance of tax avoidance via income-shifting. In the model, the owner of a privately held corporation both owns a significant part of the corporation and works for the firm. We assume that the owner makes all the relevant decisions about the distribution of profits. Profits are paid out to the owner as a combination of wages and dividends. Importantly, wages and dividends are taxed at different tax rate schedules.

The aim of static tax optimization is to choose a combination of wages and dividends such that the total taxes paid are as low as possible with a given total income. The owner receives positive utility from her net-of-tax income (i.e. net wages and net dividends). The utility function is of the form $U(W + D)$, where W is net wages and D is net dividends. The payout budget constraint is $\Pi - R = W^g + D^g$, where Π is the total distributable profits from the firm before taxes, R is retained earnings and W^g and D^g are gross wage income and gross dividend income from the firm.

As in Fjaerli and Lund (2001), we focus on the choice of the optimal combination of wages and dividends conditional on given total profits Π and retained earnings R. In other words, we do not model the income-generating process of the firm nor the optimal level of retained and/or distributed profits, and thus simply assume Π and R to be exogenous[11]. We follow this assumption throughout the paper.

[11]The choice of retained earnings (R) is relevant in dynamic tax optimization. R increase net assets, which are the base for determining the flat-taxed dividends in the Finnish DIT system. Other than purely tax-motivated issues also define the amount of R (for example, essential investments and imperfect capital markets). In the analysis, we assume that R is already optimized, or simply taken as given. However, the endogenous nature of R does not change the relevance of the static year-to-year tax minimization problem of choosing the tax-optimal combination of wages and dividends. Also,

More formally, the owner's optimization problem is to

$$max U(W+D) = [1 - t_W(W^g, D^g, I)]\, W^g + [1 - t_D(W^g, D^g, I)] D^g \tag{3.3.1}$$

subject to

$$\Pi - R = W^g + D^g \tag{3.3.2}$$

where $t_W(W^g, D^g, I)$ and $t_D(W^g, D^g, I)$ are the average tax rates on wages and dividends, respectively. The tax rate on wage income $t_W(W^g, D^g, I)$ consists of personal income taxes plus firm-level social security contributions. The tax rate on dividends $t_D(W^g, D^g, I)$ includes dividend taxes plus corporate taxes associated with withdrawn dividends. Wages are assumed to be deductible from firm profits whereas dividends are not. Also, both tax rates depend on income earned outside the firm, denoted by I. This income includes, for example, wages from a secondary job and dividends from other non-listed firms. I is assumed to be exogenous in the model.

Both tax rates are always between zero and one. In this general framework, the wage tax rate $t_W(W^g, D^g, I)$ is also a function of dividends, and dividend taxes $t_D(W^g, D^g, I)$ are a function of wages. This implies that the amount of wages withdrawn from the firm is allowed to have an effect on the tax rate on dividends, and vice versa. Also, we assume that the tax rate schedules on wages and dividends are "well-behaved", smooth and monotonically increasing functions of W^g and D^g. For now, we assume there are no optimization frictions or optimization errors.

After taking the first order conditions with respect to W^g and D^g and rearranging the terms, we get the owner's optimality condition

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without year-to-year tax optimization, the benefits from dynamic tax avoidance diminish or vanish altogether.

$$\frac{t_W(W^g, D^g, I) + \left(\frac{\partial t_W(W^g, D^g, I)}{\partial W^g} - \frac{\partial t_W(W^g, D^g, I)}{\partial D^g}\right) W^g}{t_D(W^g, D^g, I) + \left(\frac{\partial t_D(W^g, D^g, I)}{\partial D^g} - \frac{\partial t_D(W^g, D^g, I)}{\partial W^g}\right) D^g} = \frac{MTR_W}{MTR_D} = 1 \tag{3.3.3}$$

which says that the combination of gross wages and gross dividends is optimal when the marginal tax rates (MTR) are equal. The intuition is that if $MTR_W > MTR_D$, the optimal behavior would be to replace W^g with D^g up to the point at which the tax rate differential is zero.

The optimality condition (3.3.3) determines the tax-optimal combination of gross wages and gross dividends, denoted by (W^*, D^*). This gross income combination minimizes taxes, and therefore maximizes the total net income withdrawn from the firm.

However, assumptions behind the theoretical optimality condition do not generally hold in practice. For example, real-life tax rate schedules are not smooth and continuous. If anything, the schedules are more or less discontinuous piecewise linear functions of income. In addition, optimization frictions might matter, and optimization errors might occur for at least some owners. All of these issues imply a deviation from the optimality condition 3.3.3[12]. Nevertheless, equation 3.3.3 illustrates the main determinant of income-shifting behavior: the ratio of the associated tax rates of differently

[12]As shown in Chetty (2012) and Chetty et al. (2011), search costs and other optimization frictions might matter in tax-optimization behavior. Optimization costs will be analyzed later in Section 3.6. There are also some other matters that might implicate a deviation from the non-frictional solution equation 3.3.3. Fjaerli and Lund (2001) suggest that benefits received from paying social security contributions increase wages as a form of compensation, although no compelling evidence has been found to support this view. Also, wages can be seen as a socially more acceptable form of personal compensation. These matters imply that we would observe higher realized wages than what equation 3.3.3 suggests.

taxed tax bases, MTR_W/MTR_D. In other words, the tax optimal gross income combination (W^*, D^*) remains the key parameter to consider even if some of the theoretical assumptions are relaxed.[13]

3.3.2. ***The deadweight loss of income-shifting.*** After characterizing the individual owner's tax optimization pattern, we next derive a formula for the marginal deadweight loss of income-shifting behavior. Our setup is similar to the model of marginal excess burden with resource costs from tax avoidance by Chetty (2009a), and the standard taxable income model by Feldstein (1999).

In our version of the model, the owner's problem is to

$$max U(W + D, \gamma) = (1 - t_W)(\tilde{W}^g - \gamma) + (1 - t_D)(\tilde{D}^g + \gamma) - \phi(\gamma) \tag{3.3.4}$$

subject to

$$\Pi - R = (\tilde{W}^g - \gamma) + (\tilde{D}^g + \gamma) \tag{3.3.5}$$

where $(\tilde{W}^g - \gamma) = W^g$, $(\tilde{D}^g + \gamma) = D^g$. $\tilde{W}^g$ and $\tilde{D}^g$ represent wage income and dividend income in the absence of income-shifting opportunities. γ is the amount of income shifted from wages to dividends at the margin, and $\phi(\gamma)$ denotes the real private cost of income-shifting, i.e. the cost of changing the tax base. For simplicity, we assume the cost function to be convex and increasing in γ.

In this framework, we assume that the marginal tax rates t_W and t_D are constant, i.e. we are on the linear segments of the tax rate schedules. For convenience, we assume for

[13]Sivadasan and Slemrod (2008) derive similar theoretical predictions in their model for partners of partnership firms in India. Also, Fjaerli and Lund (2001) get the same result when pension considerations related to wage payments are not included in their model. Christiansen and Tuomala (2008) and Piketty, Saez and Stantcheva (2013) discuss the implications of income-shifting between tax bases in the optimal income taxation framework.

now that $t_W > t_D$. Also, there are no optimization errors and no other private transfer costs involved in income-shifting behavior[14].

We use the standard approach in the deadweight loss literature. We assume that the tax revenue collected with wage and dividend taxes is returned to the owner as a lump sum transfer (see for example Chetty (2009a, 2009b)). The social welfare function $\varpi(t_W, t_D)$ is expressed as the sum of the owner's utility (in the curly brackets) and the tax revenue collected by the government

$$\begin{aligned} \varpi(t_W, t_D) &= \Big\{(1-t_W)(\tilde{W}^g - \gamma) - (1-t_D)(\tilde{D}^g + \gamma) - \phi(\gamma)\Big\} \\ &\quad + t_W(\tilde{W}^g - \gamma) + t_D(\tilde{D}^g + \gamma) \end{aligned} \tag{3.3.6}$$

Next, consider a marginal change in the wage tax rate, dt_W. The envelope condition states that dt_W has only a first-order effect on the owner's utility, and thus we may ignore the behavioral responses in the curly brackets. The first-order effects on the owner's utility and the tax revenue of the government cancel each other out by definition. In particular, we assume that there are no changes in $\tilde{W}^g$ and $\tilde{D}^g$. In other words, we concentrate only on the marginal excess burden caused by the income-shifting effect with *given* total gross income.

After arranging the terms, the marginal excess burden can be written as

$$\frac{d\varpi(t_W, t_D)}{dt_W} = \frac{d\gamma}{dt_W}(t_D - t_W) \tag{3.3.7}$$

The right-hand side of equation equation (3.3.7) implies that the marginal deadweight loss of income-shifting comprises of two components: The first is the response of the

[14]Chetty (2009a) analyzes the deadweight loss and tax avoidance under optimization errors and transfer costs. In short, these issues add further dimensions to the analysis if the marginal social cost of avoidance behavior does not equal the net-of-tax rate. In this simplified case we abstract from this possibility. However, we briefly discuss this issue and its relevance for the interpretation of the excess burden estimate in the end of Section 3.5.

amount of income shifted, and the second is the difference in dividend and wage income tax rates[15]. Intuitively, the result suggests that the marginal excess burden of income-shifting is larger the bigger the difference is between the tax rates, and the average income-shifting response defines the scope of the deadweight loss. Thus to be able to approximate the scope of the inefficiency, we need a credible estimate of the average income-shifting response.

As shown before in Section 3.3.1, with fixed total income, the amount of income shifted depends on the relative share of the tax rates. Therefore, the goal of our empirical analysis is to derive an estimate for $d\gamma/d(t_W/t_D)$ in order to assess the marginal excess burden.

3.3.3. ***Testable hypotheses.*** Based on the theory presented above, we take up the following questions in our empirical analysis:

- Does the tax code determine the choice of income type, and if so, to what extent?
- Are income-shifting responses heterogeneous among different firms and owners?
- How large is the marginal excess burden of income-shifting?

3.4. Empirical analysis

3.4.1. ***Data.*** Our data set comes from the Finnish Tax Administration and it includes information on the financial statements and tax records of Finnish businesses and business owners for the years 2002, 2003, 2007 and 2008[16]. We use it both in a

[15]Saez (2004) derives a similar formula for the marginal excess burden when agents can shift income between the personal tax base and the corporate tax base. However, Saez's model also includes changes in real behavior (total income, labor supply etc.).

[16]As mentioned before, the content of the 2005 tax reform was made public already in late 2003. Kari et. al (2008) show evidence that privately held corporations anticipated the reform by increasing dividend payments right before the reform, and decreasing them right afterward. Therefore, we do not use the years closest to the reform in our baseline analysis in order to alleviate the effects caused by anticipation on the longer-run income-shifting response between tax bases.

cross-sectional and balanced panel form. The unique characteristic of the data is that they contain basically all Finnish businesses (all public and privately held corporations, partnerships, sole proprietors etc.).

In this study we focus exclusively on the owners of privately held corporations. The data contain all important tax information for the income-shifting analysis, for example taxable wages and dividends paid to the owner by the firm, and income earned from other sources by the owner. By linking the firm-level and the owner-level data together we can analyze the effects of tax changes on owners' income-shifting behavior while consistently controlling for various firm and individual-level effects. The owner-level data include only those individuals who received positive dividends from the firm during a tax year. Furthermore, we concentrate only on those owners who work in their own firm in an executive position and own at least 50% of the firm alone or together with immediate family members.[17]

3.4.2. ***Empirical model.*** This section describes the empirical model we use in our analysis. Our aim is to study how the tax-optimal income composition affects the decision to withdraw different types of income from the firm. This relationship can be described with the following cross sectional equation

$$W^g_{i,t} = \beta * W^*_{i,t} + X_{i,t} + C_i + \alpha_t + \varepsilon_{i,t}, \tag{3.4.1}$$

where $W^g_{i,t}$ is realized gross wages from the firm for each owner i in year t. $X_{i,t}$ is a matrix of firm and owner-level variables that affect the amount of gross wage income and the income composition. C_i describes time-invariant variables that affect gross

[17]We discuss the implications of data and sample restrictions in the end of Section 3.5.

wages, such as the innate ability of the owner.[18] α_t is the time trend, and $\varepsilon_{i,t}$ is the error term. Finally, $W^*_{i,t}$ is the tax-optimal gross wage with given total income $\Pi_{i,t} - R_{i,t} = W^g_{i,t} + D^g_{i,t}$. This is the variable of main interest in our analysis[19]. The parameter β denotes the average income-shifting effect on the actual gross wage income withdrawn from the firm.

The tax-optimal gross wage $W^*_{i,t}$ summarizes the effects that both the tax rate schedules of wages and dividends have on the actual realized gross wage, given the exogenous total income. As we have the data actually used to tax the owners, we have all the information needed to define the tax-minimizing values $W^*_{i,t}$ and $D^*_{i,t}$ for every owner each year.

The tax-optimal gross wage is calculated using tax register information on the owner's total gross income from the firm ($W^g_{i,t} + D^g_{i,t}$), net assets of the firm, gross earned income from other sources and the tax code and regulations for the year in question. As discussed in Section 3.2, we do not take into account social insurance payments when defining the tax-optimal income composition.

In order to define $(W^*_{i,t}, D^*_{i,t})$ for each owner, we formulate a function that gives the tax-minimizing amount of wages and dividends for each possible total gross income level with respect to every combination of net assets and other earned income. In the optimization function, the number of feasible outcomes for the optimal gross income combination for each total gross income level is limited due to the stepwise nature of the tax code (given all possible combinations of net assets and other earned income). In order to limit the number of different combinations of total gross income, net assets and other earned income, we use an income interval of 100 €. Table A2 in the Appendix

[18] In the data, the available controls for $X_{i,t}$ and C_i at the owner level are gender, age, other capital income and the ownership share of the firm. On the firm level, the controls are turnover, number of employees, profits, total assets, and location and industry dummies.

[19] Fjaerli and Lund (2001) use a similar explanatory variable in their study.

presents an illustrative example of the changes in tax optimal gross wages due to the tax reform of 2005.

The empirical approach of using the tax-optimal income component as a measure for income-shifting is not solely linked to the Finnish tax institutions or the dual income tax schedule. This approach generalizes to any case where there are two or more differently taxed tax bases available to the taxpayer. This also applies to different types of income which differ only with respect to tax deductions or allowances. In the Finnish context, an example of these is wages and progressively taxed dividends, which are nominally part of the same tax base, but are effectively taxed differently both before and after the tax reform of 2005.

As is well known in the microeconometric literature, estimating the causal effect of the tax code on the composition of realized income using equation (3.4.1) is difficult in practice. Many of the time-invariant variables that might affect income-shifting behavior are generally unobserved, which violates the exogeneity condition $cov(W^*_{i,t}, \varepsilon_{i,t}) = 0$. Therefore, we use panel data and the tax reform of 2005 to estimate the model. Taking first differences of equation (3.4.1) between t and $t+j$ gives us our estimable model

$$\begin{aligned} W^g_{i,t+j} - W^g_{i,t} &= (\alpha_{t+j} - \alpha_t) + \eta(W^*_{i,t+j} - W^*_{i,t}) + \\ &\quad \mu(X_{i,t+j} - X_{i,t}) + (\varepsilon_{i,t+j} - \varepsilon_{i,t}). \end{aligned} \tag{3.4.2}$$

In this first-differences (FD) model, the time-invariant component C_i gets canceled out by definition. In contrast to the cross sectional one-year analysis in Fjaerli and Lund (2001), we focus on identifying the effect of the tax-optimal income component on the composition of income using exogenous individual variation in $W^*_{i,t}$ in time.

Our main interest is in the coefficient η, which expresses the average effect of a change in tax-optimal gross wages on the change in realized gross wages conditional

on given total gross income in t and $t+j$. The change in the tax-optimal gross wage $W^*_{i,t+j} - W^*_{i,t} = \triangle W^*_{i,t}$ captures all the changes in the individual tax code. In addition to changes in wage taxes, $\triangle W^*_{i,t}$ also captures changes in dividend and corporate taxation.

The testable hypotheses in the FD model are the following: If changes in the tax code explain the changes in the composition of income, η should be statistically significant and greater than zero. A one-to-one income-shifting response implies that $\eta = 1$. Also, adding control variables to the model should not affect the value of η, and the coefficients for the controls should not be statistically significant if the change in the tax code is the dominant factor behind the change in the division of income.

3.4.3. ***Identification.*** With regard to identifying the behavioral parameter η, an important feature is that the tax reform of 2005 changed the income-shifting incentives differently among similar business owners. In other words, $\triangle W^*_{i,t} = W^*_{i,t+j} - W^*_{i,t}$ varies across otherwise similar individuals in the data. Owners with similar total gross income $(W^g_{i,t} + D^g_{i,t})$, other income, ownership share, firm total assets, profits and turnover but with different levels of firm net assets faced different changes in the marginal tax rates on dividends, and thus get different values of $\triangle W^*_{i,t}$. Owners with high level of net assets faced only modest changes in their marginal tax rates, whereas owners with low net assets faced larger tax incentives to rearrange their total gross income. Also, different levels of other earned income create variation in tax optimal gross wages, as income earned outside the firm affects the MTR on wages and progressively taxed dividends withdrawn from the firm. We assume that other earned income is exogenous.

Using $\triangle W^*_{i,t}$ as a regressor instead of $\triangle(MTR_{W_{i,t}}/MTR_{D_{i,t}})$ helps to overcome the issue of endogenous correlation between the income-shifting incentives and realized gross wages $W^g_{i,t}$. The optimal wage $W^*_{i,t}$ is not mechanically correlated with $W^g_{i,t}$ or $D^g_{i,t}$ at a given level of total gross income, whereas marginal or average tax rates themselves are. In most income tax systems, larger wages are associated with high marginal tax rates

and vice versa, causing these variables to be mechanically correlated in a FD model. However, realized gross wages do not affect the value of the tax-optimal gross wage, as $W^*_{i,t}$ is the same for *any* combination of $W^g_{i,t}$ and $D^g_{i,t}$ at a given level of $(W^g_{i,t} + D^g_{i,t})$. Therefore, in the presence of exogenous tax rate variation, $\triangle W^*_{i,t}$ is exogenous in the FD model and does not necessarily require an instrumental variable.

We need to assume that in the *absence* of the reform, owners with a large positive $\triangle W^*_{i,t}$ do not change their $W^g_{i,t}$ differently than owners with smaller changes in $\triangle W^*_{i,t}$ (and vice versa). In general, we have no explicit reason to assume that with given total income in t and $t+j$, the change in the realized gross wage $\triangle W^g_{i,t}$ depends on other factors than income-shifting incentives, conditional on individual and firm-level covariates. However, we cannot rule out the possibility that changes in some observed characteristics such as net assets and other earned income might mechanically affect both $\triangle W^g_{i,t}$ and $\triangle W^*_{i,t}$ in some cases. For example, an increase in firm net assets, which on average lowers the dividend tax rate and $W^*_{i,t}$, might induce a mechanical effect through a decrease in $W^g_{i,t}$ as well. Assuming other things unchanged, an increase in net assets might lead to less total gross income to be withdrawn altogether, for example due to an increase in retained earnings $R_{i,t}$. Therefore, we also use an instrumental variable (IV) estimator to estimate the income-shifting model. The IV estimation is presented and discussed in Section 3.6.

Finally, it is worth noting that $W^*_{i,t}$ itself is not based on individual preferences. Owners with the exact same tax record information get the exact same values for tax-optimal gross wages. Furthermore, we control for other individual and firm-level variation in a rich way. In equation (3.4.2), the matrix $(X_{i,t+j} - X_{i,t})$ controls for changes in the ownership share and other capital income on the owner's side, and changes in turnover, number of employees, profits and total assets on the firm side.

3.4.4. ***Descriptive statistics.*** Figure 2 presents the kernel density estimate distributions of wages and dividends received by the owners of privately held corporations both before (2002) and after (2007) the tax reform of 2005. From the Figure we can see that wage compensation increased significantly after the tax reform. This was the main expected outcome in the light of income-shifting incentives. Figure 2 does not indicate very notable changes in the overall shape or location of the dividend distribution. However, there is a visible dip in the density of small dividends, and an increase in the density of large dividends at the 90,000 € tax schedule kink point. This was also expected, since after the reform it became especially undesirable to distribute small amounts of dividends and dividends above 90,000 €.

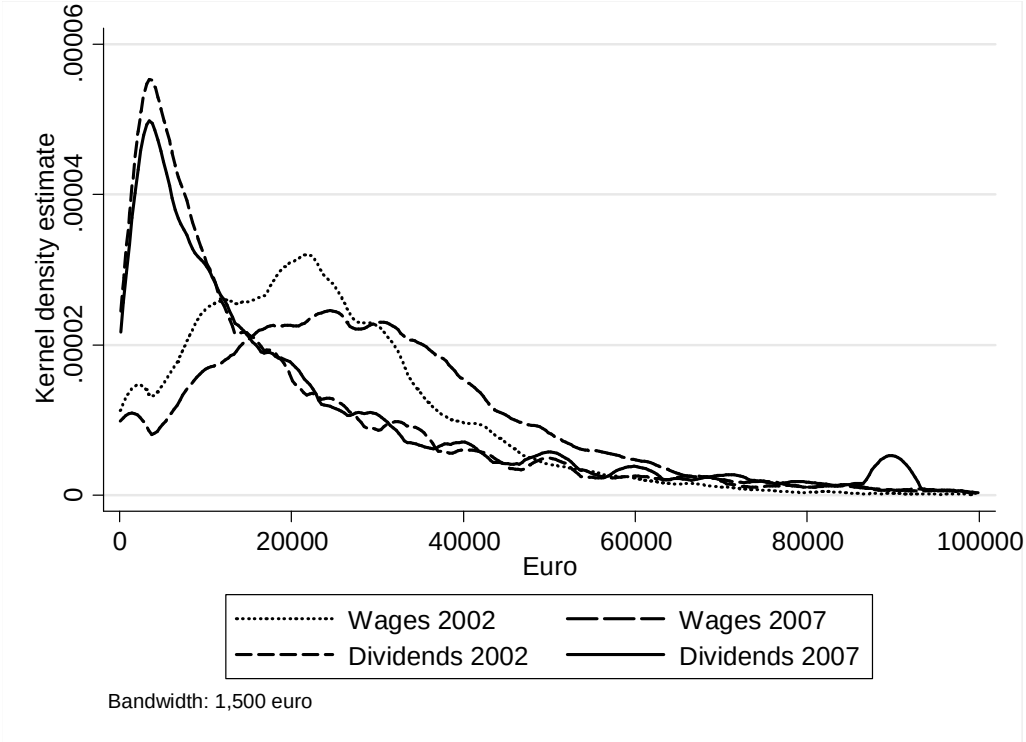

FIGURE 2. The distributions of wage and dividend income of the owners of privately held corporations in 2002 and 2007 (in current euros)

After defining the tax-optimal combination of gross wages and gross dividends, we can compare the optimal gross wages to realized gross wages in order to describe the extent of income-shifting behavior. Figure 3 presents the distribution of the difference between the tax-optimal gross wages and realized gross wages for the years 2002 and 2007. Tax-optimal behavior indicates that this difference would be equal to zero. In other words, $W^g_{i,t} - W^*_{i,t} = 0$ if the owner has optimized her wage 'perfectly' with respect to the tax code.

Figure 3 presents the distribution of $W^g_{i,t} - W^*_{i,t}$ around the tax-optimal point $W^g_{i,t} - W^*_{i,t} = 0$ in the range of +/- 10,000 €. The Figure shows that income-shifting behavior is evident. There are clear spikes in the distribution at the level of 0 in both 2002 and 2007. Thus both before and after the reform a notable number of owners withdrew exactly the tax-optimal amount of wage income from the firm. This implies that the tax code of both wages and dividends affect the total income composition of the owners, as there are no other explicit reasons for the owners to pay out exactly the tax-optimal amount of wages. In relative terms, over 40% of the owners in our sample optimized their wages perfectly in 2007. However, in 2002, we observe less complete wage optimization, as slightly under 15% of owners optimized their wages.

The monetary gains from income-shifting were smaller before 2005 (see Section 3.2 for more details). This means that gains from optimizing the income composition are on average larger after the abolition of the single dividend tax system. This might explain the larger spike at zero after the reform in 2007. The significance of monetary gains from income-shifting is analyzed in more detail later in Section 3.6. In addition, Figure 3 includes the optimal corner solutions as optimal choices. Dropping the optimal corner solutions significantly decreases the peak at the level of 0 before the tax reform in 2002. However, after the reform the overall picture of active income-shifting remains clear even when the optimal corner solutions are not included.

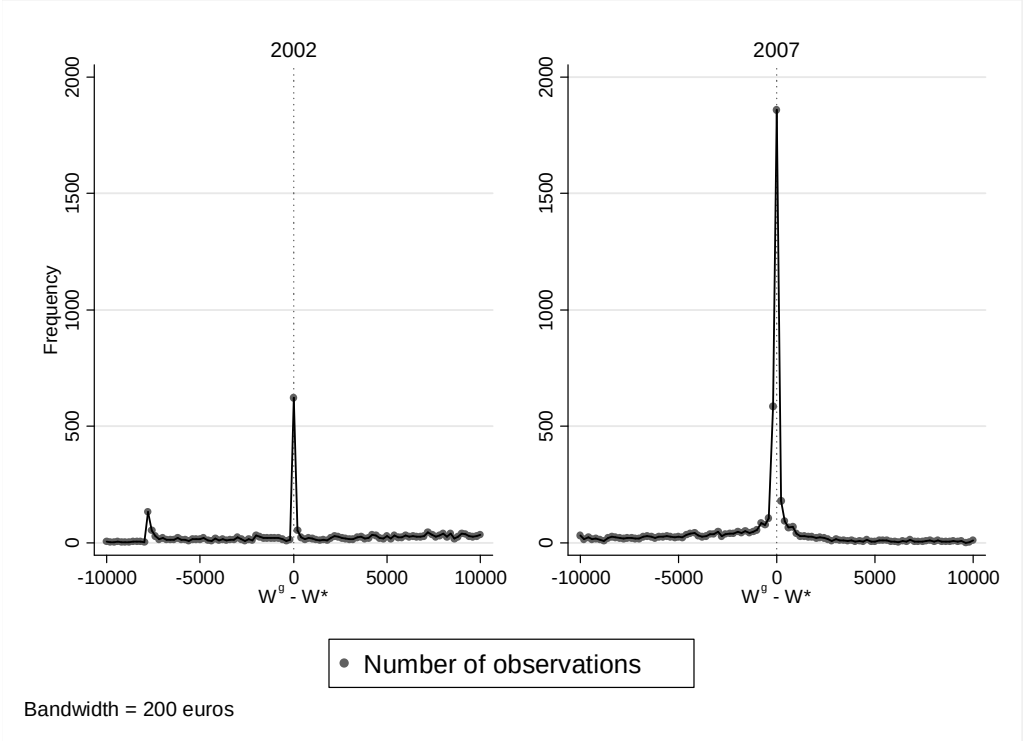

FIGURE 3. The distribution of the difference between realized gross wages and tax-optimal gross wages in 2002 (left) and 2007 (right)

Figure 4 describes the relationship of the key variables in our study, the change in realized gross wages $\triangle W^g_{i,t} = W^g_{i,t+j} - W^g_{i,t}$ and the change in tax-optimal gross wages $\triangle W^*_{i,t} = W^*_{i,t+j} - W^*_{i,t}$ between the years 2002 and 2007. There is a clear positive relationship between the variables. On average, large $\triangle W^*_{i,t}$ are followed by similar $\triangle W^g_{i,t}$. In other words, changes in the realized division of gross income are closely related to the changes in the tax code, measured by the changes in tax-optimal gross wages. Thus the owners who faced large changes in the tax-optimal income composition also changed their realized wages more than the owners who faced no or only small changes in tax incentives.

We fit a non-parametric Kernel estimate with a 95% confidence interval into Figure 4 to further illustrate this effect and its statistical significance. Furthermore, the Figure illustrates that there is a considerable amount of variation in both realized and tax-optimal gross wages in the data.

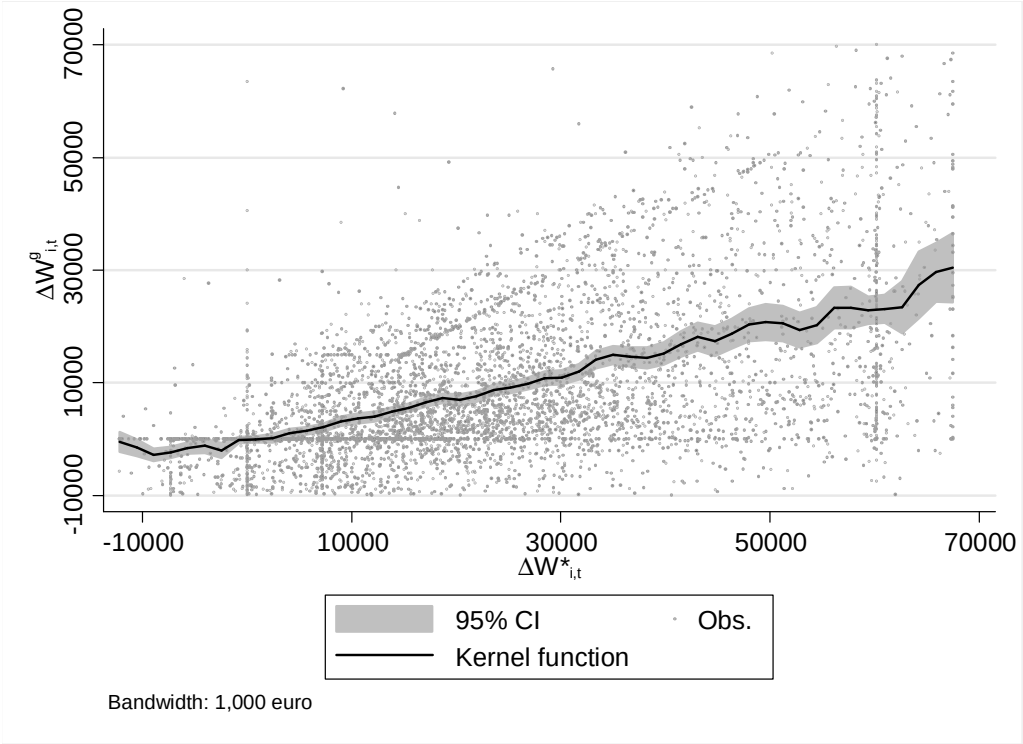

FIGURE 4. The effect of changes in tax-optimal gross wages $\triangle W^*_{i,t}$ on the change in realized gross wages $\triangle W^g_{i,t}$ between 2002 and 2007 (in current euros)

Finally, Tables A3 and A4 in the Appendix present descriptive statistics for the key variables in our analysis. Table A3 presents the variables at the owner level. For example, the wages variable represents total gross wages paid to the owner from his/her firm. Optimal gross wages and optimal gross dividends are optimized according to the prevailing tax system in each year for each observation.

There are significant differences in the pre and post-reform optimal combinations of gross wages and gross dividends. Before the 2005 tax reform, the average level of tax-optimal gross wages was relatively low. After the increase in dividend taxation, the average level of optimal wages relative to optimal dividends increased markedly.

Table A4 describes the characteristics at the firm level. These statistics are calculated only for those firms for which we also have information at the owner level. The mean of total assets, net assets and turnover all increased considerably over the time period of 2002–2008.

3.5. Results

Tax optimization model

We estimate the first-differences equation (3.4.2) using a balanced panel data consisting of the years 2002, 2003, 2007 and 2008, and adding year dummies to the model[20]. We estimate the equation in levels, as many observed and optimal wages and optimal dividends are zeros both before and after the reform. Therefore, for example, a logarithmic model would lose too much information.

The results are presented in Table 1. The first column shows the effect of a change in tax-optimal gross wages on a change in the realized gross income composition without control variables. The second column estimates are derived using the full set of individual and firm-level controls.[21]

The owners of privately held corporations react to tax changes very actively. The tax schedule has a remarkable and statistically significant effect on the decision to

[20]There were only trivial changes in the tax code of dividends and wages outside the 2005 reform.

[21]We also estimate the cross sectional model in equation (3.4.1) with a full set of control variables. The cross section OLS estimates for the years 2002, 2003, 2007 and 2008 are presented in Table A5 in the Appendix. The results show that the point estimates for the coefficients of tax-optimal gross wages (W^*) are between 0.90-1.05 and highly significant in every year. These results imply that income-shifting incentives and realized behavior seem to be highly correlated. Fjaerli and Lund (2001) get qualitatively similar results in their cross sectional analysis for Norway.

divide income into wages and dividends with a given level of total gross income. The coefficient for the optimal gross wage implies that a one euro change in the tax-optimal gross wage affects realized gross wages by 66 cents on average. The estimate differs from one, so the income-shifting response is not "perfect". However, the magnitude of the optimal wage coefficient implies that the welfare costs of income-shifting might be considerable.

Adding control variables does not change the results. The coefficient for optimal gross wages with controls is very close to the coefficient without them, which supports the view that the tax schedule is the main factor affecting the income composition. Furthermore, adding controls does not affect the fit of the model. The R-squared statistic increases only by 0.01 compared to the model with $\triangle W^*_{i,t}$ as the only explanatory variable.

We also use a two-year difference model for the years 2002 and 2008 to estimate the longer-run average effect. These results are presented in Table A6 in the Appendix. When using the data for 2002 and 2008, the point estimate for income-shifting is approximately 0.68. This estimate is not statistically different from that using the panel data for all four years. This indicates that our results are robust and independent of the length of the difference[22].

Also, the coefficients for the control variables are mostly insignificant or very small, which again indicates that the changes in the tax system are the driving force behind the decision on income composition. However, the ownership share seems to have a negative effect on realized gross wages. When ownership is concentrated, the owner has more power to make tax optimal decisions on income composition. In this case, increased ownership seems to open up a way to pay out more low-taxed dividends at

[22]The results are robust using all pairs of pre and post-reform years. The results for the years 2002 and 2007 are presented in Table 3 in Section 3.6 (columns 3 and 4). Other results are available from the authors upon request.

the expense of wages (given the changes in the tax code). This result is also expected in the light of previous literature. Chetty and Saez (2010) find that tax-optimization is more active among corporate owners who own larger shares of the firm.

In addition, a change in the turnover of the firm has a positive and statistically significant effect on the difference in realized gross wages, although the size of the effect is very small. This can be interpreted as indicating that the growth of the firm (in the sense of turnover) has a small increasing effect on wage compensations given the change in the tax code. All the other coefficients for firm-level controls are statistically insignificant, including the number of employees, profits and total assets. Therefore, changes in most of the firm-side variables have no significant effect on the division of income on average.

VARIABLES	(1) ΔWage	(2) ΔWage
ΔW^*	0.662***	0.661***
	(0.007)	(0.013)
ΔOwnership		-71.580**
		(33.259)
ΔTurnover		0.000***
		(0.000)
ΔTotal assets		0.000
		(0.000)
ΔProfits		-0.000
		(0.000)
ΔEmployees		9.927
		(9.469)
ΔOther capital income		-0.001
		(0.000)
Observations	17,238	17,238
R-squared	0.347	0.348

Notes: Owner-level clustered robust standard errors in parentheses.*** p<0.01, ** p<0.05. First-differences model estimated by OLS using balanced panel data for 2002, 2003, 2007 and 2008: the dependent variable is the difference in realized gross wages.

TABLE 1. OLS estimation results

One important aspect is the heterogeneity of the income-shifting response. First, we use quantile regression methods to study the heterogeneity around the average estimate. In Figure 5, we plot the estimates at separate percentile points with the 95% confidence intervals using equation (3.4.2) with the full set of controls.

As can be seen from the Figure, the point estimates are larger at higher percentiles. The largest estimate is close to one at the 95th percentile point, which suggests that the income-shifting response is nearly perfect among those owners who faced the largest absolute changes in their tax-optimal wages. In contrast, the estimates are smaller for those whose tax incentives were not affected as much by the tax reform. Thus income-shifting responses vary in different percentiles compared to the average OLS estimate

(dash line in Figure 5), which is important to take into account when interpreting the results. However, all estimates in the Figure are clearly statistically different from zero, implying that the responses are evident regardless of the size of tax incentive. Also, this Figure implies that monetary benefits from the change in taxes affects the response, because with large changes in tax-optimal wages the benefits are also largest. The costs and benefits from tax optimization are discussed more thoroughly in Section 3.6.

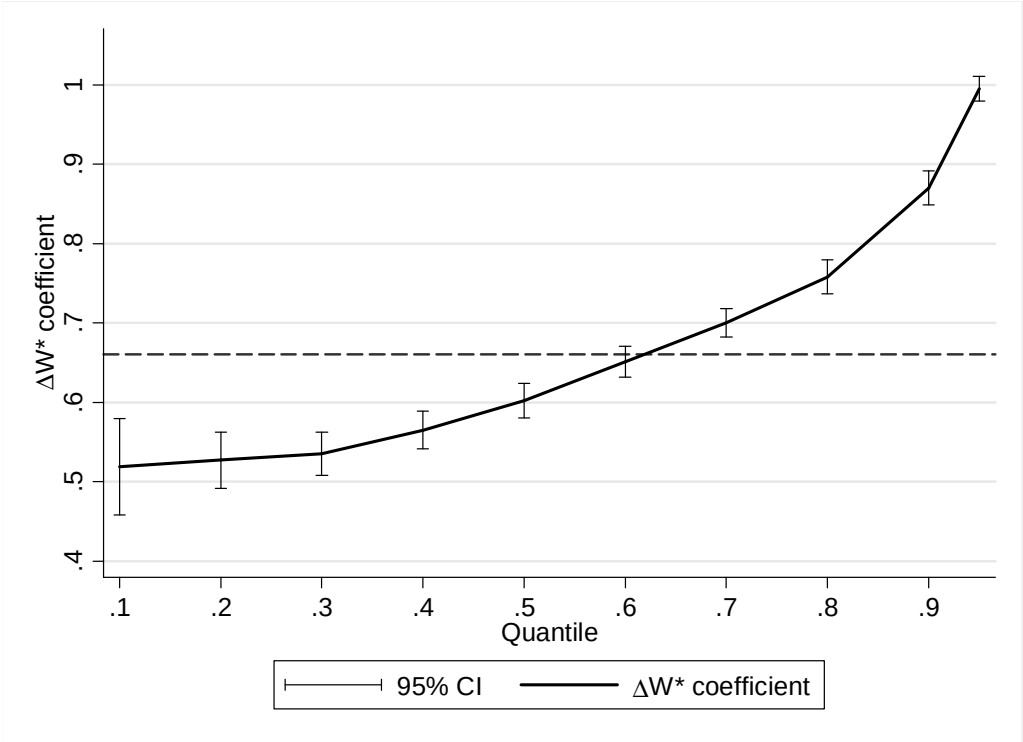

FIGURE 5. Quantile regression results

We also categorize owners into four equally sized groups and estimate equation (3.4.2) separately for these groups. We use base-year turnover, total assets and the number of employees as continuous variables to study if there are differences in income-shifting responses with respect to the size of the firm. We also estimate the model by

age and gender of the owner. In addition, we examine if there are differences in income-shifting activity between industries. The results for the heterogeneity estimations are presented in Table A7 in the Appendix.

In general, the income-shifting responses are homogeneous between different groups. There are no significant differences in tax avoidance activity between women and men, age groups or the size of the firm. Thus these results suggest that the average income-shifting response is not driven by certain types of owners or firms. However, some differences can be detected at the industry level. For example, the owners of firms in financing and agricultural industries shift income more actively than others.

There are some issues regarding the empirical setup that might affect the results. First, our data are limited to owners who receive dividends from their firms in each year. This might bias the estimated average income-shifting effect among Finnish business owners. However, the direction of the bias is unclear. The owners who do not pay any dividends might be more or less active in tax-motivated income-shifting compared to the owners who pay dividends. However, it is plausible that the owners not included in the data might be less active in income-shifting, especially before the reform of 2005 when there was in general larger incentives to pay dividends.

Secondly, our FD analysis uses balanced panel data for a relatively long time period (2002–2008). This means that our estimating sample includes only owners who were successful enough to continue their business activity throughout this period. It might be that these owners are also more active in income-shifting. This might cause an upward bias in our average estimate. In addition, our sample is limited to owners who own at least 50% of the firm alone or together with family members. It is presumable that these owners are more responsive to tax incentives than those who own less than 50%. The owners with more than 50% of the firm have more power to make tax-optimal decisions on profit distribution.

Finally, as mentioned in Section 3.2, pension and health insurance contributions might affect the income-shifting behavior. Insurance contributions are based on self-reported YEL income, which need not to coincide with the actual gross wage income of the owners in our estimating sample. However, wages and YEL income might be correlated among some owners. If insurance contributions are considered as taxes, this might decrease the incentives to increase wage payments as a response to dividend tax increase. This might create a downwards bias to our estimate, as we do not include insurance contributions based on YEL income as taxes when defining the tax-optimal wages.

The marginal deadweight loss of income-shifting

In order to link the marginal deadweight loss theory to our empirical income-shifting estimate, we assume that $\frac{d\gamma}{d(\frac{t_W}{t_D})} = \frac{dW^g_{i,t}}{dW^*_{i,t}}$. In other words, we replace the tax rate ratio parameter $d(\frac{t_W}{t_D})$ with its empirical counterpart $dW^*_{i,t}$. The income-shifting component $d\gamma$ equals the change in gross wages $dW^g_{i,t}$. This follows from the definition that total gross income is given, and thus any income shifted from or to gross wages equals the change in the gross wage level.

Formally, the approximation for the marginal excess burden of tax avoidance via income-shifting takes the following form

$$DWL \approx \frac{dW^g_{i,t}}{dW^*_{i,t}}(t_D - t_W)$$

where $dW^g_{i,t}/dW^*_{i,t}$ is the average income-shifting response, and t_D and t_W are the marginal tax rates on dividends and wages, respectively.

We approximate the DWL at the average point using the average values for realized and optimal gross wages. Ideally, $(t_D - t_W)$ should reflect the difference between the marginal tax rates when there are no possibilities for income-shifting. However, this

income composition is unobserved, as we only observe the realized income composition for each owner after the income-shifting decision has been already made.

In order to evaluate the DWL, we need "counterfactual" values for the marginal tax rates for the case where income-shifting does not exist. As the owners in the data set all hold an executive position in their firm, the counterfactual wage income and wage tax rate should correspond to the executive wage level of an employee with a similar position in the firm. Counterfactual dividend tax rate should correspond to the tax rate on the return on assets for a passive main owner not working for the firm.

The firms in the data are relatively large and profitable on average. Thus we assume that a non-owner executive position at these firms would require a relatively high wage compensation. Also, the firms are wealthy in terms of net assets. Therefore we approximate the marginal tax rate difference by using the post-reform (2007) top bracket employee wage tax rate (56%) and the effective dividend tax rate for flat-taxed dividends (26%).

We estimate the average income-shifting response $\frac{dW^g_{i,t}}{dW_{i,t*}}$ to be 0.66. Using this and the above mentioned assumptions on the tax rate difference, we approximate the marginal DWL to be 0.21[23]. In addition, the marginal excess burden is similar across different owners and firms, as the income-shifting response itself does not vary significantly between different groups.

The approximated marginal DWL can be considered significant as it does not include any real economy effects. A comparison to DWL estimates in the elasticity of taxable income literature, calculated mostly in the US, reveals that this estimate is similar in size (see Saez et al. (2012)). However, because of the absence of real economy responses, our calculation does not necessarily capture all welfare losses. Tax rate changes might also have a significant effect on the amount of total gross income ($W^g + D^g$) or other real economy variables such as investments. In addition, combining real effects and

[23]By using the second highest marginal tax rate for wages (48%), the DWL decreases to 0.15.

income-shifting responses could either decrease or increase the DWL compared to the sole income-shifting inefficiency.

Furthermore, as emphasized by Chetty (2009a), the theoretical assumptions behind the standard DWL model might not hold in practice when analyzing tax avoidance behavior. The marginal cost of income-shifting might not equal the difference of the marginal wage and dividend tax rates, which changes the interpretation of our excess burden model. In the extreme case that income-shifting has no cost, the marginal excess burden equals zero, and income-shifting only affects the allocation of resources between the public sector and the owner. If the overall marginal social cost is positive but smaller than the tax rate difference, only a part of the income-shifting response causes a deadweight loss. Therefore, our estimate of the excess burden of income-shifting serves mainly as an approximation of the scale of the income-shifting response, and need to be interpreted with caution.[24]

3.6. Extensions

IV estimation

As discussed in Section 3.4.3, it is possible that $\triangle W^*_{i,t}$ is not completely exogenous in the FD model. Therefore we also use an instrumental variable (IV) estimator to estimate the model. In the IV estimator, we define $\triangle W^*_{i,t}$ with fixed characteristics and use it as an instrumental variable. This instrument, $\triangle \overline{W}^*_{i,t}$, only accounts for the changes in tax-optimal gross wages caused directly by the tax reform of 2005.

We use only the years 2002 and 2008 in the IV estimation. We calculate $\triangle \overline{W}^*_{i,t}$ using total gross income, firm net assets and other earned income in the year in the middle of the difference. We define the tax-optimal gross wages for total gross income, net assets and other earned income in 2005 using both the 2002 and 2008 tax codes.

[24] We further discuss this issue in Section 3.6 when we analyze the significance of monetary benefits in income-shifting behavior.

The difference of these tax-optimal gross wages is then used as an instrument in the IV estimator. These types of predicted tax instruments are widely used in the elasticity of taxable income literature (see Saez et al. (2012)). The basic idea of using income and other characteristics in the middle year of the difference as a base for the instrument has been proposed by Blomquist and Selin (2010). The use of income in the middle year reduces the covariance between the instrument $\triangle\overline{W}^{*}_{i,t}$ and the error term $(\varepsilon_{i,t+j} - \varepsilon_{i,t})$ if there are reasons to suspect that the instrument is a function of the dependent variable $(W^{g}_{i,t+j} - W^{g}_{i,t})$. Therefore, for example, using characteristics at time t as a base for the instrument might provide inconsistent estimates.

The two-stage least squares results are presented in Table 2. The instrumented coefficient for the change in tax-optimal wages with the full set of controls is approximately 0.32 (column (4)), which is smaller than our baseline estimate. This shows that the possibly endogenous part of the response causes an upward bias in the average income-shifting estimate. Nevertheless, the IV estimate is still significant both statistically and economically, which indicates that income-shifting is notable even when possible mechanical effects on gross wages are taken into account.

	(1)	(2)	(3)	(4)
VARIABLES	1st stage	ΔW	1st stage	ΔW
1st stage	0.523***		0.528***	
	(0.014)		(0.014)	
ΔW^{*} (instrumented)		0.344***		0.319***
		(0.034)		(0.034)
Full set of controls	No	No	Yes	Yes
F-test	134.07		24.01	
Observations	4,334	4,334	4,334	4,334
R-squared	0.252		0.259	

Notes: Owner-level clustered robust standard errors in parentheses.*** p<0.01. Estimates from the instrumental variable model estimated with 2SLS for the years 2002 and 2008. Columns (1) and (3) present the first-stage results, and columns (2) and (4) report the coefficients for the instrumented optimal wage. The dependent variables in (2) and (4) are changes in realized gross wages.

TABLE 2. IV estimation results (2SLS)

As realized changes in net assets and other characteristics are not allowed to directly affect realized changes in the division of income, the IV estimates only denote the lower bound for the total income-shifting response. For example, there is no general explicit reason to assume that the change in net assets would be in itself (i.e. without the effect on the tax rate on dividends) endogenous to the choice of income composition and the type of income withdrawn from the firm. Therefore the IV approach probably excludes part of the exogenous variation in income-shifting incentives as well. Thus the IV estimate can also be interpreted as the lower bound income-shifting response. When using the lower bound 2SLS estimate, the approximate for the average marginal DWL of income-shifting decreases to 0.12. Thus even with the lower bound estimate, the welfare costs of income-shifting are still non-negligible.

Costs and benefits of income-shifting

It has been shown both theoretically and empirically that optimization frictions, e.g. adjustment and search costs, have an effect on individual tax-optimization behavior (see Chetty (2012) and Chetty et al. (2011)). In short, the intuition behind the optimization friction framework is that individuals are not responsive to changes in income taxation if the potential benefit does not exceed the costs related to re-optimization (e.g. adjusting the amount of labor supply). Also, our earlier results support this view as the quantile regression estimates in Figure 5 show that larger changes in tax incentives increase the behavioral response of the owners.

We define the utility gain from optimizing correctly with respect to the tax code as

$$\triangle U = U(W^*, D^*) - U(W^0, D^0) \tag{3.6.1}$$

where (W^*, D^*) is the tax optimal combination of gross wages and gross dividends, and (W^0, D^0) is the gross income combination initially selected by the owner. In other

words, $U(W^*, D^*) = (1 - t_W)W^* + (1 - t_D)D^*$ denotes the utility from behaving optimally with respect to taxes, and $U(W^0, D^0) = (1 - t_W)W^0 + (1 - t_D)D^0$ denotes the utility stemming from an initial income combination. As (W^*, D^*) is a unique optimum that minimizes taxes and maximizes net payouts, and assuming the utility function is linear in terms of total after-tax income, $\triangle U$ is by definition always non-negative.

The owner optimizes the combination of gross wages and gross dividends if the utility gain from optimization exceeds a fixed individual optimization cost ψ. By applying this threshold rule, the choice rule becomes

$$(W^g, D^g) = \begin{cases} (W^*, D^*) & if \triangle U > \psi \\ (W^0, D^0) & otherwise \end{cases} \tag{3.6.2}$$

For example, the cost of income-shifting can stem from the opportunity cost of time, or simply from monetary costs to tax consultants. To sum up, it is also rational for the owner *not* to withdraw the tax-optimal combination of gross income (W^*, D^*) from the firm *if* the costs are high and/or the monetary benefits from tax optimization are low.

We calculate $\triangle U$ as the difference between taxes paid per total income at (W^0, D^0) and taxes paid per total income at the optimal point (W^*, D^*). In our empirical analysis, (W^0, D^0) is taxes paid after the reform of 2005 when there are no behavioral changes in the pre-reform income combination and the amount of total income. (W^*, D^*) is taxes paid when the owner has optimized her gross income combination perfectly using the post-reform tax legislation and pre-reform total income level. Thus $\triangle U$ describes the monetary amount each owner would have gained by re-optimizing her gross income combination after the reform.

The benefit analysis is carried out using the years 2002 and 2007. First, we calculate (W^0, D^0) using *realized* gross income combination of wages and dividends in 2002 for each owner and tax it according to the post-reform legislation of 2007. Second, we

define (W^*, D^*) using the *tax-optimal* income combination under 2007 tax rules using the level of 2002 total gross income. Taxes paid are divided by total gross income in 2002 in order to get a more realistic picture of the relative significance of the monetary benefit.

The $\triangle U$ variable is correlated with the realized wages paid in 2002, causing $\triangle U$ to be endogenous in the model. Therefore, we need a valid instrumental variable that is correlated with $\triangle U$ but uncorrelated with the first-period realized wages (i.e. 2002 wages). A natural candidate for such an instrument is to derive a similar $\triangle U$ variable by using the total gross income and realized income composition in any of the pre-reform years. Thus we use a $\triangle U$ variable calculated with the realized gross income in the year 2003 and the tax code of 2007 as an instrumental variable for the potential benefits.

More formally, the 1st stage of the two-stage least squares estimator is

$$\triangle U^{2007}_{i,2002} = \chi_i + \kappa \triangle U^{2007}_{i,2003} + \rho(W^*_{i,2007} - W^*_{i,2002}) + \varphi(X_{i,2007} - X_{i,2002}) + \nu_i \tag{3.6.3}$$

and the 2nd stage is

$$\begin{aligned}(W^g_{i,2007}\text{-}W^g_{i,2002}) = \quad & \triangle\alpha_{i,t} + \eta(W^*_{i,2007} - W^*_{i,2002}) + \\ & \mu(X_{i,2007} - X_{i,2002}) + \theta\Delta\hat{U}^{2007}_{i,2002} + \triangle\epsilon_{i,t}\end{aligned} \tag{3.6.4}$$

where θ measures the average effect of relative monetary benefits on changing the gross income combination. $\triangle U^{2007}_{i,2002}$ and $\triangle U^{2007}_{i,2003}$ denote the potential benefits calculated with 2002 and 2003 gross income and the 2007 tax rules, respectively.

We expect those who benefit less from re-optimization not to change their behavior after the reform, i.e. small relative benefits lead to small (or zero) changes in realized gross wages, and vice versa. In this case θ is positive and significant. If the costs and

benefits are irrelevant in the income-shifting pattern, the coefficient would be insignificant or close to zero.

The results for the FD model including the potential benefits from income-shifting are presented in Table 3. The first column shows the results without controls, and the second column presents the estimates with the full set of controls using equation (13). Columns 3 and 4 present the estimates without including the benefits.

	(1)	(2)	(3)	(4)
VARIABLES	ΔWage	ΔWage	ΔWage	ΔWage
ΔW^*	0.662***	0.663***	0.620***	0.620***
	(0.012)	(0.012)	(0.012)	(0.015)
$\triangle \hat{U}$	2,796.05***	2,799.77***		
	(184.450)	(184.449)		
ΔOwnership		-29.315		-32.053***
		(20.786)		(4.221)
ΔTurnover		0.000		0.000
		(0.000)		(0.000)
ΔTotal assets		0.000		-0.000
		(0.000)		(0.000)
ΔProfits		-0.001		-0.000
		(0.000)		(0.000)
ΔEmployees		-9.875		-3.855
		(8.424)		(12.044)
ΔOther cap. income		-0.001		-0.001
		(0.000)		(0.000)
Observations	6,115	6,115	6,115	6,115
F-test (1st stage)	1,627.28	407.96		
R-squared	0.356	0.357	0.319	0.319

Notes: Owner-level clustered robust standard errors in parentheses.*** p<0.01. Estimated by OLS/2SLS using the years 2002 and 2007. The dependent variable is the difference in realized gross wages.

TABLE 3. Results with benefits from optimization (2SLS/OLS)

Monetary benefits have a significant effect on income-shifting behavior. The sign of the coefficient is positive as expected. The estimate implies that a 1% increase in

benefits from income-shifting increases the difference in realized gross wages by approximately 2,800 €. This effect is also related to the heterogeneity of the average estimate discussed before. We estimate larger responses for those who faced large incentive changes due to the tax reform. Those owners who faced clear changes in tax incentives usually also benefit more from shifting income than those who faced only minor changes.

The baseline income-shifting estimate increases slightly after adding the potential benefits into the model, but the magnitude of the tax code effect is statistically the same as without the benefits. After including the benefits to the model, none of the control variables are significant. This indicates that tax incentives and the costs of income-shifting are the main factors behind owners' decisions to withdraw different types of income from the firm.

The significance of monetary benefits also suggests that the costs related to income-shifting are relevant. As mentioned before, if income-shifting would not induce any real costs, there would be no deadweight losses either (see Chetty 2009a). Our results indicate that the costs affect the behavior of the owners. Nevertheless, it is likely that at least part of the costs are payments to tax consultants, which can be regarded as transfers within the economy. This would imply that the standard DWL model overestimates the true excess burden of income-shifting. Thus our approximation for the deadweight loss needs to be interpreted as the upper bound for welfare losses stemming from income-shifting.

Finally, Chetty and Saez (2010) conclude that concentrated ownership increases tax optimization among corporate owners. Our results in Table 3 do not support this view. When we explicitly include the potential benefits from income-shifting into the model, we find the ownership share to be irrelevant in tax avoidance behavior. Therefore, the ownership structure is not as important an aspect as the actual costs. However, our data set includes only shareholders of private corporations who own at least 50% of the

firm alone or together with family members, and thus we cannot offer a general result for the relationship between the ownership share and income-shifting.

3.7. Conclusions

In this paper we quantify the extent of income-shifting behavior by the main owners of privately held corporations in Finland. In addition, we explore the heterogeneity of the income-shifting response among different owners and firms, and study how the costs and benefits associated with income-shifting affect tax avoidance behavior.

In many tax systems, business owners can minimize taxes by choosing an optimal combination of different income types as their personal compensation from the firm. In Finland, the corporate and dividend tax reform of 2005 significantly changed the income-shifting incentives for many business owners. In the reform, the taxation of dividends tightened, which increased the incentives to pay wages as a form of personal compensation. In the light of behavioral tax research, the reform had an appealing feature: the incentives to replace dividends with wages varied among approximately similar corporate owners. This variation in incentives together with extensive micro data, including information on both the owner and firm-level, enable us to credibly analyze the extent of income-shifting behavior.

We find strong evidence that owners are active in income-shifting. Our main result shows that a one euro change in the tax-optimal gross wage results in a 66 cent change in realized gross wages on average. Our lower bound income-shifting estimate implies a 32 cent change in realized gross wages. These estimates indicate that the effect of the tax code on the composition of income is significant both statistically and economically. In addition, the income-shifting response seems to be relatively homogeneous between different firms and owners, as only the relative size of the tax incentive change affects income-shifting activity. Also, the results suggest that the dividend payments of Finnish business owners are driven by tax considerations, and not, for example, by the actual

rate of return on invested capital or the ownership share of the main owner. Similarly, executive wage compensation among the owners does not seem to reflect the actual work contribution to the firm, as the amount of wages paid is largely determined by income-shifting incentives.

We show that tax avoidance via income-shifting has welfare consequences even in the absence of real economy effects (labor supply, work effort, real investments etc.). Using standard approaches in the excess burden literature, we approximate the average marginal deadweight loss of income-shifting to be in the range of 0.12–0.21, depending on the empirical strategy used. This suggests that limiting the scope of income-shifting through administrative and legal measures has positive effects on general welfare. The government can alleviate the disadvantageous effects of income-shifting by reducing the difference between wage and dividend tax rates, and limiting the legal possibilities to shift income between tax bases.

Furthermore, our results show that the costs and benefits from income-shifting are important parts of tax avoidance behavior. Larger monetary benefits from changing the income composition drive business owners to increase income-shifting. Therefore, the inefficiency caused by income-shifting can also be influenced by affecting the costs of tax optimization. At least to some extent, the costs can be affected by simply adjusting the tax regulations.

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Appendix

	MTR on wages		MTR on dividends (no net assets)		MTR on dividends (net assets 170k)		MTR on dividends (net assets 1,000k)	
Income	*2002*	*2007*	*2002*	*2007*	*2002*	*2007*	*2002*	*2007*
5,000	18.1	11.6	23.1	32.3	29.0	26.0	29.0	26.0
10,000	23.9	17.0	19.3	35.1	29.0	26.0	29.0	26.0
15,000	37.4	32.6	36.3	36.6	29.0	26.0	29.0	26.0
20,000	43.4	32.6	42.3	41.3	23.1	32.3	29.0	26.0
25,000	43.4	43.1	42.3	46.7	23.1	35.1	29.0	26.0
30,000	43.4	43.1	42.3	46.7	32.3	36.6	29.0	26.0
35,000	49.4	48.5	48.3	49.5	36.3	41.3	29.0	26.0
40,000	49.4	48.5	48.3	49.5	42.3	46.7	29.0	26.0
45,000	49.4	48.5	48.3	49.5	42.3	46.7	29.0	26.0
50,000	49.4	48.5	48.3	49.5	48.3	49.5	29.0	26.0
55,000	56.4	48.5	55.3	49.5	48.3	49.5	29.0	26.0
60,000	56.4	48.5	55.3	49.5	48.3	49.5	29.0	26.0
65,000	56.4	56.5	55.3	53.7	48.3	49.5	29.0	26.0
70,000	56.4	56.5	55.3	53.7	48.3	49.5	29.0	26.0
75,000	56.4	56.5	55.3	53.7	55.3	49.5	29.0	26.0
80,000	56.4	55.6	55.3	53.2	55.3	53.7	29.0	26.0
85,000	56.4	55.6	55.3	53.2	55.3	53.7	29.0	26.0
90,000	56.4	55.6	55.3	53.2	55.3	53.7	29.0	26.0
95,000	56.4	55.6	55.3	53.2	55.3	53.2	29.0	32.3
100,000	56.4	54.8	55.3	52.8	55.3	53.2	23.1	35.1

Notes:

MTR on wages is calculated with dividend income equal to zero, and vice versa. MTR on wages includes average municipal taxes, central government income taxes, automatic tax deductions and tax credits and average firm-level social security contributions (3%). MTR on wages does not include pension and health insurance contributions, as these are based on self-reported YEL income which is not determined by wage income (see Section 2). MTR on wages does not include deductions based on insurance contributions. MTR on dividends includes corporate taxes on withdrawn dividends (after 2005). MTR on dividends includes all automatic tax deductions and tax credits. MTR on progressively taxed dividends includes average municipal taxes and central government income taxes. Marginal tax rates are calculated using Stata and the Finnish JUTTA microsimulation model.

TABLE A1. Marginal tax rates (MTR) on wages and dividends with different levels of firm net assets, years 2002 and 2007 (in nominal euros)

Total gross income	Net assets	Tax optimal gross wage *2002*	Tax optimal gross wage *2003*	Tax optimal gross wage *2007*	Tax optimal gross wage *2008*
15,000	*10,000*	7,700	7,300	14,500	14,100
50,000	*10,000*	7,700	7,300	49,100	49,100
100,000	*10,000*	7,700	7,300	67,500	66,000
15,000	*100,000*	12,000	12,200	14,500	14,000
50,000	*100,000*	7,700	7,300	41,000	41,000
100,000	*100,000*	7,700	7,300	67,500	66,000
15,000	*500,000*	12,000	12,200	14,500	14,000
50,000	*500,000*	12,000	12,200	14,500	14,000
100,000	*500,000*	7,700	7,300	55,000	55,000

Notes:
The optimal gross wage levels are defined assuming that the owner owns 100% of the shares and that the owner has no earned income from other sources.

In general, earned income from other sources lowers the tax optimal gross wage, especially before the reform. For example, assume the owner has 2,500 € of other earned income with total gross income from the firm being 50,000 € and net assets 100,000 €. The tax optimal gross wage in 2003 is in this case 4,800 € (compared to 7,300 € without other earned income). However, with the same combination of total gross income, net assets and other earned income, the optimal gross wage does not change after the reform (41,000 € in both 2007 and 2008). This is due to the fact that after 2005 the tax rates for progressively taxed dividends increased sharply. After the reform, it is not in general optimal for the owner to replace wages with dividends after receiving a modest amount of other earned income.

TABLE A2. Tax-optimal gross wages before (2002, 2003) and after (2007, 2008) the 2005 tax reform with different levels of total gross income and net assets of the firm (in nominal euros)

Year	Stat	Wages	Optimal wages	Dividends	Optimal dividends	Total income	Ownership share
2002	Mean	19,806	5,317	27,105	41,594	46,911	0.82
	Median	18,485	7,463	12,222	28,797	34,567	.93
	SD	16,986	3,499	82,510	84,965	85,066	0.23
	N	6,277	6,277	6,277	6,277	6,277	6,277
2003	Mean	19,244	4,794	32,744	47,194	51,988	0.84
	Median	17,223	7,011	15,000	31,783	36,996	.95
	SD	17,318	3,401	142,723	144,477	144,533	0.23
	N	6,277	6,277	6,277	6,277	6,277	6,277
2007	Mean	23,083	26,033	32,767	29,817	55,850	0.82
	Median	20,440	23,888	14,910	11,267	40,170	.99
	SD	22,443	19,416	99,552	100,123	102,931	0.22
	N	6,277	6,277	6,277	6,277	6,277	6,277
2008	Mean	23,980	26,233	35,487	33,234	59,468	0.82
	Median	20,880	23,739	15,400	12,680	42,300	.99
	SD	24,064	20,041	103,706	105,115	107,824	0.22
	N	6,277	6,277	6,277	6,277	6,277	6,277

TABLE A3. Descriptive statistics (2002, 2003, 2007 and 2008): Main owners (in current euros)

Year	Stat	Turnover	Employees	Total assets	Net assets
2002	Mean	782,450	10.35	400,805	285,155
	Median	227,617	4	141,598	100,222
	SD	4,092,140	32.98	2,174,166	1,669,665
	N	6,277	6,277	6,277	6,277
2003	Mean	946,741	10.27	529,807	381,950
	Median	289,713	4	192,240	114,693
	SD	3,982,281	30.64	2,375,763	5,233,616
	N	6,277	6,277	6,277	6,277
2007	Mean	1,082,630	10.60	723,319	448,007
	Median	321,193	4	253,792	152,155
	SD	3,155,168	36.14	2,985,295	2,378,661
	N	6,277	6,277	6,277	6,277
2008	Mean	1,152,018	10.63	811,968	516,807
	Median	329,951	4	272,411	168,326
	SD	3,329,805	36.25	3,452,935	2,791,899
	N	6,277	6,277	6,277	6,277

TABLE A4. Descriptive statistics (2002, 2003, 2007 and 2008): Firms (in current euros)

	(2002)	(2003)	(2007)	(2008)
VARIABLES	Wage	Wage	Wage	Wage
W^*	1.050***	1.054***	0.904***	0.919***
	(0.075)	(0.071)	(0.014)	(0.015)
age	731.402***	796.057***	152.225	13.974
	(178.766)	(177.301)	(166.080)	(180.098)
age sq.	-8.102***	-9.032***	-1.295	0.104
	(1.912)	(1.852)	(1.650)	(1.771)
male	2,054.167***	1,887.503***	222.468	103.157
	(632.076)	(610.805)	(471.941)	(500.517)
ownership	-5,615.921***	-6,330.395***	-3,311.677***	-1,888.356**
	(1,003.374)	(975.413)	(773.002)	(881.820)
turnover	0.000	-0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
total assets	-0.000	0.001**	0.000*	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
profits	0.009***	-0.000	-0.001*	-0.000
	(0.002)	(0.003)	(0.000)	(0.000)
employees	18.056	28.357	5.856	3.568
	(23.840)	(25.448)	(5.471)	(7.255)
capital income	-0.001***	-0.011	0.001	0.001
	(0.000)	(0.009)	(0.002)	(0.001)
Constant	-5,060.437	8,823.021**	2,042.214	806.022
	(4,528.741)	(4,394.755)	(4,210.924)	(4,548.095)
Observations	5,160	5,611	6,244	6,237
R-squared	0.115	0.114	0.637	0.613

Notes: Owner-level clustered robust standard errors in parentheses.*** p<0.01, ** p<0.05, * p<0.1.

TABLE A5. Cross-section results for the years 2002, 2003, 2007 and 2008 (OLS)

VARIABLES	(1) ΔW	(2) ΔW
ΔW^*	0.681***	0.680***
	(0.012)	(0.016)
ΔOwnership		-9.120
		(52.054)
ΔTurnover		0.000
		(0.000)
ΔTotal assets		0.000
		(0.000)
ΔProfits		-0.001
		(0.002)
ΔEmployees		-7.535
		(12.391)
ΔOther capital income		-0.000
		(0.000)
Observations	5,613	5,613
R-squared	0.348	0.349

Notes: Owner-level clustered robust standard errors in parentheses.*** p<0.01.

TABLE A6. Results the years 2002 and 2008 (OLS)

	Turnover 0-25th p	Turnover 26-50th p	Turnover 51-75th p	Turnover 76-100th p	Employees 0-25th p	Employees 26-50th p
VARIABLES	ΔW	ΔW	ΔW	ΔW	ΔW	ΔW
$\triangle W^*$	0.676***	0.597***	0.646***	0.613***	0.604***	0.626***
	(0.028)	(0.029)	(0.028)	(0.033)	(0.025)	(0.034)
Observations	1,528	1,529	1,529	1,529	2,009	1,387
R-squared	0.383	0.345	0.365	0.253	0.317	0.332

	Employees 51-75th p	Employees 76-100th p	Total assets 0-25th p	Total assets 26-50th p	Total assets 51-75th p	Total assets 76-100th p
VARIABLES	ΔW	ΔW	ΔW	ΔW	ΔW	ΔW
$\triangle W^*$	0.606***	0.655***	0.738***	0.711***	0.640***	0.647***
	(0.027)	(0.033)	(0.027)	(0.024)	(0.024)	(0.033)
Observations	1,301	1,418	1,529	1,529	1,529	1,528
R-squared	0.377	0.302	0.359	0.417	0.380	0.262

	Age 0-25th p	Age 26-50th p	Age 51-75th p	Age 76-100th p	Male	Female
VARIABLES	ΔW	ΔW	ΔW	ΔW	ΔW	ΔW
$\triangle W^*$	0.601***	0.628***	0.606***	0.583***	0.623***	0.590***
	(0.028)	(0.028)	(0.032)	(0.037)	(0.017)	(0.033)
Observations	1,597	1,587	1,623	1,308	5,247	868
R-squared	0.330	0.348	0.283	0.274	0.318	0.355

	Agriculture	Mining	Industry	Construction	Commerce	Hotels
VARIABLES	ΔW	ΔW	ΔW	ΔW	ΔW	ΔW
$\triangle W^*$	0.836***	0.561***	0.692***	0.570***	0.600***	0.638***
	(0.108)	(0.081)	(0.048)	(0.035)	(0.030)	(0.092)
Observations	70	156	842	1,070	1,500	137
R-squared	0.537	0.394	0.335	0.308	0.322	0.430

	Logistics	Finance	Estate	Education	Health care	Other services
VARIABLES	ΔW	ΔW	ΔW	ΔW	ΔW	ΔW
$\triangle W^*$	0.563***	0.964***	0.636***	0.693***	0.658***	0.579***
	(0.078)	(0.107)	(0.028)	(0.124)	(0.068)	(0.108)
Observations	462	63	1,433	48	208	125
R-squared	0.254	0.660	0.342	0.590	0.423	0.346

Note: Owner-level clustered robust standard errors in parentheses.*** p<0.01.

TABLE A7. Results for different subgroups, 2002-2008 (OLS)

CHAPTER 4

Dividend Taxes and Decisions of MNEs: Evidence from a Finnish Tax Reform[1]

ABSTRACT. In this study we explore how a firm-level tax on redistributed foreign profits affects the choices of a multinational enterprise (MNE). We examine this by 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 untaxed 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. We also find suggestive evidence that the reported profits of foreign subsidiaries of Finnish MNEs increased, which indicates an effect on profit shifting. No change in investment was detected.

Keywords: Dividend taxation, Financial decisions, Multinational enterprise, Tax reform

JEL classification: H25, F23, H32

4.1. 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.

Against this background, it is no surprise that several OECD countries have reformed their corporate tax systems in recent years. Tax rate cuts, special regimes for income from intellectual property and limitations to interest dedections are some

[1]This essay is joint work with Seppo Kari. A version of this paper is published in the VATT Working Papers series, 27, September 2011.

examples. A further trend in Europe has been to switch from an imputation system to classical corporate tax with reduced tax rates.[2] 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.[3] The case against them turned on discrimination against either foreign shareholders or foreign corporations.[4]

One of the challenged features of European imputation systems was the so called equalization tax (EQT) and its counterparts[5]. 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 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

[2]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.

[3]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.

[4]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).

[5]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.

(Ruding Committee (1992)), but also by national governments who soon implemented amendments to their tax rules.[6]

Given the growing role of MNEs and the difficulties in designing their taxation, there has been little research establishing evidence from quasi-experimental setting 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. 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.[7]

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 prices, but have no effects 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))[8].

[6]See for example Weichenrieder (1994), for Germany and Freeman and Griffith (1993), for the UK.
[7]We also aim to contribute to the empirical analyses of the Finnish 2005 tax reform. Kari et al. (2008 and 2009) have examined the reform effects in their studies but both of these analyses concentrated only to personal-level changes in dividend taxation and ignored the changes in company-level tax structures such as EQT.
[8]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.

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.[9]

Our estimation method is a standard 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

Desai et al. (2007) refer to information asymmetries and monitoring motives as major determinants of repatriation policies.

[9]There is, of course, a large empirical literature that 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 (2008).

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 4.2 introduces an overview of the elements of the tax system in question. Section 4.3 presents the theoretical background and the hypotheses to be tested in our empirical analysis. Section 4.4 is devoted to empirical analysis and section 4.5 presents the conclusions.

4.2. The taxation of dividends in Finland

We briefly summarize the main elements of dividend taxation before and after the 2005 tax reform in Finland. A full imputation system was adopted as a part of a larger base-broadening and tax rate-cutting 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, equalization tax (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 income. Substantial reliefs for dividends from non-listed companies were

maintained. Corporate tax (τ) was cut from 29 to 26 per cent and the flat tax rate on personal-level capital income from 29 to 28 per cent.[10] 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 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, s is the rate of imputation credit and $\tau_e = s/(1-s)$ is the rate of EQT. In Finland $s = \tau$ 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 $EQT = max\,(MT - CT, 0)$.

An additional complicating aspect must be mentioned. It 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:

$$TS_t = \sum_{t-10}^{t-1} max(CT_s - MT_s,\, 0), \tag{4.2.1}$$

[10]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).

where t refers to the current fiscal year. Where old tax surpluses were required to reduce the equalization tax liability, the oldest unused tax surpluses were used first (first-in-first-out rule).

We get:

$$EQT = max(MT–(CT + TS), 0).$$

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 per cent. 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. 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.

4.3. Theoretical predictions

We will draw the hypotheses for our empirical analysis by considering EQT in an infinite-horizon dynamic MNE model.[11] 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).[12]

4.3.1. 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[13]

$$\Pi(K) + Q + D^* + C = G + I + T, \tag{4.3.1}$$

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.

[11]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 (1994, 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 it focus on a narrow set of financial flows between the parent and its single affiliate.
[12]More thorough theoretical analysis is presented in a version of this paper that is published previously, Harju and Kari (2011).
[13]The starred variables refer to the f-country.

Funds are spent on dividend distributions G to shareholders, h-country investment I and h-country taxes T.

The subsidiary's budget constraint is

$$\Pi(K^*) = D^* + I^* + C + c(C) + T^*. \tag{4.3.2}$$

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:

$$\max_{\{G,Q,C,D^*\}} V = \int_{t_0}^{\infty} (\gamma G - Q) e^{-\rho(t-t_0)} dt, \tag{4.3.3}$$

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

$$G = D + D_e, \tag{4.3.4}$$

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:

$$D \leq (1-\tau)\hat{\Pi} \quad with\ \hat{\Pi} = [\Pi(K) + C]. \tag{4.3.5}$$

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

$$T = \tau[\Pi(K) + C] + \tau_e D_e, \quad T^* = \tau^*[\Pi(K^*) – C – c(C)], \tag{4.3.6}$$

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.

4.3.2. 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 the Appendix of Harju and Kari (2011).

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.[14] 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.[15] 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:

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

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.[16] The position of foreign profits as the most favoured source is solely determined by EQT.[17]

[14]More formally, compare the partial differentials of the Lagrangean in respect of dividend variables and new equity, see Appendix in Harju and Kari (2011).
[15]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 $(1-\tau_p)/[(1-s)(1+\tau_e)]$.
[16]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.
[17]Observe that without the imputation system ($s=\tau_e=0$), but retaining other aspects of the model, the pecking order becomes $foreign\,profits \approx domestic\,profits \succ new\,equity$.

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 on the marginal return on capital, we may draw the MNEs long-run cost of capital in the presence of EQT:

$$\Pi'(K) = \frac{1-\tau_p}{(1-\tau)(1+\tau_e)} r. \tag{4.3.7}$$

Without EQT but retaining other features of the tax system, the cost of capital is $\Pi' = (1-\tau_p)r/(1-\tau)$. By comparing to equation (4.3.7) we may conclude that EQT lowers the h-country cost of capital below the benchmark level and hence increases investments. In the case of a full imputation system ($\tau_e = \tau/(1-\tau)$) condition (4.3.7) 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, $G = D = \Pi(K) + iF$.[18]

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 equation (4.3.5) 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.

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

[18]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.

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 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.[19] We obtain the following condition:

$$\frac{1-\tau^*}{1+\tau^e}\left\{\begin{array}{c}<\\=\\>\end{array}\right\}(1-\tau) \iff D^*\left\{\begin{array}{c}\prec\\\approx\\\succ\end{array}\right\}C. \tag{4.3.8}$$

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 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 ($s=\tau$) the

[19] A broader analysis is given in the Appendix of Harju and Kari (2011).

condition boils down to $\tau^e > 0$ implying that transfer pricing dominates at all positive rates.

The results derived above from the standard MNE model[20] 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.

4.4. Empirical analysis

4.4.1. 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 Finnish corporations operating in Finland. When we investigate profit-shifting responses, we use Swedish multinationals and their subsidiaries as our control group. This is justifiable since Swedish MNEs were not subject to any major policy reforms during our examination period.

The estimated DD equation is the following

$$Log(Y_{it}) = \beta controls_{it} + \delta after_t + \gamma treat_i * after_t + \eta_i + \varepsilon_{it}, \tag{4.4.1}$$

[20]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.

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.[21] 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 (4.4.1). 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 similarly in the treatment and control groups over time 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.[22] The policy impact γ in equation (4.4.1) is the expected value of parameter $\hat{\gamma}$.[23]

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

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

[23]See e.g. Blundell and Costa Dias (2009).

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 effect model or pooled OLS because it allows correlation between the firm component (η_i) and the regressors.[24] 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).

An additional challenge is to produce appropriate standard errors. The problem is emphasized in two separate papers by Bertrand et al. (2004) and Cameron et al. (2008). The problem arises when the number of groups used in the estimations is small. It could be, for example, in a case where an unobserved shock affecs groups behavior differently. These papers propose several options to help solve this problem: Bertrand et al. propose to use block bootstrap method and Cameron et al. propose to apply wild bootstrap method. In this paper we apply industry level clusters with a block bootstrap. As a robustness check we also apply a wild bootstrap method with the industry clusters. In addition, as a further robustness check we use municipality level clusters with both block and wild bootstrap methods.

4.4.2. 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 tax reform of 2005 (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. In the following we argue that these issues are not too serious for our identification.

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

Anticipation could be a problem because TR2005 was announced already in November 2003. In Figure 1 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 of parallel time trends 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 2002. However, the means seem to diverge in 2003 and the difference is even larger in 2004. This suggests that some anticipation might have happened before implementation of the reform. Right after the reform in 2005, the difference between the means of dividend payments is already statistically significant.[25]

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 abolition 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.

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

[25]In Appendix, Figures A2, A3 and A4 show the average trends for other main outcomes in the paper.

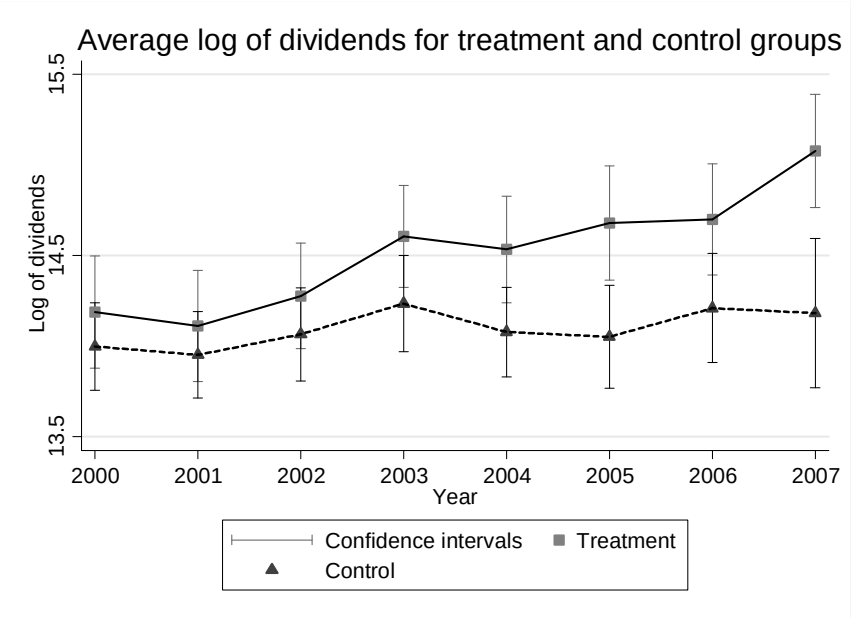

FIGURE 1. Average log of dividends: treatment and control groups

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. In addition, section 4.4.8 presents all other relevant robustness check results we have made.

4.4.3. 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 unbalanced panel form. The data contain all Finnish corporations and allow us to examine various decisions of companies. As the abolition of EQT mainly affected large firms with international operations, we exclude small firms from our analysis. The data include only Finnish MNEs (treatment) and Finnish corporations that have domestic subsidiaries (control).

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 the Amadeus data are used to identify Finnish MNEs and the location of their subsidiaries, and to investigate the changes in profit-shifting because the main data do not include information on foreign subsidiaries of Finnish based MNEs. The Amadeus database provides valuable information on the ownership structure of firms. This is important for our analysis, since it helps us to identify the Finnish MNEs precisely. However, the version of which we are applying in the analysis is only partial from the total Amadeus, including 1.5 million firms in Europe. Also, we have only data from 2000–2006. Thus, because of these reasons the information we have is incomplete and we should be careful when interpreting these results. Nevertheless, we apply the Amadeus data because we want to give a conclusive analysis of the responses.

Table 1 presents the 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. In Appendix, Figure A1 plots the averages of main control variables over time to further emphasize that the groups are relatively similar to each other.[26]

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
Sd	2.281	2.434	2.672	2.845	3.220	2.377	1.820	2.245
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
Sd	1.890	2.359	1.986	2.509	2.546	1.896	1.587	2.052
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 2 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

[26]Table A1 in Appendix shows similarly the descriptive statistics for the Amadeus data we apply as a second data set. Also Table A2 in Appendix shows the mean of turnover for treatment and control groups by main industry codes to present that the groups are comparable also by that characteristic.

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.

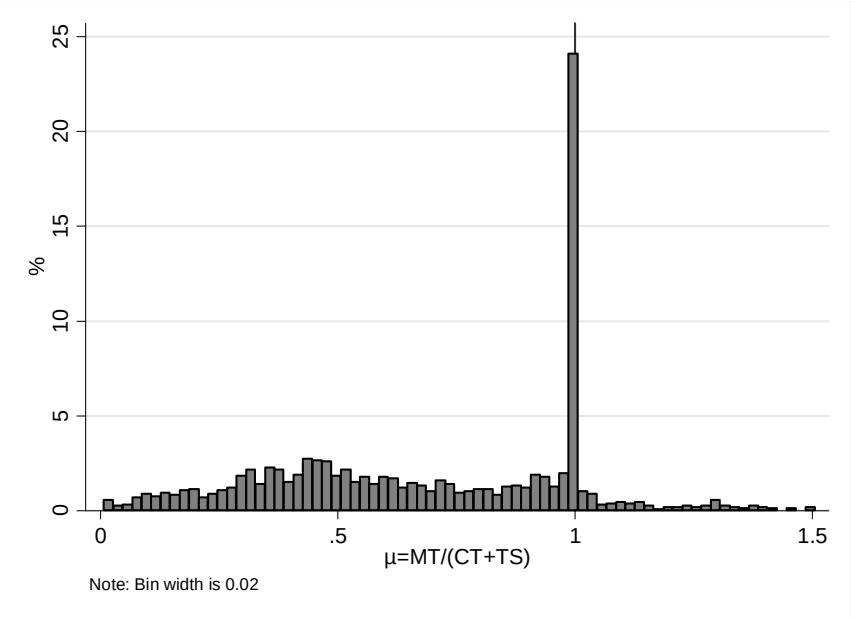

FIGURE 2. The liability of firms to pay EQT (years 2000–2003)

4.4.4. 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.

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. 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 and apply the data only from 2000 to 2004. 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 hamper our main identifying assumption. In both years we find that the estimates are statistically zero 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 in columns (5) and (6) of Table 2 without data for the years 2003 and 2004 are slightly smaller 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. This

underpins our main identification assumption of parallel time trends. More robustness checks for the estimations are presented in section 4.4.8.

	(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**			0.222*	0.209*
	(0.106)	(0.100)			(0.119)	(0.113)
Treatment *2003			0.030	0.006		
			(0.067)	(0.070)		
Treatment *2004			-0.052	-0.063		
			(0.073)	(0.066)		
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

Block bootstrapped standard errors with industry level clusters in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

TABLE 2. Estimation results: dependent variable the log of dividend payment

We present Figure 3 to show more explicitly the changes in logarithmic dividend payments due to the reform in both treatment and control groups. To be able to show the Figure, we first pooled the data to before (2000–2004) and after periods (2005–2007). Then, we calculated the changes in average logarithmic dividend payments for each firm between pooled periods. Thus, the Figure presents the whole distribution of changes in average dividend payments. It seems evident that there are very large changes in dividend payments over time as it is common to have even 100% increases in dividend payments of firms (number 1 in the horizontal axis refers to 100% increase in dividends and so on). However, the Figure suggest that almost the whole distribution of changes among treatment firms is shifted more to right in comparison to control group. It is also clear that many of the firms have increased their dividend payments very much as there are many changes between 50% and 200% increases.

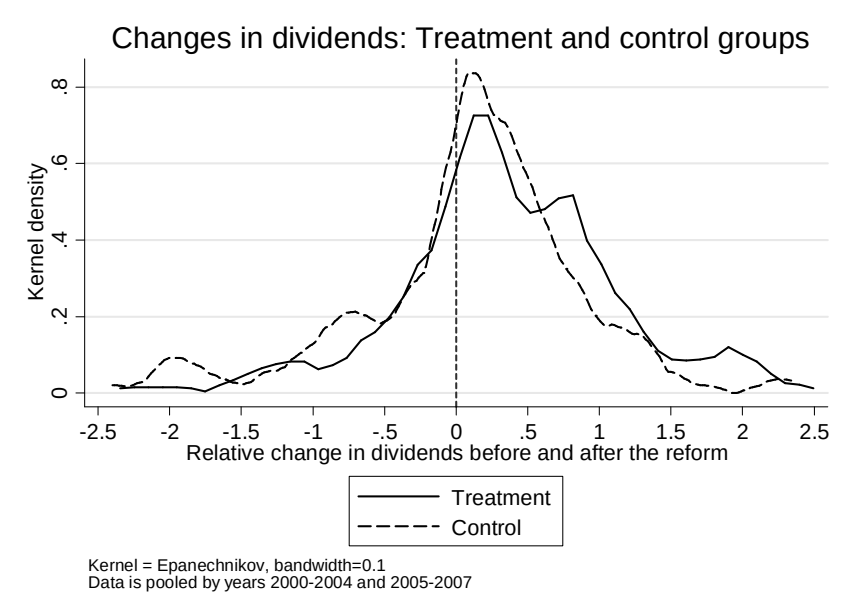

FIGURE 3. Relative changes in dividend payments before and after the reform for treatment and control groups

4.4.5. Results on investments. Our predictions in section 4.3 suggest that EQT may increase investments by MNEs in the parent's home 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 same set of controls as previously, see equation (4.4.1).[27] 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.

[27]Figure A2 shows the average real investments over time for control and treatment groups.

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
	(0.089)	(0.086)
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

Block bootstrapped standard errors with industry level clusters 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 these 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.[28] Therefore, we conclude that in contrast to theoretical predictions EQT seems not to have affected Finnish MNEs' investment decisions.

4.4.6. Results on repatriation decisions - dividends and profit shifting. In section 4.3 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.

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

[28]The results are available upon request.

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 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 that dividend income to parents increased among the treated companies compared to the control group after the reform. However, with the full set of controls the point estimate is significant only at 10% level. The magnitude of this response is high, an increase of approximately 23 per cent. This result implies that the increase in dividend payments of MNEs to the owners of the firms was mostly a result of an increase in dividend income. We interpret that the increase in dividend income is coming from the intra-company transactions from the foreign subsidiaries of MNEs to their parents. Thus the abolition of EQT also affected the transactions inside the MNEs.

	(1)	(2)
VARIABLES	Log(Divid-Inc)	Log(Divid-Inc)
After*Treatment	0.261**	0.228*
	(0.129)	(0.127)
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

Block bootstrapped standard errors with industry level clusters 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) and 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 (4.4.1). Controls include now the cost of employees, fixed assets and operating revenue. The variable after refers to the years 2005 and 2006. As mentioned in the data description section, these results should be interpreted with caution. The data set we are applying includes only a share of the total Amadeus database and is certainly lacking some important information. Still, to give a conclusive analysis, we estimate the effect of the reform on profit-shifting as well.

First we estimate the effects of the reform 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 foreign country to home country. To offer credible estimates we use two different groups of firms as controls. The first group comprises the 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 section 4.4.1.[29]

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 slightly compared to profits in the control groups. The point estimates suggest increase in profits in the range of 10 to 12 per cent being seemingly stable irrespective of the control group applied. However, the estimates are only statistically significant at 10% level when applying the full set of controls. Considering this and the data problems, we have to be careful in interpretation. Still, these estimates suggests that, in the pre-reform regime, at least some of the Finnish MNEs may have used intra-firm transactions to lower their overseas profits as a response to the threat of an extra tax burden in the form of EQT.

[29]Figure A4 in Appendix describes the mean of log EBIT in the treatment and two control groups over time. The parallel time trend assumption seems to hold relatively well.

	(1)	(2)	(3)	(4)
	Control: Swedish subsidiaries		Control: Finnish subsidiaries	
VARIABLES	Log(EBIT)	Log(EBIT)	Log(EBIT)	Log(EBIT)
After*Treatment	0.113	0.121*	0.117	0.119*
	(0.077)	(0.062)	(0.072)	(0.067)
Firm	X	X	X	X
Year	X	X	X	X
Full control set		X		X
Observations	13414	13414	12537	12537
R-squared	0.035	0.199	0.034	0.085
Number of groups	3196	3196	2706	2706

Block bootstrapped standard errors with country level clusters 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 as we are forced to use only EBIT as an outcome variable. It includes both profits from sales and dividend income. If MNEs used intra-firm transactions to shift profits from foreign sources to Finland before the reform, this should decrease the EBIT of the parent companies 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 point estimates are negative 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 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	-0.037	-0.030
	(0.098)	(0.076)
Firm	X	X
Year	X	X
Full control set		X
Observations	3935	3935
R-squared	0.020	0.229
Number of groups	851	851

Block bootstrapped standard errors with firm level clusters in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

TABLE 6. Estimation results: dependent variable the log of profits (parents)

4.4.7. Heterogeneity of the results. Our main data coming from the Finnish Tax Authority enables us to study the heterogeneity of the results. We divide the responses by the pre-reform variables. First we divide the data by the size of the tax surpluses into four quartiles. The tax surpluses in the data is a variable similar as is presented in equation (4.2.1). The firms with the low level of tax surpluses before the reform were closest to the margin to be forced to pay EQT. We interact the DD variable with the tax surplus quartiles to investigate the heterogenous responses. Columns from (1) to (3) in Table 7 offer the results of these estimations. In column (1) we estimate

the effect on dividend payments of firms, in column (2) the estimations are for real investments and the results in column (3) are for dividend income. In all spesifications the smallest tax surplus quarter is omitted.

The estimate of the main DD variable represents the effect on dividend payments for the parents with smallest tax surpluses. The interaction variables with two highest quartiles and the main DD variable are with opposite signs and are similar in size. Thus, the heterogeneity results show that the parent firms which had the smallest tax surpluses before the reform increased their dividend payments the most, column (1). We also find that parents over median tax surpluses changed their dividend payments only little, if at all. Therefore, it seems that the whole response comes from those firms having the highest incentive to increase their dividends after the reform. We do not find any statistically significant differences in real investments, results presented in column (2). This is also the case for parents' dividend income, results presented in column (3). However, the smallest tax surplus quartile seems to have the highest point estimate for dividend income and all interaction estimates are clearly negative. This suggest that some firms that had the lowest tax surpluses have also increased the repatriation of dividends from their subsidiaries. Nevertheless, all these estimates are statistically insignificant in column (3) and this offers only suggestive evidence.

In the second part of Table 7 in columns from (4) to (6) we divide the responses by the size of the pre-reform equity. We examine the responses of firms by the equity size because it is an indicator for the amount of distributable profits. The results are organized similarly as in columns from (1) to (3). The results imply that the parents with low equity responded more. Parents in the lowest quartile of equity before the reform increased their dividend payments the most after the reform, see column (4). At the same time parents in the highest quartile did not change their dividend payments at all. The real investment responses are again statistically insignificant, in column (5). The results are similar for dividend income as for dividend payments: among the

highest two quartiles of equity, there is no response in dividend income of parents, and among parents in the lowest quartile, there is a statistically significant increase. This result suggests that only those parents with small pre-reform equity levels responded to the reform. We interpret this to be a result of parents' increased repatriation of profits in a form of dividends from their foreign subsidiaries and then, distributing these profits by increasing dividend payments to their owners. Thus, the results suggest changes in financial flows within MNEs due to the reform.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Log(Div)	Log(Inv)	Log(Div-Inc)	Log(Div)	Log(Inv)	Log(Div-Inc)
DD	0.517***	-0.070	0.346	0.428***	0.121	0.383*
	(0.142)	(0.203)	(0.292)	(0.137)	(0.159)	(0.196)
Omitted: smallest quartile of pre-reform tax surplus						
2nd quartile*	-0.164	0.379	-0.284			
DD	(0.152)	(0.262)	(0.307)			
3rd quartile*	-0.394**	0.237	-0.268			
DD	(0.159)	(0.260)	(0.360)			
4th quartile*	-0.407**	0.085	-0.249			
DD	(0.171)	(0.212)	(0.291)			
Omitted: smallest quartile of pre-reform equity						
2nd quartile*				-0.202	-0.022	-0.283
DD				(0.141)	(0.219)	(0.233)
3rd quartile*				-0.249	-0.073	-0.495*
DD				(0.154)	(0.253)	(0.270)
4th quartile*				-0.409**	0.033	-0.491**
DD				(0.206)	(0.193)	(0.211)
Obs	2,835	4,173	4,435	2,712	4,229	4,498
R-squared	0.050	0.067	0.152	0.048	0.066	0.125
No groups	525	618	626	524	534	648

Block bootstrapped standard errors with industry level clusters in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

TABLE 7. Heterogeneous results for main outcomes by the size of the pre-reform tax surplus and equity with the full set of controls

We have also made other heterogeneity examinations. We have developed indicators to describe the extent of international operations for MNEs and use these to examine

the heterogeneity of the results. We do not detect heterogeneity in responses by these characteristics. However, these indicators are not perfect as we have no direct variables to measure the extent of international operations. We have only data on financial transactions between parents and subsidiaries but we are not able to detect how much of these transactions are from overseas. Thus these indicators include a lot of national transactions (between Finnish subsidiaries and parents) and do not necessarily capture the extent of multinational operations. We also divided the sample by the main industry classifications and estimated the model similarly as presented in Table 7. We did not find any statistically significant changes in responses by main industries. Similarly we used the location of the parent to divide the sample. Also, in this case we did not find any statistically significant changes in any outcomes.

4.4.8. Robustness checks. Next we focus on offering the robustness checks for the results. First, we made a placebo treatment three years before the actual reform for all outcome variables. In this setting we compare all outcome variables between treatment and control groups and pretend that the reform would have happened from the beginning of 2002. Particularly, the time period in these placebo tests is from 2000 to 2003, years 2000 and 2001 representing the before period and 2002 and 2003 are for the after period. Table 8 shows the results with exactly the same spesification and control set than what was presented previously. None of the placebo estimates are statistically signicant which gives credibility for our identification strategy.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Log(Div)	Log(Inv)	Log(Div-Inc)	Log(EBIT)	Log(EBIT)
PlaceboDD	-0.061	-0.042	0.050	-0.075	-0.000
	(0.070)	(0.100)	(0.085)	(0.081)	(0.091)
Number of groups	548	670	681	3196	851

Block bootstrapped standard errors in parentheses.

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

The dependents and comparisons are by columns: 1) Log of dividend payments: comparison between Finnish MNEs and other large Finnish companies, 2) Log of real investments: comparison between Finnish MNEs and other large Finnish companies, 3) Log of dividend income: comparison between Finnish MNEs and other large Finnish companies, 4) Log of EBIT: comparison between the subsidiaries of Finnish MNEs and the subsidiaries of Swedish MNEs, and 5) Log of EBIT: comparison between the Finnish MNEs and the Swedish MNEs.

TABLE 8. Placebo results with the full set of controls for all dependents presented before

We also made another placebo treatment similarly as described above but using only the time period from 2005 to 2007 and pretending that the reform would have taken place from the beginning of 2007. This also produced zero results for all outcomes similarly as Table 8.

One concern in our empirical strategy might be the use of logarithmic outcomes and independent variables in the analysis. As we are interested in MNEs this is not a substantial problem because all of these firms are very large, having e.g. very few zero observations. However, we estimated the spesifications in levels as well. The results are similar in size or even greater relative to our main estimates but less precise because of the large variation in variables. Thus, we use logarithmic variables in our main analysis to reduce the variation in the data and to offer results that are not very dependent on few observations.

Another challenge is that the estimation sample varies across the outcome variables we use. We also made estimations for firms that have only positive dividend payments and in that way kept the constant amount of firms in every spesification. This does not

change the results much. We also performed estimations using a balanced panel. The point estimates are similar to those with an unbalanced panel but the standard errors are larger as we have fewer observations.

In addition, we also tested the anticipation effects for all other outcome variables than dividend payments as well (Table 2 shows the anticipation results for dividend payments). The results suggest no clear anticipation effects on other outcomes. However, the log of dividend income increased already in 2003 and 2004 compared to the previous years among treated. These effects are not significant even at 10% level but still, the coefficient are similar in size than in the main estimations in Table 4. This suggests that some MNEs might have anticipated the reform by increasing the repatriated dividends from their foreign subsidiaries already before the reform. This is also visible in Figure A3 in Appendix.

We used also a wild bootstrap strategy to calculate the standard errors for the estimates with industry clusters. This does not affect the interpretation much. It seems that the block bootstrap strategy produces higher standard errors in most cases and thus, we apply it in the main results. We also used block bootstrap method with municipality level clusters and also with the interaction of the industry and municipality level clusters. These did not change the interpretations of the results.

Finally, the Hausman test suggests using the firm-level fixed effect model instead of the random effect model. For example, in the main estimations in Table 2, the null hypothesis of firm-specific effects uncorrelated with the regressors is rejected at the level of 899.22 (chi 2(5)). 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.

4.5. Conclusions

We use the abolition of equalization tax (EQT) in Finland as a natural experiment to analyze the effects of taxes on behavior of multinational enterprises (MNEs). EQT was a common element of European imputation systems which were largely repealed because the European Court of Justice considered them as inconsistent with the EU Treaties.

Theoretical analyses have pointed out that EQT treats differently dividends distributed from domestic and foreign source profits, and, therefore, distorts various financial choices of MNEs. We estimate the effects of EQT applying a difference-in-differences method commonly used in policy evaluation studies and utilizing a unique micro data which includes information on tax returns from all Finnish businesses. Consistent with theory we find substantial evidence of the effect on dividend distributions of MNEs. We estimate that the reform increased MNEs dividend payments by 23 per cent on average. Our results provide similar evidence as the previous empirical literature (for general dividend taxes, see e.g. Chetty and Saez, 2005, and Poterba, 2004, and for EQT, see Bond et al., 1996). We also find that the effect is the largest among those parents having the highest incentive to increase dividend payment due to the reform.

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 consistent with the predictions of the theoretical model and suggest a switch from profit-shifting to openly distributed intra-company dividends.

Contrary to our own theoretical predictions, we do not observe any evidence for a drop in home-country real or financial investments. Such behaviour is in fact consistent with the theoretical model in the limited case where the MNE is able to fully avoid EQT by using profit shifting. The strong dividend response that we observed suggests, however, that EQT was not fully accommodated by shifting profits. A further way to

explain the puzzling result on investments is that the theoretical model does not include some important choice opportunities of MNEs. One example might be the possibility to defer repatriations of foreign profits by investing in foreign financial assets (Altschuler and Grubert (2002)). The question is whether such a choice could crowd out effects on investments. A further study could assess this issue.

The results of this study confirm that domestic taxes matter for the behavior of MNEs. They also suggest that the European agenda to remove distortive elements from the national dividend tax systems may have improved efficiency from the global perspective. Similarly, our results, especially those concerning profit shifting, support the view that coordinated steps towards more uniform business taxation are welcome. However, we do not observe changes in real economic variables such as investments and, moreover, the efficiency changes due to the taxes might be relatively small.

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Appendix

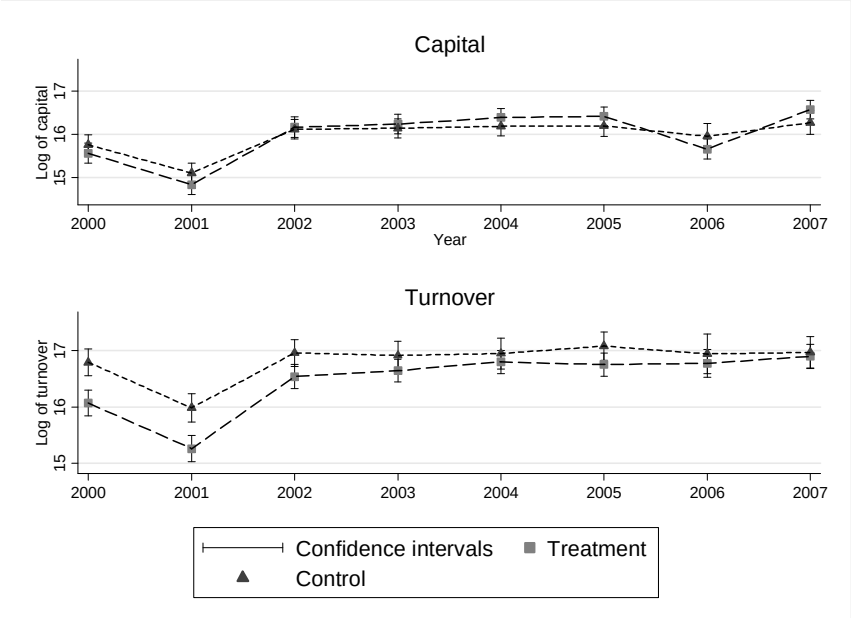

FIGURE A1. Average of log capital and turnover over time: treatment and control groups

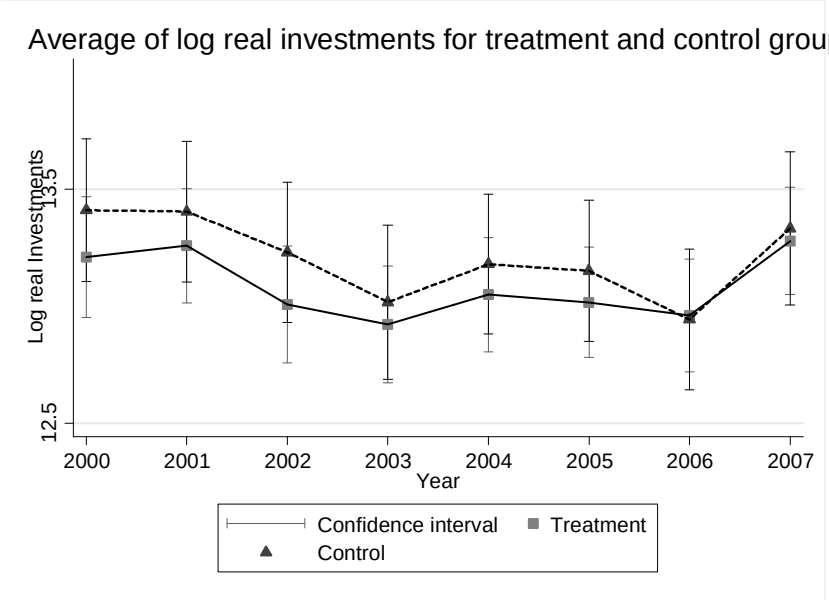

FIGURE A2. Average of log real investments over time: treatment and control groups

VARS.	EBIT	Costs of empl.	Fixed assets	Operating rev.
Foreign subsidiaries of Finnish MNEs				
Mean	13.763	14.568	14.591	16.757
SD	2.268	1.959	2.820	2.050
N	5,379	5,897	5,897	5,897
Foreign subsidiaries of Swedish MNEs				
Mean	13.259	14.335	13.627	16.105
SD	1.925	1.689	2.633	1.719
N	8,036	11,906	11,906	11,906
Domestic subsidiaries of Finnish corporations				
Mean	12.663	13.685	13.308	15.341
SD	1.731	1.603	2.314	1.557
N	7,069	10,122	10,122	10,122
Finnish MNE parents				
Mean	15.094	15.745	16.731	17.396
SD	2.140	1.644	2.602	2.051
N	1,544	1,803	1,803	1,803
Swedish MNE parents				
Mean	14.834	15.564	16.071	17.483
SD	1.839	1.640	2.386	1.794
N	2,389	4,018	4,018	4,018

TABLE A1. Amadeus data 2000–2006: Descriptive statistics

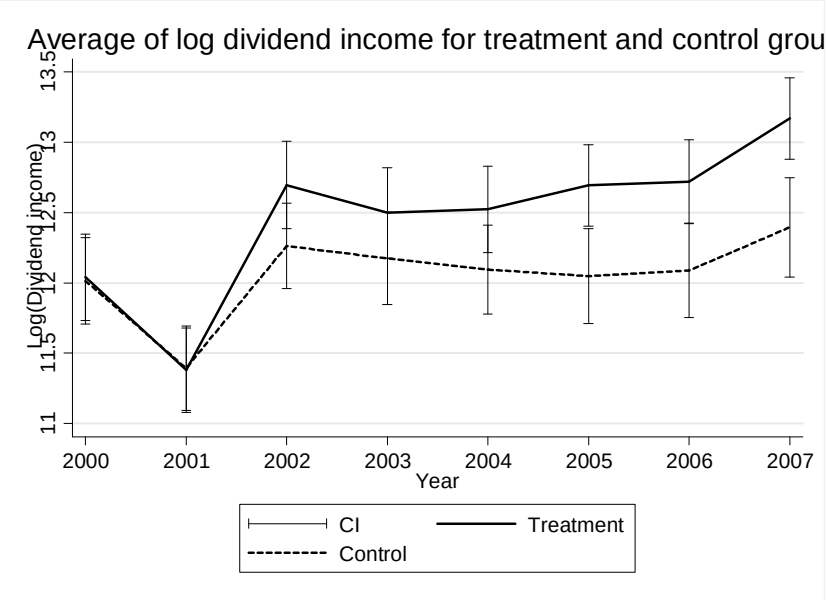

FIGURE A3. Average of log dividend income over time: treatment and control groups

	Treatment		Control	
Industry classification	mean	N	mean	N
Manufacturing	17.22	619	17.32	349
Electricity, gas and water supply	17.26	39	18.08	82
Construction	17.50	35	17.88	66
Wholesale and retail sale	16.70	282	18.04	205
Transport, storage and communication	16.48	138	16.32	106
Financial intermediation	15.04	67	15.56	73
Real estate and business activies	15.65	279	15.88	251
Other	16.68	120	15.85	132

TABLE A2. Turnover by the main industrial classifications for treatment and control groups

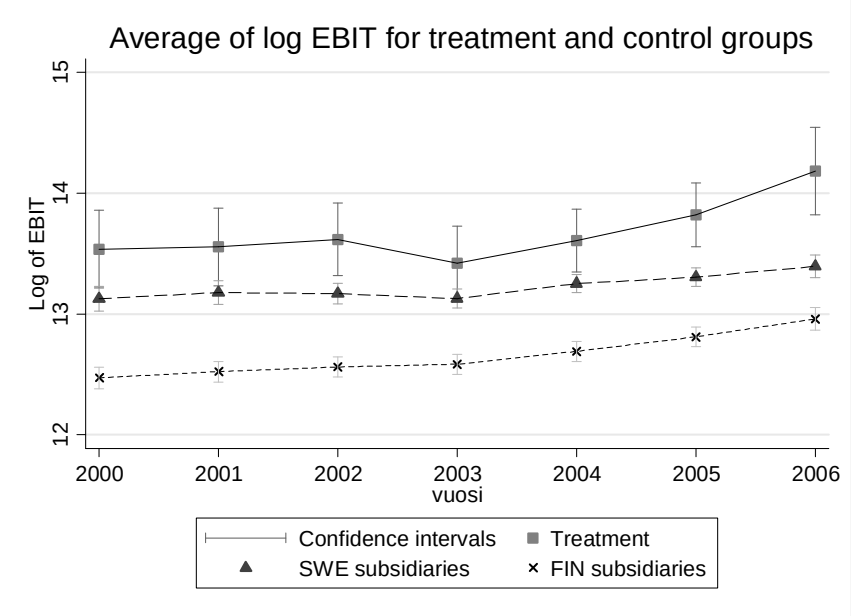

FIGURE A4. Average of log EBIT over time: treatment and control groups

CHAPTER 5

Restaurant VAT cut: Cheaper meal and more service?[1]

ABSTRACT. This paper provides causally credible estimates of the effects of consumption taxes in a service sector on prices and demand for restaurant services. We utilize a large VAT reform affecting restaurant meals, where the VAT rate was cut from 22% to 13% in 2010 in Finland. By comparing with restaurants in neighboring countries and other related sectors in Finland, the reform offers a natural experimental approach. The results indicate that restaurants reduced their prices on average by only 2%, which equals roughly a quarter of the full pass-through. Remarkably, at the same time a majority of restaurants did not reduce their prices at all and a non-trivial fraction of restaurants reduced their prices by exactly the full pass-through. Larger restaurants reduced their prices more often than smaller restaurants. We do not observe any increases in the quantity of services sold or in wage sums paid to employees. Furthermore, there are no changes in medium-term entry and exit due to the reform.

Keywords: VAT reform, restaurants, tax incidence
JEL codes: H21, H22, H32

5.1. Introduction

Internationally, the share of consumption taxes of total tax revenue seems to be increasing all the time. Governments have also tried to support specific sectors through reduced consumption tax rates aiming to create jobs in these sectors. Despite the vast theory literature[2], there is only a narrow empirical literature credibly examining the effects of consumption taxes on prices and quantities (Carbonnier (2007), Doyle and Samphantharak (2008), Kosonen (2010), Marion and Muehlegger (2011)). Many studies focus solely on price incidence. However, price responses are not sufficient statistics for more thorough efficiency analysis. It is more important to know the demand elasticity of a good or service.

[1]This essay is joint work with Tuomas Kosonen. This paper is published in the VATT Working Papers series, 52, October 2013.
[2]E.g. Ramsey (1927), Atkinson and Stiglitz (1976), Myles (1989).

This study aims to produce policy-relevant statistics on the efficiency of consumption taxation by analyzing a value added tax (VAT) reform affecting restaurants in Finland. The VAT for restaurant meals was cut from the standard rate of 22% to the reduced rate of 13% in July 2010. We utilize this policy change to investigate the effects of consumption taxes on prices, demand for restaurant services and wage sums paid to employees. The results offer insights into the effectiveness of consumption taxes in labor-intensive sectors.

We apply a difference-in-differences (DD) approach. Restaurant meals in Finland in the treatment group are compared against multiple control groups. This improves the robustness of the results. The control groups are hotel services in Finland, and restaurant meals in Estonia, Norway and Sweden. In the demand and wage sum estimations we use only hotels in Finland as a comparison group due to data limitations.

The identifying assumption in the DD approach is that a control group should behave similarly to a treatment group without facing a treatment. In the current setting this assumption is likely to be fulfilled, since we compare the same sectors in neighboring countries with a similar climate and culture. Moreover, hotels and restaurants are closely related sectors and resemble each other. Empirical support for the assumption that these groups resemble each other is provided by the similar long-term development of restaurant meal prices in the countries we compare, and in turnover and wage sum development in the two sectors we compare. The reform is exogenous to the behavior of firms, since it was made possible by European Union-level rules shortly before the Finnish VAT cut. It also seems that restaurants did not anticipate the VAT cut by altering their prices prior to the reform.

Our price data come from a self-designed survey. The survey is for a random sample of restaurants and hotels in Finland and restaurants in Estonia. Prices were collected from the websites of the firms in the sample, or if this was not possible, by phone. The data includes the price of the same meal in the same restaurant and the price of the

same room in the same hotel before and after the reform. Thus the price information allows us to follow the development of prices of individual services. By looking at the relative change of all services, we are able to describe the whole distribution of price changes, rarely possible in the previous literature. In addition, we estimate the average price response with meal-level fixed-effects, which gives us high precision. The survey contains information about interesting predetermined characteristics of firms, allowing us to divide the results by them. For robustness we use restaurant meal price data from Norway and Sweden originating from data collected for the construction of consumer price indices.

Additional interest in this paper lies in the impact of the reform on the demand for restaurant services and wage sums. For this we have a monthly and annual level tax register data. On monthly level we have information about turnover, which is the consumer price value of services sold, and the wage sums of each firm. Comparing the development of prices and turnover of the same firms in the treatment and control groups over the reform period allows to estimate the impact of the reform on the quantities of services sold. The development of wage bills in the two groups over the reform period gives an indication of whether there are any changes in employment due to the reform. In addition, we examine entry into and exit out of the restaurant industry.

Our unweighted average result shows that the VAT cut from 22% to 13% reduced restaurant prices by 2.2% in Finland. Full pass-through to consumer prices would imply a 7.4% decrease. Thus the result implies that the actual price reduction was only a fourth of the full pass-through. The consumer-weighted price response was somewhat larger, a 4% decrease in consumer prices, or over half of the full pass-through. This implies that larger restaurants reduced their prices more than small restaurants. There is a substantial heterogeneity in price responses by restaurant type. However, the estimation results suggest no increase in demand for restaurant services or employment

in the restaurant industry. Furthermore, we do not find any effects on entry into or exit out of the restaurant industry due to the reform.

Our results contribute to a narrow literature estimating the effects of consumption taxes. Many studies in the previous literature concentrate on industries with only few producers and industries where large companies dominate the market. We concentrate instead on the restaurant industry, which contains very heterogeneous firms and is a labor-intensive industry. Also, the number of studies that have produced results on the quantity of services sold or wage sums is fairly limited. By linking our unique price and tax register data, we have an opportunity to estimate these margins as well, and be more conclusive about the effectiveness of consumption taxes.

Doyle and Samphantharak (2008) estimated the tax incidence on gasoline prices in certain states in the USA from a temporary repeal and reinstatement of a gasoline consumption tax. They found almost 100% pass-through on prices. Marion and Muehlegger (2011) found similar estimates for fuel prices. Carbonnier (2007) found lower pass-through for a car retailer industry than for a repair service industry when he analyzed two separate VAT rate reductions in France. He interpreted this to be a result of differences in the degree of competition in these industries. Kosonen (2010) found that the pass-through on prices was half of the full pass-through for the hairdressing service industry, after a VAT reduction in Finland. Kosonen also studied the demand for hairdressing services and employment. He concluded that the demand for these services seems to be rather inelastic. Hairdressers and restaurants resemble each other since both are labor-intensive service sectors. Therefore it is not surprising that our results are very much in line with that study.

The paper proceeds as follows. Section 5.2 presents the institutional background and economic theory predictions as a result of the VAT reduction. Section 5.3 presents the methods used in the study, section 5.4 describes the data and section 5.5 presents the results. Finally, section 5.6 concludes the study.

5.2. Institutions and predictions

5.2.1. Value-added taxation in the EU. The European Union obligates all Member States to apply value-added taxation as a consumption tax system. Since 1977 the EU has applied uniform VAT coverage under the Sixth VAT Directive. The new VAT Directive replaced it in 2007 (CD 2006/112/EC). The Directive states that Member States can have one standard VAT rate between 15% and 25% and at most two reduced rates of at least 5%[3]. In Finland the standard VAT rate is levied on most goods and is currently 24%. There are two reduced VAT rates in Finland. The higher of these two, 14%, is levied on e.g. restaurant meal sales. The lowest VAT rate, 10%, is levied on books, accommodation services, pharmaceuticals etc.[4]

The Council of the EU introduced the possibility of applying a reduced VAT rate on labor-intensive services already in 1999 (CD 1999/85/EC). Although reduced VAT rates for certain labor-intensive industries were possible from 1999 onwards, such rates were not available for restaurants until May 2009 (CD 2009/47/EC). Thus, prior to 2009, restaurant services were subject to the standard VAT rate in all EU Member States. France was the first to apply a reduced rate for restaurant services. In July 2009, the VAT rate was cut from 19.6% to 5.5% (OECD (2010)). Despite the substantial reduction in the VAT rate, prices only fell by 1.4% after the reform (MEIE (2010)).

This paper examines the effects of the reform which took place in Finland at the beginning of July 2010 (HE 137/2009) when the VAT rate for restaurant services was reduced from 22% to 13%. At the same time the Finnish government decided to increase all VAT rates by 1 percentage point.

[3]There are some exceptions from the lowest tax rates, e.g. zero rates on books in the United Kingdom. Some sectors are also exempted from VAT, e.g. postal services.

[4]Recently there have been two increases in VAT rates in Finland. Before July 2010 the VAT rates were: 22%, 12% and 8%. After July 2010 all three VAT rates were increased by 1 percentage point. Again from the beginning of 2013 all VAT rates increased by 1 percentage point. Thus the VAT rates are currently: 24%, 14% and 10%.

5.2.2. Tax shifting and optimal consumption tax. Let us first consider the tax incidence of the VAT rate on consumer prices. A change in the VAT rate can shift to consumer prices by varying degrees. Under perfect competition, the price incidence depends on the elasticities of demand and supply. For instance, if demand is fairly inelastic and supply very elastic, there would be close to full pass-through to consumer prices. In general, the pass-through to prices increases with supply elasticity and decreases with the demand elasticity.

When the number of firms is limited and/or there is strategic interaction between the firms (imperfect competition), consumption taxes could under- or over-shift to consumer prices. The elasticities of demand and supply also affect the pass-through in an imperfect competition model. Additionally, in an imperfect competition model, the shape of the demand curve relative to the perfect competition prediction affects the pass-through. With a concave demand curve, the tax under-shifts to prices but with a convex demand curve over- shifts to prices (Myles (1989), Weyl and Fabinger (2013)).

We study the price incidence with a reduction in the VAT rate for restaurant services from 22% to 13%. The data include prices for the same meal offered in the same restaurants before and after the reform. Thus, as we analyze the price effects, we can identify the proportional change in consumer prices for each meal in the following way:

$$\Delta = \frac{p^a - p^b}{p^b} * 100 = x\% \tag{5.2.1}$$

$$\phi * 1.22 = p^b \blacktriangleright \phi * 1.13 = p^a$$

where p^a is the consumer price after the reform and p^b is the consumer price before the reform. The consumer price is the producer price ϕ plus the VAT. When there is

100% pass-through, the producer price does not change. Thus the full pass-through is:

$$\frac{\phi(1.13 - 1.22)}{\phi 1.22} * 100 = -7.38\%$$

A couple of remarks should be made. First, the quality of the meals could change due to the reform. The quality of meals could perhaps increase as the costs of producing them decrease, if there are no changes in prices. But if the quality of meals increases due to the reform, the restaurants are likely also rename the meals as well, and this would not be problem for us. On the other hand, the quality of meals could decrease in those restaurants that lower their prices. Even where the price decreases and the quality of the product decreases, price changes when applying the above equation would give us an upper bound for the pass-through. However, it is important to note that the price data we have, concerns meals offered by restaurants exactly with the same name before and after the reform. Thus, we assume that the quality does not change if the name of the meal does not change.

Second, we are not able to observe cross-price effects on other goods or services. A restaurant meal can be a substitute or a complement for other goods or services affecting the amount of consumption or prices of these other goods due to the reform for meals. For example, lunch meals during the working day can be a substitute for lunch boxes or take-away meals from a restaurant. On the other hand, a restaurant meal can be complementary to hotel services, especially during holiday seasons. Despite these problems, restaurant meals represent only a small proportion of the whole consumption budget (3.6% in 2006) and thus the effects due to substitutability or complementarity should be small.

In order to design an optimal consumption tax system, a perfectly competitive model result implies that the consumption tax rates of a good or a service should vary

according to the elasticity of its own demand, the elasticity of supply and the cross-price effects on other goods. In the case of fairly inelastic demand, a good should face a higher tax rate than a good with elastic demand, if cross-price effects between taxed goods are zero. The reason is that an increase in the tax rate of an inelastic good would have only little effect on demand for the good and thus lead to only small distortions in the demand for that good (Ramsey (1927), Diamond and Mirrlees (1971)). However, cross-price effects could be high if there are close complements or substitutes for a taxed good.

The literature presents another argument for efficient consumption taxation. This concerns the distortions created by labor taxation on labor supply (Atkinson and Stiglitz (1976)). These distortions could be diminished by using consumption taxation. The result is that these distortions diminish if the consumption of goods or services highly complementary with work are taxed less, and vice versa. Clearly this suggests setting lower tax rates for goods and services that are closely related to work and labor, and tax more the consumption of goods that are related to leisure. We do not analyse this argument in this paper. This is because the complementarity of a restaurant meal with labor supply is not clear. It is complementary with work if we consider lunches during the working day. On the other hand, a restaurant meal is complementary with leisure in terms of enjoying meals one's spare time, e.g. fine dining. Moreover, restaurant services represent only a small fraction of the total consumption basket of an average individual (3.6% in 2006 in Finland[5]). Thus changes in taxation for this small share of one's consumption are not likely to greatly affect the substitutability of labor.

We assess the efficiency of the consumption tax system for restaurant services by examining the effect of the VAT cut on the quantity of restaurant meals sold and wage sums paid to employees. The best case scenario to evaluate the demand for a good would be to be able to observe the price of a good and the amount of the good sold by

[5]Statistics Finland: Household Budget Survey (2009).

the firm. The second best case is to observe prices and the total sales of the firm. This is what we have in our data set, including prices and the reported value of turnover in consumer prices.

Assume for now that the whole turnover consists of sold restaurant meals. Then turnover is simply the quantity of restaurant meals sold times the consumer price. With this variable we estimate the changes in demand (quantity) due to the VAT reform. If there are no changes in consumer price and quantity, turnover would remain the same over time, before and after the reform. However, if the consumer price decreases due to the VAT rate reduction and quantity remains the same, turnover decreases by the amount of the price decrease. If the consumer price decreases and the quantity sold increases relatively more than the price decreases, turnover would increase. We observe the consumer prices for restaurant meals and the monthly level consumer price value of total sales in the data before and after the VAT reduction. Thus we have an opportunity to investigate the changes in the quantity of meals sold for each restaurant and interpret how demand changed due to the reform.

We also estimate the effects of the VAT reduction on wage sums. The costs of producing restaurant meals decreased due to the VAT reduction. This could increase the wage payments of a restaurant to its employees and/or increase the number of employees working in a restaurant. The wage sums of restaurants would then increase due to the reform if restaurants hire more workforce and/or pay more wages to their current workers after the reform.

5.3. Methods

This section describes the methods. Because of the exceptional data sets, we make extensive use of graphical analysis to examine the effects of the reform in this paper. We also use a natural experimental method to investigate the average effect of the reform

on prices, turnover and wage sums. We apply a difference-in-difference (DD) approach and thus compare the outcomes between the treatment and control groups over time.

We have a unique possibility to perform graphical analysis with our price data. We show the whole distribution of relative price changes, applying the equation (5.2.1), as we follow the prices of the same product or service before and after the reform. Graphical evidence shows explicitly the whole range of price changes and thus is more informative than, for example, a standard mean regression of the change in prices. In our graphical analysis the proportional price changes in Finnish restaurants are compared to price changes in Estonian restaurants and hotel room price changes in Finland. We also perform comparisons within the restaurant industry using different categorical variables.

We also use a standard DD method with meal fixed-effects to estimate the average effect of the reform on meal prices. The simplest set-up of the DD method is when outcomes are observed for two separate groups for two different time periods. The standard way to describe the DD method is to present the following equation:

$$P_{it} = \eta_i + \beta_1 1(Treat)_i + \beta_2 1(After)_t + \beta_3 1(Treat_i * After_t) + \beta_4 (X_{it}) + \varepsilon_{it} \quad (5.3.1)$$

where the dependent variable P represents the logarithmic meal price of firm i at time t, the constant η_i is the estimated fixed effect for every meal, *1(Treat)* is an indicator variable with the value one for treated and zero otherwise, *1(After)* is also an indicator variable with the value one after the reform and zero otherwise, and *1(Treatment*After)* represents the interaction variable of these two variables. The coefficient of this interaction term identifies the effect of the reform on outcome P. X contains a vector of firm-level control variables and ε is the i.i.d. error term.

As a result of the fixed-effects estimation, β_3 represents the average proportional change in meal prices as a result of the reform. We are able to perform a meal-level fixed-effects estimate because we followed the prices of the same meals in the same restaurants over time, before and after the reform. This gives us a very precise price estimate.

The main identifying assumption in the DD approach is the parallel time trends. Thus the time effects should behave similarly in both groups before the reform. The difference between the groups is that one of the groups is exposed to a treatment and the other is not. The treatment group consists of Finnish restaurants which experienced the VAT reduction. We use many separate control groups to show the robustness of the results. In our main price analysis we use restaurant meal prices in Estonia to formulate the control group. We also use Swedish and Norwegian Consumer Price Index (CPI) data for restaurants and Finnish hotel room prices to represent control groups.

One concern might be that restaurants in these countries are not suitable comparison groups for restaurants in Finland. However, there are a number of reasons to believe that the assumption holds in this case. All the countries are neighboring countries to Finland and, for example, face similar weather conditions, vacation periods, global food prices, business cycles, culture etc. We have no reason to believe that e.g. Finnish and Estonian restaurants would behave differently from each other during our short examination period without an exogenous shock in Finland. Restaurants in Estonia could experience different conditions in the long run, e.g. in the competitive environment, but we do not consider this to be a problem over our relatively short examination period (3 months). In addition, we can test the robustness of the results by comparing the prices of Finnish restaurants to restaurant meal prices from the statistics offices in Norway and Sweden, which are collected for CPI purposes. We believe that all these control groups constitute good counterfactuals for the treatment group.

In order to give further credibility to our approach, we use another control group from Finland, namely hotels, which operate in an industry similar to restaurants, but which did not experience the VAT cut. The VAT applied to hotel services was already at the lowest reduced rate of 9% before the reform in Finland. Hotels are used as a comparison group when we study price effects, but more importantly, we apply hotels as a control group when we are interested in the effects on quantity of meals sold and wage sums. We are forced to do this because of the lack of tax register data from the restaurants in neighboring countries. There might be problems in the analysis when comparing restaurants to hotels. Hotels can, for example, have more flexible or organized pricing strategies and face more concentrated demand for their services within the calendar year than restaurants. More importantly, hotels might have been affected by the reform as many hotels also offer restaurant services. Also, there might be cross-price effects between meals and hotel room prices. However, despite of all these problems and the lack of any other relevant control group, we compare these industries and try to convince that the comparison is plausible. To offer evidence favoring the comparison, we find a similar trend in turnover and wage sums over time for hotels and restaurants (see Figure 9). Thus hotels seem to comprise a relatively good control group for restaurants. However, the monthly variation in demand for hotel services is more pronounced during summer period than for restaurant services and this could still cause challenges for our analysis.

We apply the same DD method, described in equation 5.3.1, when we examine the demand and employment effects of the reform. The measure applied for demand is the monthly turnover of the firms valued at consumer prices and for employment the measure is the monthly wage sums paid to employees. In these estimations we use Finnish restaurants in the treatment group and Finnish hotels in the control groups because we lack tax register data from neighboring countries.

One possible problem in using DD method could be that the policy change is not exogenous or the firms in the treatment group anticipated the reform by changing their behavior before the actual policy change. The Finnish government allowed the restaurant industry, and not other industries, to apply a reduced VAT rate since the EU Directive permitted them to do so. Thus, the reform was not solely dependent on the economic conditions in the restaurant industry, rather it was an attempt to revive the economy overall. Also, in Figure 1 we show that we do not find any empirical evidence to support anticipation behavior among restaurants. Therefore, we believe that it is possible to use the standard DD method to examine the causal effects of the reform on restaurant meal prices, demand for restaurant services and wage sums paid to employees. However, because of the short examination period available we concentrate only on the short-run changes.

One challenge in our empirical set-up is to present appropriate standard errors for the estimates. Two previous papers by Bertrand et al. (2004) and Cameron et al. (2008) emphasise this problem. The problem arises when the number of groups used in the estimations is small. It could be, for example, that there is an unobserved shock affecting the groups' behavior differently and thus biasing the standard errors. Fortunately, the two papers mentioned above offer us tools to overcome this problem. Following the guidelines of these papers, we apply a block bootstrap strategy to calculate the standard errors. We use two sets of clusters. First, we apply country-level clusters in the price estimations. Second, when we compare Finnish restaurants to Finnish hotels we use industry-level clusters in the price, quantity and employment estimations. The strategy of calculating standard errors does not affect the significance of results too much as, at most, it doubles the standard errors of the main price estimates with no clustering. However, for the weighted price results block bootstrapping is not possible. Then we only apply heteroscedasticity-consistent standard errors and the significance of these results should be interpreted with caution.

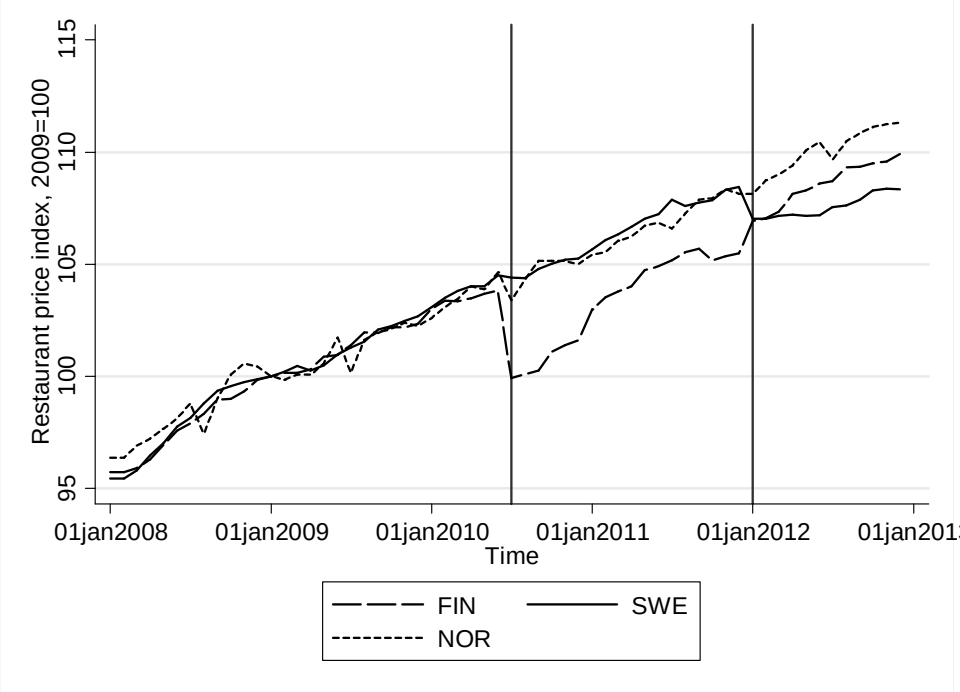

FIGURE 1. Longer-term development of restaurant prices in Finland, Sweden and Norway

5.4. Data

We have price data from a price collection survey which was conducted on the basis of a random sample of restaurants and hotels from the Tax Administration data including all firms liable for VAT in Finland. We designed our own survey method to collect prices. We were able to collect prices from approximately 750 restaurants in Finland before and after the reform. The data include many categorical variables which we can use to divide prices, e.g. belonging to a chain, restaurant type, etc.

We took a random sample just before the reform in March 2010 from both the restaurant and hotel industries. The sample is representative of all restaurants and hotels in Finland. The price collection was made before and after the reform, i.e. in May/June 2010 and July/August 2010. The survey was also conducted in Estonia,

where the VAT rate on restaurant meals did not change during the collection period. The sample of Estonian restaurants was also a random sample from the Estonian tax register data.[6]

In the collection method, we mainly collected prices from the internet. If this was not possible via the internet we collected the prices by phone. The collection followed a questionnaire where the restaurants were divided into four categories by restaurant type.[7] Each category had its own questionnaire with a minimum of 7 prices and a maximum of 11 prices. In each round of surveys (before and after) we recorded the price of the same product from each firm. Also, the price collectors used exactly the same collection questionnaires and methods in both countries, which is very important for our analysis. In addition, the price collection for hotels followed the same principles than the survey for restaurants. Hotel prices refer to hotel room prices. Table 1 presents descriptive statistics of the price data in euros. On average, meal prices seem to be lower in Estonia than in Finland but this is not a substantial problem as we are interested in the price changes over a short period of time.[8]

[6]We also use CPI data sets for restaurant meal prices in Sweden and Norway as comparison groups in our price-response analysis.
[7]The restaurant types are a la carte, fast food, cafeteria and lunch restaurants.
[8]Table A1 in the Appendix shows the descriptive statistics for CPI data from the statistics offices in Sweden and Norway.

	Finland			Estonia		
Variable	Mean	SD	N	Mean	SD	N
Main Meal	10.68	7.10	1452	6.51	3.97	746
Other Meal	9.97	5.89	1146	6.35	3.67	748
Vege Meal	8.94	4.64	900	3.72	2.02	674
Pizza	7.71	2.27	704	2.97	1.60	226
Appetizer	4.81	2.90	678	3.34	2.50	542
Lunch	8.30	2.69	464	3.12	1.85	266
Wine	8.70	11.44	204	3.98	6.64	220
Beer	4.44	.97	194	2.36	.71	320
Hotel price	156.38	246.67	518			

TABLE 1. Price data: Continuous variables

We also collected various firm-level categorical variables. The location of the firm (Finland/Estonia), the method of collection (phone/internet), belonging to a chain and belonging to a lobbying union representing restaurants and hotels in Finland (MaRa)[9] are the most important categorical variables in the analysis. In our study, a firm is considered to being a chain if there is more than one restaurant with same name or firm identifier. We also categorize franchising firms as chains. MaRa, instead, represents the leading national trade and labor market association in the hospitality industry in Finland, including e.g. both restaurants and hotels. MaRa members produce over 80% of all turnover in the sector. Table 2 describes the statistics of these variables (in euros). Most of the prices are from the internet, almost nine out of ten prices in Estonia were collected from the web, whereas in Finland a quarter of the prices were collected by phone. It also seems that there are more restaurants belonging to a chain Finland than in Estonia.

[9]Officially, the name of the association is the Finnish Hospitality Association (in Finnish, Matkailu- ja Ravintolapalvelut MaRa).

	Finland			Estonia		
Variable	Share	SD	N of firms	Share	SD	N of firms
Internet	.72	.45	1345	.89	.32	712
Phone	.28	.45	523	.11	.32	88
Chain	.32	.47	598	.15	.36	120
MaRa	.31	.46	572			

TABLE 2. Price data: Categorical variables

The histogram in Figure 2 compares the mean of three meal prices between Finnish and Estonian restaurants. It seems that the distribution of restaurant meal prices is relatively similar in Finland and in Estonia. However, the variation in prices seems to be larger in Finland and there is more weight on the right-hand side of the distribution in Finland than in Estonia. Nevertheless, the shapes of the distributions are similar, and thus we are able to compare Finnish prices with Estonian prices.

The second data set is from the Finnish Tax Administration and include all firms liable for VAT in Finland. A firm is liable with register to the tax authority if its turnover for the accounting period (12 months) is over 8,500 euros. The data contain important monthly-level information about the firms' activities including turnover and the wage sums paid by the firms. Table 3 shows the pre-reform descriptive statistics of turnover and wage sums per month for Finnish restaurants and hotels. It seems obvious that hotels are larger than restaurants, on average. We also have an extensive set of yearly-level tax record data which we can employ as controls in our estimations.

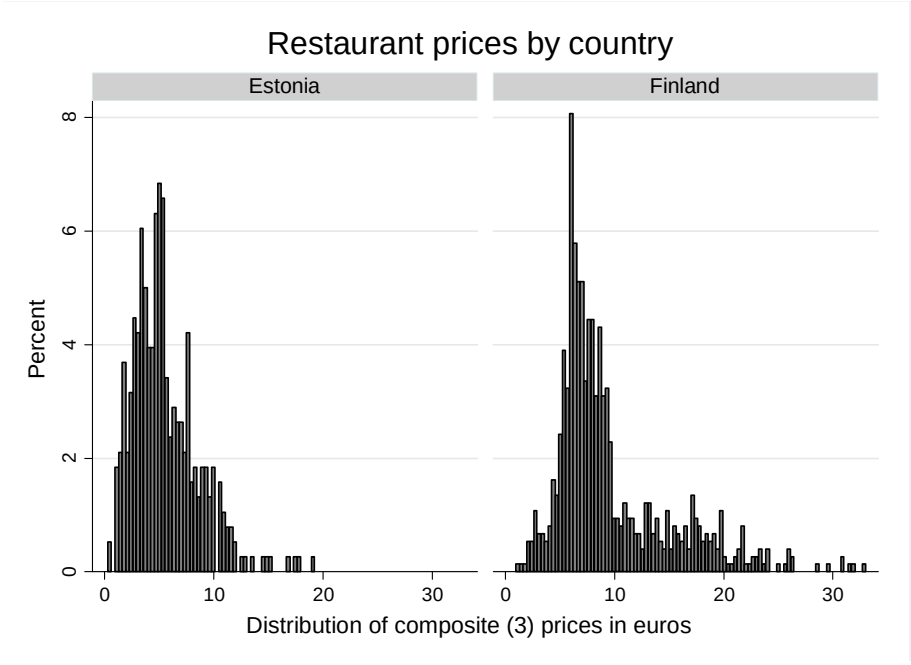

FIGURE 2. Histogram of the mean of three meal prices in Estonia and Finland

	Restaurants		Hotels	
	Turnover	Wage sum	Turnover	Wage sum
Mean	38,166	12,430	82,090	33,804
Median	14,861	4,876	8,048	11,108
SD	373,656	57,116	360,798	90,372
N	11,343	11,343	1,245	1,245

TABLE 3. Descriptive statistics for monthly pre-reform turnover and wage sums of Finnish restaurants and hotels

Figure 3 shows the average monthly turnover of restaurants taxed at different VAT rates over time from the beginning of 2008 to the end of 2011. The standard VAT rate, 23% after July 2010, and two reduced VAT rates, 13% and 9% after July 2010, are levied on different goods[10]. The Figure clearly shows the VAT reform for restaurants in July

[10]Before July 2010 all three VAT rates were 1 percentage point lower. From the beginning of 2013 the VAT rates have been 24%, 14% and 10%.

2010, marked with a solid vertical line, as the turnover reported in the second lowest VAT rate increases considerably and at the same time turnover in the standard VAT rate decreases. The reported turnover decreases by approximately 15,000 euros at the standard VAT rate and increases by a similar amount at the reduced rate. We consider this to represent the share of turnover in restaurants from meal sales, on average. Thus less than half of the turnover of restaurants comes from sales of meals (including non-alcoholic beverages)[11], the remainder coming from selling alcohol, drinks, etc. which are not taxed at the reduced VAT rate. Sales at the lowest VAT rate seem to be irrelevant for restaurants over time.

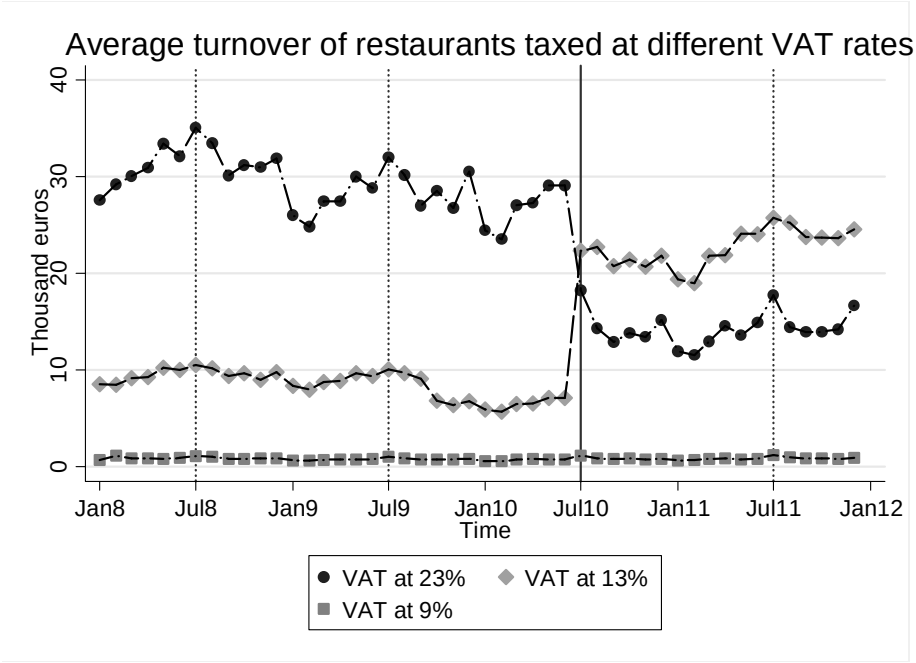

FIGURE 3. Average turnover of restaurants taxed at different VAT rates over time

[11]Take-away meals were already at the lower VAT rate of 12% before the reform of July 2010.

5.5. Results

5.5.1. Price Effects. In our main price analysis we formulate a composite of the average of three main meal prices for each restaurant before and after the reform.[12] Therefore, the following graphical analysis of relative changes in consumer prices shows the changes in this variable. We construct this composite meal in order to avoid being overly dependent on the changes in individual meal price. By constructing a composite meal we can examine the entire change in a restaurant menu more precisely. However, we also offer the average price change results for each individual price.

We use equation (5.2.1) to calculate the relative price change for each firm. The relative price change denotes the percentage change in the price after the reform compared to the price level before the reform. Thus we can show the whole distribution of price changes, which gives very explicit evidence of how prices have changed.

Figure 4 presents the relative price changes as a composite in Finland and Estonia. Similarly, Figure 5 shows the distribution of relative price changes in composite prices of restaurant meals and hotel rooms in Finland. The vertical line represents the location of full pass-through in both graphs, which is -7.4%. A substantial proportion of restaurants did not change their prices at all in Finland, the zero relative change in the Figure. This indicates that over half of the whole sample of restaurants did not change their prices as a result of the VAT cut. However, there is a distinctive peak at the level of full pass-through. These restaurants shifted the entire tax change to their prices. We do not observe much change in hotel prices in Finland or restaurant prices in Estonia.

Next we divide the relative price change Figures for restaurants by firm-level characteristics. These divisions describe the relative price changes among Finnish restaurants very precisely. In Figure 6 we divide the data by whether or not a restaurant belongs to a chain. The Figure shows that restaurants belonging to a chain changed their prices

[12]If we have less than three meal prices for an individual restaurant, we use only one or two prices as a composite meal.

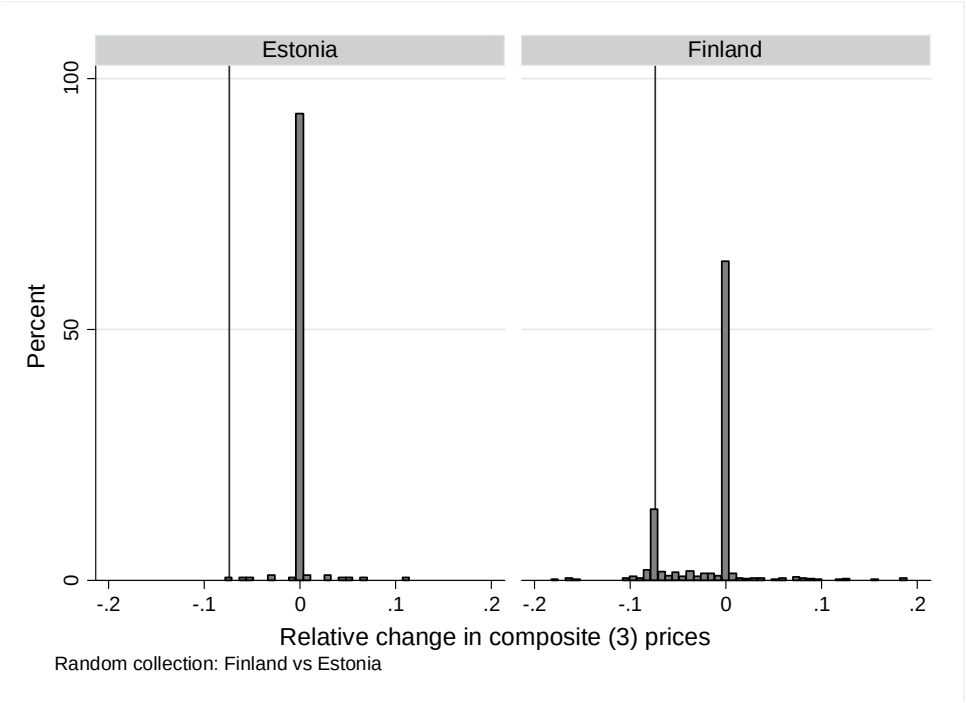

FIGURE 4. Distribution of relative price changes in Finnish and Estonian restaurants

more often after the VAT cut than those not belonging to a chain. Notice also that chain status divides the sample very clearly into those that changed their prices and those that did not. Only 25% of all chain restaurants did not change their prices and 40% responded with full pass-through. Almost all of the rest also decreased their prices and we observe only few price increases among chains. This suggests that the more organized restaurants changed their price more. They may operate in a more competitive environment, which may have forced them to reduce their prices more due to the VAT reform. Also, they might have more centralised price setting strategies than independent restaurants that are not part of a chain. It is also remarkable that restaurants not belonging to a chain have almost an equal amount of both price decreases and increases. Also, for them, there is no clear peak at the level of full pass-through.

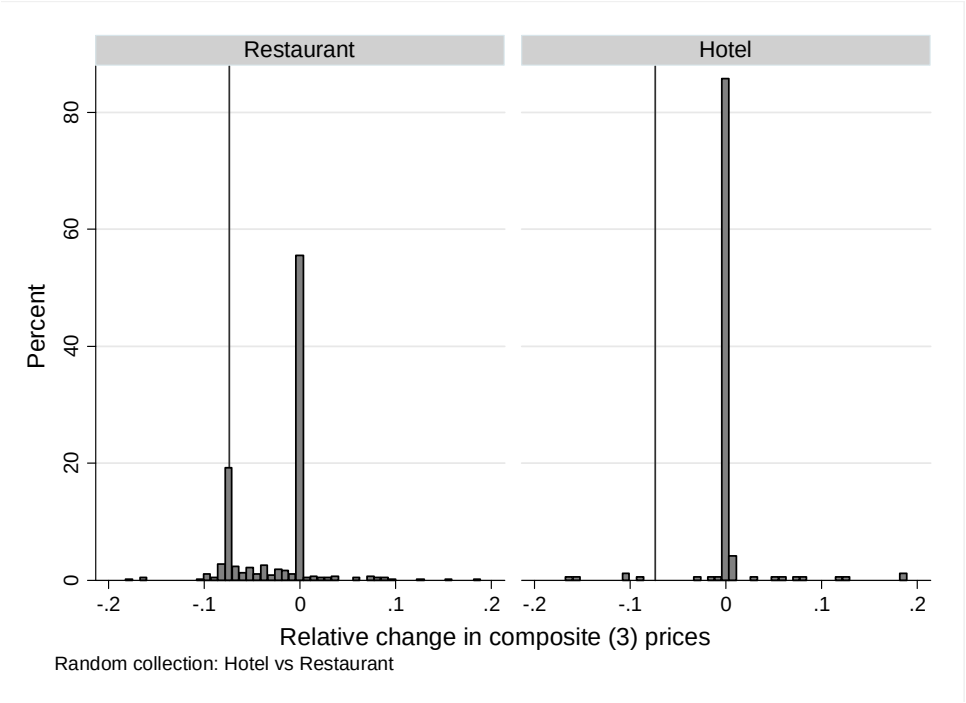

FIGURE 5. Distribution of relative price changes in Finnish restaurants and hotels

In Figure 7, we divide the data into those restaurants that belong to MaRa and to those that do not. The Figure evidently shows that these lobbying union members reduced their prices more often than others. Figures 6 and 7 are very similar because many of the chains also belong to MaRa. However, Figure 7 also shows a small peak at the level of full pass-through for restaurants not belonging to MaRa. Furthermore, this suggests a similar interpretation as we found for chain restaurants: more organized restaurants had larger price responses to the reform than independent restaurants.

We employ a natural experimental method to estimate the average price effects of the VAT reform. The dependent variable is the log of composite price, including 3 prices

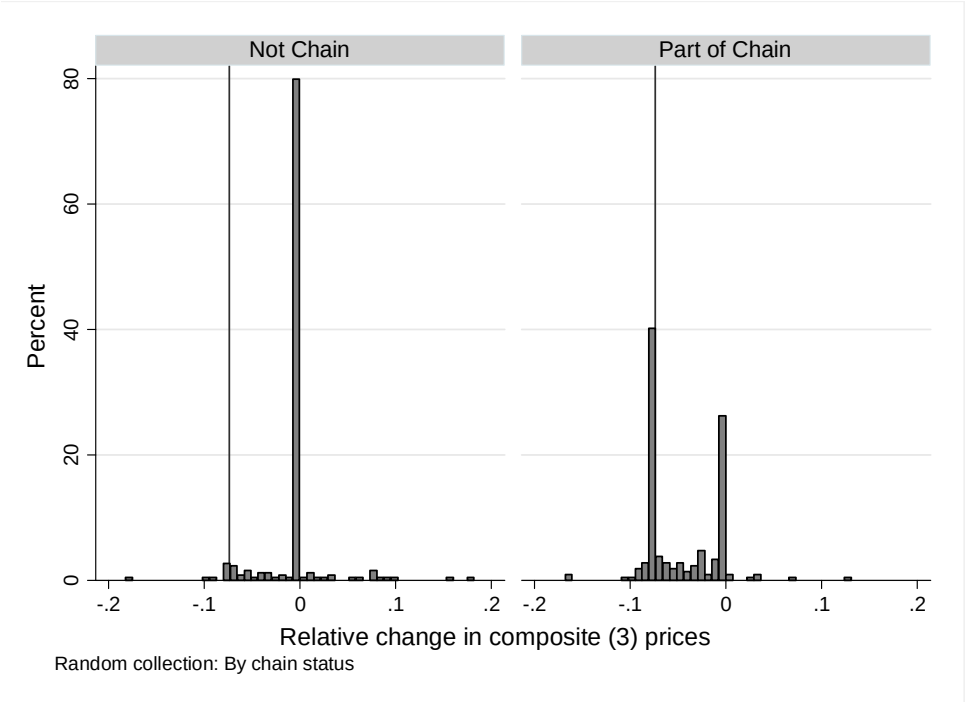

FIGURE 6. Distribution of relative price changes according to restaurants belonging to a chain and those not belonging to a chain

from the same restaurant before and after the reform. All estimates are differences-in-differences (DD) results comparing Finnish restaurant prices in the treatment group with several control groups over time.

Table 4 presents the average estimates of the effect of the VAT reform on prices. The Table shows comparisons of Finnish restaurant prices with Estonian restaurant prices in columns (1) to (3), Finnish hotel room prices in column (4), Swedish restaurant prices in column (5) and Norwegian restaurant prices in column (6). Column (1) presents the DD results controlling for covariates and columns from (2) to (6) present the fixed-effects results.

Our main result in column (2) indicates that unweighted meal prices in Finnish restaurants fell by 2.2% as a result of the VAT reduction when we compare them to

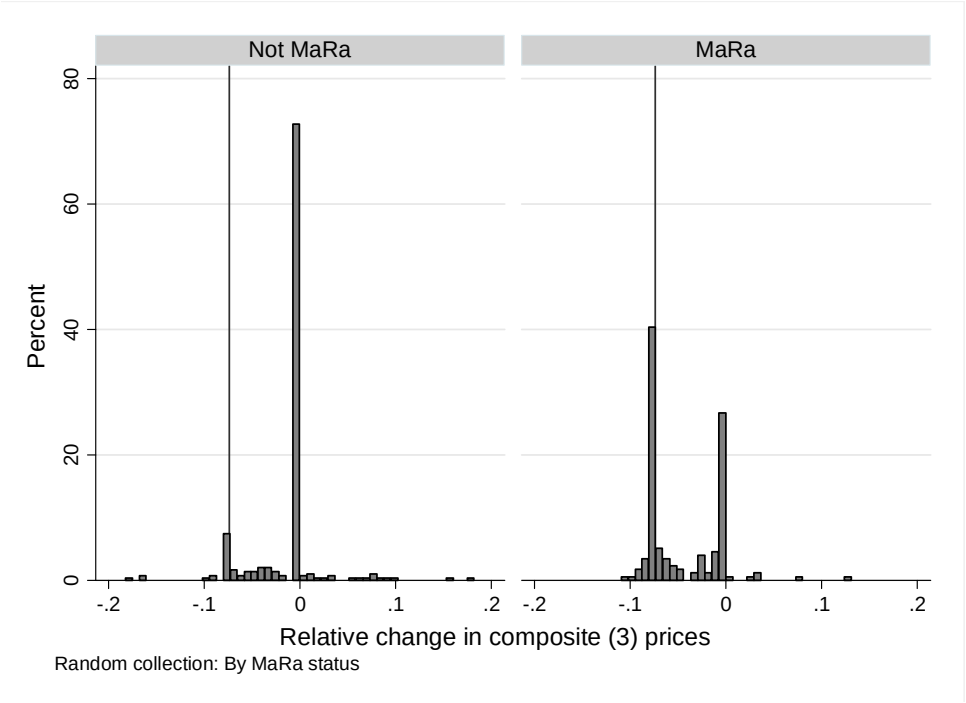

FIGURE 7. Histogram of relative price changes according to whether restaurants belong to MaRa or not

Estonian meal prices. The response in column (3) is a bit larger, a 2.8% decrease in lunch prices. This suggests that lunch prices are a bit more responsive to the tax reduction. However, the response is not statistically different from the main estimate. When comparing with hotel prices, in column (4), meal prices seem to decline even more: 4.4%. This results is somewhat dependent on few price observations and overall the variation in hotel room prices is much larger than in meal prices. A comparison with Swedish meal prices from the CPI data shows that the average response is only a 1.2% decrease in consumer prices. However, the CPI data from Sweden includes only a very small number of observations for restaurant meals, see Table A1 in the Appendix. The price decrease is a bit larger than our main estimate as we use Norwegian restaurant meal prices as a comparison group, in column (6).

Control	(1) Composite Est	(2) Composite Est	(3) Lunch Est	(4) Composite Hotels	(5) Composite Swe	(6) Composite Nor
DD	-0.022**	-0.022**	-0.028**	-0.044**	-0.012	-0.031**
	(0.011)	(0.010)	(0.012)	(0.022)	(0.009)	(0.016)
Specification	OLS	FE	FE	FE	FE	FE
N	2250	2250	1162	2020	1270	2155
R^2	0.200	0.153	0.128	0.081	0.163	0.088
N of firms		1125	581	1010	764	1106
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

TABLE 4. Main estimation results. Differences-in-differences estimates of prices. Note: The dependent variable is the log of the composite price variable. Column (1) presents the DD results controlled for restaurant category, collection method and restaurant type, columns (2) to (4) present the DD results from the fixed-effects regression. Columns (1) to (3) compare Finnish and Estonian restaurant prices and column (4) compares changes in Finnish restaurant prices with hotel prices. Columns (5) and (6) compare Finnish composite restaurant meal prices with Swedish and Norwegian meal prices. The standard errors are calculated by using country or industry clusters with a block bootstrapping method.

We present the weighted fixed effect results in Table 5. The weighted results aim at measuring the price change for a representative consumer. With this weighting we also take into account the heterogeneity in restaurant sizes. We use turnover statistics for 2010 to construct the weights. In practice we construct a categorical variable of 10 size groups to weight the results. We do this because the CPI data for Swedish and Norwegian restaurants contain only this kind of categorical variable without information about the exact numerical value of yearly turnover.

The dependent variable is again the log of composite price. Column (1) in Table 5 shows again the main unweighted result, column (2) presents the main weighted estimate, column (3) shows estimates comparing Finnish restaurants with hotels. Columns (4) and (5) compare Finnish restaurant meal prices with Swedish and Norwegian meal

prices. The tax incidence on prices because of the VAT reduction varies from a 2.4% to 5.9% decrease in prices, depending on the comparison group.

The overall result is that weighting by restaurant size categories leads to larger price change estimates than without weights. This observation suggests that relatively larger restaurants reduced their prices more than smaller ones. The weighting increases all point estimates compared to the unweighted main result but they are still smaller than full pass-through (-7.4%). On average, the results suggest that the representative meal price decreased by slightly more than half of the full pass-though.

VARS	(1) Norm	(2) weight	(3) weight Hotel	(4) weight Swe	(5) weight Nor
DD	-0.022***	-0.033***	-0.059***	-0.024***	-0.042***
	(0.010)	(0.003)	(0.008)	(0.007)	(0.009)
N	2250	2250	2020	1270	3182
R^2	0.153	0.350	0.131	0.380	0.320
N of firms	1125	1144	1010	764	1663
Standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

TABLE 5. Estimation results weighted by turnover

Note: Fixed effects DD estimates where the dependent variable is the log of composite price variable. Column (1) presents the main result, columns (2) to (5) present the weighted estimation results, where the weights are firm turnover in 2010. Columns (1) and (2) compare changes in Finnish and Estonian restaurant prices, whereas column (3) compares changes in Finnish restaurant and hotel prices. Columns (5) and (6) compare Finnish composite restaurant meal prices with Swedish and Norwegian prices from CPI data. The heteroscedasticity-consistent standard errors are in parenthesis.

There are number of caveats with these weights, however. The turnover statistics also include other sales than restaurant meals as long as these sales are made within the same firm. In some cases there are really large corporations that have a range of activities from supermarket activities to gas station operations, as well as restaurant operations. We tackled this problem by reducing the weights especially for firms that

were not classified as primarily belonging to the restaurant sector. Still, the whole weighting process is somewhat ad hoc in nature, but nevertheless the best available. The weighted results should be regarded as indicative rather than precise estimates. We expect that these weighted results offer an upper bound for the actual price changes as the weighting could still be too high for large restaurants even after the corrections we make. We also have to be careful when interpreting the significance of the results as we present naive heteroscedasticity-consistent standard errors.

To shed more light on what drives the heterogeneity of the results, Tables 6 and 7 show the results where the effect of the reform, represented by the DD-variable, is interacted with the main categorical variables we collected in the price survey process. Column (1) in Table 6 presents the result where the DD variable is interacted by the type of restaurant. The omitted type is fast-food restaurants. The results indicate that there are no differences in pass-through whether the restaurant is fast-food, cafeteria or a la carte. But the results suggest that especially restaurants serving mostly lunches reduced their prices the most. In column (2) the DD variable is interacted by whether the prices where collected from the internet or by phone. The price reduction is larger among restaurants for which we were able to find a website listing the prices.

VARS	(1) Classification	(2) Collect rule
DD	-0.014*	-0.025**
	(0.008)	(0.012)
A la carte	-0.007	
*DD	(0.005)	
Cafe	-0.007	
*DD	(0.009)	
Lunch	-0.020**	
*DD	(0.009)	
Phone		0.015**
*DD		(0.008)
N	2250	2250
R^2	0.171	0.163
N of firms	1125	1125
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

TABLE 6. Estimation results divided by restaurant type and collection method
Note: Fixed effects DD estimates where the dependent variable is the log of the composite price variable. Column (1) presents the results where the DD variable is interacted with the 4-step restaurant classification and column (2) interacted with the price collection method (internet or phone). The standard errors are calculated by using country clusters with a block bootstrapping method.

Table 7 presents further divisions of the results. These are the same divisions we presented in Figures 6 and 7. It certainly holds here that if a restaurant belongs to chain or union, prices are cut more than in the rest of the sample. The results even suggest that most of the price responses come from these more 'organized' or 'unionized' restaurants, and among restaurants not belonging to these groups, the price response was very small if significantly different from zero at all, on average. This is the same conclusion we already reached based on the graphical analysis.

VARS	Chain	MaRa
DD	-0.006	-0.012*
	(0.005)	(0.007)
Chain	-0.040**	
*DD	(0.017)	
MaRa		-0.029***
*DD		(0.012)
S-Group		
*DD		
N	2250	2250
R^2	0.279	0.215
N of firms	1125	1125
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

TABLE 7. Estimation results divided by whether an establishment belongs to a chain or to MaRa

Note: Fixed effects DD estimates where the dependent variable is the log of composite price variable. Column (1) presents results where DD variable is interacted with whether restaurant belongs to a chain or not and column (2) whether restaurant belongs to MaRa or not. The standard errors are calculated by using country clusters with block bootstrapping method.

The results, thus far, show the responses on the log composite of three prices. However, this perhaps begs the question as to how dependent the results are on this categorization or how heterogeneous the price responses are across meal types. Figure 8 shows the average relative reduction in prices across the price categories in our price data. Prices fell by a similar amount in most price categories. The largest point estimate of price changes is for desserts. However, this is still not statistically different from any other meal prices affected by the VAT reduction. Wine and beer are in the control group, since their VAT remained at the standard rate. We also observe zero price effects for them. This is also a robustness check for our method.

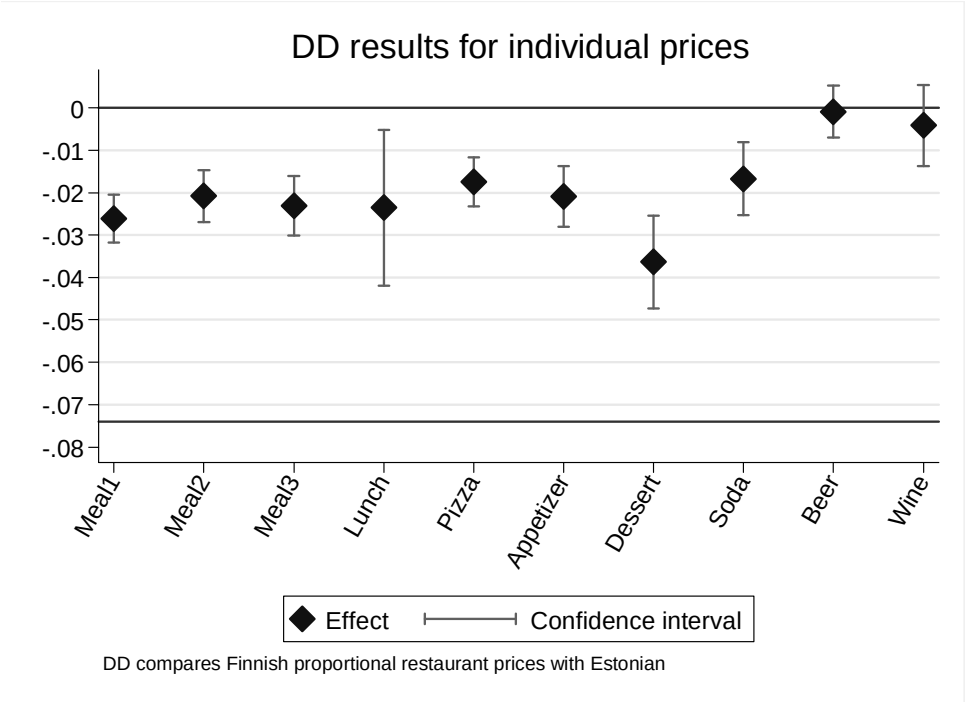

FIGURE 8. The restaurant-level results from fixed-effects regression by each price category and 95% confidence intervals

5.5.2. Demand effects. We start the analysis of demand effects by showing graphical evidence. Figure 9 describes the development of average monthly turnover in thousands of euros for the restaurant and hotel industries over time from January 2008 to December 2011. The solid line on the horizontal axis is the time of the VAT reform, July 2010, and the dashed lines are for every July in the following years. The Figure shows that the overall trend over time is similar for these two industries, although on average it seems to be more pronounced for hotels. There seems to be a lot of variation in turnover during the calendar year. Consistently, July in each year has the highest turnover in both industries. However, the variation creates challenges for statistical analysis.

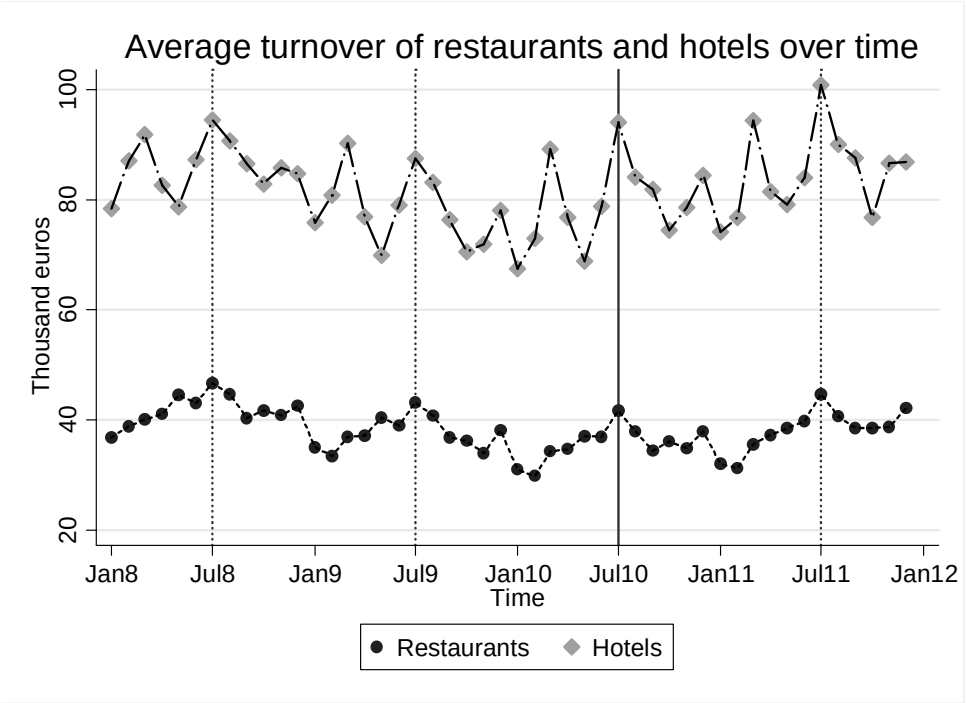

FIGURE 9. Average turnover over time for restaurants and hotels

To reduce the variation and to identify the changes in turnover clearly, we compute a percentage change variable for each firm. It compares the monthly turnover with the turnover in the same firm 12 months previously. As a formula the variable is:

$$S_{R,m} = \frac{1}{n^R} \sum_{i \epsilon R} \frac{s_{m,i} - s_{m-12,i}}{\bar{s}_{y-1,i}} \tag{5.5.1}$$

$$\triangle S_m = S_{R,m} - S_{H,m}$$

where i denotes the firm, R denotes the restaurant industry, H denotes hotels, m is the month, y is the year, n is the number of firms, $\bar{s}_{y-1,i}$ denotes the average monthly turnover of firm i in the previous year and $s_{m-12,i}$ refers to the turnover of firm i 12 months previously. We also compare the percentage changes in turnover between

groups by taking the differences of the means of the groups, e.g. between restaurants and hotels, described by $\triangle S_m$. In addition, we apply this method to investigate the changes in wage sums as well in section 5.5.3.

We apply some necessary data restrictions. We examine only those restaurants where over half of the turnover comes from restaurant meals and those hotels where at least a third of the turnover comes from hotel room sales. This is necessary as the industry classification is not exact enough to separate firms by the principal sales of the firms. First, the problem is that there are many restaurants and hotels with occasional operations only. The restaurant industry includes firms offering occasional catering services, bars and kiosks etc. Similarly, the hotel industry includes many motels which operate during the summer only and firms renting cottages occasionally. Second, there are some large firms with a restaurant or hotel industry classification but the turnover of these firms comes from operations other than selling meals or offering hotel services. Third, there are also firms coded in different industries than restaurants or hotels but where a large share of their turnover comes from sales of restaurant meals or hotel services. The method of examining changes in consumer prices presented in equation (5.5.1) also requires firms to have positive turnover over time. Thus we use this method to examine the intensive margin responses. The relevant data set used in the analysis is approximately half of the total number of the firms described in Table 3. This data restriction is valid until section 5.5.4, where we investigate the extensive margin responses.

Figure 10 describes the weighted estimates[13] for $S_{R,m}$ and $S_{H,m}$ in the upper panel and the mean difference of these two $\triangle S_m$ in the lower panel over time. The interpretation of Figure 10 is as follows: if the consumer prices and quantities sold change immediately after the reform and remain unchanged in the long run, the turnover changes would emerge in the first 12 months after the reform and there would be no

[13]We use average turnover in 2009 for each firm to weight the estimates.

changes after 12 months. This is because we compare monthly turnover with turnover 12 months previously for each firm. The horizontal axis is in months from the reform, and thus zero refers to July 2010, -12 is July 2009 and so on. The overall trends seem to be relatively similar between the groups before the reform although there are small differences just before the reform. Nevertheless, the Figure shows that there is a decrease in the change in turnover right after the reform among restaurants relative to hotels.

We estimated 2% unweighted and 4% weighted pass-through to consumer prices. With no changes in the quantity of services sold, we should see a 2-4% drop in turnover for restaurants. If the quantities sold increase due to the reform, the change in turnover would be positive or at least closer to zero than the observed pass-through to prices. Figure 10 shows that turnover decreases after the reform among restaurants. This gives us initial evidence suggesting no increase in demand for restaurant meals due to the reform.

In addition, Figure 1 suggests that consumer prices in the Finnish restaurant industry catch up with prices in restaurants in neighboring countries soon after the reform. Figure 10 indicates a similar development in turnover. After the reform the change in turnover gradually increases and six months after the reform there is no difference in the changes in turnover between restaurants and hotels. This suggests that the increases in consumer prices affect strongly the turnover valued at consumer prices, which further implies that demand for restaurant meals is inelastic in respect of prices in the short run. However, the quantities of restaurant meals sold could also increase gradually over longer period of time, which then would increase turnover.

Nevertheless, there is a reason which could dampen the size of the effect. Turnover includes sales of products and services other than restaurant meals, as Figure 3 previously described. For example, the VAT rate for alcohol and drinks sold in restaurants is different than that for meals, but these goods are included in the total turnover.

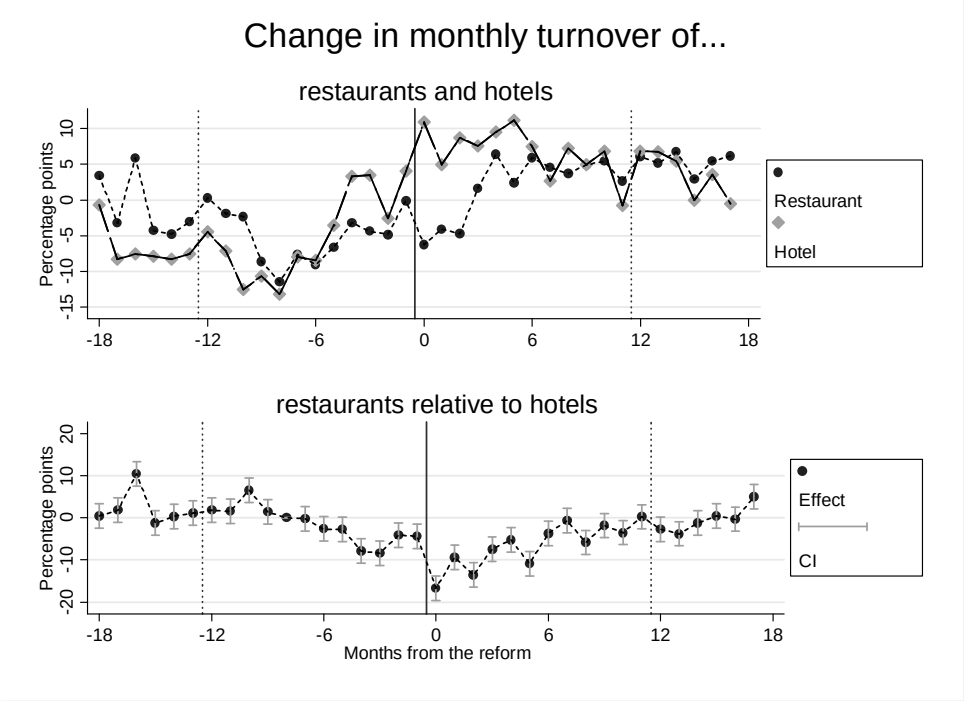

FIGURE 10. Changes in monthly turnover of restaurants and hotels over time

However, the data restrictions mentioned above diminish this problem. The changes in turnover should, however, be correct if the share of turnover coming from the other VAT bases is unchanged due to the reform.

An additional margin of response could be a change in tax evasion in the industry due to the reform. This is not directly observable in the data and we cannot investigate this channel of response precisely. However, we can discuss the possible effects of tax evasion with respect to our results. The benefits from tax evasion decline after the reform, which could end up reducing tax evasion. A reduction in tax evasion would increase reported turnover at the lower VAT rate and turnover would also increase in response.[14] This effect would go in the same direction as the demand response and

[14]There might be some manipulation in reported VAT by firms due to the reform. Restaurants, for example, could report part of their sales at reduced VAT rate for which that rate is not applicable. We cannot observe how correctly firms apply the reporting rules in the data. However, this kind of

vice versa. Thus our estimate would be a lower bound for the real estimate of reported turnover and quantity changes.

Next we show the change in turnover for firms in our price sample. We measure the change in turnover per quarter to reduce the seasonal variation in the data. Again we apply the method presented in equation (5.5.1). Figure 11 illustrates the change in turnover for restaurants by dividing the data according to their chain status. We split the data by chain status as chain restaurants reduced their prices more often than others (see Figure 6). Therefore, one would expect to observe growth in turnover especially for those restaurants if the quantities respond to price changes considerably. The horizontal axis presents quarters from the reform and the solid vertical line is for the time of the VAT cut. It seems that there is a downward sloping change in turnover right after the reform for chain restaurants. The change in turnover one quarter after the reform for chain restaurants seems also to be similar in size than the price pass-through was. This clearly suggests that the quantity of restaurant meals sold did not increase in response to the reform. Furthermore, these observations together imply that the demand for restaurant meals is rather inelastic.

In addition, we estimate the effect of the reform on turnover using a similar DD strategy as we did for prices. In these estimations we again collapse the data from months to quarters and use the data only one year before and one year after the reform to diminish the variation in the data. Thus these results can be interpreted as short-run effects on demand.

We compare the log of turnover between restaurants and hotels before and after the reform. The logarithmic outcome produces proportional changes and the fixed effect model controls for the history of each firm in a similar fashion as the graphical analysis

report manipulation is illegal (tax evasion), and we think it is not a great problem for the analysis. Yet the effects on total turnover (turnover taxed at different VAT rates in total) that should provide a correct estimate if tax evasion behavior is not affected in total.

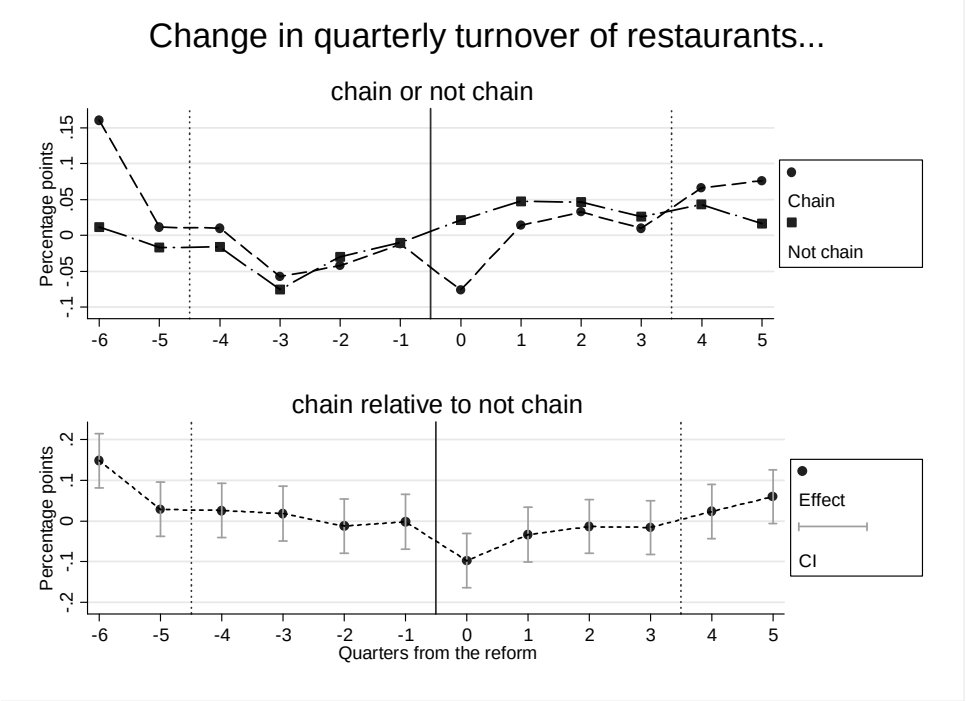

FIGURE 11. Change in quarterly turnover of restaurants: Competitive and not competitive

presented above. The difference between the graphical analysis and the estimation strategy is that the comparison is now made with the previous quarter of the year, not with the year before.

Table 8 shows the results. The first part of Table 8, columns (1) and (2), is for all the restaurants and hotels in the data. Column (1) reports the DD result and column (2) interacts the DD variable with the MaRa dummy, MaRa being the union representing the restaurant and hotel industries. The second part of the Table, columns (3) to (6), is only for firms for which we have price data. Otherwise, columns (3) and (4) are constructed as columns (1) to (2). Column (5) distinguishes the effect on chain restaurants from other restaurants, column (6) separates the effect on restaurants that did reduce their prices by over 5% right after the reform from other restaurants.

Overall the results imply a decrease in turnover for restaurants after the reform. Column (1) shows that the turnover of restaurants decreased by 4.2% after the reform relative to hotels. In our price analysis we found a 4.4% decrease in consumer prices for restaurants when we compared them to hotels (see Table 4 column (4)). Thus the changes in turnover and consumer prices are very similar. This clearly suggests no increase in the quantity of restaurant meals sold in the restaurant industry due to the reform. In column (2) we interact the DD variable with a dummy of belonging to MaRa or not. It seems that the turnover of MaRa restaurants decreases less due to the reform than the average impact. However, the overall effect is still negative also for MaRa restaurants.

We also estimate the effects of the reform for the data for which we have price observations. Because of the small sample and large variation in turnover, we do not find any statistically significant results. Nevertheless the point estimates are what we should expect based on the graphical analysis above. They are mostly negative and in column (5), where we interact the chain dummy with the DD variable, it shows that turnover decreased the most among restaurants belonging to a chain. This is also true for those restaurants that reduced their consumer prices most right after the reform, in column (6). In general, it also seems that the estimates produced by using the sample for which we have prices (columns 3 and 4) are a bit larger than for the whole sample (columns 1 and 2), however, the difference is not statistically significant for any comparison.[15]

[15]The results survived a battery of robustness checks. For example, we performed placebo treatments a year before and a year after the actual reform and both of these produced zero results. This also suggests that the main assumption of the DD method, parallel time trends between groups, is satisfied. We also varied the time frame used from the base case of two years to one, three and four years. These changes do not affect the results for turnover much. In addition, we added yearly level control variables to the specifications but these did not change the results.

	All		Firms with price observations			
	(1)	(2)	(3)	(4)	(5)	(6)
VARS	All	MaRa	All	MaRa	Chain	Price change
DD	-0.042***	-0.048***	-0.005	-0.020	0.008	0.006
	(0.010)	(0.010)	(0.034)	(0.039)	(0.036)	(0.036)
MaRa*		0.025***		0.056		
DD		(0.010)		(0.035)		
Chain*					-0.051	
DD					(0.055)	
Price change >5%*						-0.063
DD						(0.054)
N	26,963	26,963	4,146	4,146	4,146	4,146
R^2	0.072	0.072	0.036	0.037	0.037	0.037
N of firms	3,402	3,402	543	543	543	543
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

TABLE 8. DD estimation results: Turnover

Note: Fixed effects DD estimates where the dependent variable is the log of consumer price turnover. Columns (1) and (2) present the results for the whole data set of restaurants and hotels, and columns (3) to (6) present the results for those firms for which we have price data around the reform. Column (1) presents the DD results, column (2) presents the result where the DD variable is interacted with whether the restaurant belongs to MaRa or not, columns (3) and (4) contain the same estimates as in columns (1) and (2) but only for firms for which we have price data. In column (5) we interact the DD variable by a dummy for belonging to a chain or not, and in column (6) for whether or not a restaurant reduced prices by over 5% after the reform. The standard errors are calculated by using industry-level clusters with a block bootstrapping method.

5.5.3. Employment effects. We analyse the employment effects by examining the changes in firms' monthly wage sums paid to their employees. If there are changes in the number of employees or in the salaries of existing employees, we should observe it with this variable. One of the EU's main reason for allowing reduced VAT rates for labor-intensive industries was to stimulate employment. Thus, from a policy point of view, it is highly relevant to study these effects.

We start again with graphical evidence. Figure 12 describes the changes in monthly wage sums similarly as we described in Figure 11 for turnover. Therefore, the analysis is only on the intensive margin responses. The trends in the changes in these two Figures are relatively similar before the reform. However, there is no clear change in restaurants' wage sums after the reform. This also seems to hold if we compare the changes in restaurants' wage sums to the corresponding trend in hotels' wage sums (lower panel of Figure 12). It even seems that the average change in wage sums for restaurants decreases slightly right after the reform. Therefore, based on the graphical evidence, we do not detect any clear changes, on average, in restaurant wage sums due to the reform.

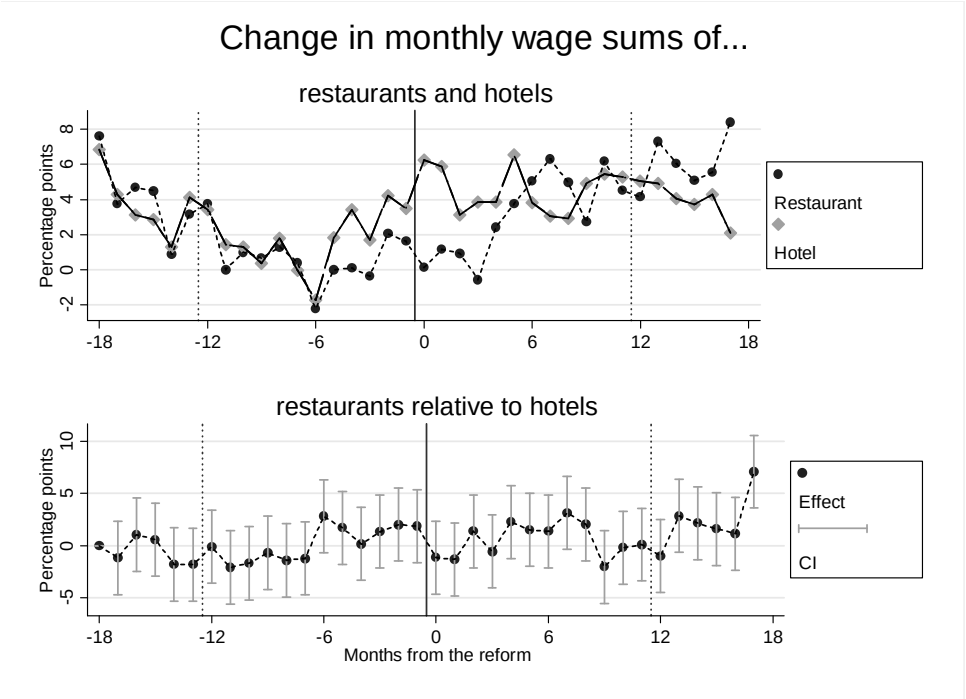

FIGURE 12. Change in monthly wage sums of restaurants and hotels

We also estimate the effects of the reform on wage sums using the DD approach. We aggregate the data into quarters and use the log of wage sums as a dependent variable

similarly as in the turnover estimations. Table 9 reports the results. The columns are organized exactly as in Table 8. There are no statistically significant changes in the wage sums of restaurants due to the reform. All the DD estimates are negative, suggesting that some of the restaurants even decreased their wage payments or the number of employees after the reform. However, none of these estimates are statistically significant. The negative point estimates suggest that restaurants did not increase their wage sums due to the reform. We also interacted the DD variable with the same set of categorical variables as for the turnover estimations. Restaurants belonging to MaRa or a chain, or restaurants which changed their price most, all have positive interaction coefficients. However, again, none are statistically significant. The zero result for wage sums seems to be a fair conclusion from these estimations. This gives more evidence supporting the inefficiency of VAT reductions for labor-intensive industries. This also supports the view that VAT reductions are not an efficient way to increase employment in the industry, which was the objective defined by the EU for VAT cuts for labor-intensive industries.[16]

[16]Again, we checked the robustness of the results similarly as described in footnote 15 for turnover. The results survived these examinations well.

	All		Firms with price observations			
	(1)	(2)	(3)	(4)	(5)	(6)
VARS	All	MaRa	All	MaRa	Chain	Price change
DD	-0.031	-0.042	-0.016	-0.032	-0.027	-0.051
	(0.035)	(0.037)	(0.048)	(0.061)	(0.055)	(0.058)
MaRa*		0.029		0.037		
DD		(0.023)		(0.066)		
Chain*					0.039	
DD					(0.065)	
Price change >5%*						0.143
DD						(0.094)
N	17,065	17,065	2,831	2,831	2,831	2,831
R^2	0.003	0.003	0.007	0.007	0.007	0.009
N of firms	2,563	2,563	440	440	440	440
Standard errors in parenthesis						
*** p<0.01, ** p<0.05, * p<0.1						

TABLE 9. DD estimation results: Wage sums

Note: Fixed effects DD estimates where the dependent variable is the log of wage sums. Columns (1) and (2) present the results for the whole data set of restaurants and hotels, and columns (3) to (6) present the results for those firms for which we have price data around the reform. Column (1) presents the DD results, column (2) presents the result where the DD variable is interacted with whether a restaurant belongs to MaRa or not, columns (3) and (4) contain the same estimates as columns (1) and (2) but only for firms for which we have price data. In column (5) we interact the DD variable with a dummy for belonging to a chain or not, and in column (6) for whether or not a restaurant reduced prices by over 5% after the reform. The standard errors are calculated by using industry-level clusters with a block bootstrapping method.

5.5.4. Entry and exit. An additional channel of response could be in extensive margin. This would be reflected in an increase in the entry of new restaurants in the industry and/or a decrease in the number of exits. The costs of entering the market decreased due to the reform, and this might have stimulated new businesses. In addition, the reform, of course, also decreased the costs of operating firms in the industry, and thus could have revitalized those businesses struggling in the restaurant

sector, resulting in a decrease in exits. Thus, to provide a conclusive analysis, we study the number of new entries and exits by comparing hotels and restaurants over time. This is possible as we have the total data for all restaurants and hotels in the industry which are obliged to register with the tax authority. In this section, we only emphasise the graphical evidence.

First, in Figure 13 we show how many entries and exits there are per quarter. It would seem natural for the number of entries and exits to be much higher in the restaurant than the hotel industry. The Figure indicates that the number of entries roughly equals the number of exits in both industries, leaving the total number of firms unchanged. Both the number of entries and exits seems to be more pronounced in the first quarter of the year.

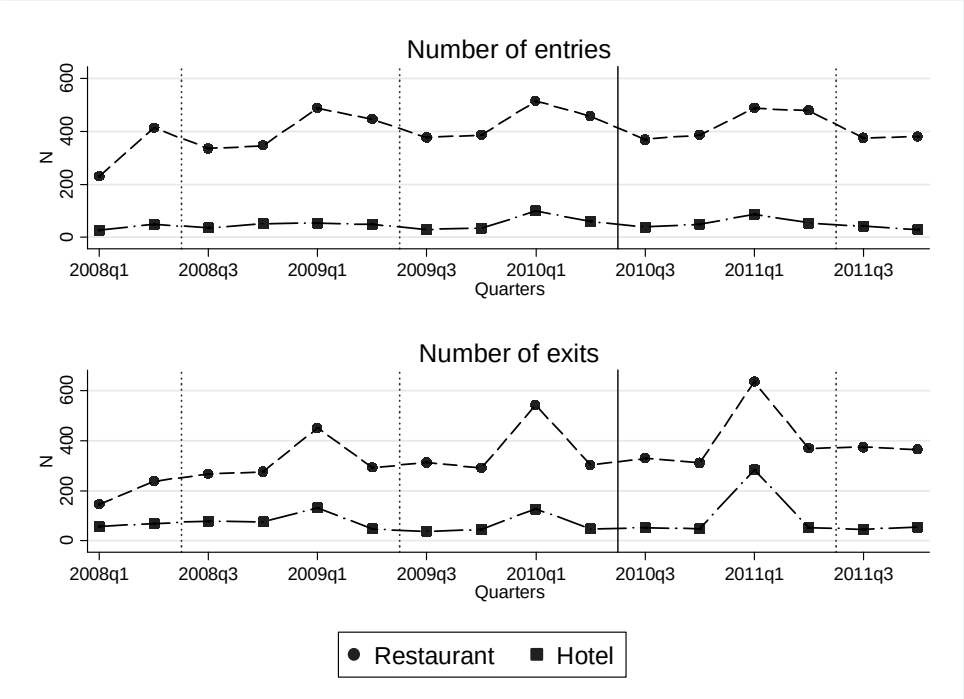

FIGURE 13. Number of entries and exits over time: Restaurants and hotels

To study the possible effects of the reform, we also plot the probabilities of exit and entry in Figure 14. Both the exit and entry probabilities seem to be relatively stable over time, although there are some exceptions from the overall trend, e.g. the spike of exits in the first quarter of 2011 among hotels (quarter 2 in the Figure). Thus, until now we may be fairly sure in concluding that we do not observe any change in exits or entries due to the reform. However, we still estimate the DD model between restaurants and hotels, and present the estimates and 95% confidence intervals in Figure 15. The estimation confirms our previous conclusion: we do not see any change in DD estimates, neither for entries nor exits after the reform. However, it is still possible to see some changes over a longer period of time, but, at least after 1.5 years, no evidence of change is observable.

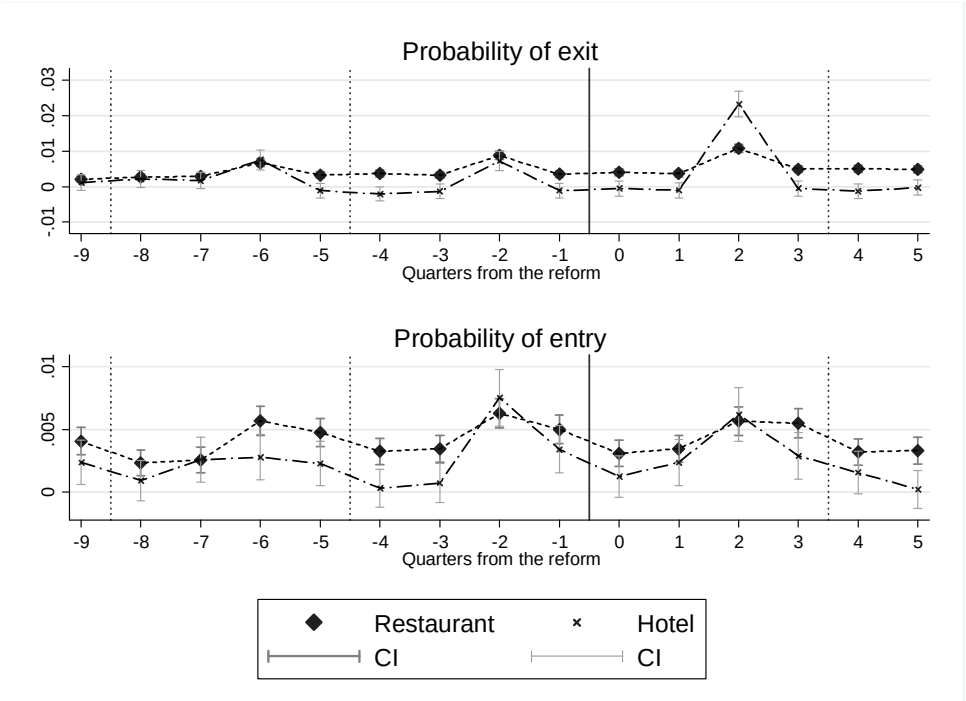

FIGURE 14. Exit and entry probabilities over time: hotels and restaurants

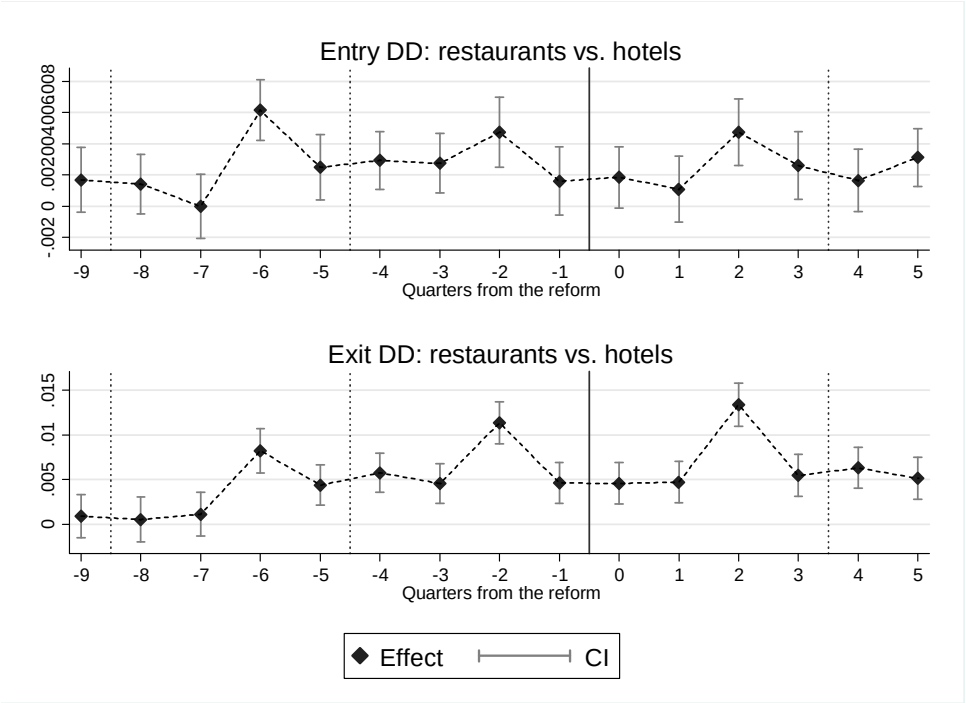

FIGURE 15. DD estimates for exit and entry over time: hotels vs. restaurants

5.6. Conclusions

We examine the effects of a VAT cut on restaurant meal prices, demand and wage sums paid to employees in Finland. The VAT rate was reduced from 22% to 13% from the beginning of July 2010. The EU Member States were allowed to apply reduced VAT rates for restaurant services just one year before the Finnish reform (CD 2009/47/EC). Thus restaurants did not have much time to anticipate the change. We also think that policy endogeneity is not a substantial problem, since it was because of the EC Directive that the Finnish government chose to apply reduced VAT to the restaurant industry rather than other similar industries. Therefore, we have an interesting opportunity to credibly estimate the effects of consumption taxes on different important margins of response.

We use an extensive amount of graphical evidence in the analysis. This is possible because we have unique firm-level price data and tax record data for monthly turnover and wage sums. With our price data, created especially for this study, we are able to show the whole distribution of price changes due to the reform. This is not common in the previous literature. In addition, we have an opportunity to estimate rarely available margin of response in the previous literature as we approximate the changes in quantities of restaurant meals sold after consumption tax reform. Using these information together we may draw a conclusion of the effectiveness of consumption taxes on this sector.

We make use of the standard difference-in-difference approach with fixed effects to estimate the average effect of the reform on consumer prices, demand for restaurant meals and wage sums. Our main estimate implies that the VAT cut reduced restaurant meal prices on average by 2.2%. A full pass-through would have implied a 7.4% consumer price reduction. Thus, the price reduction is approximately a quarter of full pass-through to prices. The weighted change in prices was higher, 4%, over half of the full pass-through. The interpretation of the difference between the estimates is that, on average, larger firms reduced prices more than smaller firms. Also, there seem to be large differences in the price estimates, especially depending on whether or not the restaurant belongs to a chain or MaRa (the union representing restaurants and hotels). If a restaurant belongs to one (or both) of these categories, the price change was much larger than in our base-line estimates. Independent firms, not belonging to any union or chain, seem to have mostly ignored the reform as they did not change their prices at all in a result of the reform. We also found that lunch restaurants reduced their prices slightly more than other types of restaurants.

Our results for turnover and wage sums suggest no changes in demand for restaurant services or employment in the sector. We find that even those restaurants which did change their prices the most did not experience an increase in the number of restaurant meals sold. We also have graphical evidence supporting the view that turnover follows

the development of consumer prices. In addition, we do not find any effects on entry into or exit out of the restaurant industry due to the reform.

These observations imply that the price elasticity of demand (quantities) is very small or even close to zero. Our estimates are in line with the paper by Kosonen (2010) studying the effect of a VAT cut on hairdressers in Finland. Thus we conclude that consumption tax reforms for labor-intensive industries, even when as large as in this case, are not very efficient policy means for increasing demand. Also, the job creation objective of reduced VAT rates for labor-intensive industries (CD 1999/85/EC) is evidently not fulfilled.

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Appendix

Sweden			Norway		
Variable	Mean	N	Variable	Mean	N
Dinner1	42.41	84	Beef	8.95	36
Dinner2	32.28	63	Salmon	21.74	138
Dinner3	24.37	93	Salad	14.58	165
LunchA	9.70	115	Pizza	15.06	144
LunchB	10.34	59	Sandwich	5.97	202
Lunch Fish	14.26	49	Soup	11.15	92
Wine	29.31	117	Wine	8.91	310
Beer	6.32	117	Beer	8.05	220

TABLE A1. Desciptive statistics for CPI data from the statistics offices of Sweden and Norway (in euros)

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