The impact of tax incentives on the economics activity of entrepreneurs

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Abstract

Based on existing evidence, we know little about how the taxation of small business owners affects their economic activity. This paper studies the effect of two Finnish tax reforms, in 1997 and 1998, on the effort decisions of the owners of small businesses utilizing both theoretical model and empirical data. The reforms reduced the income tax rates of small business owners and applied only to unincorporated firms, leaving corporations out. We use a difference-in-differences strategy to estimate the causal impact of tax incentives on the economic activity of small businesses. The results imply that lighter taxation leads to an increase in the turnover of firms that we interpret as an increase in effort exerted by their owners.

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1 Introduction

Small businesses are seen as one key source of economic growth. For this reason, myriad economic policies have been devoted to promote the economic activity within small businesses (Buss 2001). Various theories exist about what kind of activity in small businesses leads to greater growth ranging from the risk-taking opportunities of entrepreneurs (Cullen and Gordon, 2007) to maintaining external funds (Carpenter and Petersen, 2002). This paper argues that one important channel for increased output in small firms is the activity of the owner. This activity can be promoted or hindered through taxation in a similar way to the labor effort of employees. We establish this in a theoretical model and study empirically to what extent the income tax burden on entrepreneurs affects the output of their firms.

We are interested in the determinants of the real economic activity of entrepreneurs. One real economic activity is the effort decision of an entrepreneur. Earlier literature has established that the effect of the tax system on this decision is ambiguous (Carroll *et al.* 2001) and depends on the type of entrepreneur and opportunities (Kanniainen *et al.* 2007). We build a simple theoretical model that explores this in an intertemporal framework. In the model it is essential that an entrepreneur can affect her own tax burden and consumption opportunities either through increasing effort or shifting assets from one period to another. The former is purely a real economic decision that entails a utility cost, while the latter also affects the timing of lifetime consumption opportunities. Shifting assets could also be seen as tax-planning. We argue that in this environment more leniently taxed income from the firm can either increase or decrease the effort exerted by an entrepreneur. The direction of this effect depends on how forward-looking the entrepreneur is.

Empirically, it is challenging to analyze the causal effect of taxation on any firm-level outcomes. We contribute to this by analyzing two Finnish reforms that typically reduced the income tax burden of owners of unincorporated firms but did not change the tax system for incorporated firms. The reforms altered a predetermined capital income imputation rule. By exploiting this

feature, we are able to construct an exogenous measure for each firm that describes the change in the tax burden of the owner of the firm due to the reforms. These reforms allow us to apply a natural experimental approach where we compare the outcomes of unincorporated firms before and after the reforms with the outcomes of incorporated firms. As a result, we can control for unobserved changes in these outcomes by comparing treated firms with similar control firms, which only differ in their legal form. We demonstrate that the two groups develop in a similar manner over time, except for the reform period.

Our second contribution is a solution to the problem how to observe the actual economic activity of an entrepreneur. We have access to firm-level tax record data that include the turnover of firms. We argue that an increase in the turnover, which is the output value of a firm, is an indication of increased economic activity. In a small firm increase in the output could come from increased effort by an entrepreneur or increase in the input use, like labour or investments. We estimate how the reform affected all of these. Thus we can allocate the effects of the income taxation of owners to either the effort decisions or input use.

The results indicate that decreasing the marginal tax rate of an entrepreneur increases the turnover of her firm. Our main specification that compares partnerships with corporations indicates that a 10 percent reduction in the marginal tax rate leads to a 1.7 percent increase in turnover.[1] We also study heterogeneous effects by the size of the change in tax incentives and pre-reform income. We find that the larger was the change in incentives or pre-reform income, the larger was the response in turnover. We do not find much for the input use of the affected firms. Wage sums increase, but there is no indication that more people are being employed. Thus it seems that the reforms did not increase labor demand. Moreover we do not find any statistically significant increase in investments. Therefore the increase in turnover is due to increase in effort that the entrepreneurs exert. Our main

[1]Sole proprietors were also in the treatment group, but empirically their tax incentives did not change much, and correspondingly their turnover did not seem to react to the reform.

results pass various robustness checks, for example to take into account the extensive margin decisions of exit and entry, or to instrument the dependent variable.

Apart from increasing their output, a real economic activity, entrepreneurs could respond by tax-planning. In the tax system that we study an indication of tax planning would be to arrange accounts in a fashion that increases profits, or change net assets or wage sum in a firm in response to tax incentives. For example Sivadasan and Slemrod (2008) study income shifting within firms in India. They use similar set-up to ours, where they compare partnerships in the treatment group with corporations in the control group. They find that firms responded to changed tax incentives by shifting income from profits to wages. We find an indication that the income from the firm increased, but not necessarily more than the output of the firm. We do find that wage sums increase like Sivadasan and Slemrod (2008), which would indicate tax planning if entrepreneurs paid more wages to themselves. Firms also increase their assets, which reduces their marginal tax rate in future.

Another indication of tax planning is that more firms choose legal forms that are more leniently taxed (Gordon and Mackie-Mason 1994 and 1997, Goolsbee 1998b and 2004). We study how tax reforms affect the switching of legal forms. We find that more lenient taxation of partnerships makes switching from partnerships to corporations a statistically significantly less common phenomenon.

Earlier literature has established that more progressive income taxation reduces the willingness to take risk, thus leading to less entrepreneurial activity (Kerr and Nanda 2009) and lower economic growth (Cullen and Gordon 2007). We do find that the reforms affected the extensive margin decisions, exit, entry and switching legal form. We think that our results complement the picture of the literature focusing on extensive margin responses by showing that both margins of response, extensive and intensive, can be important at the same time.

We also contribute to the literature studying policies that directly aim to boost employment. The 1997 reform added part of the wage sum to an imputed income rule, where capital income from the firm is imputed. Thus

income taxation of the owner of the firm reduced the more the higher was the wage sum in the firm. Earlier papers have analyzed policies where payroll taxes are reduced, and which have a similar effect on labour costs as the 1997 reform wage sum rule. The results indicate that employment increased only very modestly, if at all (Korkeamäki and Uusitalo 2009). Bennmarker *et al.* (2009) found that wages increased as a result of the abolition of payroll tax, but employment did not. This is in line with our result. In contrast, Duranton *et al.* (2011) find that increases in local tax rates can reduce the labor demand of firms.

The rest of the paper proceeds as follows: section 2 presents the macroeconomic conditions at the time of the reforms, describes the institutional aspects of firm taxation and presents a theoretical model that describes how an entrepreneur responds to changes in tax incentives. Section 3 presents the econometric specification and discusses identification issues. Section 4 presents the data and descriptive statistics derived from them. Section 5 presents the results and robustness checks. Section 6 concludes the study.

2 Economic conditions and institutions

2.1 Macroeconomic situation surrounding the reforms

The mid-1990s were a period of economic growth in most developed countries. This is true for Finland as well, but the deep recession between 1991 and 1993 makes the Finnish situation particular. However, the economy was already recovering from it in 1997, when the first reform we study took place.

The severity of the recession and the subsequent growth can be seen from figure 1, where the development of Finnish GDP per capita and the unemployment rate is compared with neighboring Sweden and the OECD average. The vertical line marks the year 1997, when the first reform took place. In the early 1990s in Finland GDP fell heavily and unemployment rose compared to other countries. Finland experienced a very deep recession. However, when the reforms of 1997 and 1998 targeting partnerships and sole proprietors took place, the Finnish economy had already been growing for a

few years. Note also that there is no visible deviation from the general time trends in Finland in 1997 or 1998. This indicates that the reforms did not have significant and immediate macroeconomic consequences. This is not a concern for the current study, since the reforms were targeted at a small part of the Finnish economy. Moreover, a significant macroeconomic effect would have weakened our identification strategy, since then the general equilibrium effects would have caused an identification problem that we could not control for.

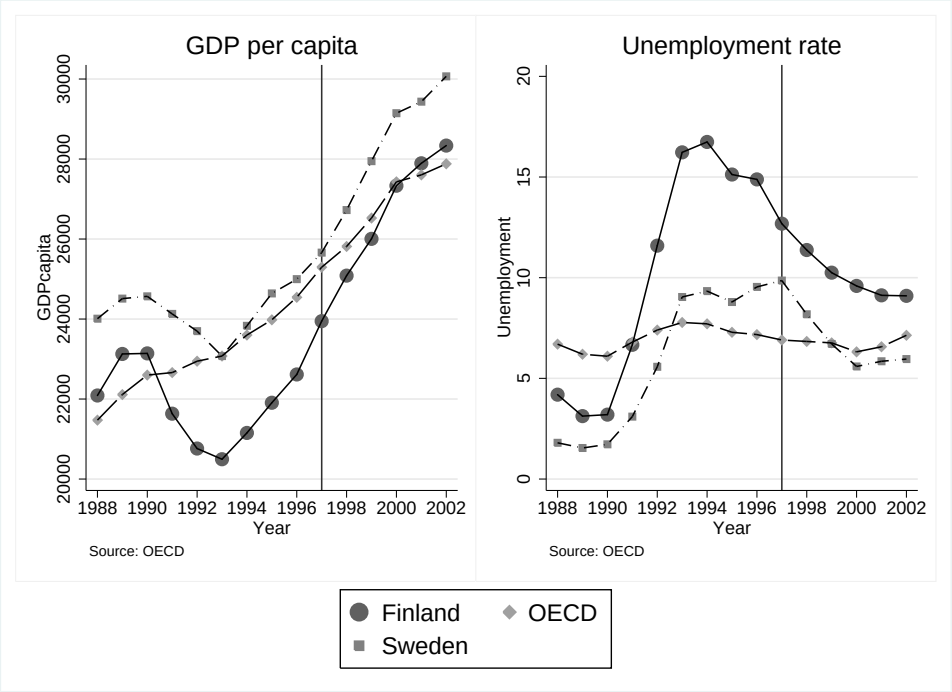

Figure 1: GDP per capita and unemployment in Finland, Sweden and OECD average over time.

2.2 The institutional background

The tax system for all income in Finland is the Nordic Dual Income Tax (DIT) system and has been in place since 1993 (Nielsen and Sörensen 1997 and Kanniainen *et al.* 2007). Capital income from firm is imputed, which is a variant of the imputed income method (Boadway and Bruce, 1984) or similarly a variant of comprehensive business income tax (Auerbach *et al.*

2010).

In general, the motivations for the DIT system include attempts to reduce distortion on incentives to save and to limit incentives for tax arbitrage through a proportional capital tax system. At the same time, progressive earned income taxation maintains the ability to redistribute more income from the rich to the poor. The weak point of the system is horizontal equity, since labor income may be heavily taxed, whilst similar work as an entrepreneur may not be.

Income from firms is taxed as part of personal income of the owner, and it is split into capital and earned income by a predetermined rule (Lindhe *et al.* 2004). The split is made according to a fixed share of net assets and other determinants of the firm in the previous year. Capital income tax in Finland was proportional 28 % in 1997. In taxation of an entrepreneur, earned income from firm and other sources is lumped together. Earned income tax is progressive, with the lowest marginal tax rates being zero and the highest marginal tax rates being over 60 %. Therefore, even with low income from a firm, the marginal tax rate could be high, if one has earned income from other sources. As a consequence, when total income is high enough, earned income is substantially more heavily taxed than capital income from the firm.

Institutional setting for legal forms in Finland resembles that of the UK (Crawford and Freedman 2010). The main three legal forms are sole proprietors, partnerships and corporations. Two former face the same tax system, but the tax system for corporations is different, although all are under DIT. The corporations differ, because they issue dividends and the liability of the owner is limited to the stocks in the company. The largest share of legal forms among all firms is sole proprietors. However, large number of these are small in output size or do not have any activity. Partnerships are usually owned by either one entrepreneur or small number of entrepreneurs.

2.3 The reforms

The reforms in 1997 and 1998 affected the income-splitting rule for unincorporated firms, i.e. partnerships and sole proprietors. The 1997 reform had

been planned for a while, but the details were changed at the last minute (HE 105/1996). It was only in September 1996 that the government announced that there was going to be a new tax rule, where part of the wage sum is added to the net assets of the firm. Thus affected firms did not have time to anticipate this reform. The law was passed in last weeks of 1996 and there was not much discussion about it in the Finnish media prior to the end of 1996.

In 1996, prior to the reforms, a sum of 15 % of the net assets of the previous year was considered as capital income. This changed in 1997 to 18 % of net assets. An even larger change was that 30 % of the wage sum of the previous year was added to net assets. Therefore the marginal tax rate declined for all entrepreneurs who had an unincorporated firm and who had enough income for their earned income tax rate to be higher than the capital income tax rate. The splitting rule can be presented as a formula as follows:

$$C_{it} = p(A_{it-1} + k * \max(0.5 * D_{it}; 84,000) + xWL_{it-1})$$

where C_{it} is capital income, A_{it} net assets, D_{it} debt and WL_{it} wage sum in firm i and year t. The 1997 reform increased p from .15 to .18 and x from 0 to 0.3. The 1998 reform eliminated k: it changed from 1 to 0.

The 1998 reform ended a transit rule where half of the absolute value of long-term debt D up to 84,000 euros had been added to the asset side of net assets (ITL 1992). Therefore the 1998 reform reduced the net assets of affected firms, unlike the 1997 reform. As a result the tax burden increased for firms that had any long-term debts and whose earned income tax rate was higher than the capital income tax rate. A significantly lower number of firms were affected by the ending of transit rule in 1998 than the reform in 1997. The transit rule was created in a law that took effect from the beginning of 1993. This is the same law that created the DIT system for unincorporated firms, and consequently for all income earned in Finland.

We define the marginal tax rate as the marginal increase in taxes for a marginal increase in income from a firm. Thus the marginal tax depends on income-splitting, since capital and earned income have different tax rates.

Furthermore, the marginal tax rate depends on the amount of earned income of a taxpayer in total, since the earned income tax schedule is progressive. The total income y from the firm faces a total tax burden T in formula:

$$T = C * \tau_C + (y - C) * \tau_E$$

where C is the imputed capital income taxed with capital tax rate (τ_C) . Correspondingly $(y-C)$ is the part of income taxed by earned income tax rate (τ_E).[2] From the formula it is evident that the total tax burden as well as the average tax rate is weighted by the two tax rates: capital and earned income. Therefore the reform affected the total tax burden as well as the marginal tax rate by changing C. The effect of changing the imputed capital income on taxes is simply $\partial T/\partial C = \tau_C - \tau_E$, which is negative (tax burden is reduced), when the earned income tax rate is larger than the capital income tax rate. The reforms effectively shift the whole tax schedule up or down depending on these two tax rates. Note that given certain imputed capital income level, the marginal tax rate (increase in tax burden from extra income) depends only on earned income tax rate:

$$MTR = \frac{\partial T}{\partial y} = \tau_E + (y - C) * \frac{\partial \tau_E}{\partial y}$$

The idea that capital income tax rate does not affect marginal income increasing decisions follows the imputation idea in DIT that the capital income is exogenous to the current decisions. In sum, the reforms affected the total tax burden by shifting the tax schedule up or down and marginal tax rates by changing the amount of income taxed as earned income. Both the average and marginal tax rate schedules were shifted in similar fashion.

Figure 2 presents four different scenarios of the total marginal tax rate schedules depending on the characteristics of the firm under the income-

[2]A typical entrepreneur in Finland at the time of the reforms had 32,000 euro income from her firm and the typical net assets and wages were 33,000 and 23,000 euro. Thus according to the imputation rule the imputed capital income C was 7,200. Thus the income taxed with earned income is 32,000-7,200=24,800. The capital income tax rate was 28 % and the earned income tax rate with this income level 35 %. The total tax burden is then 7,200*0.28 + 24,800*0.35 = 10,696 euro. The average tax rate was 10,696/32,000= 0.334.

splitting rule. We composed the figure by applying to the actual tax code a range of incomes and four typical scenarios of net assets, wages and debts in the firm. The tax schedule increases in a stepwise manner. This results from the stepwise progressive earned income tax schedule. The figure also presents how this changes in the dual reforms. It is evident that there is a dip in the tax schedule: for the lowest income the tax rate is only the capital income tax rate of 28%, and then for a range of incomes it dips to a lower tax rate. The dip occurs when the earned income tax rate kicks in, which is lower than the capital income tax rate on low incomes.

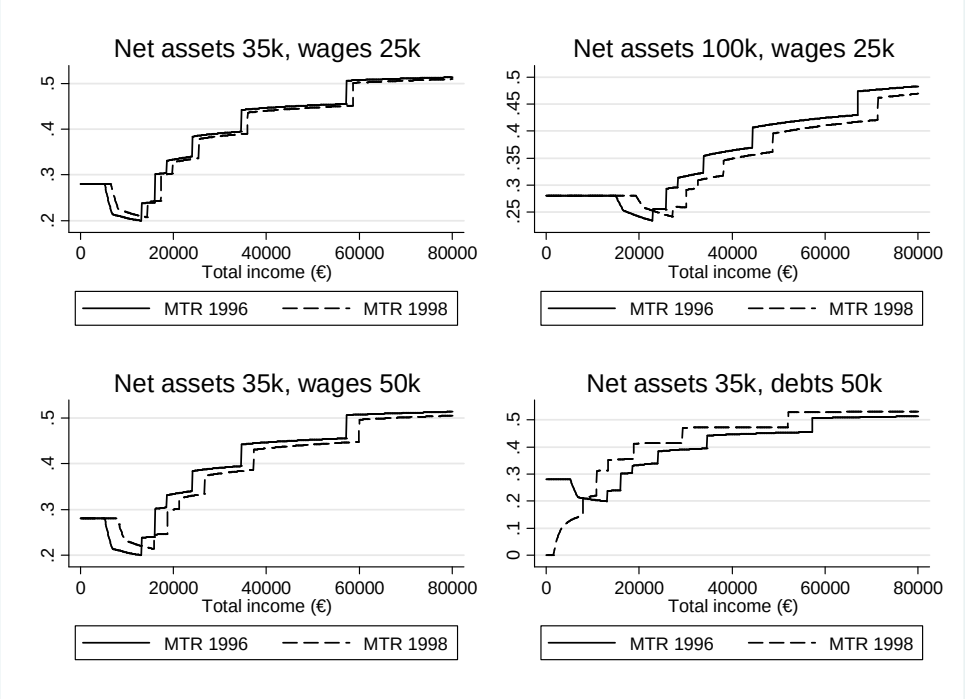

Figure 2: Marginal tax rates before and after the two reforms

Note: Each panel shows marginal tax rate schedule of total income from unincorporated company before and after the two reforms in 1997 and 1998. Figure presents four different combinations that affect the splitting rule between capital and earned income.

The two reforms affected the marginal income schedule, depending on the size of the firm's net assets, wages and long-term debts. It is evident that the 1997 reform, which affected the imputed income rule in favor of capital income, eased the tax burden of everyone high enough in the marginal tax

schedule. On the other hand, for those on low incomes, the reform increased the marginal tax rate. Then again, those that had high enough long-term debts and high income experienced an increase in marginal tax rates, evident in the lower right panel of the figure.

The marginal tax rate features two extreme cases depending on the size of net assets. It is possible for the net assets of the firm to be so great relative to income that it only pays capital income taxes. On the other hand, if a firm does not have positive net assets, it only pays taxes according to the earned income tax schedule. Neither of these extreme cases are interesting for our analysis here, since we are interested in cases where the marginal tax schedule shifted due to a change in imputed capital income. Therefore we exclude all firms from our estimation sample that feature these two cases.

At the time of the reforms, firms could not choose how the income split was made. However, they could engage in intertemporal tax planning by altering their net assets, or after the 1997 reform, by increasing their wage sum. One avenue of intertemporal tax planning for entrepreneurs is to choose the legal form of their firm so as to minimize the tax burden.

The reasons for the government to reform the tax system are not perfectly clear. The overall reason is that the tax reforms from 1991 to 1993 modified the tax system for incorporated firms so that their taxation became significantly lighter than for unincorporated firms. Therefore, the main reason to reform the tax system for unincorporated firms was to retain tax neutrality across legal forms of firms. As for the motivation for the particular details of the tax system, especially the 30 per cent wage sum feature, there is no published reasoning as to why the government wanted to have that in the tax code.

2.4 Model of entrepreneurial choices

A priori, it is not clear how the DIT tax system and the reforms of 1997 and 1998 affect the behaviour of entrepreneurs. This is because it is possible that entrepreneurs have incentives to produce greater income from their firm and also save more, but it is also possible that they want to consume the

extra income right away. We present a theoretical model in which this kind of tax system could affect entrepreneurial choices. The idea of the model is to focus on the changes in entrepreneurial effort decisions as a response to changes in the tax system, as in Kanniainen *et al.* (2007) and Carroll *et al.* (2001). The distinction between our model and earlier literature is that we let entrepreneurs affect their own tax rate through tax planning in addition to the choice of effort level.

We employ a two-period model, since the tax system affects and depends on time-dependent decisions, like saving. The model highlights how time preference, alternative return on savings and tax rules together affect the effort and saving choices of an entrepreneur. The model abstracts from the details of the tax system, since the idea is to focus on the behavior of an entrepreneur in a tax system, where a part of income is imputed. However, we retain enough structure from the actual Finnish tax structure in the model so that theoretical predictions can be linked with the empirical analysis below.

The model features a utility-maximizing entrepreneur. She produces income by exerting effort in a firm. The entrepreneur enjoys utility from consumption and dislikes effort. In the first period the entrepreneur makes relevant production choices and may transfer negative or positive income to the second period either within the firm or from her own consumption. In the second period the entrepreneur enjoys consumption from savings and exogenous income and initial net assets.

An inter-temporal utility function is written in the separable utility form

$$u(c_1) + h(e_1) + \delta u(c_2)$$

where $c_1$and e_1 refer to consumption and effort in period 1 and c_2 consumption in period 2. The utility function has the standard properties: $u_c > 0$, $u_{cc} < 0$, $h_e < 0$ and $h_{ee} < 0$. The discount rate is $0 < \delta < 1$.

The entrepreneur has a firm that produces income y_i in period $i = 1, 2$. In the first period the entrepreneur produces income in the firm using effort. The production function is proportional to effort and is denoted ne_1, $n > 1$. In the second period the entrepreneur earns only exogenous income Y. The

entrepreneur can also transfer income from period 1 to period 2 using two different income transfers. The first is to transfer an amount of income m within the firm. This also reduces the exogenous initial net assets A already in the firm. Income transfer m captures the possibility to increase net assets A within the firm over time. The net assets A left in the firm are consumed in the second period. The second method of transferring income is to save or dissave amount R from private consumption at an interest rate $r > 0$. The incomes from the firm for the two periods are denoted as follows:

$$y_1 = ne_1 - m$$

$$y_2 = Y + m$$

The entrepreneur consumes income from the firm, but has to pay taxes on that income. The periodic budget constraints are written as follows:

$$c_1 = y_1 - T_1(y_1, \mu(A - m)) - R$$

$$c_2 = y_2 - T_2(y_2, \mu(A + m)) + rR + A$$

The tax function and its effect on the endogenous variables are the focus of this model. The periodic tax function T_i in period i is a function of two arguments: income y_i and net assets within the firm $\mu(A - m)$. As describe in the previous section, the actual reforms shifted the whole tax function and also affected marginal tax rates. The tax function imposed to the model mimics these features without going too deep into the details of the actual tax system to be analytically tractable. The special tax rule, the second argument, is affected by exogenous net assets A, which the entrepreneur can change through an income transfer m from period 1 to period 2. This transfer is multiplied by the parameter μ, which reflects the share of net assets used to calculate the share of income liable to capital income tax. We denote $T(y, \mu(A - m)) = T(y, A)$ to simplify the notation. The more income that is transferred within firm, the smaller the tax burden due to the special tax rule

($\frac{\partial T}{\partial m} = T_m < 0$), and this relationship is linear ($T_{mm} = 0$)[3]. We also assume $T_\mu < 0$ and $T_{\mu\mu} < 0$. This special tax rule captures the fact that increasing net assets in the firm reduces the marginal income tax rate. This is line with the imputed income method, which allows, as a function of assets, a larger share of profits to be taxed at a lower capital income tax rate. Finally note that the special tax rule is not affected by savings from private consumption R, which is again similar to the actual tax system.

We insert the periodic budget constraints in the utility function and get as the inter-temporal objective function:

$$\begin{aligned} U &= u_1\left(ne_1 - m - T_1\left(ne_1 - m, A\right) - R\right) + h(e_1) \\ &+ \delta u_2\left(Y + m - T_2\left(Y + m, A\right) + rR + A\right) \end{aligned}$$

We present the conditions of the FOCs for tax rates and m in the Appendix. Inserting from 5 to 6, it follows:

$$r\left(1 - T_{1y} - T_{1m}\right) = 1 - T_{2y} - T_{2m}$$

This condition reveals that the first derivatives of the tax rates in the two periods are linked by the interest rate. Without the special tax rule that induces the terms T_{im}, the interest rate would equal the ratio of the net of the marginal tax rates in the two periods.

We are interested in the effect of a reform to parameter μ, which reflects the significance of the special tax rule, on the choice variables: effort and savings within the firm. With the assumptions in the model increasing μ reduces the progressive income tax rate. However, since μ affects the second argument in the tax function, this is not directly the same as changing income marginally (the first argument in the tax function). This assumption corresponds to the actual reform, where both the average and marginal tax rates were changed. The second-order condition and derivation of the follow-

[3]The main results are qualitatively the same also with $T_{mm} > 0$. They are not presented here, since this assumption introduces complicated terms without adding anything interesting to the model.

ing results is presented in the Appendix. Utilizing Cramer's rule, we obtain the following results:

$$\frac{\partial e_1^*}{\partial \mu} \gtreqless 0 \Rightarrow \frac{T_{1\mu}}{T_{2\mu}} \gtreqless \delta r \frac{u_{2cc}}{u_{1cc}}$$

and

$$\frac{\partial m^*}{\partial \mu} \gtreqless 0 \Rightarrow \frac{T_{1\mu}}{T_{2\mu}} \gtreqless \delta r \frac{u_{2cc}}{u_{1cc}}.$$

These results imply that the tax reform that makes assets in the firm more significant in taxation, and thus reduces the income tax burden of the entrepreneur, increases effort of the entrepreneur and savings within the firm when the entrepreneur is relatively patient. This is because increasing μhas a positive effect on equilibrium effort and income transfers when the derivative of the tax rate with respect to μ is larger in period 1 than in period 2 and when the second derivative of utility is relatively smaller in period 2. Within the model these conditions are fulfilled when firstly there is relatively less income in period 1 and / or secondly relatively more consumption in period 2. This in turn is consistent for transferring income from the first to the second period, i.e. not eating all extra income wright away. Therefore the kind of entrepreneur that cares more about future than present consumption has higher income in the second period.

This model predicts that a tax reform that increases imputed capital income increases effort and thus leads to greater output for some firms. These are firms that are relatively forward-looking. If some entrepreneurs care more about the present than the future, this kind of reform could decrease effort and thus output of firms. The same entrepreneurs would also lower the net assets of the firm. The intuition for this is that the reform makes taxation lighter in the first period and the entrepreneur aims to consume this extra income immediately and needs to exert less effort as a consequence. This is similar to the standard income effect dominating substitution effect result.

In reality entrepreneurs have other choice variables that might lead to increasing output of the firm than just effort. The model abstracts from these possibilities to remain tractable. One significant input for the firm would be labour demand, and another investments. We argue that although

the presented model does not capture all details about how taxation affects these input choices, increasing labour demand or investing more to capital requires managerial decisions, and thus entrepreneurial effort. On the other hand if the firms are relatively small, an entrepreneur is the firm. Even with small number of employees, the entrepreneurs usually also work themselves in the firm. Furthermore, since the tax reforms we are studying affected the income taxation of the owner of the firm, it is natural that the entrepreneur wants to adjust her own consumption and, as a result, income from the firm as a response. It remains an empirical question which margin within firms adjust to the reforms we are studying. The answer to that question is pursued next.

3 Econometric specification

3.1 Treatment and control groups

As described in the institutional setting section (2.2), the tax reforms applied to partnerships and sole proprietors. Therefore, firms with these legal forms comprise the treatment group. Corporations comprise the control group. The reforms affected the marginal tax rate structure of income from unincorporated firms while it remained constant for corporated firms. Therefore we can analyze the effects of marginal tax rates on firm-level outcomes by comparing the changes in taxes and outcomes between these two groups before and after the reform.

3.2 Difference in differences

We apply a difference-in-differences (DD) approach, using both binary and continuous treatment to find the causal effect that the tax system has on the treated group. The standard binary DD approach compares treatment and control groups before and after the reform. Since we have a rich variation in marginal tax rates due to the reforms, we can regress the continuous in tax rate variables on the changes in outcomes. This model is a DD approach

with continuous treatment, where there is no change in the tax rates for the control group. We estimate the following equations:

$$\triangle lny_{it} = \alpha_i + \beta_1 DD_{it} + \gamma X_{it} + \upsilon_t + \nu_{it} \tag{1}$$

$$\triangle lny_{it} = \alpha_i + \beta_2 lnTR(I_{96})_{it} + \gamma X_{it} + \upsilon_t + \nu_{it} \tag{2}$$

$$\triangle lny_{it} = \alpha_i + \epsilon \triangle lnMTR(I_{96})_{it} + \gamma X_{it} + \nu_{it} \tag{3}$$

where y represents the outcome for firm i in year t. The main outcome is logarithmic turnover, since it is a key variable describing the output of a firm. The other outcomes are the wage bill, number of employees, assets and investments. The explanatory variable of interest in equation (1) is a DD indicator, in equation (2) the log of the tax rate variable and in equation (3) the change in the log marginal tax rate, the coefficient of which ϵ can be interpreted directly as an elasticity with respect to the marginal tax rate. In equation (2) we use alternatively the average tax rate or the marginal tax rate. X_{it} contains a list of firm-level control variables from the accounting data and group level variables like a linear time trend for the treatment group. α_i indicates that we utilize a fixed-effects specification to control for firm-specific effects. Therefore, with the differential specification that we utilize, this includes firm-specific trends. Furthermore, υ_t indicates that we include year fixed effects to control for flexible time trends that are common to all firms. ν_{it} is the residual error term.

For the explanatory variable to be exogenous, it can not depend on the behaviour of the firm as a response to the reform. Clearly, the observed marginal tax rates in equations (2) and (3) are endogenous, since they depend directly on income, which is one of the outcome variables. Thus we utilize changes in the imputed marginal tax rates, instead of the observed, that do not depend on the behavior of the firm. The imputed tax rates utilize changes in the tax law arising from the two reforms. We apply to pre-reform income (average between 1994 and 1996) and other determinants of marginal tax rates the tax laws of each year, and especially the reform years (1997

and 1998), as Gruber and Saez (2002) did. The imputed marginal tax rate is calculated using the variation in wage sums, long-term debts and total owners' income due to the reform. As described in section 2.2, the wage sum affects net assets from 1997 onwards and long-term debts until 1998. We observe all relevant variables in the data, and thus can calculate marginal tax rates for all owners for each year in the data. For partnership owners we also observe income from other sources than from the firm.[4]

We are interested in the elasticity of turnover with respect to marginal tax rates. We estimate the equation 3, where firm's proportional change in turnover is estimated against proportional change in marginal tax rate to identify this elasticity. We only compare growth rates just before and just after the reforms, since the tax rates did not change in other years. The coefficient ϵ from this estimation is similar to elasticity of taxable income, except for turnover instead of income. This methodology follows that in the elasticity of taxable income literature (see Saez *et al.* 2012).[5]

We exclude sole proprietors from most of the analysis for two reasons. Firstly, many sole proprietors did not face any change in their taxation due to the reform (see figure 3). Moreover from those who did, nearly as many faced an increase in their marginal tax burden as faced a decrease. Secondly, as stated in section 3.2, we are not able to impute correct MTRs for all sole proprietors as we do not observe all of their income, contrary to partnerships. Even though, the tax burden of some sole proprietors did decrease, and therefore we present some standard DD analysis for them.

3.3 Potential identification problems and solutions

We apply a DD strategy and thus the normal DD assumption must apply: the control group should represent the counterfactual.[6] Thus equation 1

[4]The statistics for the imputed the marginal tax rates are given in table 1 and the distribution is shown in figure 3.

[5]Our approach differs from elasticity of taxable income literature in that we can compare firms with similar income instead of comparing e.g. rich firms with poor firms. (Gruber and Saez 2002, Saez 2003, Kopczuk 2005 and Pirttilä and Selin 2011).

[6]Figure B5 in the Appendix comprises the mean values of the main outcome variables over time to show the development of trends for partnerships and corporations.

identifies the causal effect of the reforms if the treatment and control groups would have behaved similarly over time in the absence of the reforms. Since the estimated equation is in a difference form, and is estimated using a fixed-effects procedure, we can control for time trends across firms in a flexible way. When treatment group deviates from their overall behaviour and that of the control group at the time of the tax reforms, we assign these changes to be caused by the tax variable. If we did not have corporations in the control group, this method would not be possible, since we could not separate the changes in the outcome variable from general time trends. Thus the DD assumption is most likely violated if there are unobserved shocks at the time of the reforms that affect the two groups in a different way. Figures 4 and B5 compare time trends in number of outcome variables. It seems that the DD assumption gets support from the similar trends in the figures in other than the reform years.

In principle the only difference between treated and untreated firms is the legal form. As a consequence they are observationally part of the same economy, face the same fluctuations from the global economy and changes in market conditions like demand for their products. Even so, there could be differences between these groups and changes in the conditions they face. One is international trade. If the control group e.g. has a lot of international customers and subsidiaries abroad and the treatment group has not, the groups could experience different shocks coming from international trade. To eliminate this potential problem, we exclude from our sample large corporations that have international activity like subsidiaries abroad.

Potential problems are selection into exit, selective entry or switching legal form. In the main estimates we exclude these extensive margin behaviours by focusing on firms that continue in the sample before and after the reforms. If we find that the reforms changed behaviour in the treatment group relative to the control group, this is a true intensive margin response in these firms. Remaining problem is that the continuing firms both in treatment and control groups are a selected sample and might not represent the whole economy. To check for this, we also look at how these extensive margin behaviours were affected by the reforms after the main estimates. Since the

sample of continuing firms represent major share of the Finnish economy, we interpret the extensive margin responses to be additional responses to the intensive margin responses.

We impute the marginal tax rates for each year according to the tax law of that year and 1996 income and net assets information for each firm as explained above. This might lead to measurement error if we make a mistake in the imputing process. The standard solution for this in elasticity of taxable income literature (Gruber and Saez, 2001) is to instrument the actual tax rate with the imputed tax rate and use variation from this to explain the changes in outcomes. We also present these instrumented results after the main DD results as a robustness check. The DD estimates are the main estimates, because they are more transparent due to the clear source of identifying variation used there. Furthermore, we perform standard DD estimates using just an indicator of the treatment group instead of the marginal tax rate variable to make sure that measurement error in the tax variable is not driving the results.

4 Data description

We perform the estimations on comprehensive tax record panel data for the years 1994 to 2000. The data come from the Finnish Tax Administration and they include every firm liable to taxation in Finland.[7] The data set contains information on the financial statements and tax records of Finnish businesses, as well as information on the taxation of business owners.

The data contain all the important tax information for our analysis. We observe income from the firm, net assets, the wage bill and long-term debts, which influence marginal tax rates. In addition, for partnerships we observe the income of the firm's owner earned from sources other than the firm. The most relevant outcome for our analysis in the data is the turnover of the firm. This variable captures how much output the firm made and thus it is at the

[7]Sole proprietors are in the data and the reforms in principle applied to them. However, empirically their tax incentives did not change much and they can't be compared well with corporations in a way required as figure B1 shows in the appendix.

same time a good indicator of the economic activity of the owner of the firm among small businesses.

4.1 Descriptive statistics

Table 1 presents the descriptive statistics of the outcome variables: turnover, wages, investments and assets pooled between the years 1996 and 1998. The table is for the main estimation sample, in which firms are required to have income in 1996. Furthermore we have excluded firms having international operations. The table is divided according to the legal form of the firm. Partnerships are in the treatment group and corporations in the control group. There are more corporations than partnerships and they are on average larger. However, the bulk of the firms in the two groups are of similar size, the difference is that there are few really large corporations. Table B1 in the appendix gives similar statistics for the control variables used in the regression analysis.

Table 1 also contains imputed marginal tax rate which has important role as an explanatory variable in our consequent regression analysis. We impute the marginal tax rates by applying to the income information from pre-reform years the changes in the tax code for each year. For some owners the pre-reform income information was missing. Thus, to be able to calculate the imputed marginal tax rates, we needed first to impute income for those who had missing income information. We imputed the incomes according to other observational characteristics of the firms that we did observe. Those were assets, output of the firm and some cost variables. The share of observations replaced in this way is 16 % of the total sample. In addition, we exclude a small fraction of firms, for which we can not calculate the change in tax incentives correctly. Those firms were low in the marginal tax rate schedule and represent 3 % of the total share of partnership owners.

Firm type	Statistics	Turnover	Wages	Investments	Assets	Imp. MTR
Partnership	Mean	249445	31770	12885	112801	.358
	N	103013	103013	103013	103013	103013
	SD	1123436	78234	46686	1691747	.091
	N of firms	14788	14788	14788	14788	14788
Corporations	Mean	483917	89414	27538	335397	.278
	N	253151	253151	253151	253151	253151
	SD	954354	194671	452553	6121030	.134
	N of firms	36957	36957	36957	36957	36957
Total	N of firms	51745	51745	51745	51745	51745

Table 1: Descriptive statistics for years from 1996 to 1998

Table 2 presents descriptive statistics for partnerships and their owners. The total labour income statistic describes how much labour income in total the owner of a partnership had, and the labour income statistic is for the income from the firm. The table gives similar statistics for capital income. It is evident that on average most of the income for the owners come from the firm. They have income from some other sources as well, but on average it seems that the firm is the major source of income for the owners. Therefore the firm could be seen as the place where the entrepreneurs are employed (for themselves), rather than merely owning the firm for investing purposes. The average number of owners per firm is two. This supports the view that the entrepreneurs are tightly linked to their firm, instead of being distant investors in a firm.

From table 2 it is evident that the firms in treatment group do not have many employees: 30 per cent of partnerships are with no employees and on average they have 4 employees. This means that an entrepreneur needs to exert own effort in order to keep her firm running. Therefore there must be a link between the output of the firm and the effort or hours of work that the entrepreneur puts forward.

	Total labour income	Total capital income	Labour income	Capital income	Employees
Mean	26828	6777	20420	4773	4.05
Median	22058	2877	16830	2224	2
	Share of no employees	N of owners per firm	△lnMTR from 96 to 97		
Mean	0.306	1.98	-0.037		
N	72786	72786	72786	72786	72786

Table 2: Descriptive statistics for partnerships

Figure 3 describes the proportional changes in imputed MTRs and tax burdens from 1996 to 1998 for partnerships. The imputed MTRs are calculated using the data for each firm, as explained earlier in sections 2.2, 3.2 and described in figure 2. The change in tax burden is calculated applying changes in the tax laws to the income from the firm from 1996. As the figure shows, the reforms induced a lot of variation in MTRs, both increases and decreases. Evidently, as a net effect of the two reforms, most partnerships did face a decrease in their MTRs, and only fewer than 5% faced no change. Furthermore, their total tax burden changed by several hundreds or even thousands of euros due to the reforms.

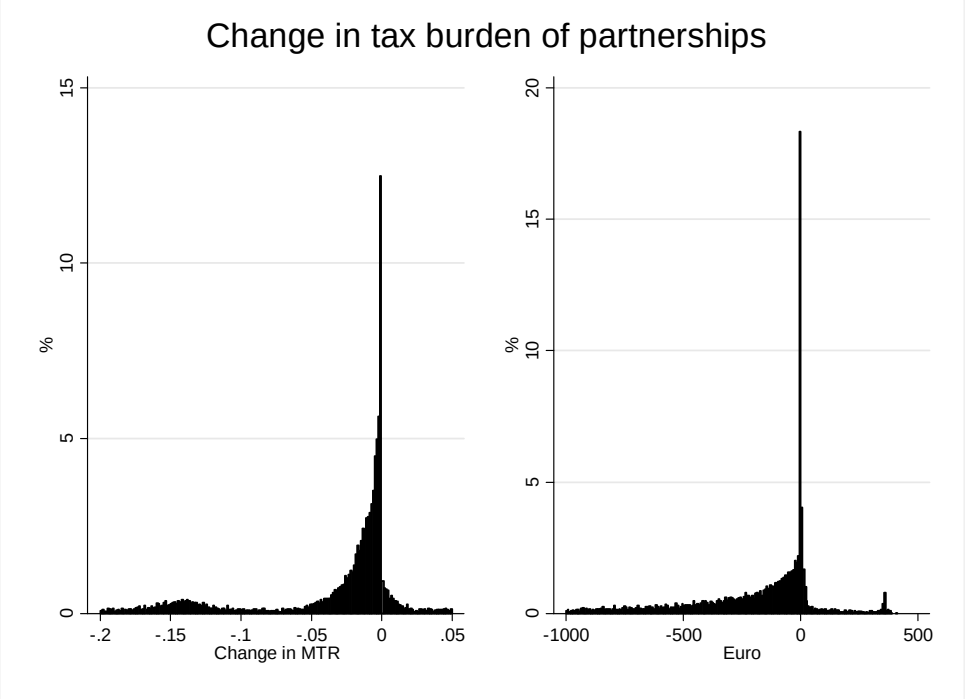

Figure 3: Distribution of proportional changes in marginal tax rates and tax burden in euros for partnerships

Note: Figure shows the distribution of changes in imputed marginal tax rates and tax burden from 1996 to 1998 due to the double reform.

Figure 4 presents the trends over time in proportional growth in turnover in the treatment and control groups. The figure is composed so that the left panel presents the mean over the two groups in the logarithmic change in turnover. Figure B5 in the appendix offers a similar graph for other outcomes. The right panel in figure 4 presents the coefficients from a fixed effects regression. It plots the interaction of year and a treatment group indicators on the change in log turnover. Both panels present clearly the jump in the treatment group (partnerships) at the time of the 1997 reform. There is no deviation from overall trend in the control group (corporations). In other years the trends in two groups follow each other pretty well, which gives credibility to the estimation strategy.

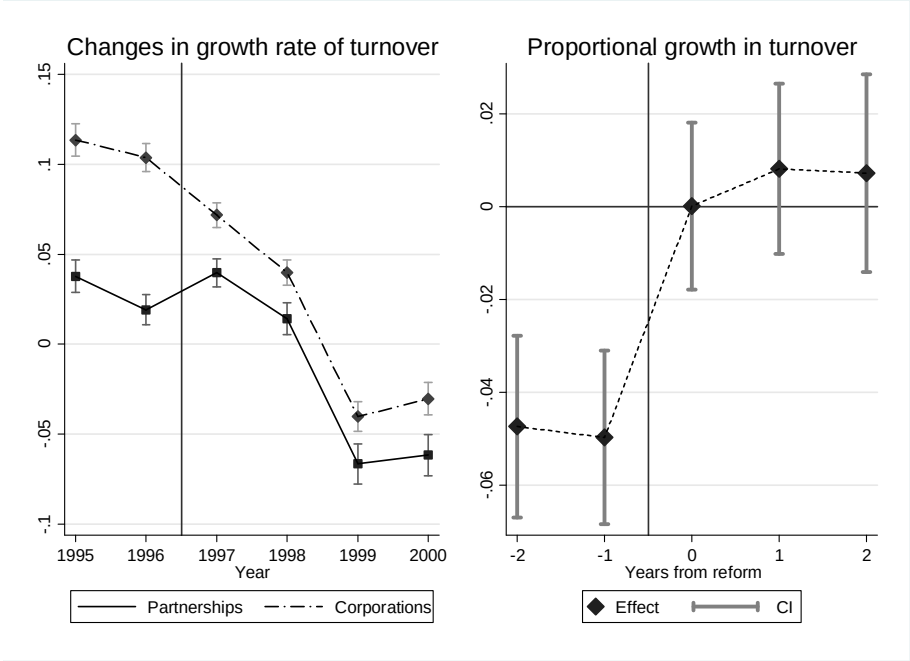

Figure 4: Development of turnover growth rate in partnerships and corporations

Note: Figure compares proportional change in turnover between partnerships in treatment group and companies in the control group. The effects are from fixed effect regression where change in logarithmic turnover is regressed against interaction between year and treatment group indicators. The confidence intervals are 95 % interval from robust standard errors.

5 Results

We study the effect of the reforms empirically, first on the turnover (output) of firms and then on other outcomes. We perform estimations by applying the natural experimental method described in section 3 on firm-level data described in section 4. We estimate these only for partnerships in the treatment group and corporations in the control group. We do not include sole proprietors into the treatment group, since the reform did not apply to them much and they can not be compared with corporations well, as indicated in figure B1.

All outcomes are in the change of logarithmic form, since we are interested in the growth rate of outcomes. We present a standard differences-

in-differences (DD) specifications to show what happened to the outcome in treated group after the reform relative to the control group. We are interested to see how much variation in tax rates drives the change in outcomes. To this end we present specifications with a continuous treatment, where the explanatory variable of interest is a log tax rate or change in the log tax rate. The point estimates from the latter can be interpreted as an elasticity of outcome with respect to the tax rates. A positive coefficient in a DD specification indicates that turnover started to grow faster in unincorporated firms after the reform, and likewise a negative coefficient in a tax rate specification.

Table 3 presents the main estimation results, where the outcome is the proportional growth of turnover. The table compares partnerships in treatment group with corporations in control group. Column (1) presents a standard DD estimation results from fixed effects regression without additional controls. Column (2) adds to this year indicators, a linear trend for treatment group and firm level controls. Both results indicate that turnover grew 5% faster in treatment group due to the reforms. This result is comparable with the jump in treatment group trend in figure 4.

Column (3) presents the results for the imputed log marginal tax rate as the outcome variable. This result is not statistically very strong, but it indicates that the relative changes in marginal tax rate are associated with a 9% growth in turnover. To estimate the elasticity of marginal tax rate with respect to turnover, columns (4) and (5) compares the difference in the log marginal tax rate with the difference in the log turnover. Column (4) utilizes the 1997 reform by comparing the growth rates in 1996 with the growth rates in 1997. Similarly, column (5) utilizes the 1998 reform and compares growth rates in 1997 with those in 1998. We do not include more years to these estimates, since there were no changes in the tax code in other that the reform years. Column (4) presents our preferred estimate for the elasticity of turnover with respect to tax rate: -0.17.[8] The result in column (5) implies a smaller elasticity and it is not statistically significant. This is not surprising,

[8]We also performed the estimation with the net-of-tax rate as the explanatory variable in place of the marginal tax rate. This estimation produced a larger elasticity estimate than the marginal tax rate estimation.

	(1) DD	(2) DD	(3) log MTR	(4) Δln MTR 96-97	(5) Δln MTR 97-98
DD	0.051***	0.056***			
	(0.005)	(0.009)			
lnMTR			-0.089*		
			(0.054)		
△lnMTR				-0.172**	-0.019
				(0.081)	(0.079)
N	298,380	298,380	293,679	101,852	101,847
R^2	0.004	0.022	0.022	0.017	0.020
N of firms	51,745	51,745	50,926	50,926	50,926

Note: Fixed effects regressions that compare partnerships with corporations for the change of log turnover. Columns (1) and (2) present a standard DD specification. Column (2) adds flexible time and firm level controls to the simple specification in column (1). Column (3) presents the continuous treatment model with the log of marginal tax rate as explanatory variable. Columns (4) and (5) present the elasticity estimations comparing the effect of changes in marginal tax rates with changes in growth rate of log turnover. Column (4) compares years 1996 and 1997 and column (5) years 1997 and 1998. Estimations include a comprehensive set of control variable: year dummies, other income, rent expenses, purchasing expenses and fixed expenses. Robust standard errors in parentheses:*** p<0.01, ** p<0.05, * p<0.1.

Table 3: Main estimation results

since the variation in tax rates induced by the 1998 reform was smaller than that induced by 1997 reform and it applied to much smaller group than the 1997 reform.

We study whether there were heterogeneous treatment effects. Table 4 presents the divided-sample results for turnover. Each column is divided in to three parts: they first present the average of proportional changes in marginal tax rates, then the DD results and finally the elasticity estimate utilizing changes in the log marginal tax rate. We first divide the sample by the greatness of changes in the imputed marginal tax rate due to the 1997 reform. We do this because we are interested whether those responded more whose tax incentives changed more. This would imply that the reform can indeed be interpreted as a natural experiment with continuous treatment. Figure B2 in the appendix presents how the growth rate of turnover and marginal tax rates changed over time in the two groups. The figure and the first two columns in table 4 support our view that the reform can be interpreted as

a continuous treatment model. In the group, where the marginal tax rate decreased more than two per cent (and the average change is -10%), the turnover shows visible increase. On the other hand in the group where the tax rate decreased between 0 and 2 %, the turnover do not show any great increase. In the large change group we estimate an elasticity of -0.39 and in the latter small change group the elasticity estimate is not statistically significant.

We then divide the sample by the size of income prior to the 1997 reform. We use the average income from the firm between 1994 to 1996 to alleviate mean reversion problems. We divide the sample by income, because we want to know whether higher income firm owners responded to tax incentives more. In the elasticity of taxable income literature it is found that individuals higher in the marginal tax rate schedule, and who consequently has higher income, respond more to tax incentives (Gruber and Saez 2002 and Saez *et al.* 2012). In this case the marginal tax rate division is not suitable, since higher income taxpayers may have lower marginal tax rate if they have a lot of net assets, since the capital income imputation affects the tax rates. Therefore we divide the sample directly by median income instead. Figure B3 presents the development of proportional turnover and marginal tax rate on average over time. The last two columns in table 4 give the estimation results for these two groups. It seems that higher income tax group had on average greater change in tax incentives and they responded more. We estimate an elasticity of -0.38 for this group. On the other hand we find smaller and statistically insignificant result for lower income group. The results support the findings in earlier literature that higher income individuals respond more. However, the graphical evidence presented in figure B3 indicates that the difference between these two groups is not very large.

	Divided by △lnMTR		Divided by profits in 1994-1996	
	<-0.02	-0.02<△ <0	High	Low
△lnMTR	-0.109	-0.007	-0.049	-0.024
DD	0.042***	0.027**	0.076***	0.018
	(0.013)	(0.012)	(0.013)	(0.015)
N	204,398	211,705	114,553	135,919
R^2	0.022	0.021	0.034	0.015
N of firms	34,341	35,584	19,238	22,882
△lnMTR	-0.298***	-1.342	-0.369***	0.017
	(0.083)	(1.067)	(0.110)	(0.134)
N	67,374	69,860	38,476	44,454
R^2	0.020	0.018	0.041	0.006
N of firms	33,687	34,930	19,238	22,227
N treated	4,913	6,156	6,887	5,805

Note: Fixed effects regressions for the change of log turnover. lnMTR is the log of the imputed marginal tax rate. The results are divided according to two dimensions: 1) the size of the change in the marginal tax rate between 1996 and 1997 and 2) by median profits between 1994 and 1996. The table shows the change in marginal tax rates on average, a DD estimate and an elasticity estimate for each group. The same set of control variables is used as in the main estimations. Robust standard errors in parentheses:*** p<0.01, ** p<0.05, * p<0.1.

Table 4: Results divided by the pre-reform size of MTR

We present robustness checks in table 5, to check against potential identification problems discussed in section 3. Column (1) is an instrumental variables regression, where the observed marginal tax rates are instrumented with imputed marginal tax rates. This instrument should be valid, since it uses the changes in legislation, which do not depend on the behaviour of firms. Thus the first-stage regression indicates how much imputed tax rate explains the observed tax rates. The coefficient from first stage is 1.7 implying that the actual marginal tax rate is larger than the imputed. The first stage result and the F-test indicate that the instruments are strong. The second stage result for turnover is very close to the main estimation results in table 3, column (4). Thus it seems that measurement errors in the tax variable do not endanger our identification strategy.

The second column in table 5 presents a placebo result, where it is pre-

tended that the reform happened in 1999 instead of 1997. This is achieved by moving the actual imputed tax variables forward in the data. We find no statistically significant effect from the placebo estimate. We conclude from this estimate, and from figure 4, that treatment and control groups develop is similar manner over time, except in the reform year 1997. Thus, unobserved shocks do not seem to be driving our main results.

The last column of the table presents an elasticity estimation using the average tax rate in place of the marginal tax rate. Otherwise the estimation is similar to our main estimation result in table 3, column (4). The point estimate is -0.47, which is somewhat larger than the main estimate of -0.17. Therefore it seems that there is variation in the tax rates induced by the reforms that the marginal tax rate does not fully capture. It is possible that especially the owners of firms high in the marginal tax rate schedule experienced only a small change in their marginal tax rate schedule, but since the total tax burden is achieved integrating the whole marginal tax rate schedule up to that point, their average tax rate changed by a lot more than the marginal tax rate. The heterogeneous results indicate that higher income individuals responded more.

We estimate the effect of reforms on other outcomes than turnover. Figure B5 in the appendix presents how these outcome variables developed over time in the treatment and control groups. The figure presents the growth rate for those firms that had positive pre- and post-reform observations, for years from 1995 to 1999, in the outcome variable. Additionally the firms in the figure had turnover between 1995 and 1997. We impose these restrictions since we are interested in intensive margin responses, so that the firms needed to exist before the reforms. It is evident that the treatment and control groups in general develop in similar manner over time in the outcome variables in the figure. Therefore the requirement for common time trends seem to hold for the other outcome variables as well as for turnover. The assets and wage sum of partnerships deviate from their overall trend at the time of the reforms. This indicates that partnerships responded to the 1997 reform by increasing their total assets and wage sums. There is no clear deviation from the trend for investments or number of employees.

	IV	Placebo	ATR
△lnMTR	-0.120**	0.067	
	(0.049)	(0.100)	
1st stage	1.710***		
	(0.030)		
△lnATR			-0.472***
			(0.132)
N	84,538	99,013	103,490
R^2	0.018	0.023	0.017
N of firms	42,269	50,926	51,745
F test	658.44		

Note: Fixed effects regressions for the change in the log of turnover. First column presents an instrumental variable estimate, where the actual marginal tax rate is instrumented with the imputed marginal tax rate. Second column presents a placebo estimate, where it is pretended that the reform happened in 1999. The last column presents an elasticity estimate from the 1997 reform using the average tax rate as an explanatory variable. The same control variables are used as in the main estimates. Robust standard errors in parentheses:*** p<0.01, ** p<0.05, * p<0.1.

Table 5: Robustness of the results

Figure B4 presents the growth rate of profits for partnerships over time. It shows that there is a peak in growth of profits in 1997. This indicates that the increased turnover went to increased profits, and thus income from the firm. Corresponding profit data from corporations is missing. Thus we could not graphically compare the development of profits between partnerships and corporations or perform a DD regression for profits below.

Table 6 presents the results for wage sum, total assets, own capital, debts, number of employees and investments. We present for each outcome a DD specification. We find a positive and statistically significant effect for wage sum. From the graphical inspection it was clear that partnerships increased their wage sums. It is possible that the owners of firms paid more wages to themselves. This intuition is supported by a similar result (not shown) for a sub-group that had no employees prior to the reform. At the same time it seems that if anything, number of employees decreased as a response to the reform. However, from figure B5 it seems that there were no clear effect and the weakly statistically significant result is due to deviation from the general trend in control group.

We present the DD specification for total assets, which is own capital plus debts in the second column of table 6. We also perform the same specification separately for the two variables that comprise total assets. It seems that both outcomes increased as a response to the reform. This is possible if part of the firms increased their own capital and at the same time other firms their debts. Nevertheless, the prediction from our theoretical model, that some firms will increase their assets at the same time with the output, seems to hold. Result on investments in the last column is negative but not statistically significant. Investments refer here to real investments to machines and equipments. Goolsbee (1998a) proposes that the supply of capital goods would be upward sloping. This would explain the result in literature, that tax incentives are not typically found to increase investments much, similar to our result.

	Wage sum	Tot. Assets	Own capital	Debts	Employees	Investments
DD	0.082***	0.030***	0.064***	0.134***	-0.022*	-0.010
	(0.017)	(0.010)	(0.009)	(0.016)	(0.012)	(0.062)
N	201,663	237,339	202,320	210,686	164,960	127,810
R^2	0.011	0.006	0.015	0.005	0.017	0.001
N of firms	40,907	43,772	40,795	37,499	29,437	32,587

Note: Fixed effects regressions for the change in logarithmic wage sum, total assets, own capital, debts, number of employees and investment. The outcome in each column is the title of the column. The explanatory variable is a DD indicator. The same set of control variables is used as in the main estimates, except no asset related control variables for assets, own capital or debts. Robust standard errors in parentheses:*** p<0.01, ** p<0.05, * p<0.1.

Table 6: Other outcomes

Table 7 presents the results for exit, entry and switching legal form. The results for exit and entry in columns (1) and (2) are performed with a DD indicator as an explanatory variable. The overall pattern of the results is that the reforms induced partnerships both to exit less and entry more often. This is to be expected, since the reform made the income taxation from a partnership firm lighter on average. Therefore it is intuitive if entry to this business form was seen more favorable after the reform. Likewise, especially for low-profitable firms, exiting decisions could have been postponed because

	(1) exit	(2) entry	(3) switch
DD Effect	-0.072***	0.026***	-0.021***
	(0.001)	(0.001)	(0.000)
N	1,157,040	1,157,040	439,488
R^2	0.008	0.001	0.011
N of firms	192,840	192,840	73,248

Note: Fixed effects regressions on indicators for exiting or entering the sample and switching from a partnership to a corporation in column (3). Regressions do not include additional controls, since these are not observed for non-surviving firms. In Columns (1) and (2) explanatory variable is a DD indicator. In column (3) explanatory variable is an after indicator. Robust standard errors in parentheses:*** p<0.01, ** p<0.05, * p<0.1.

Table 7: Results: exit, entry and switching

economic conditions were more favorable to continue after the reform. The exit result in column (1) is relatively large, exit probability is reduced by more than 7 percent. This could partly be explained by the recession in early 1990s in Finland. It is possible that the exit was becoming less common for partnerships little bit later than for corporations after the deep recession. Column (3) presents the switching result from partnerships to corporations. The estimation is performed by regressing an indicator of switching against an indicator for after the reform. The result indicates that this switching probability fell by 2 percent due to the reforms. This result is similar to what have been found earlier in literature (Gordon and Mackie-Mason 1994 and Cullen and Gordon 2007).

6 Conclusion

The main goal of this paper was to understand the determinants of entrepreneurial choices better. Surprisingly few studies have offered credible empirical analysis of how the economic activity of entrepreneurs depends on their tax incentives. We studied entrepreneurial choices both using a theoretical model and by analyzing empirically tax reforms that altered the income tax rates of entrepreneurs.

The theoretical model presented a conjecture of how effort decisions and

saving decisions could be affected by a reform to a tax rule that features an imputed income (Boadway and Bruce 1994). The question is interesting, since an entrepreneur can affect her income tax rates by saving within the firm. On the other hand, an entrepreneur can exert more effort within the firm that then produces more output. Alternatively the entrepreneur could consume more now and suffer lower consumption in the future. Our theoretical model predicted that decreasing both marginal and average tax rates through increasing imputed income in the tax rule increases both effort and income transfers within firm, but only in some cases. One interpretation for the result is that effort is increased when the entrepreneur is sufficiently patient.

It remained an empirical question to which direction the tax incentives affect entrepreneurial choices. Thus we studied empirically the effects of two Finnish tax reforms. They affected only owners of unincorporated firms, and thus provided exogenous variation in the tax burden of entrepreneurs. We used as an outcome the turnover of the firm, that indicates whether the output in the firm had increased or decreased as a result of the reforms. The main result indicates that turnover increased 5% more in the treatment group than in the control group. The elasticity of turnover with respect to the marginal tax rate was -0.17. These main estimation results passed various robustness checks, making them more credible.

The divided sample results revealed that the turnover of those firms whose owner's tax incentives changed more also responded more. Also those that higher pre-reform income increased their firm's turnover more. These results imply that the stronger are the incentive, the greater is the response. This result is in line with the finding in the elasticity of taxable income literature that higher income individuals respond more to changes in tax incentives (Gruber and Saez 2002 and Saez *et al.* 2012). The interpretation in this literature is that the higher income individuals have more possibilities to plan their tax payments, and also that larger changes in the tax code are more salient.

The turnover result is encouraging for the interpretation that the effort exerted by entrepreneurs had increased as a response to their reduced in-

come tax burden. However, in general firms also use other inputs than entrepreneurial effort. Thus larger turnover (output) could result from greater labour demand or investments. To pursue these hypothesis, we estimated how the labour demand and investments developed as a response to the reforms. We did not find a robust statistically significant increase in these variables. Furthermore, graphical inspection of the trends in the treatment and control groups did not give a support to the hypothesis that the increase in turnover had resulted from an increase in these visible inputs. All in all, only factor that remains to explain the turnover result, is the greater effort exerted by an entrepreneur. Therefore the empirical results support the possibility explored by our theoretical model that entrepreneurial effort does respond to changes in entrepreneur's taxation.

It seems that partnerships reacted to the tax incentives also by increasing their profit margin, which is the income from the firm. However, we did not have enough data to pursue this hypothesis further than graphical presentation of the growth in the profits form partnerships over time. Also, the wage sums increased among partnerships as a response to tax changes, which leaves the possibility that entrepreneurs might have paid more wages to themselves. These two figures together, increased profits and wage sums, indicate that taxable income of the owner of the firm increased at least by as much as the output of the firm. The response of the income from the firm to the tax incentives points to the elasticity of taxable income, which is relevant for deadweight loss calculations (Feldstein 1999 and Chetty 2009). Since the income from the firm seems to increase about as much as output of the firm, the elasticity could be a comparable figure, on the interval between -0.15 to -0.4. Compared to findings in literature (see Saez *et al.* 2012 for discussion), this range of taxable income elasticities is not overly large for entrepreneurs.

Another margin of responding is exit, entry and switching legal form. These are extensive margin decisions, whereas marginally changing output is an intensive margin decision. Previous literature studying the tax incentives of small firms has focused quite a lot on this (Gordon and Mackie-Mason 1994, Gordon and Cullen 2007, Goolsbee 1998b). In the current study the main estimation results we performed only for firms that continued in the

sample from before to after the reform. Despite of that, the reforms influenced extensive margin behaviour in a statistically significant way. The reduced income tax for income from firm influenced the decisions to switch legal form; fewer firms switched from partnerships to corporations after the reform. Also exits among partnerships became less common and entry more common phenomenon. This was expected since the reform made the taxation of partnerships more lenient relative to the pre-reform situation. It is interesting how these extensive margin responses complete the picture what happened as a result of the reform without hindering our intensive margin results.

Our results suggest that the economic activity of entrepreneurs in their firms can indeed be promoted by providing them better tax incentives. However, we interpret the elasticity of output with respect to income taxation, -0.17, to be relatively small. As a result, it is possible that reducing the tax burden in this way may prove to be a relatively costly way of increasing firms' output. This is supported by the relatively low taxable income response. Our results indicate that intensive margin decisions are important when analysing the response of entrepreneurs to tax incentives, in addition to the extensive margin responses, which much of the earlier literature has focused on analyzing.

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Appendix A: First-order conditions and Cramer's rule derivations

This appendix presents the derivation of the main theoretical results. We start by presenting the derivation of the first-order and second-order conditions. Then we present how changing the tax parameter μ affect the optimized endogenous variables.

Take the inter-temporal objective function of an entrepreneur:

$$\begin{aligned} U &= u_1\left(ne_1 - m - T_1\left(ne_1 - m, A\right) - R\right) + h(e_1) \\ &+ \delta u_2\left(Y + m - T_2\left(Y + m, A\right) + rR + A\right) \end{aligned}$$

Next we take the first-order conditions with respect to e_1, R and m:

$$\frac{\partial U}{\partial e_1} = u_{1c} n \left(1 - T_{1y}\right) + h_e = 0 \tag{4}$$

$$\frac{\partial U}{\partial R} = -u_{1c} + \delta u_{2c} r = 0 \tag{5}$$

$$\begin{aligned} \frac{\partial U}{\partial m} &= -u_{1c}(1 - T_{1y} - T_{1m}) + \\ &\quad \delta u_{2c} \left(1 - T_{2y} - T_{2m}\right) = 0 \end{aligned} \tag{6}$$

We take the second-order conditions form the first-order conditions

$$\frac{\partial^2 U}{\partial e_1 \partial e_1} = -u_{1c} n^2 T_{1yy} + u_{1cc} \left(n \left(1 - T_{1y}\right)\right)^2 + h_{ee} < 0$$

$$\frac{\partial^2 U}{\partial e_1 \partial m} = \frac{\partial^2 U}{\partial m \partial e_1} = -u_{1cc} \left(n \left(1 - T_{1y}\right)\right) \left(1 - T_{1y} - T_{1m}\right) + u_{1c} n T_{1yy} > 0$$

$$\frac{\partial^2 U}{\partial R \partial R} = u_{1cc} + \delta u_{2cc} r^2 < 0$$

$$\frac{\partial^2 U}{\partial e_1 \partial R} = \frac{\partial^2 U}{\partial R \partial e_1} = -u_{1cc} n \left(1 - T_{1y}\right) > 0$$

$$\frac{\partial^2 U}{\partial m \partial m} = u_{1cc}(1 - T_{1y} - T_{1m})^2 + \delta u_{2cc}(1 - T_{2y} - T_{2m})^2 + u_{1c} \left(-T_{1yy}\right) + \delta u_{2c} \left(-T_{2yy}\right) < 0$$

$$\frac{\partial^2 U}{\partial R \partial m} = \frac{\partial^2 U}{\partial m \partial R} = u_{1cc} \left(1 - T_{1y} - T_{1m}\right) + \delta r u_{2cc}(1 - T_{2y} - T_{2m}) < 0$$

The sign of the determinant H must be negative for the second-order conditions of this model to be fulfilled

$$H = \begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial e_1} & \frac{\partial^2 U}{\partial e_1 \partial R} & \frac{\partial^2 U}{\partial e_1 \partial m} \\ \frac{\partial^2 U}{\partial R \partial e_1} & \frac{\partial^2 U}{\partial R \partial R} & \frac{\partial^2 U}{\partial R \partial m} \\ \frac{\partial^2 U}{\partial m \partial e_1} & \frac{\partial^2 U}{\partial m \partial R} & \frac{\partial^2 U}{\partial m \partial m} \end{vmatrix}$$

We insert into the second-order conditions the arbitrage condition derived from the first-order conditions that $r\left(1 - T_{1y} - T_{1m}\right) = 1 - T_{2y} - T_{2m}$. For example developing by the first term of the determinant, we have $\frac{\partial^2 U}{\partial e_1 \partial e_1}$, which is negative multiplied by square determinant as follows:

$$\begin{aligned} & \frac{\partial^2 U}{\partial R \partial R}\frac{\partial^2 U}{\partial m \partial m} - \frac{\partial^2 U}{\partial R \partial m}\frac{\partial^2 U}{\partial m \partial R} \\ = \; & \left(1 - T_{1y} - T_{1m}\right)^2 \left(u_{1cc} + \delta u_{2cc} r^2\right) \left(u_{1cc} + \delta u_{2cc} r^2 - \frac{1}{\left(1 - T_{1y} - T_{1m}\right)^2} \left(u_{1c} T_{1yy} + \delta u_{2c} T_{2yy}\right) \right) \\ - \; & \left(1 - T_{1y} + T_{1m}\right)^2 \left(u_{1cc} + \delta u_{2cc} r^2\right)^2 > 0 \end{aligned}$$

Developing all the terms in similar fashion as above, we get the following signs for the terms of the determinant H:

$$\begin{aligned} H \; = \; & \underbrace{\frac{\partial^2 U}{\partial e_1 \partial e_1}}_{-} \underbrace{\begin{vmatrix} \frac{\partial^2 U}{\partial R \partial R} & \frac{\partial^2 U}{\partial R \partial m} \\ \frac{\partial^2 U}{\partial m \partial R} & \frac{\partial^2 U}{\partial m \partial m} \end{vmatrix}}_{+} - \underbrace{\frac{\partial^2 U}{\partial R \partial e_1}}_{+} \underbrace{\begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial R} & \frac{\partial^2 U}{\partial e_1 \partial m} \\ \frac{\partial^2 U}{\partial m \partial R} & \frac{\partial^2 U}{\partial m \partial m} \end{vmatrix}}_{+} \\ & + \underbrace{\frac{\partial^2 U}{\partial m \partial e_1}}_{+} \underbrace{\begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial R} & \frac{\partial^2 U}{\partial e_1 \partial m} \\ \frac{\partial^2 U}{\partial R \partial R} & \frac{\partial^2 U}{\partial R \partial m} \end{vmatrix}}_{+} < 0 \end{aligned}$$

The sign of the H determinant is negative, and the second-order conditions fulfilled, as long as the following condition is fulfilled from the second square determinant

$$\frac{\left(1 + \frac{1}{r}\frac{T_{2yy}}{T_{1yy}}\right)\left(1 - T_{1y}\right)}{\left(1 - T_{1y} - T_{1m}\right)} < 1 + \delta r^2 \frac{u_{2cc}}{u_{1cc}}$$

In this case the first two terms in H determinant in the first line above

dominate the second square determinant. Since the first line is negative when the condition stated above holds, the whole H determinant is negative and the second-order condition holds.

We next derive the effect the parameter μ in the model have on the optimum values of the endogenous choice variables using Cramer's rule. Take first the derivative with respect of μ from the first-order conditions for R and m in equations (5) and (6).

$$U_{R\mu} = u_{1cc}T_{1\mu} - \delta u_{2cc}rT_{2\mu}$$

$$U_{m\mu} = u_{1cc}T_{1\mu}\left(1 - T_{1y} - T_{1m}\right) - \delta\left(u_{2cc}\left(1 - T_{2y} - T_{2m}\right)T_{2\mu}\right)$$

Here we assume that $T_{ym}, T_{mm} = 0$ and $T_m < 0$, transferring income within firm (m) affects the tax function in a negative and linear way. Utilizing a condition from FOC it follows that $U_{R\mu}\left(1 - T_{1y} - T_{1m}\right) = \left(1 - T_{1y} - T_{1m}\right)\left(u_{1cc}T_{1\mu} - \delta u_{2cc}rT_{2\mu}\right) =$ $U_{m\mu}$. The effect of a change in μ on optimal effort is:

$$\frac{\partial e_1^*}{\partial \mu} = \frac{\begin{vmatrix} 0 & \frac{\partial^2 U}{\partial e_1 \partial R} & \frac{\partial^2 U}{\partial e_1 \partial m} \\ -U_{R\mu} & \frac{\partial^2 U}{\partial R \partial R} & \frac{\partial^2 U}{\partial R \partial m} \\ -U_{m\mu} & \frac{\partial^2 U}{\partial m \partial R} & \frac{\partial^2 U}{\partial m \partial m} \end{vmatrix}}{H}$$

$$\frac{\partial e_1^*}{\partial \mu} = U_{R\mu}\begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial R} & \frac{\partial^2 U}{\partial e_1 \partial m} \\ \frac{\partial^2 U}{\partial m \partial R} & \frac{\partial^2 U}{\partial m \partial m} \end{vmatrix} - U_{m\mu}\begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial R} & \frac{\partial^2 U}{\partial e_1 \partial m} \\ \frac{\partial^2 U}{\partial R \partial R} & \frac{\partial^2 U}{\partial R \partial m} \end{vmatrix}$$

This complicated calculation is manipulated into:

$$\begin{matrix} & \left(u_{1cc}T_{1\mu} - \delta u_{2cc}rT_{2\mu}\right) \\ * & \frac{\left(u_{1cc}\left(1 - T_{1y}\right)\left(T_{1yy} + \frac{1}{r}T_{2yy}\right)\right)}{\left(1 - T_{1y} - T_{1m}\right)} \end{matrix}$$

where the second line is always negative. Thus the effect of the special tax rule on effort is determined by the first line above. Therefore the effect is positive as long as

$$\frac{\partial e_1^*}{\partial \mu} \gtrless 0 \Longleftrightarrow \frac{T_{1\mu}}{T_{2\mu}} \gtrless \delta r\frac{u_{2cc}}{u_{1cc}}$$

Statistics	Rents	Inputs	Fixed expenses
Mean	6180	144692	3425
Median	1009	29113	0
SD	16446	471532	17960
N	68514	68514	68514

Table B1: Control variables for partnerships

A similar calculation is performed for m. Cramer's rule produces the following determinant, the sign of which has to be determined:

$$\frac{\partial m^*}{\partial \mu} = \frac{\begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial e_1} & \frac{\partial^2 U}{\partial e_1 \partial R} & 0 \\ \frac{\partial^2 U}{\partial R \partial e_1} & \frac{\partial^2 U}{\partial R \partial R} & -U_{R\mu} \\ \frac{\partial^2 U}{\partial m \partial e_1} & \frac{\partial^2 U}{\partial m \partial R} & -U_{m\mu} \end{vmatrix}}{H}$$

$$\frac{\partial m^*}{\partial \mu} = U_{R\mu} \begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial e_1} & \frac{\partial^2 U}{\partial e_1 \partial R} \\ \frac{\partial^2 U}{\partial m \partial e_1} & \frac{\partial^2 U}{\partial m \partial R} \end{vmatrix} - U_{m\mu} \begin{vmatrix} \frac{\partial^2 U}{\partial e_1 \partial e_1} & \frac{\partial^2 U}{\partial e_1 \partial R} \\ \frac{\partial^2 U}{\partial R \partial e_1} & \frac{\partial^2 U}{\partial R \partial R} \end{vmatrix}$$

The effect of the special tax rule on m^* turns out to depend on the same condition as for e^*:

$$\frac{\partial m^*}{\partial \mu} \gtrless 0 \Longleftrightarrow \frac{T_{1\mu}}{T_{2\mu}} \gtrless \delta r \frac{u_{2cc}}{u_{1cc}}$$

Appendix B: Figures and tables

This appendix presents additional tables and figures to the main text.

For sole proprietors, the reforms did not change tax burden significantly. The left panel of figure B1 presents the change in MTRs for sole proprietors due to the reforms. A large share of them is at zero and the bulk of the data is inside one per cent change in absolute value. The right panel of the figure presents the proportional change in the main outcome for sole proprietors and compares that with corporations. Firstly it is evident that there is no clear deviation from the general trend for sole proprietors at the time of the reform. Secondly, the pre-reform trends between the two groups do not

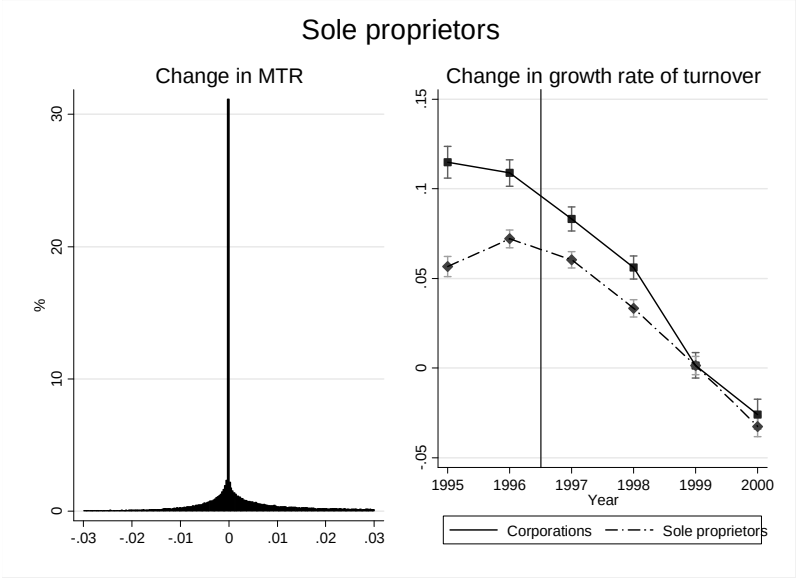

Figure B1: Sole proprietors: Changes in marginal tax rates and change in mean of growth of corporations and sole proprietors

resemble each other. Thus the common trends assumption required for a natural experiment analysis in not fulfilled. For these reasons we exclude the sole proprietors from the analysis, although the reform in principle applied to them as well.

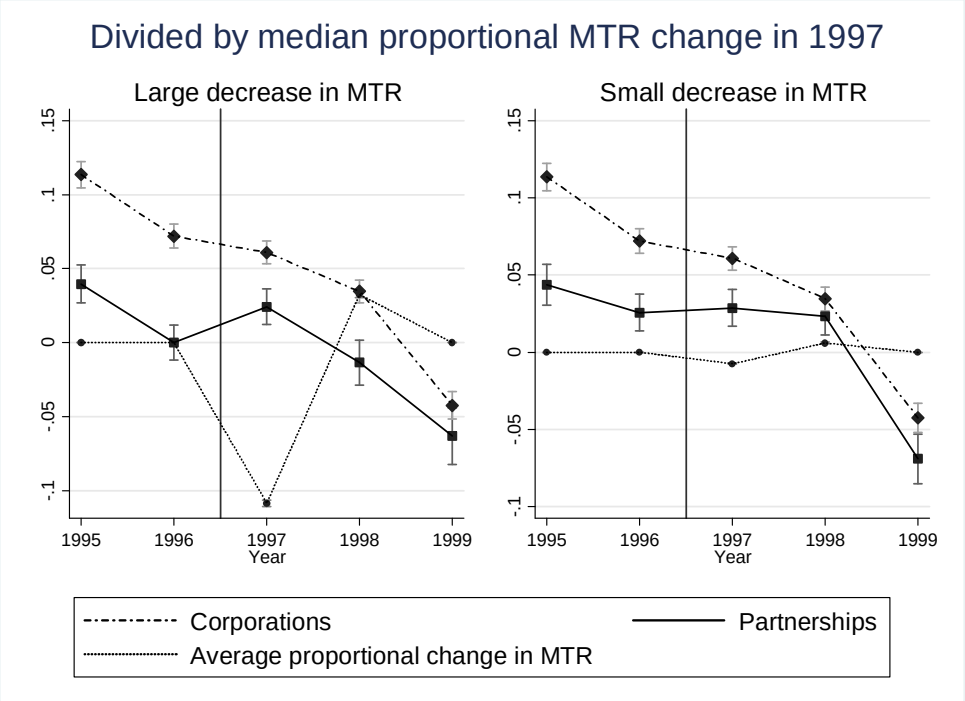

Figure B2: Divided sample description by the size of change in tax incentives

Note: Figure compares proportional change in MTRs and the development of turnover according to the pre-reform size of MTR .

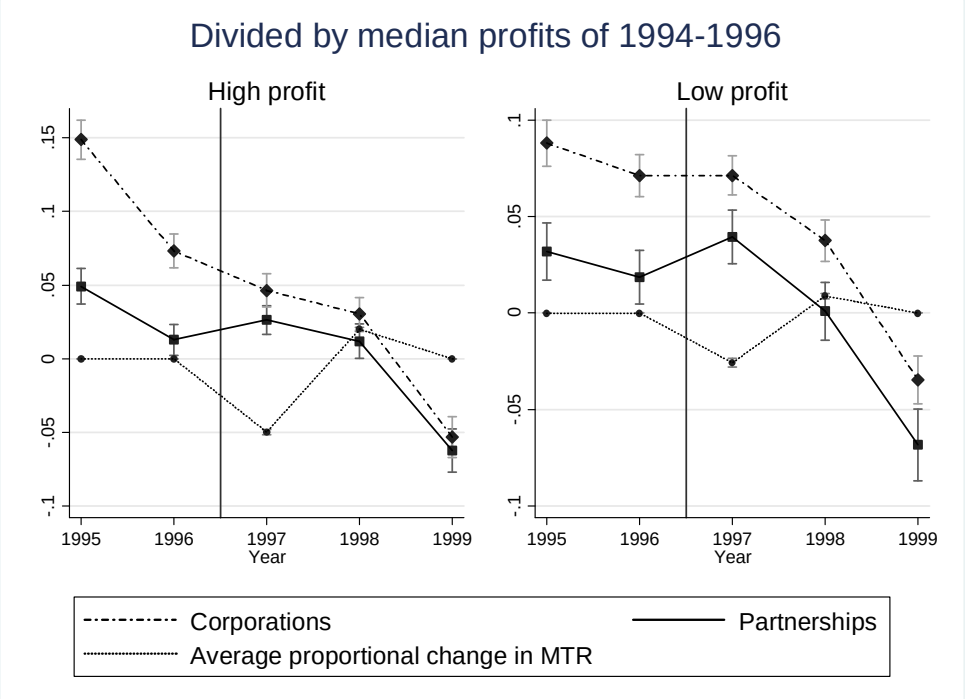

Figure B3: Divided sample description by median profit in 1994-1996

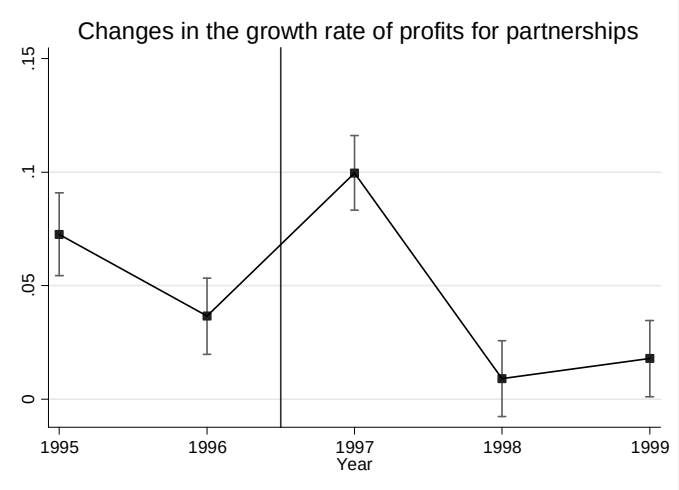

Figure B4: Profits from partnerships

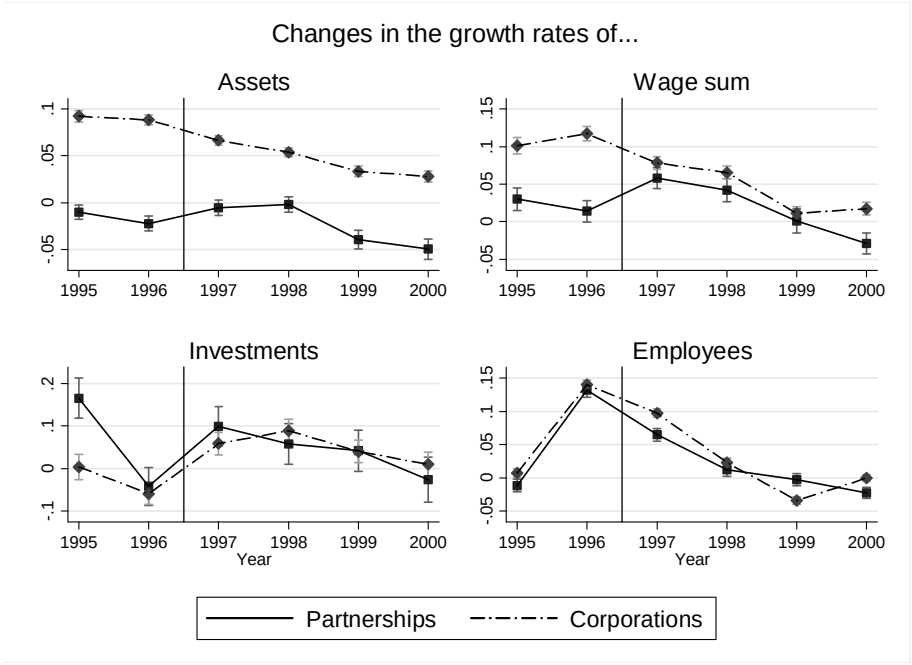

Figure B5: Mean values of the main outcome variables over time for partnerships and corporations

Note: Figure compares the mean of proportional change in profits, wage sums, investments and number of employees.

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