Government
Institute for
Economic Research

Working Papers 43

Entrepreneurs and income-shifting: Empirical evidence from a Finnish tax reform

Jarkko Harju

Tuomas Matikka

VATT WORKING PAPERS

43

Entrepreneurs and income-shifting: Empirical evidence from a Finnish tax reform

Jarkko Harju
Tuomas Matikka

Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
Helsinki 2012

Many thanks to Richard Blundell, Essi Eerola, Ari Hyytinen, Laurence Jacquet, Seppo Kari, Olli Kärkkäinen, Tuomas Kosonen, Jukka Pirttilä, Panu Poutvaara, Håkan Selin and Joel Slemrod for their very useful comments and discussion. We also thank the assigned discussants and participants in many conferences and seminars for their helpful comments. All remaining errors are our own. The authors gratefully acknowledge funding from the Nordic Tax Research Council and the Yrjö Jahnsson Foundation. Harju gratefully thanks the Alfred Kordelin Foundation, and Matikka thanks the Finnish Cultural Foundation, OP-Pohjola Group Research Foundation, the Emil Aaltonen Foundation and the Finnish Doctoral Programme in Economics for their financial support.

Jarkko Harju, Government Institute for Economic Research, jarkko.harju@vatt.fi

Tuomas Matikka, Government Institute for Economic Research,
tuomas.matikka@vatt.fi

ISBN 978-952-274-050-2 (PDF)

ISSN 1798-0291 (PDF)

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

Edita Prima Oy
Helsinki, December 2012

Cover design: Niilas Nordenswan

Entrepreneurs and income-shifting: Empirical evidence from a Finnish tax reform

Government Institute for Economic Research
VATT Working Papers 43/2012

Jarkko Harju – Tuomas Matikka

Abstract

This study examines the extent of direct tax avoidance through income-shifting between wages and dividends, and approximates the deadweight loss due to this behavior for the owners of privately held corporations. The dual income tax system in Finland offers noticeable incentives for income-shifting. The extensive 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 considerable welfare effects. We also find evidence that costs related to income-shifting behavior affect the effectiveness of taxation.

Key words: Tax avoidance, income shifting, entrepreneurs, dual income tax

JEL classification numbers: H21, H25, H32

Tiivistelmä

Tässä tutkimuksessa tarkastellaan yrittäjien tulonmuunnon aktiivisuutta. Suomessa voimassa oleva eriytetty tuloverojärjestelmä kannustaa tulojen siirtämiseen ansiotulojen ja pääomatulojen välillä. Tämä tulonmuuntokannustin on erityisen merkittävä listaamattomien osakeyhtiöiden omistajille, jotka voivat nostaa tuloa yrityksestään sekä palkkana että osinkona. Tutkimuksessa hyödynnetään vuoden 2005 osinkoverouudistusta, joka keskimäärin lisäsi omistajien kannustimia maksaa enemmän palkkaa suhteessa osinkoihin. Tulonmuuntoa mitataan tarkastelemalla miten verotuksellisesti optimaalisen palkan osuuden muutos vaikuttaa yrittäjän nostaman palkan määrään.

Tulosten perusteella verouudistus vaikutti selvästi tulokombinaation valintaan. Yhden euron muutos vero-optimaalisessa palkassa johtaa keskimäärin 66 sentin muutokseen havaitussa palkassa. Tulonmuuntoaktiivisuus on suhteellisen samanlaista eri omistajaryhmissä ja erilaisissa yhtiöissä. Lisäksi kustannukset ja hyödyt tulojen muuntamisesta vaikuttavat havaittuun käyttäytymiseen.

Tulonmuunto on tärkeä ottaa huomioon, kun verojärjestelmää suunnitellaan ja verotuottoja arvioidaan. Tulonmuunto vaikuttaa verotuloihin ja heikentää verojärjestelmän taloudellista tehokkuutta. Tulosten perusteella tulonmuuntoa ja sen haitallisia vaikutuksia voidaan vähentää kahdella tavalla: kaventamalla palkka- ja osinkotuloverojen välistä eroa sekä vaikuttamalla lainsäädännöllisesti osinko- ja palkkatulojen määräytymisperusteisiin.

Asiasanat: Tulonmuunto, yrittäjät, eriytetty tuloverotus

JEL-luokittelu: H21, H25, H32

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 activity. Income-shifting between differently taxed tax bases is a common example of a tax avoidance channel. This behavior directly decreases tax revenue and increases the deadweight loss of income taxation. Income shifting is generally recognized in the literature, but only a few studies have offered credible empirical estimates of its size. Our aim is to provide new evidence on the extent and significance of income-shifting behavior, and study how the design of the tax code affects it.

Income-shifting is especially relevant for entrepreneurs and the owners of privately held businesses. Compared to wage earners, entrepreneurs and business owners have a wider scope of legal possibilities to engage in income-shifting, as they can more easily apply different types of income as a source of personal compensation[1]. Income-shifting possibilities and tax incentives are especially 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[2]. We then use these results to approximate the 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 rate of the income-shifting response. The potential effects of these factors offer evidence for both researchers and policy makers that the inefficiency caused by income-shifting might be mitigated by simply re-designing and adjusting the tax code and regulations.

We exploit the extensive corporate and dividend tax reform of 2005 in Finland as an exogenous source of tax rate variation. The reform increased the marginal tax rate on dividends, thus increasing the incentives to pay wages instead of dividends as a form of personal compensation. Furthermore, the reform changed the tax incentives differently for approximately similar owners. Also, the reform created variation in the potential

[1] In addition to many tax bases, income-shifting can also occur in other forms. A well-known example is intertemporal income-shifting, where the behavioral response comes in the form of anticipating the forthcoming tax rate change or in some other change in behavior over time (see for example Goolsbee (2000)). This paper focuses on the (static) longer run effect of income-shifting between tax bases.

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

monetary benefits stemming from income-shifting. These features combined with the total tax record data and the unique opportunity to link tax record information from the owner level to the firm level create an interesting starting point to analyze income-shifting. The extensive data enable us to precisely define the tax-optimal composition of total gross income for each owner of a privately held corporation before and after the reform.

We find clear support for the view that the owners of privately held corporations are active in income-shifting. Increased dividend taxation following the 2005 tax reform led the owners to adjust their composition of income by significantly increasing wage compensation at the expense of dividends. Using standard approaches in the excess burden literature, we assess this income-shifting response to be substantial. In addition, we do not observe 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 affect the income-shifting response.

Earlier empirical studies concerning tax avoidance behavior among entrepreneurs and corporate owners 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 entrepreneurs than wage earners (Auten and Carroll (1999)). Top-income earners, who are often entrepreneurs and business owners, seem to respond to tax changes more actively than others (Gruber and Saez (2002)).

Also, Saez (2010) and Chetty et al. (2011) show that entrepreneurs bunch at the kink points of the tax schedule much more than laborers. This suggests that individuals with self-employment income 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, 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 2 presents the institutional background of the Finnish DIT schedule and describes the main attributes of the 2005 tax reform. Section 3 depicts the theoretical background for our empirical analysis. Section 4 presents the empirical model and descriptive statistics. Section 5 presents the results. Section 6 presents extensions to our baseline model, including an analysis of the costs and benefits in income-shifting behavior. Section 7 concludes.

2 Finnish dual 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 low flat tax rate for all 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.[3]

[3] A more general discussion and the theoretical reasons for applying Nordic type DIT can be found for example in Nielsen and Sørensen (1997) and Sørensen (2005).

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 general, the taxation of wages, dividends and capital gains from privately held corporations was organized according to the following rules and principles:

- Firm profits were taxed at a flat corporate income tax rate (29%), which equaled the personal capital income tax rate.
- Dividends:
  - Dividends up to the amount corresponding to the imputed normal return on the net assets of the firm (assets−liabilities) were regarded as *capital income dividends*, taxed at the flat capital income tax rate of 29%.
  - Dividends exceeding the imputed normal rate of return were categorized as progressively taxed *earned income dividends*[4].
  - Corporate taxes were fully credited against the dividend tax liability of a shareholder, resulting in single taxation of dividends.
- Capital gains were taxed as personal capital income.
- Wages were taxed as earned income, subject to a progressive tax rate schedule (0-56%, depending on taxable income). Wages were single-taxed as they were deductible from firm profits. Wages and progressively taxed earned income dividends were not taxed with fully similar tax rules.

The main attributes of the 2005 dividend tax reform

From 2005 onward, the full imputation system was abolished, and Finland switched to a partial double taxation of dividend income where 70% of dividends were included in the shareholder's taxable income[5]. Therefore, after the reform, all dividends were subject to the corporate tax rate, and 70% of dividend income became double-taxed. However, capital income dividends up to 90,000 € were made tax-exempt in individual taxation, resulting in effective single taxation of these dividends. Also, the corporate tax rate

[4]The effective imputed normal rate of return on net assets is 9%. For example, with assets of 500,000 euros, liabilities of 100,000 euros and the rate of return set to 9%, the maximum amount of dividends taxed at the flat tax rate is 36,000 euros. In other words, in 2004, any dividends received from the firm below 36,000 euros were effectively taxed at the flat tax rate of 29%, and any dividends above this amount were subject to progressive earned income taxation with marginal tax rates between 0-56%.

[5]The content of the 2005 tax reform was made public already in 2003. For evidence of anticipation effects, see Kari et al. (2008).

was cut to 26% from the previous 29% and the capital income tax rate was lowered by one percentage point to 28%. The splitting rule of dividend income into capital income dividends and earned income dividends was maintained.

The effective taxation of capital income dividends below 90,000 € did not change significantly in the reform, as the imputed normal return on net assets was single-taxed. Consequently, the main outcome of the reform was the higher taxation of earned income dividends as they were no longer single-taxed. At the same time, there were no significant changes in the taxation of wages.[6]

Another very 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 credit was not given 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 was exogenous from the point of view of domestic shareholders.

Tax incentives for income-shifting

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.

Even though the Finnish DIT system prevents direct income-shifting through profit distributions, there are still ample possibilities for tax avoidance. 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[7]. In this paper we focus on the latter case.

The reform of 2005 significantly changed the income-shifting incentives for the owners of privately held corporations. Figure 1 describes the changes in the overall tax incentives

[6] A broader description of the Finnish tax system and the 2005 tax reform can be found in Appendix A.

[7] There are only a few minor legal limitations on the form in which the main owner can withdraw income from the firm. For more details, see Appendix A.

due to the tax reform. This 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). Thus the Figure also describes the effect of net assets on the MTR of dividends. As described before, the net assets position of the firm defines the amount of dividends taxed at the flat capital income tax rate.

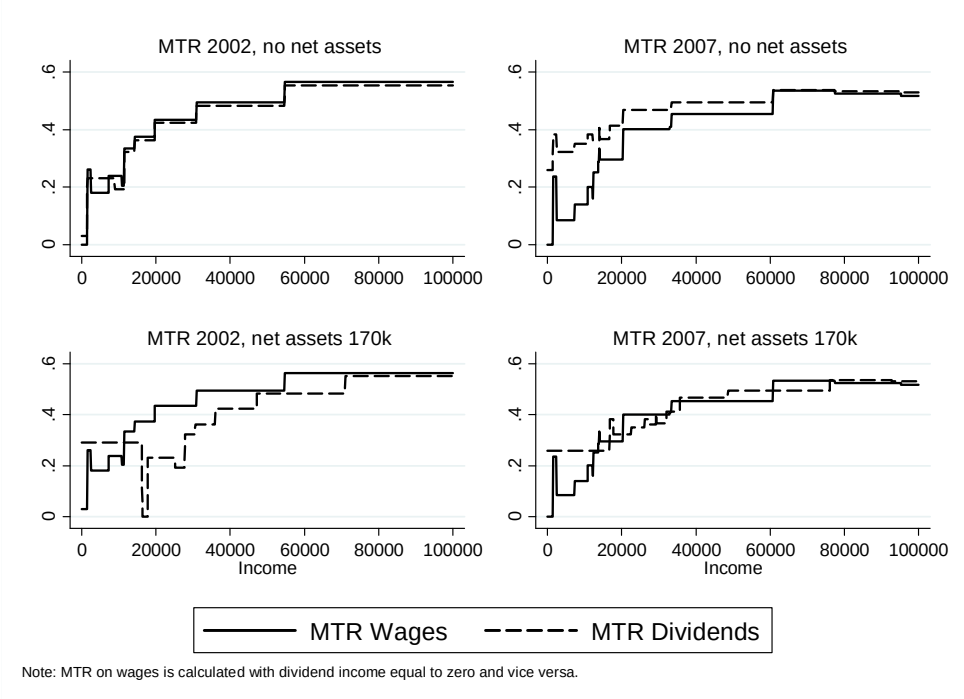

Figure 1: Marginal tax rates (MTR) on wages and dividends: Years 2002 (left) and 2007 (right). Above no net assets, below net assets of 170,000 €

When comparing 2002 and 2007, we can see that the MTR on dividends increased after the reform, while there were only modest changes in the tax schedule for wages. Also, an increase in the level of net assets has a notable effect on the MTR on dividends, as larger net assets decrease the MTR. Thus Figure 1 shows that owners with the same total income but different firm net assets experienced very different changes in their tax incentives following the reform of 2005.

To recap, Table 1 below highlights the main characteristics of the pre and post reform tax systems and the changes in income-shifting incentives.

Before	After
Tax law	
All dividends are single-taxed.	Capital income dividends below 90,000 € are single-taxed. All other dividends are partially double-taxed.
Tax incentives	
Capital income dividends are tax-preferred over wages if the MTR on wages is higher than the capital income tax rate of 29%.	Capital income dividends below 90,000 € are tax-preferred over wages when the MTR on wages exceeds the corporate income tax rate of 26%.
Small wage income ($<$ 7,500 €) is tax-preferred over earned income dividends.	Wages are tax-preferred over earned income dividends up to 60,000 €.

Table 1: Main characteristics and implications of the tax reform of 2005 for the owners of privately held corporations

3 Theoretical framework

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. The owner receives positive utility from his/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 exclusively 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[8]. We follow this assumption

[8]The choice of retained earnings (R) is relevant in dynamic tax optimization. R increase net assets, which are the base for calculating the share of dividends taxed as capital income 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

throughout the paper.

More formally, the owner's optimization problem is to

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

subject to

$$\Pi - R = W^g + D^g \tag{2}$$

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[9]. 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. 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 owners' optimality condition

$$\frac{t_W(W^g, D^g, I) + \left(\frac{\partial t_W(W^g, D^g, I)}{\partial W^g} - \frac{\partial t_W(W^g, D^g, I)}{\partial D^g}\right) W^g}{t_D(W^g, D^g, I) + \left(\frac{\partial t_D(W^g, D^g, I)}{\partial D^g} - \frac{\partial t_D(W^g, D^g, I)}{\partial W^g}\right) D^g} = \frac{MTR_W}{MTR_D} = 1 \tag{3}$$

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) determines the optimal combination of gross wages and gross dividends, denoted by (W^*, D^*). This gross income combination minimizes taxes,

year-to-year tax minimization problem of choosing the tax-optimal combination of wages and dividends. Also, without year-to-year tax optimization, the benefits from dynamic tax avoidance diminish or vanish altogether.

[9]Wages are assumed to be deductible from firm profits whereas dividends are not.

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)[10]. Nevertheless, equation (3) illustrates the main determinant of income-shifting behavior: the ratio of the associated tax rates of differently 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[11].

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 taxable income model by Feldstein (1999).

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

$$maxU(W + D, \gamma) = (1 - t_W)(\tilde{W}^g - \gamma) + (1 - t_D)(\tilde{D}^g + \gamma) - \phi(\gamma) \tag{4}$$

subject to

$$\Pi - R = (\tilde{W}^g - \gamma) + (\tilde{D}^g + \gamma) \tag{5}$$

where $(\tilde{W}^g - \gamma) = W^g$, $(\tilde{D}^g + \gamma) = D^g$. $\tilde{W}^g$ and $\tilde{D}^g$ are wage income and dividend income when there is no income-shifting. 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,

[10] 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 6. There are also some other matters that might implicate a deviation from the non-frictional solution (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) suggests.

[11] 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 (2011) discuss the implications of income-shifting between tax bases in the optimal income taxation framework.

i.e. the cost of changing the tax base[12].

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 now that $t_W > t_D$. Also, there are no optimization errors and no other private transfer costs involved in income-shifting behavior[13].

We use the standard approach in the deadweight loss literature and compare the marginal excess burden caused by behavioral responses to a tax rate change to a benchmark case without any behavioral responses, or assuming that the tax revenue collected by the government is returned to the owner as a lump sum transfer (see for example Chetty (2009a) and (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

$$\begin{aligned} \varpi(t_W, t_D) &= \Big\{(1-t_W)(\tilde{W}^g - \gamma) - (1-t_D)(\tilde{D}^g + \gamma) - \phi(\gamma)\Big\} \\ &\quad + t_W(\tilde{W}^g - \gamma) + t_D(\tilde{D}^g + \gamma) \end{aligned} \tag{6}$$

Next, consider a marginal change in the wage tax rate, dt_W. As the owner has optimized γ (resulting in a tax optimal combination of gross wages and gross dividends, (W^*, D^*)), we may ignore the behavioral responses in the curly brackets (i.e. the envelope condition states that dt_W has only a first-order effect on the owner's utility). After arranging the terms, the marginal excess burden can be written as[14]

$$\frac{d\varpi(t_W, t_D)}{dt_W} = \frac{d\gamma}{dt_W}(t_D - t_W) \tag{7}$$

We assume that there are no changes in $\tilde{W}^g$ and $\tilde{D}^g$, i.e. $\tilde{W}^g$ and $\tilde{D}^g$ are exogenous. In other words, we concentrate only on the marginal excess burden caused by the income-shifting effect with given total gross income, which is denoted on the right hand side of equation (7).

Equation (7) implies that the marginal deadweight loss of income-shifting comprises of two components: The first is the response of the amount of income shifted, and the

[12]The outcome of the marginal excess burden model remains the same whether we set the cost to be fixed or an increasing function of the amount of income shifted. However, the definition of the cost parameter has implications when interpreting the tax-optimization model of the owner. Section 6 discusses this in the presence of fixed costs of income-shifting.

[13]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 in the end of Section 5.

[14]The first-order effects on the owner's utility and the tax revenue of the government cancel each other out by definition.

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 behavioral income-shifting response defines the scope of the deadweight loss. In general, both tax rates t_W and t_D are known. To be able to approximate the scope of the inefficiency, we need a credible estimate of the average behavioral response.

As shown before in Section 3.1, with fixed total income, the amount of income shifted depends on the relative share of the tax rates (i.e. the change in wage income directly affects dividend income and the tax rate on dividends, and vice versa). 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 *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?

4 Empirical analysis

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 cross-sectional and balanced panel form. The unique characteristic of the data is that they contain basically all

[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.

Finnish businesses (all public and private 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 (so called YEL-insured entrepreneurs in Finnish tax legislation[17]).

4.2 *Empirical model*

This section describes the empirical model we exploit 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

$$W^g_{i,t} = \beta * W^*_{i,t} + X_{i,t} + C_i + \alpha_t + \varepsilon_{i,t}, \tag{8}$$

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 wages, such as innate abilities of the owner and the workers within the firm[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, which is the variable of main interest in our analysis[19]. The parameter β denotes the 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

[17] For more details on YEL-insurance status, see Appendix A.

[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.

total income $\Pi_{i,t} - R_{i,t} = W^g_{i,t} + D^g_{i,t}$. As we have the data actually used to tax the owners, we have all the information needed to unambiguously 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 owners' total gross income from the firm (gross wages + gross dividends), net assets of the firm, gross earned income from other sources and the tax code and regulations for the year in question. In order to define $(W^*_{i,t}, D^*_{i,t})$, 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, while also taking other individual tax information into account. 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, an income interval of 100 € is used[20].

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 earned income dividends, which are nominally part of the same earned income 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 (8) 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 (8) between t and $t + j$ gives us our estimable model

[20]The calculations are performed using Stata. The codes are available from the authors upon request. Appendix B presents an illustrative example of the optimization process and the changes in tax optimal gross wages due to the tax reform of 2005. Ropponen (2012) provides a thorough analysis and discussion of optimal income components within the Finnish dual income tax system (in Finnish only).

$$W^g_{i,t+j} - W^g_{i,t} = (\alpha_{t+j} - \alpha_t) + \eta(W^*_{i,t+j} - W^*_{i,t}) + \mu(X_{i,t+j} - X_{i,t}) + (\varepsilon_{i,t+j} - \varepsilon_{i,t}). \quad (9)$$

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^* in time.

Our main interest is in the coefficient η, which expresses the effect of a change in tax-optimal gross wages on the change in realized gross wages (conditional on given total gross income in both years). 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 truly the dominant factor behind the change in the division of income.

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 for approximately similar 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, and 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 $\triangle W^*_{i,t}$. For example, owners with relatively low total income and a high level of net assets faced only modest changes in their marginal tax rates, whereas owners with higher income and relatively low net assets were faced with larger tax incentives to rearrange their total gross income. Also, different levels of other earned income (i.e. earned income not received as wages or dividends from the firm) create variation in tax optimal gross wages, as other earned income affects the marginal tax rate on earned income withdrawn from the firm.

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. $W^*_{i,t}$ is not mechanically correlated with realized gross wages or gross dividends at a given level of total gross income, whereas marginal or average tax rates themselves are. In most income tax systems, larger realized wages are associated with high marginal tax rates and vice versa, causing these variables to be mechanically correlated in the 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 realized gross wages and realized gross dividends at a given total gross income level ($W^g_{i,t} + D^g_{i,t}$). 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.

However, we cannot rule out the possibility that changes in 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 realized wages as well (as there is, assuming other things unchanged, less total gross income to be withdrawn altogether, e.g. 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 6.

Finally, it is worth noting that $W^*_{i,t}$ 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 (9), the matrix $(X_{i,t+j} - X_{i,t})$ controls for changes in the ownership share and other capital income on the owners' side, and changes in turnover, number of employees, profits and total assets on the firm side.

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. Furthermore, 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 €.

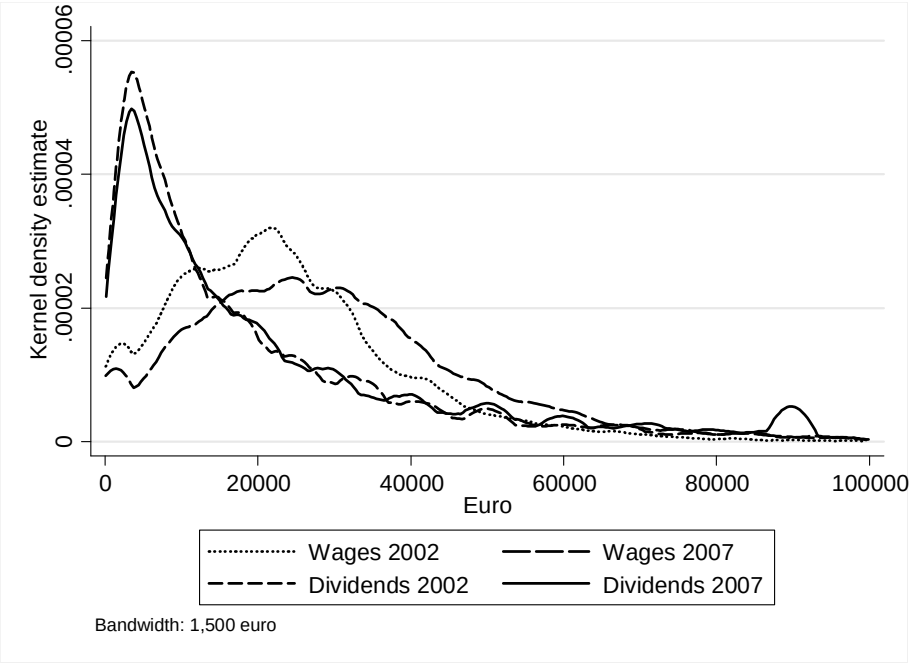

Figure 2: The distributions of wage and dividend income of the owners of privately held corporations in 2002 and 2007 (in current euros)

After defining the tax-optimal combination of gross wages and gross dividends, we can compare the optimal gross wages to realized wages in order to describe the extent of income-shifting behavior. In Figure 3, realized gross wages are divided by optimal gross wages. The share is one if the owner has optimized his/her wage 'perfectly' with respect to the tax code. Again, we use 2002 and 2007 as example years of pre- and post-reform situations, respectively.

Figure 3 indicates clearly that owners optimize their level of wages actively. In 2007, over 40% of main owners optimized their wages perfectly. However, in 2002, we observe less complete wage optimization, as slightly under 15% of owners optimized their wages[21]. Peaks at the level of zero tell us that a fairly large proportion of all owners were not paying wages at all in both of the years[22].

[21]The monetary gains from income-shifting were smaller before 2005 (see Section 2 and Appendix A for more details). This might explain the differences between post and pre-reform behavior in the cross-sectional context. The significance of monetary gains from income-shifting is analyzed in Section 6.

[22]Figure 3 includes the optimal corner solutions as optimal choices. Dropping the optimal corner solutions decreases the peak at the level of 1 especially before the tax reform. However, after the reform

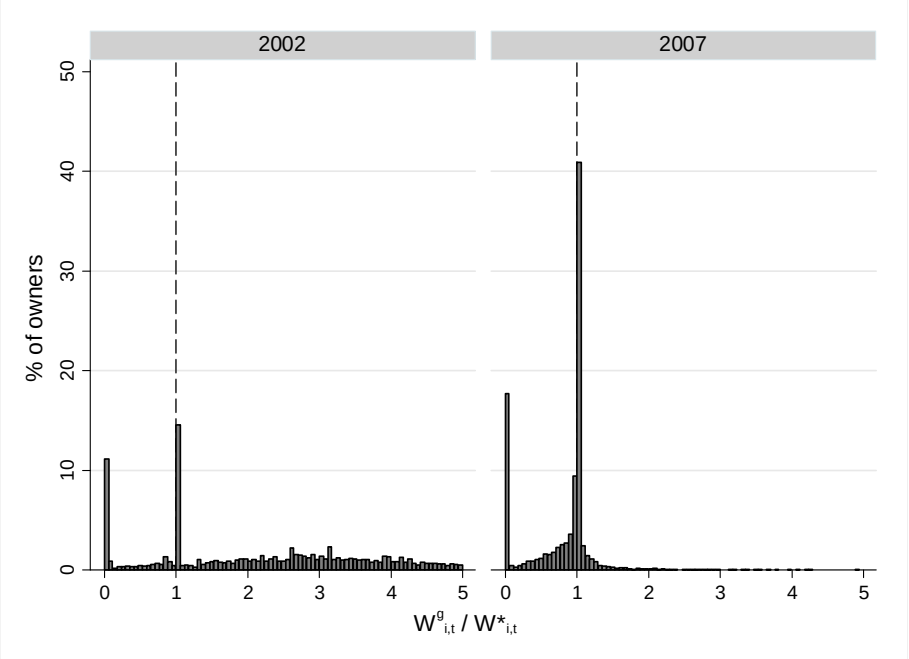

Figure 3: Realized gross wages divided by optimal gross wages in 2002 (left) and 2007 (right)

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. 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. We fit a non-parametric Kernel estimate with a 95% confidence interval into the figure 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.

the overall picture of active income-shifting remains even when the optimal corner solutions are not included.

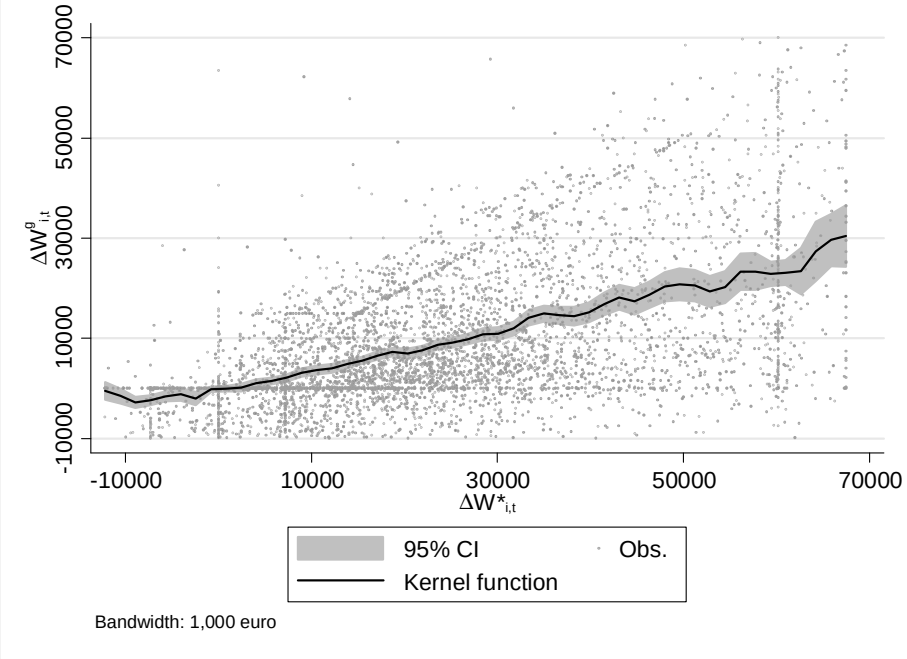

Figure 4: The effect of changes in tax-optimal gross wages $\triangle W^*_{i,t}$ on the change in realized gross wages $\triangle W^g_{i,t}$ between 2002 and 2007 (in current euros)

Finally, Tables 6 and 7 in Appendix C present descriptive statistics for the key variables in our analysis. All variables are presented in current euro prices. Table 6 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 7 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.

5 Results

Tax optimization model

We estimate the first-differences equation (9) using a balanced panel data consisting of the years 2002, 2003, 2007 and 2008, and adding year dummies to the model. We estimate the equation in levels, as many of both observed and optimal wages and optimal dividends are zero both before and after the reform. Therefore, for example, a logarithmic model would lose too much information.

The results are presented in Table 2. 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, and the second column estimates are derived using the full set of individual and firm-level controls[23].

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 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 without controls). 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 Appendix E. 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[24].

[23] We also estimate the cross sectional model in equation (8) with a full set of control variables. The cross section OLS estimates for the years 2002, 2003, 2007 and 2008 are presented in Appendix D. 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.

[24] 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 4 in Section 6 (columns 3 and 4). Other results are available from the

Also, the coefficients for the control variables are mostly insignificant or relatively 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 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).

	(1)	(2)
VARIABLES	ΔWage	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

Note: 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 2: First-differences model: OLS estimation

One important aspect is the heterogeneity of the income-shifting response. First, we

authors upon request.

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 (9) 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 it seems that 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.

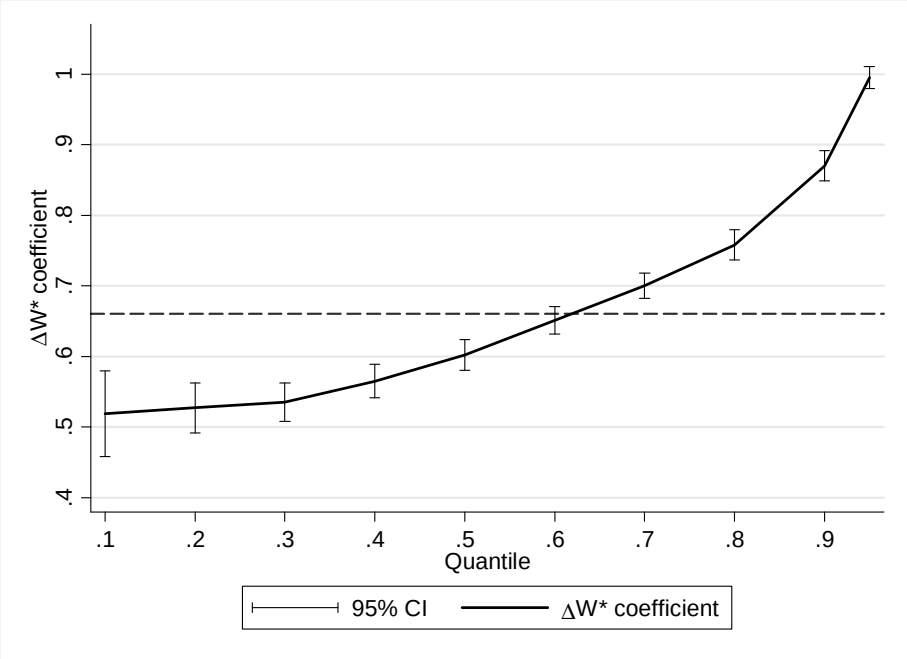

Figure 5: First-differences model: Quantile regression results

We also categorize owners into four equally sized groups and estimate equation (9) 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 Appendix F.

In general, the income-shifting responses are quite 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. These results thus also 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.

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 $dW^*_{i,t}$. Furthermore, 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 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 compositions for each owner[25]. 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 income and the dividend tax rate should correspond to the return on assets for a passive main owner not working for the firm.

The firms in the data are relatively large and profitable. 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

[25] I.e. in theory we would need to observe $\tilde{W}^g_{i,t}$ and $\tilde{D}^g_{i,t}$, but we only observe the income composition when the income-shifting decision has already been made (see Section 3.2).

the marginal tax rate difference by using the post-reform top bracket employee wage tax rate (56%) and the dividend tax rate for capital income dividends (26%).

We estimate the average income-shifting response $\frac{dW^g_{i,t}}{dW_{i,t*}}$ to be 0.66, which can be considered large. Using this and the above mentioned assumptions on the tax rate difference, we approximate the marginal DWL to be 0.21[26]. 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 if tax rate changes also have a significant effect on the amount of total gross income ($W^g + D^g$). In addition, combining real effects and 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. 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 where 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[27]. 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.

6 Extensions

IV estimation

As discussed in Section 4.3, it is possible that $\triangle W^*_{i,t}$ is not completely exogenous in the FD model. Thus we also use an 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

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

[27] In Section 6 we show that costs and benefits associated with income-shifting are significant in income-shifting behavior.

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 income in 2005 using both the 2002 and 2008 tax codes and regulations. 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) for a review). 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, the use of characteristics at time t as a base for the instrument might provide inconsistent estimates.

The two-stage least squares results are presented in Table 3. 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	

Note: 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) represent 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 3: First-differences model: IV estimation (2SLS)

As realized changes in net assets and other characteristics are not allowed to directly

affect realized changes in the division of income, these 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.

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.

Optimization frictions

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 utility benefit does not exceed the costs related to re-optimization (e.g. adjusting the amount of labor supply). Also, the quantile regression estimates in Figure 5 show that larger changes in tax incentives increase the behavioral response of the owners, which indicates that frictions might matter.

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

$$\triangle U = U(W^*, D^*) - U(W^0, D^0) \tag{10}$$

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, i.e. choosing the tax optimal gross income combination, 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

$$(W^g, D^g) = \begin{cases} (W^*, D^*) & if \triangle U > \psi \\ (W^0, D^0) & otherwise \end{cases} \tag{11}$$

The cost of income-shifting can be interpreted as an opportunity cost of time or simply as a monetary cost to tax consultants, or as any other individual fixed tax compliance cost. 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.

In the empirical analysis, we calculate the potential benefit $\triangle U$ as the difference between the taxes paid per total income at (W^0, D^0) and taxes paid per total income at the optimal point (W^*, D^*) while keeping the total gross income level fixed. We compare the relative amount of taxes paid after the reform of 2005 when there are no behavioral changes in pre-reform income combination to taxes paid when the owner has optimized her gross income combination perfectly. This variable thus 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 a difference between only two years, namely 2002 (pre-reform) and 2007 (post-reform). To create the $\triangle U$ variable, we take the 2002 actual realized gross income combination for each owner and tax it according to the post-reform legislation of 2007. We then compare taxes paid under this setup to taxes paid in the tax-optimal gross income combination under 2007 tax rules and 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 above $\triangle U$ 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 realized income in any of the pre-reform years. Thus we use a $\triangle U$ variable calculated with the realized total gross income in the year 2003 and the tax code of 2007 as an instrumental variable for the potential benefits in our model.

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

$$\triangle U^{2007}_{i,2002} = \chi_i + \kappa \triangle U^{2007}_{i,2003} + \rho(W^*_{i,2007} - W^*_{i,2002}) + \varphi(X_{i,2007} - X_{i,2002}) + \nu_i \tag{12}$$

and the 2nd stage is

$$(W^g_{i,2007}\text{-}W^g_{i,2002}) = \begin{array}{c} \triangle\alpha_{i,t} + \eta(W^*_{i,2007} - W^*_{i,2002}) + \\ \mu(X_{i,2007} - X_{i,2002}) + \theta\Delta\hat{U}^{2007}_{i,2002} + \triangle\epsilon_{i,t} \end{array} \tag{13}$$

where θ measures the average effect of monetary benefits on changing the gross income combination. $\triangle U^{2007}_{i,2002}$ and $\triangle U^{2007}_{i,2003}$ denote the potential monetary benefits calculated with 2002 and 2003 total 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 (on average), 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 4. 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

Note: 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 4: First-differences model with benefits from optimization

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 in monetary terms 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 the tax schedule and the simple costs from applying it are the main factors behind owners' decisions to withdraw different types of income from the firm[28].

Chetty and Saez (2010) conclude that concentrated ownership increases tax optimization among corporate owners. Our results from the model including the benefits 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.

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, entrepreneurs and 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 sig-

[28] As a robustness check, we also divide the data using the information from the distribution of potential benefits. We use a 3% limit in potential monetary benefits to divide the data set into two parts. 3% potential benefits means that by optimizing the gross income composition correctly, the owner could have increased his/her total net income by this percentage. This approach also shows that the owners with higher potential benefits optimize more precisely. However, the estimate is not statistically different from the main result in the FD model. Results for the splitted data are presented in Appendix G.

nificantly changed the income-shifting incentives for privately held corporate owners. In the reform, the taxation of dividends tightened, which led to an increase in 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 identification condition together with extensive micro data, including information on both the owner and firm-level, give us a unique setup to study 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. The results also suggest that the dividend distribution pattern of Finnish privately held corporations is 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 do not seem to reflect the actual work contribution to the firm.

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 entrepreneurs to increase income-shifting. Therefore, the inefficiency caused by income-shifting can also be influenced by affecting the costs of tax minimization. At least to some extent, the costs can be affected by simply adjusting the tax regulations.

However, the costs associated with income-shifting do not seem to hamper tax avoid-

ance as a whole. Income shifting is very active, even though the overall tax minimization routine associated with the Finnish tax system is relatively complex. All in all, our study suggests that the deadweight loss caused by income-shifting should not be unheeded, and the incentives for income-shifting should be carefully examined by policy makers when a corporate tax system is re-designed.

References

[1] Auten, G. and C. Carroll., 1999. The effect of income taxes and household behavior. Review of Economics and Statistics, 81(4): 681-693.

[2] Blomquist, S. and H. Selin., 2010. Hourly wage rate and taxable income responsiveness to changes in marginal tax rates. Journal of Public Economics, 94: 878-889.

[3] Chetty, R., 2012. Bounds on elasticities with optimization frictions: A synthesis of micro and macro evidence on labor supply. Econometrica 80(3): 969-1018.

[4] Chetty, R., 2009a. Is the taxable income elasticity sufficient to calculate the deadweight loss? The implications of evasion and avoidance. American Economic Journal: Economic Policy, 1(2): 31-52.

[5] Chetty, R., 2009b. Sufficient statistic for welfare analysis: The bridge between structural and reduced-form methods. Annual Review of Economics, 1: 451-488.

[6] Chetty, R., J. Friedman, T. Olsen and L. Pistaferri., 2011. Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from Danish tax records. Quarterly Journal of Economics 126(2): 749-804.

[7] Chetty, R. and E. Saez., 2010. Dividend and corporate taxation in an agency model of the firm. American Economic Journal: Economic Policy, 2(3): 1-31.

[8] Christiansen, V. and M. Tuomala., 2008. On taxing capital income with income shifting. International Tax and Public Finance, 15: 527-545.

[9] Feldstein, M., 1999. Tax avoidance and the deadweight loss of the income tax. Review of Economics and Statistics, 81(4): 674-680.

[10] Fjaerli, E. and D. Lund., 2001. The choice between owner's wage and dividends under the dual income tax. Finnish Economic Papers, 14: 104-119.

[11] Goolsbee, A., 2000. What happens when you tax the rich? Evidence from executive compensation. Journal of Political Economy, 108(2): 352-378.

[12] Gordon, R. and J. Slemrod., 2000. Are "real" responses to taxes simply income shifting between corporate and personal tax bases?, in J. Slemrod (ed.), Does Atlas Shrug? The Economic Consequences of Taxing the Rich, Russell Sage Foundation and Harvard University Press, 2000: pp. 240-280.

[13] Gruber, J. and E. Saez., 2002. The elasticity of taxable income: evidence and implications. Journal of Public Economics, 84: 1–32.

[14] Kari, S., H. Karikallio and J. Pirttilä., 2009. The impact of dividend taxation on dividends and investment: New evidence based on a natural experiment. Government Institute for Economic Research VATT Working Papers.

[15] Kari, S., H. Karikallio and J. Pirttilä., 2008. Anticipating tax changes: Evidence from the Finnish corporate income tax reform of 2005. Fiscal Studies 29.

[16] le Maire, D. and B. Schjerning., 2012. Tax bunching, income shifting and self-employment. EPRU Working Paper Series 2012-4.

[17] Nielsen, S. B. and P. B. Sørensen., 1997. On the optimality of the Nordic system of dual income taxation. Journal of Public Economics, 63: 311–329.

[18] Piketty, T., E. Saez and S. Stantcheva., 2011. Optimal taxation of top labor incomes: A tale of three elasticities. NBER Working Paper 17616.

[19] Pirttilä, J. and H. Selin., 2011. Income shifting within a dual income tax system. Evidence from the Finnish tax reform of 1993. Scandinavian Journal of Economics, 113(1): 120-144.

[20] Ropponen, O., 2012. Yrittäjän verotuksen arviointi – mallikehikko ja simulointituloksia. Government Institute for Economic Research VATT Memo 20 (in Finnish only).

[21] Saez, E., 2010. Do taxpayers bunch at kink points? American Economic Journal: Economic Policy 2(3).

[22] Saez, E., 2004. Reported incomes and marginal tax rates, 1960-2000: Evidence and policy implications., in J. Poterba (ed.), Tax Policy and the Economy Volume 18, MIT Press, 2004:. 117-172.

[23] Saez, E., J. Slemrod and S. Giertz., 2012. The elasticity of taxable income with respect to marginal tax rates: A critical review. Journal of Economic Literature, 50(1): 3-50.

[24] Sivadasan, J. and J. Slemrod., 2008. Tax law changes, income-shifting and measured wage inequality: Evidence from India. Journal of Public Economics, 92: 2199-2224.

[25] Sørensen, P.B., 2005. Neutral taxation of shareholder income. International Tax and Public Finance, 12: 777–801.

Appendix A

Dividend taxation in Finland and the dividend and corporate tax reform of 2005

	1993-2004	2005 -[a]
Imputation system	Full imputation of corporate taxes, single taxation of dividends	Partial tax relief from double taxation of dividends
Capital income tax rate (nominal)	29%[b]	28%
Imputed rate of return on net assets (% of net assets, effective)	9.585%	9%
Dividend tax rate, including corporate taxes (effective):		
• Dividends from listed corporations	29%	40.5% (2005: 37.8%)
• Dividends from privately held corporations:		
– dividends below the imputed return on net assets	29%	Below 90,000 €: 26%. Over 90,000 €: 40.5% (2005: 26% / 37.8%)
– dividends above the imputed return on net assets	Earned income taxation (with some differences compared to labor income taxation[c])	26% + partial earned income taxation: 70% under earned income taxation (2005: 57%), 30% tax free (2005: 43%)
Corporate tax rate	29%[d]	26%

[a] In 2005, special transition rules were applied in dividend taxation. The effective tax rates for 2005 are given in parentheses.

[b] Nominal tax rate on capital income in 2000–2004. In 1993–1996, the tax rate was 25%, and in 1996–2000 28%.

[c] The earned income tax allowance in municipal taxation was not granted for dividend income. Dividends are not subject to wage-based social security contributions.

[d] Nominal corporate tax rate in 2000–2004. In 1993–1996, the corporate tax rate was 25%, and in 1996–2000 28%.

Other notable features of the Finnish tax code and regulations

Firm-level social security contributions

Firm-level social security contributions are paid on wage income only. The level of the contribution is 2-6% of wages depending on the level of total wages paid and the depreciations made by the firm.

Tax deductions for wages and earned income dividends

There are some differences in tax deductions and tax allowances between wages and earned income dividends, especially before the 2005 tax reform. Most importantly, the earned income tax allowance in municipal income taxation was only granted to wage income before the reform. After the reform, the earned income tax allowance was also granted based on earned income dividends. All the differences in tax allowances and deductions are accounted for in the analysis.

YEL entrepreneur status (entrepreneurial pension insurance)

Our 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. Owners who satisfy these conditions are given a favorable treatment in pension insurance contributions, and these owners are termed YEL entrepreneurs in the Finnish tax legislation. An owner satisfying the YEL conditions cannot change his/her status to another form of entrepreneurial insurance. The main principles of pension insurance payments for YEL entrepreneurs are briefly discussed below.

Mandatory pension insurance payments (YEL payments)

Pension insurance payments are not included in our analysis. Among YEL entrepreneurs, mandatory pension insurance payments are not levied on dividend income either before or after the reform. The pension insurance payments are not dependent on the actual wages paid either. YEL-insured entrepreneurs report a self-selected computational level of wages from which pension insurance payments are accumulated from. The reported wages for pension insurance payments can be above or below the actual wages paid without implications or sanctions. However, there are regulations for both the lower and upper limits of these reported wages, which are, however, also independent of actual taxable wage income. Therefore, the mandatory pension insurance payments have no effect on the actual income division between wages and dividends, and are thus ex-

cluded from our analysis.

Limitations on paying dividends or wages

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 (by the legal definition of the YEL-insured entrepreneurs).

Changes in the tax code between 2002-2003 and 2007-2008

In our analysis, we also include year differences outside the tax reform of 2005. In general, there have been only trivial changes in the income tax code outside the 2005 reform. The main tax rate changes between 2002-2003 and 2007-2008 are small declines (0.5 percentage points) in progressive earned income tax rates throughout the income distribution, and a small average increase in proportional municipal level earned income tax rates (0.26 and 0.09 percentage points in 2002-2003 and 2007-2008, respectively). All these changes in the earned income tax code are accounted for in our analysis. There were no relevant reforms in dividend or corporate taxation between 2002-2003 and 2007-2008.

Appendix B

Illustrative example: Optimal gross income combination (W^*, D^*) before and after the 2005 tax reform

Table 5 presents the tax optimal gross wage levels for a representative owner of a privately held corporation before and after the 2005 tax reform. The optimal gross wage levels in Table 5 are defined assuming that the owner owns 100% of the shares and that the owner has no earned income from other sources[29].

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

Table 5: 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)

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 with 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 taxation of earned income 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.

[29]The tax optimal gross dividend is simply the difference between total gross income and tax optimal gross wages.

Appendix C

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
	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
	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
	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
	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 6: Descriptive statistics (2002, 2003, 2007 and 2008): Main owners

Year	Stat	Turnover	Employees	Total assets	Net assets
2002	Mean	78,2450	10.35	400,805	285,155
	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
	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
	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
	SD	3,329,805	36.25	3,452,935	2,791,899
	N	6,277	6,277	6,277	6,277

Table 7: Descriptive statistics (2002, 2003, 2007 and 2008): Firms

Appendix D

	(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

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

Table 8: Cross-section results for the years 2002, 2003, 2007 and 2008 by OLS

Appendix E

	(1)	(2)
VARIABLES	ΔW	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

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

Table 9: Results for the first-differences model for the years 2002 and 2008 by OLS

Appendix F

	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 10: Results for the first-differences model by OLS for different subgroups

Appendix G

	(1)	(2)
VARIABLES	ΔW	ΔW
ΔW^*	0.641***	0.716***
	(0.016)	(0.056)
ΔOwnership	-31.844***	1,732.515
	(3.868)	(1,176.120)
ΔTurnover	0.000	0.001
	(0.000)	(0.001)
ΔTotal assets	0.000	-0.003
	(0.000)	(0.003)
ΔProfits	-0.000	-0.006
	(0.000)	(0.013)
ΔEmployees	1.853	-3.822
	(16.713)	(20.977)
ΔOther capital income	-0.001	-0.008
	(0.000)	(0.006)
Observations	5,489	626
R-squared	0.341	0.417

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

Table 11: First-differences model for the years 2002 and 2007 estimated by OLS. Data divided by relative benefits from correct tax optimization, Column (1) $<$ 3%, Column (2) $>$3%

IN VATT WORKING PAPERS SERIES PUBLISHED PUBLICATIONS

25. Olli Ropponen: A Note on the Robustness of Card and Krueger (1994) and Neumark and Wascher (2000). Helsinki 2011.
26. Teemu Lyytikäinen: Tax competition among local governments: evidence from a property tax reform in Finland. Helsinki 2011.
27. Jarkko Harju – Seppo Kari: Dividend taxes and decision of MNEs: Evidence from a Finnish tax reform. Helsinki 2011.
28. Piia Aatola – Kimmo Ollikka – Markku Ollikainen: Informational Efficiency of the EU ETS market – a study of price predictability and profitable trading. Helsinki 2012.
29. Kristiina Huttunen – Jenni Kellokumpu: The Effect of Job Displacement on Couples' Fertility Decisions. Helsinki 2012.
30. Essi Eerola – Teemu Lyytikäinen: On the role of public price information in housing markets. Helsinki 2012.
31. Jenni Pääkkönen – Timo Seppälä: Dimensions of health care system quality in Finland. Helsinki 2012.
32. Saara Tamminen – Han-Hsin Chang: Company heterogeneity and mark-up variability. Helsinki 2012.
33. Jarkko Harju: Voluntary pension savings and tax incentives: Evidence from Finland. Helsinki 2012.
34. Saara Tamminen – Eljas Tuomaala: Variation in price and substitution elasticities between sectors – a microdata analysis. Helsinki 2012.
35. Joni Hokkanen - Aki Kangasharju - Ismo Linnosmaa - Hannu Valtonen: Generic substitution policy, prices and market structure: evidence from a quasi-experiment in Finland. Helsinki 2012.
36. Mika Kortelainen - Tuukka Saarimaa: Do homeowners benefi t urban neighborhoods? Evidence from housing prices. Helsinki 2012.
37. Juha Honkatukia – Ville Kaitila – Markku Kotilainen – Janne Niemi: Global trade and climate policy scenarios – Impact on Finland. Helsinki 2012.
39. Mira Jussila – Saara Tamminen – Jouko Kinnunen: The estimation of LES demand elasticities for CGE models. Helsinki 2012.
40. Marita Laukkanen - Céline Nauges: Evaluating greening farm policies: A structural model for assessing agri-environmental subsidies. Helsinki 2012.
41. Seppo Kari – Laitila Jussi: Non-linear dividend tax and dynamics of the firm. Helsinki 2012.
42. Jarkko Harju – Tuomas Kosonen: The impact of tax incentives on the economic activity of entrepreneurs. Helsinki 2013.

VALTION TALOUDELLINEN TUTKIMUSKESKUS
STATENS EKONOMISKA FORSKNINGSCENTRAL
GOVERNMENT INSTITUTE FOR ECONOMIC RESEARCH

Valtion taloudellinen tutkimuskeskus
Government Institute for Economic Research
P.O.Box 1279
FI-00101 Helsinki
Finland

ISBN 978-952-274-050-2 (PDF)
ISSN 1798-0291 (PDF)