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Taxation and Inequality. Study of Changing Income Inequality in Finland, 1961–2005

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Abstract

Following the publication of Thomas Piketty's magnum opus *Capital in the Twenty-First Century* (2014a) and his subsequent work *Capital and Ideology* (2020), much attention has been paid on taxation as a driving cause behind changing income inequality from the 1980s and 1990s onward. In Finland, the work of Piketty and his colleague, Emmanuel Saez (*e.g.*, Piketty & Saez, 2003), has received the attention of leading inequality scholars, including the economists Marja Riihelä, Risto Sullström and Matti Tuomala (*e.g.*, Riihelä et al., 2005). Following Piketty & Saez, these authors have arrived at the conclusion that changes in income inequality in Finland during the 1990s and early 2000s can be attributed to changes in income taxation at the beginning of the 1990s. Riihelä *et al*. argue that the introduction of the so-called Nordic dual income tax (1993) lowered the effective tax rates on top capital incomes *vis-à-vis* wages and salaries, thus increasing the incentives of transforming the latter into more favorably treated capital incomes.

This paper seeks to criticize the Riihelä *et al.* explanation on the grounds of tax history and changes in Finnish companies' profitability. It is proposed that the chain of causation needs to be taken beyond taxation and into the creation of income in businesses and corporations, as well as its distribution. The paper shows that the firms' payout ratio has remained surprisingly stable apart from the tumultuous years of the early 1990s depression. Although taxation has probably affected the *composition* of the firms' payout, it has, on average, had a much lesser impact on its *level*. While taxation may have amplified the changes in after-tax income inequality, it has not been their fundamental cause. It is argued that profitability may hold the key to these shifts in income inequality. Firm ownership in Finland, as elsewhere (*e.g.*, Bengtsson & Waldenström, 2018) has been highly concentrated in the top-most fractiles (for example, the top 1% or 0.1%). Given the fact that these fractiles' income has historically been contingent on profits (even if paid in wages or fringe benefits, for example), it is argued that the changes in Finnish income inequality during this period have been very much a top-level phenomenon. It is also argued that these results may provide impetus for similar research in other countries, as well.

The paper's research period coincides with a ∪-shaped trend in profitability and income inequality. First, both profitability and income inequality decreased from the 1960s until a deep depression in the beginning of the 1990s. Then, during the 1990s, inequality and profitability rebounded, leveling off after the turn of the millennium. The paper uses Finnish taxable income and wealth statistics as its primary source of income data. National accounts data is used for estimating business and corporate profitability. Additional survey-based data on Finnish households' income is used for robustness checks. Additionally, the paper uses secondary sources on tax legislation, firm ownership and capital structures to support its argument. Methodologically, income shares are estimated using a generalized Pareto curve interpolation developed by Blanchet et al. (2017). The impact of the 1993 tax reform as well as its late 1980s

and early 1990s predecessors are assessed in terms of marginal tax rates and elasticity of taxable income. Finally, the medium-term dynamic impact of the interaction of profitability and payout, the so-called payout rate of response, is measured on the top 1 percent taxable income share.

Keywords: income inequality, taxation, Finland, Nordic Dual Income Tax, profitability, capital income

Contents

1 Introduction

The Nordic countries are well known for their relatively low levels of income inequality and egalitarian policies. Against this background, it may seem unfitting that these countries have also adopted comparatively low taxes on capital and wealth income since the late 1980s and early 1990s. These tax systems, known collectively as the Nordic dual income tax, split the state taxation of earned income (*e.g.*, wages, salaries and entrepreneurial income) and capital income, (*e.g.*, dividends, interest and capital gains), in half, the former being taxed at a progressive schedule and the latter at a flat rate, which has generally been much lower than the top marginal tax rates on the former. Finland adopted this dual income tax system in 1993 as part of the Aho government's (1991–5) Income Tax Act, a broad set of business and personal tax reforms intended as a response to similar reforms in the other Nordics as well as a remedy for the serious depression the country was going through at the time. Additionally, it may seem that adopting this dual income tax has been one of the reasons behind rising income inequality in the Nordics—apart from Denmark—in the 1990s and early 2000s. Indeed, as this article shows, this contradiction between the broad, historical aims of these countries' welfare and tax systems has aroused much discussion, not the least in Finland, where income inequality has risen quite markedly since the early 1990s.

The question of taxation and inequality is by no means peculiar to the Nordics. Following the seminal contributions by Piketty (2001), Piketty and Saez (2003) and Piketty (2014b) in particular, the debate has been going on at a global scale. Although the connection between lowering top marginal tax rates and inequality, in particular, may seem logically sound at first, estimating the causality between these and other variables of interest has been quite challenging.[1] Indeed, many authors, including Atkinson et al. (2011), have resorted on statistical inference and the use of circumstantial evidence, such as the number of household workers (*e.g.*, maids) and the development in estate taxation as well as historical events, such as the two world wars and the Great Depression of the 1930s. As this article shows, this has been the case in Finland, as well, where important contributions by Riihelä et al. (2001; 2005; 2010) and other have relied on inference when assessing the ostensible connection between the introduction of a dual income tax in 1993 and the subsequent rise in income inequality in the 1990s and early 2000s.

The impetus for this article rests in the development of Finnish firms' average profitability from the early 1960s towards the present. As this article shows, the firms' average profitability decreased from the beginning of 1960s to the early 1990s, when Finland entered a three-year depression in 1991–3. After the depression, the firms' profitability recovered quite rapidly before settling at a historically high level in the early years of the new millennium. The article seeks to assess whether the improving profitability has had a causal connection to the rising income inequality in the late 1990s and early 2000s. Indeed, at a very broad level, not only income inequality, but also profitability have followed a ∪-shaped trajectory from the 1960s until the early 2000s. Since then, income inequality has remained quite stable. This article's inquiry thus ends at the early 2000s and seeks to assess the impact of the 1993 tax reform, in particular, on inequality *vis-à-vis* the firms' profitability.

This article seeks to contribute to the growing tax data based literature on income inequality. By emphasizing the role of profitability, the article tries also to bridge the gap between production and distribution. This article is concerned, in line with Piketty and Saez (2003), Saez et al. (2012) and Slemrod (1995), with the relationship between short-term income shifting and medium- to long-term effects of tax reforms on income inequality. The 1993 Income Tax Act, it is argued, has certainly been favourable towards high-income capital income recipients together with the cancellation of double taxation of dividends via a dividend imputation or *avoir fiscal* type arrangement in 1990–2004. However, the relatively rapid increase in income inequality emphasized by Riihelä and Sullström (2004) could not have taken place had profitability not recovered from the 1991–3 depression, nor had it not surpassed its previous levels in the 1970s and 1980s.[2]

[1] See Saez et al. (2012) for a thorough review of recent years' research on the topic.
[2] Riihelä & Sullström, 2004, 13.

The article is structured as follows. Section 2 presents the data and methods used in this article, with supplementary information on the data provided in the article's Appendix. Section 3 reviews the relevant reserach on income inequality, profitability and payout and seeks tentative connections between these admittedly separate fields of inquiry. Section 4 goes through the history of profitability and payout in Finland in 1961–2005. Although this section does not offer an in-depth analysis of the changes in the two variables, potential reasons behind the relevant changes are discussed in some detail. After this, Section 5 provides an overview of the history of the Finnish income tax system with particular emphasis on the late 1980s and early 1990s reforms. Section 6 analyzes the the impact of these tax reforms relative to profitability. Finally, Section 7 concludes.

2 Data and methods

This article's primary data comes from the wealth and tax statistics and national accounts produced by Statistics Finland (in Finnish, Tilastokeskus), the official state bureau on statistics. Both macro and micro data is used. The beginning of this article's research period has been chosen mostly on grounds of data availability. The relevant national accounts data on sector incomes and stock of fixed capital used to construct the time series on profitability and payout begin in 1960. Although the national accounts data in 1960–74 follows partially different accounting guidelines than the more recent data from 1975 onward, the differences are relatively narrow. When necessary (as in the case of the average profit rate series), chaining has been used from 1975 backwards. The national accounts data allows one to construct the before- and after payout rates of profit necessary for assessing the changes in the firms' average payout ratio. This data is also necessary for the construction of the payout rate of response, the interaction between the difference in the before- and after payout profit rates and the payout ratio, which seeks to capture the firms' average response in payout to the changes in profitability.

In terms of income distribution, this article relies on tax data. Micro data from relevant Household Expenditure (HES) and Income Distribution Surveys (IDS) have been used to check for some of the inconsistencies in the tax data.[3] The article thus differs from the recent efforts by Piketty and others on distributional or DINA accounting, which have incorporated both income and wealth tax data, survey data as well as national accounts.[4] The reasons for this are threefold. Firstly, the survey data is only available for a relatively small number of years, the relevant HESs having been conducted in 1966, 1971, 1976, 1981, 1985 and 1990 and IDSs being available from 1987 onward. Secondly, this data suffers from a number of compatibility issues, the sample size being much smaller in the HES than IDS surveys. Thirdly, the surveys do not fully mitigate for the shortcomings in income and wealth tax data in terms of nontaxed incomes, such as interest or capital gains. These reasons by no means deny the construction of DINA-style income share data in the future, although a number of issues are to be solved if the data is to reach an annual coverage. The income and wealth statistics (in Finnish, tulo- ja varallisuustilasto) are available on an annual basis since 1920. The data for the years 1961–86 is based on published tabulations. For these years, a generalized inverted Pareto curve interpolation by Blanchet et al. (2017) has been used for estimating taxable and after-tax income shares. Micro data has been used for the years 1987–2005. This data follows a percentile distribution which defines also the size of the units of observation in this article.[5] There are a number of issues with these sources. The biggest issue is the change in the income and tax statistics in 1968–9. Prior to 1969, the data is based partially on a relatively large sample of individual taxpayers (in 1968, the sample covered around 39 percent of taxpayers). Since 1969, the data has come from the Finnish tax authorities' computerized register and has a much wider coverage. Before 1969, the taxpayers below a certain threshold (FIM (Finnish markkas) 40,000 in 1968, € 60,700 in 2016) were picked with even sampling which means that the data may not be as accurate for the vast majority of individuals as for the taxpayers within the p99.1–100, or the top 0.9 percent,

[3] Statistics Finland, 2021b,c.

[4] For example, Garbinti et al., 2018.

[5] I thank Timo Matala from Statistics Finland for providing this data. According to Matala, the data is unfortunately not available prior to 1987 as it is yet to be digitized or otherwise not readable by modern computers (on magnetic reels, etc.). Source: the author's email discussion.

as in 1968.[6] Since 1969, the tabulations have included almost all Finnish individual taxpayers with small exceptions for estates, tax consortia and seamen.[7] This break in the data results in a jump in top income shares (*e.g.*, the top 1 and 0.1 percent) and various income metrics, such as the Gini coefficient. As the immediate post-1968 values in income inequality and top income shares seem rather high, these years' figures have been interpolated over from 1968 until 1976 using a 4th-degree polyomial trend. Unfortunately, as the HES data does not cover the years 1968–9, it is hard to evaluate this interpolation against other data. The 1971 and 1976 HES data points seem to support this method, however, even if at a coarse level. Other, lesser issue with the tabulated taxable income data include discontinuity in the nominal value of the highest threshold (in FIM). This is a particular nuisance in the late 1960s and early 1970s when taxpayers' nominal incomes grew at a fast rate meaning that top-most bracket in the tabulations has become "heavier".[8] Thankfully, the Pareto interpolations do not seem to respond to these changes in a significant way. Yet another issue with the tabulations is that the bracket thresholds (*e.g.*, FIM 5,000–9,999) are for the taxable income only. Therefore, the data does not allow for the direct estimation of after-tax income shares or for a decomposition by source of income using the bracket thresholds, although they can be estimated using the bracket shares, even if at a slightly lower level of accuracy.

The before- and after-tax percentile shares in the 1960–86 income and wealth tabulations are estimated using the aforementioned generalized inverted Pareto curve interpolation developed by Blanchet et al. (2017) and further applied in Blanchet et al. (2018).[9] This method has been found rather precise by Blanchet et al. (2017) when compared against micro data. They even go as far as to claim that "the precision of the method is such that is is often preferable to use tabulations based on exhaustive data rather than individual data from a non-exhaustive subsample of the population, even for subsamples considered very large by statistical standards". As an example, the authors state that a 100,000 observation subsample can yield a mean relative error of around 3 percent on the top 5 percent income share whilst a comparable tabulation "based on exhaustive data" can yield a mean relative error of less than 0.5 percent. The accuracy of the measure tends to improve the higher one goes in the distribution: for the top 0.1 percent (p99.9–100), the mean relative error in a subsample can be as high as 20 percent, while the same for a tabulation can be less than 4 percent.[10] The 1987–2005 micro data on taxable income has been fitted to a simple percentile distribution at Statistics Finland. The aforementioned Blanchet et al. (2017) has also been used to estimate the top 1 percent marginal tax rate (MTR) using the `shares_fit` function which allows one to use taxpayer brackets' shares of income taxes regardless of the fact that the tabulations for 1961–86 understandably lack thresholds for the taxes.

The data on profitability and payout comes from national accounts.[11] Statistics Finland's estimations on the stock of fixed capital in Finland begin in 1960.[12] This is also the starting year of the sector accounts data in Finland. Although Statistics Finland has produced tables on certain accounts which extend as far as 1948, this data does not suffice for assessing the profitability as defined below.[13] Supplementary data on historical national accounts extend as far as 1900

[6] In 1968, the median taxable income was around FIM 9,000. The 1960–86 tabulations include taxpayers whose annual taxable income in state taxation met the FIM 10 threshold. For individuals in the FIM 10–999 bracket, every 40th was chosen for the sample (2.5 percent of the population). For individuals in the FIM 1,000–6,999 bracket, every 20th (5.0 percent). For those in the FIM 7,000–14,999 bracket, every 10th, and for the individuals with a taxable annual income within the FIM 15,000–39,999 bracket, every 5th. In 1968, there were around 23,000 individuals with taxable incomes of FIM 40,000 or above (Statistics Finland (1972b, 7) and Table 6 (p. 64)).

[7] Statistics Finland, 1974, 6.

[8] In the 1968 statistic, the highest threshold is FIM 100,000. In the 1969 tabulation, it is changed to FIM 200,000 and in 1984 to FIM 300,000. These changes reduce the number of taxpayers (and their average income) within the top bracket.

[9] Blanchet et al. (2017, 1) define the generalized Pareto curve as a curve of inverted Pareto coefficients $b(p)$, where $0 \leq p \leq 1$ is the rank and $b(p)$ is the ratio of average income above the rank p and the p-th quantile $Q(p)$, *i.e.*, $b(p) = E[X|X > Q(p)]/Q(p)$. The estimations have been run using the `gpinter` package written by Thomas Blanchet for **R**. The particular function used is the `thresholds_fit` which requires inputs on the quantiles (*e.g.*, 0.50, 0.75, 0.90, 0.99), their lower thresholds in money terms, the corresponding brackets' averages, the average above the highest threshold as well as the distribution average and the lower bound (FIM 10 in 1961–86).

[10] Blanchet et al., 2017, 3.

[11] For the published tables based on the old, SNA68 accounting standard, see Tilastokeskus (1984).

[12] Statistics Finland, 1985.

[13] Statistical Office of Finland, 1968. Tilastollinen päätoimisto (Statistical Office of Finland) was the predecessor of Tilastokeskus (Statistics Finland).

and 1860.[14] While this data may be useful for future research on these questions, the lack of sector-level data on payout has necessitated the use of a periodization beginning in 1960. There are certain compatibility issues with the older SNA68 and the current ESA2010 accounting standards. For example, the industry definitions are not completely the same. As the older, SNA68-based accounts thankfully overlap with the ESA2010 accounts, chaining has been used when there have been obvious jumps or drops in the time series caused by this shift. All the chainings have been performed backwards in time given the assumption that the newer accounts offer a more accurate picture of the economy as a whole.

Profitability is assessed in this article using the so-called rate of profit as expressed by Marx in *Capital*, Volume 3. As such, there is nothing particularly "Marxian" about this metric; what is simply expressed is the quotient of the firms realized surplus (net operating surplus in national accounting terms) over their previous year's stock of constant capital (net stock of fixed capital) and the current year's variable capital (wages, salaries and overhead):

$$\overline{\varphi}'_t = m_t/(c_{t-1} + v_t), \tag{1}$$

where m_t stands for the surplus or profits, c_{t-1} is the previous year's stock of constant or fixed capital and v_t stands for variable capital or labour costs. Where this expression stands apart from Marx's original is the use of the previous year's capital stock. The reason for choosing this variable lies in its popularity in the profitability literature, the question of profitability having occupied a prominent position in the Marxian tradition. By using this definition, the profit rate avoids the measuring of profitability on current year's investments instead of previous years' cumulated capital stock. As the growth rate of c has typically been slow in relative terms, the practical consequences of this definition on the level of $\overline{\varphi}'_t$ are quite small. These variables are all measured in current prices. As emphasized by Shaikh (2016), this acts as an inflation adjustment itself.[15] This rate of profit is calculated for the corporate and business sector, excluding financial corporations and all other sectors of the economy. Although financial institutions, commercial banks and insurance companies in particular, have been major owners in this sector and also major dividend payers in the 1960s, 1970s and 1980s, their dividends have, to a large extent, rested on their debtors' interest, dividends and insurance payments. From the individual taxpayers and households' viewpoint this has not resulted in any "new" payouts. Whilst excluding the financial sector certainly has an impact on the estimations of profitability, payout and income distribution, it should be of a rather limited extent.

In this article, the relationship between profitability and payout is measured using the so-called payout rate of response. This novel measure tries to capture the response in the firms' payout to the changes in their profitability. For example, if profitability—as measured by the rate of profit—goes down whilst the payout ratio is increasing, the latter can offset this effect for the firms' owners and creditors. Vice versa, if profitability improves, the firms can maintain a stable payout (*e.g.*, a steady growth in the money value of the dividend per share) whilst lowering their payout ratio. Of course, not all payout is as voluntary from the firms' viewpoint. Dividends and stock repurchases, for example, are much more flexible a form of payout than interest. If the interest rate increases, as it did in Finland during the late 1980s and early 1990s, whilst firms have relied on debt-based accumulation rather than on issuing stock, as they again had in Finland until the late 1980s, the payout ratio as well as the payout rate of response can increase in an "involuntary" fashion. Again, this is what seemingly happened in Finland during the 1991–3 depression as many firms struggled with copious amounts of maturing debts and high real interest rates whilst suffering a historical collapse in profitability not seen during the post-war period nor since. The payout rate of response is expressed in

$$\overline{\phi}'_t = ([\overline{\varphi}'_t - \overline{\varphi}^*_t][1 + \overline{\kappa}'_t]) + \overline{\varphi}^*_t, \tag{2}$$

[14] See Hjerppe, 1988; Tiainen, 1994; Statistics Finland, 2021a.

[15] Shaikh, 2016, 810. One has to bear in mind, however, that inflation can be interesting for income distribution.

where $\overline{\varphi}'_t$ is the before-payout rate of profit, $\overline{\varphi}^*_t$ is the after-payout rate of profit and $\overline{\kappa}'_t$ is the payout ratio $\overline{\kappa}'_t = 1 - (\overline{\varphi} *_t / \overline{\varphi}'_t)$. The after-payout rate of profit is expressed simply as $\overline{\varphi}^*_t = (m_t - \kappa_t)/(c_{t-1} + v_t)$, where $kappa_t$ is the current year's payout. The overlining reminds that we are dealing with a business and corporate sector average: different industries', branches' and firms' payout response rates have of course differed according to their profitability, indebtedness and payout policies. As theorized by Mueller (1972), one relevant variable may also be the firms' age structure and average in a given industry, as older, well-established businesses which have survived through years of competition yet face diminishing demand may have greater payout ratios than younger, fast-growing firms with high levels of initial debt and low profitability.[16]

This article approaches the relation of profitability and income distribution *vis-à-vis* the 1993 income tax reform using a number of methods. First, a difference-in-differences estimator is produced to assess the change in top 1 percent's (p99–100) effective marginal tax rate (MTR) relative to those in a reference group. This estimation is extended to the years 1987–2005, as it is possible that the previous government's tax reforms in 1989–91 have already had an impact on the treatment group's MTR. The impact of the 1993 reform is then assessed relative to the elasticity of taxable income (ETI) using the methodology reviewed by Saez et al. (2012). Then a dynamic cumulative multipliers model is run using the top 1 percent before- and after-tax income shares as the dependent variable and the payout rate of response as independent using different lag lengths for robustness checks. This third method seeks to assess the medium-term impact of both profitability on the top 1 percent income share.[17] Finally, a LOESS-filtered time series OLS model is estimated for the relationship between top 1 percent taxable income share, the payout rate of response and the given group's MTR.

3 Previous research

According to a prevailing discourse in Finland, a rise in income inequality since the 1991–3 depression was caused to a large extent by the 1993 Income Tax Act (the so-called dual income tax). This reform split the state income tax between progressively taxed earned income and capital income taxed at a relative, or flat, rate. The municipal taxation of capital income was cancelled. The reform opened a major gap between the highest MTRs in state and municipal taxation on earned income and the state-only taxed capital income. This has allegedly led to a varying degree of income shifting especially at the top of the income distribution. The profoundness of these changes has been pivotal for the development of a so-called taxational explanation of rising income inequality in Finland. The key contributors to this discourse have been the prominent Finnish economists Marja Riihelä, Risto Sullström and Matti Tuomala, whose joint work has been crucial for academic and public awareness of increasing income inequality in Finland since the early 2000s.

According to the taxational explanation, the 1993 reform not only lowered the MTRs on capital income but also created incentives for income shifting from wages, salaries and other earned income to capital income, such as dividends.[18] As in many other countries, the relevant changes in the before- and after-tax distributions seem to have been concentrated within the top 1 or 0.1 percent of households and taxpayers.[19] The share of capital income in the top 1 percent gross income was around 37 percent in 1994. By 2004, this share had risen to 55 percent. Not only dividends

[16] The question of the firms' age composition remains, however, to be addressed on another occasion, as there is no sufficient data on the firms' age density available for this particular study.

[17] On the relation between top income shares (*e.g.*, the top 1, 0.1 and 0.01 percent shares) and overall inequality measured by the Gini coefficient, see Chu and Wang (2021) and Leigh (2007). Although the Gini is relatively unresponsive to changes in the tails of the distribution, the top fractiles' share nonetheless gives a relatively good prediction for its value. On the issues with the Gini coefficient, see Cowell (2011).

[18] Riihelä et al., 2001, 26; Riihelä et al., 2008, 16,17–18,20.

[19] Riihelä et al., 2005, 11.

but also capital gains have grown in prominence, in particular in the top 0.1 percent.[20] In this sense, Finland seems similar to Sweden, where capital gains have set the country apart from many others according to Roine and Waldenström (2010),[21] as well as in the sense that capital incomes have since the 1990s dominated the top taxpayers' (*e.g.*, top 0.1 and 0.01 percent) taxable incomes.[22] This development was part of an overall weakening of tax progression and redistribution in Finland.[23] As noted by Suoniemi (2003), the progressivity and redistributiveness of the Finnish income tax system declined particularly in the latter half of the 1990s.[24]

The tradition of the taxational explanation predates the contributions by Riihelä, Sullström and Tuomala. As most authors in this field have utilized HES and IDS data, they have been limited in scope to the post-1966 period.[25] Examples of this tradition include Uusitalo (1989) and Suoniemi (1999), according to whom the Finnish income tax system has been essential for the decrease in after-tax income inequality from the mid-1960s until the late-1980s.[26] These studies as well as those by Riihelä et al. have led to a prevalent view that Finnish income inequality has, broadly speaking, followed a ∪-shaped trajectory from the mid-1960s to the early 2000s. This development, it seems, has stood in direct contrast with the classic Kuznets (1955) hypothesis according to which the expected development in income inequality should resemble a ∩-shaped pattern as industrialization and emigration from the countryside to urban centres progresses.[27]

The taxational explanation relies extensively on the contributions by Anthony Atkinson, Thomas Piketty and Emmanuel Saez. The 2003 Piketty and Saez article on historical U.S. income inequality seems to have been particularly influential, even though the first publications in this tradition predate this article by two years.[28] This influence has covered topics such as the emphasis of top incomes (*e.g.*, the top 1 or 0.1 percent), the "working rich" at the expense of "coupon clippers", a critique of the skill-biased technological change hypothesis as well as an emphasis on state income taxation and social norms as driving factors behind changing income inequality.[29]

Although the taxational explanation has built traditionally on the aforementioned HES and IDS data, Jäntti et al. (2010) have moved closer to the tradition of Atkinson and others by utilizing a parametric imputation method on published income and wealth tax tabulations which are available in Finland on an annual basis since 1920.[30] Whereas most researchers in the Atkinsonian (or Pikettian) tradition have used various Pareto distribution based interpolation methods, Jäntti et al. (2010) rely on a split-histogram method.[31] Unlike in many other countries which took part in WWII, in Finland income inequality seems to have risen in the late 1940s, declining only from the late 1960s until the early 1990s. Although Jäntti et al. (2010), relying on the contributions of Riihelä and others before, state that

[20] Riihelä et al., 2010, 18,22–23. These figures are based on IDS data.

[21] Roine & Waldenström, 2010, 327–328.

[22] See Bengtsson & Waldenström, 2018 on the relationship between capital shares and income inequality in the long run.

[23] Riihelä & Sullström, 2004, 20.

[24] Suoniemi, 2003, 418.

[25] The relevant HESs have been conducted in 1966, 1971, 1976, 1981, 1985 and 1990. Although the history of these surveys goes back all the way to the first inquiries in 1908–9, the pre-1966 surveys lack the representativeness necessary for country-level inferences on income distribution (see Statistics Finland, 1972a, 3). From 1987 onward, the HES data has typically been continued with annual data from the IDSs which have been conducted annually since 1977. The IDS sample size has typically been larger (around 9,000 to 11,000 households) than that of the HESs (the 1966 survey had around 3,000 households).

[26] Uusitalo, 1989, 35,36,43; Suoniemi, 1999, 3.

[27] Riihelä et al., 2005, 9.

[28] Piketty & Saez, 2003.

[29] For example, Riihelä et al., 2005, 14–15. As for the "working rich" thesis, Atkinson et al. (2011, 53–54) state that top wages and capital incomes tend to "co-habitate" at the very top of the distribution. This may indicate that wages and various forms of capital income may be at least partial substitutes to one another (*i.e.*, wages and capital income in name only, comprising mostly of the firms' profits and paid out under either name due to tax reasons), although Atkinson et al. do not delve deeper into this question.

[30] Although these tabulations, as well as direct income taxation, go back to 1865, state income taxes were not levied on a continuous basis before this year.

[31] Jäntti et al., 2010, 379. In this approach, the authors take the average in a given interval $[a_j, b_j]$ and split the cumulative distribution function $F(.)$ in two at their average. For a contribution on income inequality in Finland in 1865–1934 utilizing the Blanchet et al. (2017) methodology, see Roikonen and Heikkinen (2020).

income inequality rose in Finland quite rapidly in the late 1990s, the change does not seem to have been historically unprecedented as the Gini coefficient of taxable income does not seem to have been in the early 2000s as high as in the late 1960s.[32] This stands somewhat in contrast to the conclusions in previous works, such as Riihelä et al. (2005). Nonetheless, Jäntti et al. (2010) emphasize the effects of the 1993 tax reform on income inequality in the late 1990s and early 2000s.[33]

The ∪-shaped trajectory of income inequality in the U.S., as noted by Piketty and Saez (2003), seems to apply in Finland at least from the 1960s onward.[34] However, unlike in the U.S. and many other countries, where high MTRs have been seen as a driving cause behind diminishing top income shares, income inequality grew in Finland after WWII in the 1950s and 1960s despite a significant war-time increase in the taxation of high-income couples and other war-time burdens.[35] The fact that income inequality decreased quite significantly from the mid-1960s until the 1970s can, in the first instance, be easily explained with the phenomenon known as bracket creep—fixed nominal income thresholds in the progressive tax schedule combined with a rapid increase in the taxpayers' nominal incomes.[36] However, as this article shows, this bracket creep and the associated increase in marginal and average tax rates coincided with a decrease in the average profit rate in the corporate sector, which was partially brought about by an increase in Finnish workers' nominal (and real) wages. Thus, the mechanism which brought about lowering profitability also brought about, albeit indirectly, higher tax rates and greater room for redistribution by the state and local authorities.

Atkinson, Piketty and Saez (2011) state that "[e]conomic mechanism can be very different for the distribution of labor income (demand and supply of skills, labor market institutions, etc.) and the distribution of capital income (capital accumulation, credit constraints, inheritance law and taxation, etc.), so that it is difficult to test these mechanisms using data on total incomes."[37] The idea on the relative separation between the determination of the distribution of wages and capital income misses the fact that these forms of income share the same source—value added in production—unless capital is defined, as Piketty (2014b) does, as a synonym of wealth. This means that in practice, the factors which influence the determination of real wages influence the firms' profitability and this in turn sets the limits to the firms' payout: in the long run, firms cannot pay out more than they make in profits, although short term fluctuations in profitability can be compensated for by the firms' unrestricted capitals. Indeed, as is later shown in this article, the latter seems quite plausible given the emphasis given on smooth and predicable payout policy in the relevant literature.

Although some authors have noted similarities between different countries' inequality patterns[38], the contemporary evidence tends to suggest that different countries have followed distinct inequality trajectories over time. According to Piketty and Saez (2003), income inequality in the U.S., measured in the changes in top taxable income shares, fell sharply during WWII, having declined already before in WWI and the Great Depression. U.S. income inequality remained quite stable until the early 1980s. The Reagan administration's 1986 tax reform led to a rapid increase in top income shares. Piketty and Saez claim that the subsequent rise in top income shares is attributable to an increase in top wages throughout the 1990s.[39] According to Saez and Veall (2005), the trajectories in top taxable income shares have shown a strong resemblance to those in the U.S., with top wages having apparently been a driving factor behind these changes. Unlike in the U.S., however, the top managerial wages and salaries have not relied as extensively on stock options or bonuses.[40] In the U.K., inequality, measured in the Gini coefficient of disposable income decreased

[32] Jäntti et al., 2010, 387.

[33] Jäntti et al., 2010, 411. For a pioneering contribution on 19th and early 20th century income inequality in Finland, see Hjerppe and Lefgren (1974, 109), according to whom income inequality rose in 1955–67.

[34] Piketty & Saez, 2003, 2,7,11.

[35] Hjerppe & Lefgren, 1974, 106,109. According to Hjerppe and Lefgren, income distribution became more even during WWI and WWII. They attribute this to war-time inflation which was quite high despite price controls and regulation. In this sense, Finland stands in contrast to the U.S., where a comprehensive price freeze managed to slow down the growth in producer and consumer prices to a significant degree after 1942.

[36] A similar development had taken place in Sweden after WWII (see Henrekson and Stenkula (2015, 13)).

[37] Atkinson et al., 2011, 4.

[38] For example, Atkinson & Søgaard, 2016, 266 and Saez & Veall, 2005, 847.

[39] Piketty & Saez, 2003, 17.

[40] Saez & Veall, 2005, 832, 839–840, 841.

from 1937 to the late 1970s. It recovered again in the 1980s and early 1990s. In 1995–2012, changes in the Gini coefficient have been more modest, the measure exhibiting no discernible trends during these years.[41] According to Piketty (2003), the French top 1 percent pre-tax income share fell from its pre-WWI level of 20 percent to around 15 percent in the mid-1930s. The fractile's share collapsed markedly during WWII, stabilizing around the 9 percent mark in the late-1940s and early 1950s. It declined also in the 1960s and 1970s. A modest recovery in the top 1 percent income share has taken place after the early 1980s.[42] Garbinti et al. (2018) state that the top 0.1 percent pre-tax income share increased from a trough of 2.2 percent in 1983 to around 4.4 percent in 2004. The changes in this group's share have, however, been quite modest in the 1990s and 2000s.[43]

In Germany, Dell (2007) states that both the top 1 and 0.01 percent taxable income shares declined after WWII but recovered already in the 1950s and 1960s. These top groups' shares have nonetheless remained below those of their U.K. and U.S. counterparts at least until 1998.[44] According to Atkinson and Søgaard (2016), the Danish top 1 percent taxable income share fell significantly during WWI and continued to decline until the 1980s. The percentile's share has increased modestly in the 1990s and early 2000s.[45] In Denmark, a dual income tax system was introduced in 1987. In Sweden, following Roine and Waldenström (2010), the share of top 1 percent taxable income declined until the early 1980s with a fairly significant increase taking place thereafter in the late 1980s and 1990s. The authors emphasize the role of capital gains which have become a prominent source of income for top taxpayers.[46] A dual income tax system was put in place in Sweden in 1990–1. In Norway, the top 0.1 and 1 percent taxable income shares fell from around 2.8 and 9 percent, respectively, in 1948 to slightly below one and 4.5 percent in the early 1980s. Both of these fractiles' shares have recovered from the early 1990s onward.[47] It is worth noting that a dual income tax system was stipulated in Norway in 1992, a year before Finland adopted the system.

Other interesting cases include Japan, where the top 1 percent taxable income share collapsed during WWII, but has not seen a major recovery in the late 20th or early 21st centuries. Moriguchi and Saez (2008) claim that this shift was caused by war-time regulation and attrition, such as a dividend-to-equity ratio gap, regulation of top executives' remuneration and a significant increase in taxes during 1937–45. Further lowering in the top 1 percent share was brought about by the introduction of a progressive property tax in 1946–51 as well as a major land reform in 1947–50. In the vein of Piketty (2003), the authors thus claim that exogenous shocks have been the major cause behind lowering income inequality during and after the war.[48] Spain is another example of a country where the top fractiles' income shares have not rebounded to previous late 19th or early 20th century levels. According to Alvaredo and Saez (2009), the top 0.01 percent pre-tax income share was around 1.4–1.5 percent before the Civil War (1936–9) and around 0.5 percent in the 1960s. From the early 1980s onward, the top 0.01 percent share has risen to around 0.8 percent at the close of the 20th century, exhibiting, however, no continuous trends.[49] Unlike in Canada, where geographical proximity and interconnectedness with the U.S. seems to have caused similarities in the countries' top income share development, the two Iberian countries, Spain and Portugal, stand apart in their inequality development. According to Alvaredo (2009), the top 0.1 before-tax income share remained relatively stable around four percent from 1936–9 to the 1960s. From 1969–70 onward, the fractile's share declined markedly, having descended to around 0.5 percent by 1981–2. From the late 1980s onward, the top 0.1 percent before-tax share had risen to around two percent by the early 21st century. Like in many other countries, including the U.S. and Canada, rising top wages seem to have been the

[41] Atkinson & Jenkins, 2020, 262–263.
[42] Piketty, 2003, 1012.
[43] Garbinti et al., 2018, 69.
[44] Dell, 2007, 367,377.
[45] Atkinson & Søgaard, 2016, 274.
[46] Roine & Waldenström, 2010, 307.
[47] Aaberge & Atkinson, 2010, 453.
[48] Moriguchi & Saez, 2008, 720, 726–727, 732–733. According to Piketty (2003, 1034), the change in the top fractiles' income share was, at least in France, "an accidental, capital income phenomenon (for the most part)".
[49] Alvaredo & Saez, 2009, 1151–1152. Like Piketty (2003), the authors cite "large but accidental shocks" as the driving cause behind changes in the top income shares.

driving factor behind this rise. Interestingly, Alvaredo believes that emigration may have been a potential cause behind the lowering top 0.1 percent share, as over 1.8 million emigrants left the country in 1950–75.[50] Although he does not go into the actual causal mechanism between these variables, it can be speculated that a diminishing labour force may have caused real wages to rise, subsequently squeezing the top income earners' shares by diminishing profit margins.

The previous short review has shown that the given mature capitalist economies have differed in their top income share and inequality patterns quite significantly. Different researchers have pointed to different causes behind the discovered patterns. In some countries, including the U.S., U.K., Canada, Sweden and Portugal, top income shares have risen significantly during the latter half of the 20th century. In others, such as France, Japan, Denmark and Spain, top income shares and inequality have remained more stable. Finland, according to Riihelä et al., has been prominently in the former camp, having experienced a rapid increase in top fractiles' income shares in comparison to many other countries (Russia, perhaps, being another, more extreme example of a similar development during the 1990s[51]). In many countries, top income shares seem to have diminished during WWI, the Great Depression of the 1930s and WWII. Much emphasis has been paid on taxation, especially the rise in top MTRs during the first half of the 20th century. Likewise, many authors have emphasized the cuts in these tax rates as a major cause behind rising inequality in the latter half of the century. However, not much attention has been paid on changing profitability or returns to capital. Many authors, it seems, have followed Piketty (2003; 2014b) and taken these variables as given or even as constants. Indeed, taxation has understandably received great attention against this assumption, as "fixing" profitability puts an obvious weight on the distributive effects of taxation both in terms of the elasticity of taxable income (ETI) and the long-term cumulative effects on financial wealth concentration and subsequent income distribution. This article by no means claims that changes in top marginal taxation have been irrelevant. Instead, it is argued that by focusing on profitability and payout helps to contextualize the role of taxation in shaping both the current after-tax and the future before-tax distributions of income and wealth.

One key link in the chain of causation running from profitability to income distribution is payout, or the firms' propensity to pay. If this propensity is susceptible to changes in either the firms' own or their owners' taxation, it may well be that changes in profitability itself are not sufficient to explain the changes in the owners' income and the distribution among households or individuals as a whole. Therefore it is important to have a view on the literature on firms' payout and propensity to pay.

A pioneering work in the literature on profit payout is Lintner (1956). This study surveys U.S. firms' financial top executives, asking them about their payout policies relative to shareholder taxation and other variables of interest. Lintner establishes that firms have emphasized continuity and stability over short-term fluctuations in payout. The shareholders' taxation, according to Lintner, has had an impact on the firms' dividends, although this may reflect the relative stability of the U.S. tax system at the time.[52] Lintner formalizes his hypothesis in the expression $\Delta D_{it} = \alpha_i + \beta_{1i} D_{i,t-1} + \beta_{2i} E_{it} + u_{it}$, where D stands for dividends and E the firms' profits. As is shown in this brief overview, this 1956 Lintner study has formed the backbone for many subsequent studies and has, with exceptions, held relatively well over time. One of the early works supporting Lintner's model is Fama and Babiak (1968) who find empirical support for the stability in firms' payout expressed in the Lintner equation.[53] The Lintner thesis has also been supported from the viewpoint of the firms' investments. Fama (1974) finds no systematic evidence of a positive or negative relationship between dividends and investments which means that these questions have been treated somewhat separately.[54] The Lintner thesis of stable payout has found more recent support in the survey by Brav et al. (2005) who conduct a survey among U.S. top financial executives on their payout policies. Brav et al. state that "beyond

[50] Alvaredo, 2009, 409, 410–411, 412.

[51] Novokmet et al., 2018, 212. According to Novokmet et al., the top 1 percent pre-tax income share was around 4 percent in 1980. After the collapse of USSR, it had risen to around 25 percent by 2001. This has been an extreme increase in inequality by contemporary standards and clearly overshadows all similar developments in mature capitalist countries in Europe and North America.

[52] Lintner, 1956, 97,99–100,107.

[53] Fama & Babiak, 1968, 1160.

[54] Fama, 1974, 312,315,316.

maintaining the level of dividends per share, payout policy is a second-order concern; that is, increases in dividends are considered only after investment and liquidity needs are met". Furthermore, taxes seem also to be a "second-order policy concern". The surveyed financial executives prefer stock repurchases over dividends for their flexibility; indeed, "many of those firms that pay dividends wish they did not", for the executives believe there to be very little benefit in raising dividends relative to the penalty received should dividends be reduced. These findings seem to support the Lintner (1956) thesis quite well, although the geographical scope and time period may obviously have their effect.[55]

A major discovery regarding the firms' payout globally has been the so-called death of the dividends first noted by Fama and French (2001) in their famous study on U.S. listed corporations' payout in 1978–99. The authors find that around 67 percent of NYSE, AMEX and NASDAQ listed firms paid dividends in 1978. In 1999, this figure had declined to around 20 percent. A major driver behind this change has been the companies' worsening profitability. Still, the firms that have continued to pay dividends have done so in a rather consistent manner, again supporting the Lintner thesis.[56] Fatemi and Bildik (2012) find support for the Fama and French thesis on a more global scale over the 1985–2006. They find that dividends have been highly concentrated among a few large payers. This applies also to Finland, where the top 10 dividend-paying, listed companies have accounted for the vast majority of dividends paid over this time period. Furthermore, average payout ratios have also declined with a few exceptions, such as Brazil, Denmark and Sweden.[57] These findings have been corroborated by von Eije and Megginson (2008) for the EU15 countries in 1993–2005. DeAngelo et al. (2004) caution against the Fama and French (2001) interpretation. They state that while the share of dividend-paying companies has indeed declined, the remaining payers have increased their dividends over time sufficiently to compensate for this change. DeAngelo et al. also emphasize the stability of the firms' payout ratios, the average among listed U.S. corporations having been 37.9 percent in 1978 and 35.5 percent in 2000 based on a single year's earnings.[58] Although the evidence on declining dividend payout propensity captures a long-term trend in many countries, this does not mean that exogenous factors, such as tax reforms would not have had an impact. Chetty and Saez (2005) claim that the Bush government's dividend tax cut in 2003 caused firms to increase they payout significantly, having ostensibly postponed their payment in anticipation of this reform.[59] It is, however, uncertain that this or comparable reforms would have necessarily have had a longer-term impact on the firms' payout ratios.

One of the main reasons behind this decline in the firms' propensity to pay dividends—if not their outright death—has been the rise in stock repurchases since the 1980s and 1990s. Dittmar (2000) states that the growth in repurchases in the U.S. may have been due to the rising popularity of stock options; that is, firms have chosen to counter this expansion or dilution in ownership concentration by repurchasing stock. Like Brav et al. (2005), Dittmar finds support for the firms' alleged preference for repurchases over dividends on grounds of flexibility.[60] The so-called tax clientele effect, *i.e.*, the claim that prominent shareholders' taxation has had an influence on the firms' payout composition (dividends v. other forms of payout), has received mixed support in the literature. An early study on the topic is Dann (1981), who does not find unrestricted support for this hypothesis in the U.S.[61] Barclay et al. (2009) do not find either that major shareholders (blockholders) would have had a major influence on the firms' payout, yet firms which have had major blockholders seem to have had some preference for repurchases over dividends.[62] In Finland, Liljeblom and Pasternack (2006) find that foreign owners have preferred repurchases over dividends as they have not enjoyed the cancellation of double taxation via the dividend imputation system as domestic owners have until 2004.[63]

[55] Brav et al., 2005, 484–485,503–506,520.
[56] Fama & French, 2001, 4–5,10,14.
[57] Fatemi & Bildik, 2012, 663,667.
[58] DeAngelo et al., 2004, 426,452.
[59] Chetty & Saez, 2005, 793.
[60] Dittmar, 2000, 332,333,439.
[61] Dann, 1981, 137.
[62] Barclay et al., 2009, 2444.
[63] Liljeblom & Pasternack, 2006, 23. The dividend imputation system was introduced in 1990 and cancelled in 2004 after it had been found incompatible with EU law on grounds of an unfair tax advantage for domestic owners.

More theoretically, the 1956 Lintner study inspired the classic 1961 study by Miller and Modigliani on the relationship between firms' dividend payout and stock prices, the so-called bird-in-hand or dividend irrelevance hypothesis. According to Miller and Modigliani (1961), "[i]f investors behave rationally ... a change [in dividend policy] cannot affect market valuations".[64] Albeit indirectly, this lends support to more recent studies on the secondary importance of dividend payout relative to the firms' financial needs (*e.g.*, Brav et al. (2005)). The 1961 Miller and Modigliani article has prompted many researchers to test this hypothesis empirically. Friend and Puckett (1964) find that an increase in dividends seems to have had a lesser effect on stock prices than had been previously established by Graham and Dodd (1934).[65]

A more evolutionary or historical theory on the firms' payout practices is Mueller's (1972) life-cycle theory. According to this theory, younger firms have a lower propensity to pay than their mature, established counterparts. Newly-founded firms are often growing rapidly and need their profits for investments. Older firms which have a more secure footing in the market may initiate payouts or increase them as they run short of new, promising investment opportunities, preferring to pay out profits for owners who then may seek new investments elsewhere.[66] Andersson et al. (2016) apply this theory to the Swedish paper and pulp industry in 1945–77. They find that dividends made up to 50 percent of this industry's profits in 1945–55, but in the late-1950s the payout ratio grew substantially to more than 80 percent. They find this as an evidence of worsening profitability: as the industry has experienced deteriorating profitability, is has been found better to reinvest the remaining profits elsewhere, thus propping up the payout ratio.[67] A separate but related, longer-term study is Foerster and Sapp (2006), who analyze the history of the Bank of Montreal's dividend payout policy in 1818–2003. Unlike Andersson et al. (2016) who find a significant change in the paper and pulp industry's payout ratio, Foerster and Sapp discover that the bank's payout ratio has actually diminished over time, having been up to 100 percent in the 1920s and 1930s and having contracted significantly during WWII.[68] Though only little can be said on the grounds of these studies on the explanatory power of Mueller's life-cycle theory, it may well be that the firms' more general willingness to retain a stable payout policy may have lead to increasing payout ratios when profitability has deteriorated and lowering ratios as profits have recovered. Indeed, this seems to have been the case in Finland, at least on average, as is seen later in this article.

Although by no means complete, this short review of studies shows that many researchers have supported either explicitly or implicitly the 1956 Lintner thesis on payout stability. Although the composition of payout (dividends, repurchases and others) seems to have altered over time, potentially on the grounds of different incomes' tax treatment, the overall ratio of payout to a given denominator (profits, stock prices) has remained relatively stable over time. As Brav et al. (2005) have stated, firms have been conservative in their payout policies, preferring continuity over reductions in payment and abstaining from dividends instead of favouring them over other forms of payout, or payout at all.

One of driving questions in relation to taxation and income distribution has been the question of income shifting and elasticity of taxable income. In other words, to what extent have the late-20th century tax reforms—including the 1986 U.S. reform and the Nordic dual income tax reforms of the late 1980s and early 1990s—resulted in "mere" income shifting between tax bases (*e.g.*, between corporate and individual, or wage and capital income bases) or whether they have caused "real" changes in taxpayers' behaviour, such has a greater willingness to work. This latter question has gone under the term elasticity of taxable income (ETI). The question of income shifting, in particular, has been an important part of the aforementioned taxational explanation in Finland since the early 2000s.

The 1986 U.S. tax reform lowered top MTRs substantially and created an advantageous tax position for partnerships

[64] Miller & Modigliani, 1961, 425.
[65] Friend & Puckett, 1964, 679–680.
[66] Mueller, 1972, 200.
[67] Andersson et al., 2016, 282,290.
[68] Foerster & Sapp, 2006, 1328–1329.

(the so-called Subchapter-S corporations), which are not treated as separate tax subjects but whose income is taxed at their owners' level. According to Slemrod (1995), this reform brought about significant income shifting as partnerships grew in popularity relative to corporations.[69] Indeed, the surge in top 1 or 0.1 percent income shares witnessed by Piketty and Saez (2003) and others is a showcase example of the effects a major tax reform may have on income distribution via shifting between tax bases. According to an extensive survey of ETI literature by Saez et al. (2012), the empirical estimates of the ETI both in the case of this particular reform and many others have varied significantly. They thus seem highly contingent on the data, time period, model specification and other identification questions at hand. Like Slemrod (1995), Saez et al. conclude that the 1986 tax reform's effects on top taxable income shares (*e.g.*, the top 0.01 percent) can hardly be interpreted as a supply-side effect and rather a consequence of income shifting. Furthermore, "[e]stimates of the elasticity of taxable income in the long run (i.e., exceeding a few years) are plagued by extremely difficult issues of identification, so difficult that we believe that there are no convincing estimates of the long-run elasticity of reported taxable income to changes in the MTR", according to Saez et al.[70] The 1986 U.S. reform is important for this article on two grounds. First, the reform acted as an impetus for the dual income tax reforms in all Nordic countries in the late 1980s and early 1990s. Second, it has been used extensively as a reference point or benchmark in the empirical literature assessing the relation of income shifting to ETI in these countries.

Pirttilä and Selin (2011) study the income shifting effects of the 1993 income tax reform in Finland. They use panel data built around the Finnish 1992 IDS and connect this data with tax records from 1995. They find that self-employed individuals have been more likely to engage in income shifting than other social groups. One of the issues with the Pirttilä and Selin study is the time period: the 1992 data is from the middle of the 1991–3 depression, the worst economic crisis in Finland since the 1930s. In addition, the 1995 data point is from a period when firms and taxpayers were still recovering from the depression with a high level of unemployment and ongoing bankruptcies, mergers and other restructuring blurring the image.[71] It is important to bear in mind that this limitation concerns also other assessments of this 1993 tax reform's effects on, for example, effective MTRs. In a more recent study which focuses on Swedish taxpayers in 2001–11, Alstadsæter and Jacob (2016) find that closely held corporations' owner-managers have been particularly likely to engage in income shifting between tax bases, shifting on average around 6 percent of their total gross income from labour to capital income during this period.[72] Although the Alstadsæter and Jacob time period does not cover the 1990–1 dual income tax reform in Sweden, it gives a point of comparison on the scale of income shifting in other countries and in different time periods. Alongside income shifting, closely held corporations and holding companies, in particular, have presumably been used for outright tax avoidance in Finland, as in many other countries, although the scale and distributional effects of this phenomenon are largely unknown at the time.[73]

Both Finland and Norway returned to a partial double taxation of dividends in the early 2000s. In Finland, the change was stipulated in 2004 when the previous dividend imputation system (*avoir fiscal*) was cancelled. Although double taxation was not introduced in full, there is evidence of significant income shifting in both countries. Alstadsæter and Fjærli (2009) find that the 2006 return to partial double taxation led to an increase in dividends before its stipulation, as the reform was announced already in 2004. After the reform, dividends contracted significantly. The authors note that the impact of the 2006 tax reform is nonetheless hard to verify, as the firms' profitability was changing throughout the period.[74] Harju and Matikka (2016) find a similar effect in Finland in 2004–5. Their data comprises of privately-held corporations which is comparable to the 75,000+ firm panel used by Alstadsæter and Fjærli. Harju and Matikka find that the owners of closely-held private corporations have been more likely to engage in income shifting than the rest of

[69] Slemrod, 1995, 177,178,179. The corporate income tax rate was reduced from 46 to 34 percent, whereas the top personal tax rates fell from 49–50 percent to 28 percent, that is, below the corporate rate "for the first time in the history of the U.S. tax system" (ibid., 178).

[70] Saez et al., 2012, 37–39,43.

[71] Pirttilä & Selin, 2011, 134–135,137,139.

[72] Alstadsæter & Jacob, 2016, 694–695.

[73] See Alstadsæter & Jacob, 2012 for a recent estimate on the scale of tax avoidance in Sweden. The authors find that around 0.6 percent of the Swedish population has exploited legal tax avoidance opportunities around the time of writing, and that holding companies have been an important instrument for this practice.

[74] Alstadsæter & Fjærli, 2009, 572,577,589.

the population. In this sense, their results are in line with Alstadsæter and Fjærli's findings from Norway. Harju and Matikka acknowledge, however, that their data suffers from an unknown degree of survivorship bias, as the 2002–8 panel includes only businesses which did not fail during these years.[75] In addition to income shifting, the 2005 Finnish tax reform seems to have influenced the timing of dividend payments especially among non-listed corporations whose tax treatment changed the most in 2004–5. According to Kari et al. (2008), although firms increased their dividend payouts in anticipation of the reform, it did not have an effect on their investments. Instead, some firms seem to have accumulated debt instead to fund their pre-reform dividends.[76]

The literature on income shifting and payout timing effects seems to suggest that tax reforms such as the 1993 Income Tax Act in Finland may have had short-term impacts on the firms' payout and perhaps longer-term ones on income shifting. The Finnish studies cited thus far have mainly focused on relatively short time periods (*e.g.*, 1992–5 and 1999–2004). The increase in Finnish households' and taxpayers' income inequality was likewise quite brief, from the mid-1990s until the early 2000s. In this sense, the late-20th century Finland stands apart from countries like the U.S., U.K. and Japan which have exhibited either longer periods of increasing inequality or relative stability. Thus, the question of increasing income inequality after the 1991–3 depression is not one of these studies' time period than a question of accounting for an underlying factor, profitability, which has been largely missing in the taxational explanation literature as well as the studies on income shifting, ETI and payout.

The question of profitability and its trajectories feature prominently in classical political economy and its Marxian critique. Smith (2015), Ricardo (1932), Mill (2008) and Marx (2015) all held the view that profitability would deteriorate gradually over time. For Smith, this was to be mostly brought about by competition. For Ricardo, a rise in the real wages due to an arithmetical growth in food production and an exponential growth in population. For Mill, the exact causes are more ambiguous, yet the tendency is there. In Marx, much emphasis is given on the conditionality of this deterioration. In *Capital*, Volume 3, Marx goes through a number of offsetting countertendencies to the tendency of the rate of profit to fall. As noted by Cámara Izquierdo (2007), Marx's theory includes both a cyclical, short-term component as well as a long-term component. Fluctuations in real wages, unemployment and investments may lead to temporary recoveries in profitability even if the long-term trend would exhibit a downward trajectory. Much debate has been waged over the accuracy and consistency of Marx's theory, including the early contributions by Eugen von Böhm-Bawerk, Nobuo Okishio and Paul Roemer.[77] This article does not delve into these debates and chooses to approach the issue from an empirical viewpoint: in other words, how has profitability developed over time and how this relates to income distribution and taxation. As such, the question of long-term developments in profitability are set to the side; what suffices instead is the evidence on the *movements* in profitability prior to and after the 1993 tax reform.[78]

An early empirical study of the development of the "Marxian" rate of profit is given in Gillman (1958), who applies Marx's theory on U.S. national accounts data. This approach was developed further by Mage (1963) in his now-famous yet unpublished dissertation. Weisskopf (1979) studies the rate of profit in the U.S. non-financial corporate business sector over the 1949–75 period. Although he finds that the rate of profit exhibits cyclical upswings and downturns, it has nevertheless been on downward-sloping trajectory from the late-1940s onward. Weisskopf attributes this trend to rising real wages and the worsening of the U.S. terms-of-trade, among other factors.[79] Moseley (1991) finds a statistically significant, negative time trend in the U.S. average rate of profit in the post-WWII period, thus supporting

[75] Harju & Matikka, 2016, 127,129.

[76] Kari et al., 2008, 190,191–192.

[77] Kliman (2007) provides a good overview of the history of the debates around the question of the so-called transformation problem and the question of the consistency of Marx's argumentation in *Capital*.

[78] As a caveat, an interesting take on the Okishio theorem and the Roemer critique is given in Cottrell and Cockshott (2007). They view the question of the choice of production technique from the viewpoint of demographics; in other words, the authors ask what makes capitalists to adopt techniques that will in time lower their rate of profit given a slowdown in population and labour force growth and an ensuing dearth of free labour-power. According to the authors, capitalists do not "choose" the technique that will yield them smaller (relative) profits—they are instead *compelled* to do so under the circumstances given which can, of course, change over time.

[79] Weisskopf, 1979, 349,369–370.

some of Weisskopf's findings.[80] Shaikh (1992) studies the rate of profit as one of the causes of long waves in U.S. manufacturing in 1899–1984. He discovers that while the rate of profit has seen periodic, medium-term recoveries, it has shown a lowering trajectory over this period.[81] More recent studies of the rate of profit in the U.S. include Kliman (2012) who finds a broadly similar development in the the non-financial corporations' profitability in the 1929–2009 period. Especially noteworthy is the emphasis Kliman puts on the stagnation of profitability since the late 1970s.[82] More recent evidence on the U.S. rate of profit has also been given in Shaikh (2016), who shows a similar stagnation in the U.S. profit rate after a modest recovery in the early 1980s.[83]

In the U.K., Cockshott et al. (1995) note a decline in the average rate of profit from the late 1950s and early 1960s until a period of crisis in 1975–9. After this, the profit rate recovered and settled at a higher level in the 1980s.[84] This supports an earlier finding by Reati (1986) who also refers to more mainstream evidence on the same phenomenon in the 1960s and 1970s. Reati's findings are, however, limited to the British industries and not the entire enterprise sector.[85] Reati (1989) has also studied the rate of profit in French manufacturing. He finds that the after-tax rate of profit remained quite stable from the late 1950 until the mid-1960s. The rate of profit rose significantly in the late 1960s and early 1970s. It started to fall in 1972–3 and did so to quite an extent until around 1976 after which its changes have been modest until the early 1980s.[86] Castex (2011) provides further evidence on the average profit rate in France from the late 1980s until the financial crisis of 2007–8, noting a declining trend since the early 1990s.[87] Cámara Izquierdo (2007) studies the rate of profit in Spain in 1954–2001. He observes both short- and long-term trends in its development. The profit rate has gone through a number of peaks and troughs. In 1960–3, the profit rate reached its post-1954 peak and declined significantly in 1965–7 and from the late 1960s to the early 1970s. The profit rate reached its lowest post-1954 values in 1974–9. It recovered again in 1983–5 and went through another slump in 1989–93. From the early 1990s until 2000, the profit rate recovered once again, although it has not reached its early-1960s level during this time.[88]

Edvinsson (2010) has conducted a long-term study on the movements of the rate of profit in Sweden in 1800–2005. Edvinsson does not observe the profit rate directly but rather via its perceived determinants. He finds that the gross and net surplus to labour income ratios (a close proxy to Marx's rate of surplus value) has remained relatively trendless from 1850 until the early 1920s with a peak in the 1870s and during WWI. Both ratios declined from the early 1940s onward with a trough in the late 1970s and early 1980s. Since then, the ratios have recovered, albeit unevenly, until 2005.[89] This recovery coincides with an increase in top fractiles' income share, as noted by Roine and Waldenström (2010). Vaona (2011) studies the relation between profit rates, income distribution and structural and technical change in Denmark, Finland and Italy from the 1970s and 1980s until the early 2000s. Vaona notes that the profit rate was relatively stable in Finland during the 1980s and dipped in the early 1990s during the depression. He also acknowledges its increasing trend until around 2001. In Denmark, the rate of profit has remained quite stable during the 1970–2006 period. In Italy, the profit rate increased slightly from the early 1980s until the turn of the decade, and again after the mid-1990s. In the early years of the new millennium, the profit rate has declined again to its early-1990s level. These developments coincide with those in income distribution—whereas there was a significant shift in the wage-to-capital income ratio in Finland, these ratios remained quite stable in both Denmark and Italy. This leads Vaona to conclude that a "substantial" redistribution from wage to profits has been necessary for the profit rate to grow. Without such a redistribution, the profit rate has declined.[90]

[80] Moseley, 1991, 76.
[81] Shaikh, 1992, 185.
[82] Kliman, 2012, 74,76,77.
[83] Shaikh, 2016, 65–66.
[84] Cockshott et al., 1995, 120. See also Cockshott et al. (2010) on the rate of profit in other countries, such as Japan and South Korea.
[85] Reati, 1986, 537–538.
[86] Reati, 1989, 15.
[87] Castex, 2011, 12.
[88] Cámara Izquierdo, 2007, 546.
[89] Edvinsson, 2010, 475.
[90] Vaona, 2011, 252,254,255.

Marx's law of the tendency of the rate of profit to fall in *Capital*, Volume 3, has also been tested econometrically. Basu and Manolakos (2013) apply time-series methods for testing whether there has been a trend in the U.S. rate of profit in 1948–2007. They also account for the various counter-tendencies (*i.e.*, factors which may have offset a decline), such as an increase in the rate of exploitation (*i.e.*, the annual deviation of the productivity of labour from its long-term trend), a deviation of the wage rate from the value of labour-power, unemployment (overpopulation), the price of constant capital (that is, machinery, plant, equipment, patents, etc.) as well as a deterministic time trend. Basu and Manolakos find support for Marx's law, noting a significant negative trend in its long-term development over this period.[91] Interestingly, as noted by Piketty and Saez (2003) and a host of other researchers, top income shares and overall income inequality have risen in the U.S. despite the fact that the average rate of profit seems to have either fallen or stagnated in the early 1980s. This may purport that other factors, such as the rise in stock prices and payout via top managerial compensation (bonuses, stock options, and so on) as well as income shifting after the 1986 tax reform may have accounted for this change. A more recent time-series contribution on the question of the rate of profit is Trofimov (2017), who also tests for the presence of a time trend in 21 countries using the Penn World Tables data for the post-WWII period. Trofimov observes a positive trend in 11 countries (*e.g.*, Belgium, Finland and Sweden) and a negative trend in 10 countries (*e.g.*, Australia, Canada and the U.S.), although the significance of these trends has varied extensively. In Finland, Trofimov observes a mean-reverting tendency.[92]

Profitability has, of course, received attention in other fields as well. In Finland, Haavisto and Hagfors (1973) study the profitability of industries in the 1960s. The authors pay emphasis to the rising share of labour costs and a subsequent worsening in profitability especially in the early 1960s.[93] The question of profitability has received attention also after the mid-1970s recession amongst Finnish economists and specialists in economic policy.[94] One impetus for this discussion has been Feldstein and Summers' 1977 paper on the rate of profit in the U.S. In the paper, Feldstein and Summers observe "a strong cyclical pattern" in the rate of profit as it fell from 1948–51 to 1957–8. Although the profit rate has varied in the 1960s and 1970s as well, its late-1970s level has been "well below the postwar averages".[95] More recently, Pitkänen and Sauramo (2005) have noted that the average profitability in Finnish manufacturing has been in the year 2000 at its highest level since 1951, when the so-called Korean boom brought many firms peak profits via significant increases in export prices.[96] Although these authors' viewpoints have differed from their Marxian colleagues' contributions, the observed phenomenon has been the same. As such, it is understandable that their conclusions have exhibited a degree of similarity. After the 1991–3 depression, a number of authors have noted the significant recovery in Finnish businesses' and corporations' profitability. Pohjola (1996) states that Finnish labour productivity increased rapidly after the depression. For Pohjola, a major structural cause for the depression had been a low productivity of capital. As the growth rate of real wages has been modest after the depression, this has led to a redistribution of income from wage earners to recipients of capital income. Pohjola emphasizes additionally the shift towards a greater intensity of work as a potential factor behind the companies' improving profitability.[97] Maliranta (1997) uses production unit level micro data on Finnish industries' productivity in the 1990s. He discovers that aggregate-level productivity has improved after the depression wiped out a number of lower-than-average productivity units and workplaces.[98] In a more recent study, Maliranta (2002) observes that productivity has been enhanced at the micro level in units where the labour share of the value added has been lower than average.[99] The same phenomenon can be observed via other circumstantial evidence. Kyyrä (2002) studies the change in functional income distribution in Finland in the 1990s. Kyyrä finds that the wage–capital ratio remained relatively stable for a long time until the late 1980s. After the 1991–3

[91] Basu & Manolakos, 2013, 79–80,86,92.
[92] Trofimov, 2017, 95–96,104,111.
[93] Haavisto & Hagfors, 1973, 46.
[94] For example, Airaksinen et al., 1978; Alho, 1981; Koskenkylä, 1981.
[95] Feldstein & Summers, 1977, 217.
[96] Pitkänen & Sauramo, 2005, 11.
[97] Pohjola, 1996, 13,127,147.
[98] Maliranta, 1997, 506.
[99] Maliranta, 2002, 13.

depression, the ratio diminished markedly in capital's favour to levels not observed since the 1950s. Kyyrä observes that this shift has been caused mostly by industrial restructuring, as the changes at the firm level have been more mundane. All in all, productivity and profitability have varied quite extensively between industries, although the productivity and profitability averages of the weakest decile of firms has been further above the loss line than before the depression.[100]

This short and incomplete survey of previous literature shows that profitability has taken different courses in different countries and time periods. Finland has been a relative latecomer in the "game" of recovering profitability. In many European countries, such as Sweden, Spain and the U.K., the average profit rate in the corporate and business sector or manufacturing has started its recovery already in the 1970–80s. The same has applied also to income inequality, although not without caveats. The payout literature thus reviewed seems to support the claim that changes in profitability should have a relatively direct impact on the owners' income, given the stability and conservatism in the firms' payout policies. Taxation, of course, adds another level of complexity to the issue. Has income taxation influenced both the form and level of payout, or has its impact been limited to the former? In other words, has taxation caused firms to favour salaries, bonuses, stock options and fringe benefits over dividends and interest at times, and vice versa? To put it differently still, has income shifting also happened at the firms' end and has taxation also influenced the firms' financing, *i.e.*, the debt-to-equity ratios? Although this article can only claim to answer these questions in a limited fashion, it is hoped that the questions asked and the answers given can inspire further research on the topic.

4 Profitability and payout in Finland from the 1960s until the early 2000s

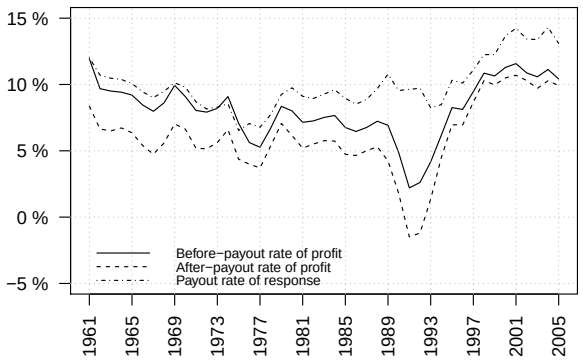


Figure 1: Before- and after-payout rates of profit and the payout rate of response, 1961–2005

Sources: see Appendix
Note: the older, SNA68-based profit rate series have been chained with the newer ESA2010 series from 1975 backwards. The payout rate of response has been calculated on the basis of these two series

[100] Kyyrä, 2002, 2,49,54.

Finnish corporations' and businesses' profitability has, on average, gone through a number of trend shifts in 1961–2005. There have been both short-term fluctuations covering the time span of two to three years as well as longer, decades-long trends. The before-payout rate of profit decreased, albeit unevenly, throughout the 1960s and early 1970s. The 1975–7 recession—a delayed response to the 1973 oil crisis[101]—caused profitability to contract quite significantly. Although its recovery in 1978–9 was almost equally as rapid, the profit rate did not break away from its previous longer-term trend, even though its deterioration slowed down to an extent in the 1980s. The profit rate collapsed right before and during the 1991–3 depression, the worst post-WWII economic crisis in the country and possibly comparable to the 1930s Great Depression. The immediate causes of this crisis lay in factors such as the devaluation of the FIM after a few years' period of strong exchange ratios and the consequent increase in the value of may firms' and households' foreign-currency debts and an interest rate panic. The fact that the average rate of profit had been diminishing for at least three decades prior to the crisis must, however, have been an underlying factor which made the crisis worse in its effects than it would have otherwise been. Indeed, the number of bankruptcies, mergers and layoffs reached unprecedented levels during and after this three-year depression.[102] As noted by Maliranta (1997; 2002) and Kyyrä (2002), the profit rates and productivity of the previously profitable firms has not necessarily increased that tremendously after the depression. Instead, the average (before payout) rate of profit has increased as many of the least profitable firms have gone bust during or after the crisis. This applies, among others, to firms in the Finnish textile industries. These factors, as well as a slowdown in the growth rate of the real wage per capita relative to the firms' surpluses has also enabled the latter to reap much higher profits in the late 1990s and early 2000s than during the previous decades. Although the growth rate of the per capita real wage had slowed down already after the 1975–7 recession, this change had not been matched by a similar increase in the firms' surpluses. Indeed, as the following figure shows, both the real wage and the firms' surplus grew at approximately the same rate throughout the 1980s. What then made the rate(s) of profit to decline was the increase in the so-called organic composition of capital, namely the change in the ratio of the value of fixed capital measured at some base year's value to the value of a unit of labour-power (wages, salaries, fringe benefits, etc.) at the given base year's value.[103] The series have been indexed at 1961.

[101] At the time, Finland purchased most of its crude oil and other petroleum commodities from the Soviet Union at prices which were less responsive to the price and supply shock caused by the OPEC countries after the Jom Kippur war. As such, the Finnish GDP growth contracted not due to a direct oil price shock but due to a slowdown in western export demand.

[102] The depression sparked off a number or research projects on its causes and consequences. Kiander and Vartia (1998) provide a good summary of the "lessons" of the crisis. The question of pre-crisis profitability does not, however, feature prominently in this research. Instead, much emphasis has been paid on the role of fiscal and monetary policies in the 1980s.

[103] This particular formulation of Marx's (2015) admittedly ambiguous definition of the organic composition is from Shaikh (1990, 304–306) who expresses it in $OC = TC/v_0$, where TC stands for the so-called technical composition of capital and v_0 is the value of the unit of labour-power at some base year's value, the latter being a scalar for the change in the former. The technical composition of capital is expressed in $TC = \sum_j \lambda_{j0} k_j$, where λ_{j0} is the unit value of the means of production (or fixed capital in this particular case) and k_j is the j-th means of production per worker at some base year. The base year in these estimations is 1961. In other words, the organic composition of capital in all its complexity seeks to measure the change in the ratio of fixed capital to a base year's unit value of labour power. It is a measure for the "mechanization of labour process" as defined by Shaikh in line with Marx's original formulation.

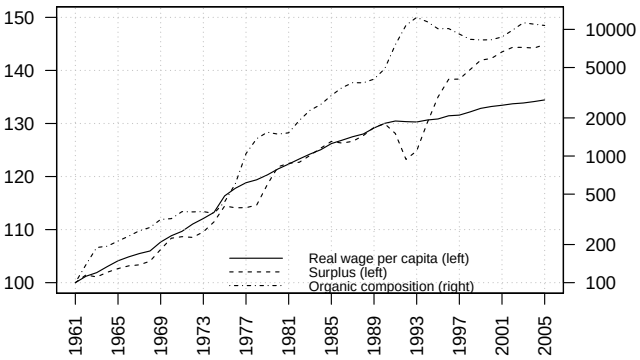


Figure 2: Real wage per capita, surplus and the organic composition of capital, 1961–2005 (1961 = 100)

Sources: see Appendix
Note: the older, SNA68-based time series on the number of workers and their wages, the stock of fixed capital as well as the firms' surplus have been chained with the newer ESA2010 series from 1975 backwards. The real wage has been obtained using the consumer price index (1951:10 = 100) produced by Statistics Finland (2021d)

Another noteworthy phenomenon is the slowdown in the growth rate of the organic composition of capital after the 1991–3. This coincides with a decrease in the firms' average investment rate. As Pitkänen and Sauramo (2005) have noted, Finnish firms have began to incrase their foreign investments at the expense of domestic ones in the 1990s. Although the origins of this phenomenon predate the depression, the domestic investment rate did not decrease or the growth rate in the organic composition of capital stagnate before the 1990s.[104] These findings obviously point only to some of the causes behind the changes in the firms' profitability throughout the period.

This article does not delve deeper into the causes behind the observed changes in profitability. What is more important at this stage is the relationship between profitability and payout. Figure 1 showed already that the so-called payout rate of response has varied at times relative to the before- and after-payout profit rates. Given the way this former metric is constructed, it already points out to certain changes in the firms' payout ratio, as the response rate has been certainly higher in the 1990s and early 2000s than in the 1960s and early 1970s. This is indeed what can be discerned from the following figure on the firms' payout ratio. This ratio has been defined in a few alternative ways.

[104] On the emergence of foreign direct investments from Finland, see Kinnunen (1990; 1991) and Haaparanta (1990).

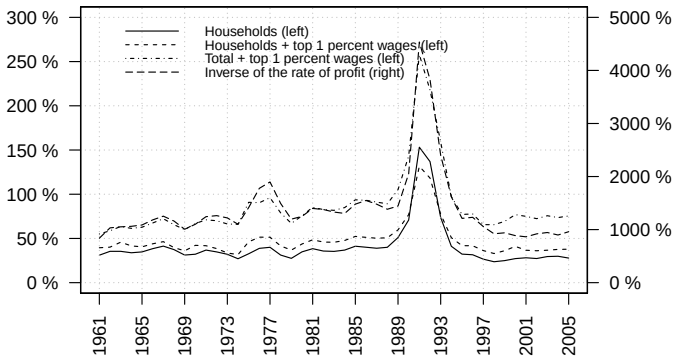


Figure 3: Payout ratios and the inverse of the before-payout rate of profit, 1961–2005

Sources: see Appendix
Note: the chaining rules mentioned before apply to these series as well. The series "Households" includes the dividends, interest, capital withdrawals and other investment incomes received by the household sector. The "Households + top 1 percent" includes these aforementioned incomes as well as the top 1 percent wages, salaries and overhead. The top 1 percent wage share has been estimated using the tabulations from the tax and wealth statistics with this share then applied to the total wages received by the household sector in the national accounts. The series "Total + top 1 percent wages" includes the firms' total payout to all sectors and the top 1 percent wages.

The payout ratios exhibit a number of similarities and differences. All three series and the inverse of the before-payout rate of profit show an explosion in the late-1980s–early-1990s period. This coincides with the 1991–3 depression. The two major causes for this peak in payout include the collapse in the rates of profit—the after-payout profit rate went negative during the crisis, thus increasing the payout ratio by definition—and a rapid growth in interest rates as firms were forced to use short-term lending in order to cover their maturing debts which had often increased in relative value after the devaluation of the FIM in 1992, had they been taken in foreign currencies. The fact that the total payout ratio has increased even more than the households' series means that much of the payout has been in interest to the firms' creditors, mainly financial institutions such as foreign and domestic banks as well as insurance companies. The inverse of the rate of profit shows that the firms seem to have compensated for the deterioration of their profitability by increasing their relative payout, and vice versa.

The difference between the household and the total payout series yields also circumstantial evidence on the firms' ownership. The fact that the household series receive lower values than the total payout series means that only part of the firms' payout has been received directly by the households. The series show that the payout ratio for the households' capital income has remained relatively trendless from the early 1960s to the late 1980s. The addition of the top 1 percent wages—a control for income shifting–does not seem to alter the series' development, although moving the top 1 percent wages from the profit rate's denominator to its nominator does increase its value which can be seen during the early 1990s depression. Interestingly, and importantly for the distribution of income, the household series show that the payout ratio has declined after the depression even below its pre-crisis value. Although the difference is not great, it means that the households have not received, in relative terms, a higher level of payout than before the crisis or the 1993 tax reform. The same does not seem to apply to the firms' payout in total. The "Total + top 1 percent wages" series shows that the payout ratio has increased already in the 1960–80s. A smaller peak in its value can be seen

in the mid-1970s recession. After the 1991–3 crisis, the total payout ratio does settle at a lower level than before, yet its level in 2005 does exceed its initial value in 1961.

The important conclusion to be drawn from these payout ratios is that the firms have not, in relative terms, increased their payout after the early 1990s crisis or the changes in tax law in 1989–1 and 1993. The fact that the series are sector averages means of course that there may certainly have been firms whose payout ratios have increased (or diminished) as a result of these tax reforms. Likewise, the *composition* of the firms' payout and households' capital income has gone through significant changes without which means that different forms of finance have been substitutes and have brought about incomes under different names.[105] However, as the focus in this article is on income inequality at the level of a country, these averages seem to purport that the growth in income inequality in the 1990s and 2000s has been, at least partially, related to an increase in the firms' average profitability and not to a change in their average propensity to pay. The most important series in the previous figure are those of the households, as their relation to households' and individuals' income distribution is more direct than that of total payout.

5 The history of Finnish income taxation and the Nordic dual income tax

> A tax system with a *narrow base* and many *deductions* and *avoidance opportunities* is likely to generate high elasticies [of taxable income] and hence large efficiency costs. In that context, *broadening* the tax base and *eliminating* avoidance opportunities such as to reduce the elasticity is likely to be more *efficient* and more *equitable* than alterning tax rates within the old system.[106]

The history of Finnish income taxation is one of increasing and diminishing entropy.[107] The tax base, deductions, exemptions and imputations have all varied over time. In the 1960–80s, the Finnish income tax system had a (comparatively) narrow base, high nominal tax rates with the highest MTRs in state taxation reaching up to 51–53 percent—not to mention the contribution by municipal taxation, the church tax (membership coverage of the Lutheran church in Finland going up to almost 98 percent in 1960 and 83 percent in 2005[108]) and various social security payments as well as a relatively high number of available deductions and exemptions which were granted either automatically (*e.g.*, deductions for labour and capital income) or could be applied for (for example, due to a diminished ability to pay). By the 1980s, the Finnish income tax base was perforated with exceptions which treated taxpayers sometimes quite unequally from a horizontal and vertical viewpoint.[109] According to Allén (1985), had these deductions not been available for example in 1982, the state income tax yield would have increased by a fourth which would have matched a broadening of the tax base by a third.[110] In the late 1980s, the tax base was relatively complete for labour income, as employers generally withheld the income tax on their workers' behalf. However, according to one estimate, only around 17 percent of property income (*i.e.*, rents, dividends and interest) was being treated as taxed income. The same figure for capital gains was only around two percent.[111] According to Myhrman et al. (1995), up to 65 percent

[105] See Appendix on the households' capital income composition in 1961–2005.

[106] Saez et al., 2012, 4–5 (emphasis added).

[107] "Entropy" in this context refers to the narrowing of the tax base via various exceptions granted via changes to the tax code. This phenomenon dates back to the late 19th century and the first temporary tax laws passed in the Diet of the Grand Dutchy of Finland. This applies also to the first wealth tax which has been carried in 1918–2005. The first semi-permanent income and wealth tax law was passed in 1920 (the law had to be renewed in the Parliament each year). This law had already a sizeable number of deductions on income-generating expenditure and debt (see Statistical Office of Finland, 1926, 2–3,3–4).

[108] Statistical Office of Finland, 1962; Statistics Finland, 2005.

[109] In the early 1980s, there were around thirty different deductions available in state taxation alone. According to Allén (1984, 1,12,16,22,40), they had equalled around a third of all taxable income in state taxation and around a tenth in municipal taxation in the 1970s. Around 50–60 percent of all taxpayers enjoyed deductions on mortgages, labour income, sick leave and commuting. Their distribution has been quite uneven given different taxpayers' levels and sources of income *vis-à-vis* the available deductions.

[110] Allén, 1985, 67. See also Turkkila, 1983, 14.

[111] HE 109/1988vp, 1988, 5. The government proposal for income and wealth tax law.

of dividends in had been completely tax free in Finland in the late 1980s.[112] Although dividends between firms and nontaxed organizations, such as various foundations have been exempted in taxation throughout the research period, these figures give a rough impression on the degree of entropy the Finnish income tax system was facing by the late 1980s, before the major tax reforms by the Holkeri and Aho governments in 1989–91 and 1993.

The question of the double taxation of dividends has occupied the Finnish lawmakers and tax authorities ever since the first temporary income taxes in the 1860s. In 1919, firms were given a dividend deduction based on their payout.[113] In a sense, reducing the double taxation of dividends at the firms' end was to prevail until the late 1980s. For example, corporations were given a 40–60 percent dividend deduction in 1969 and this system lasted until its replacement by a dividend imputation system (*avoir fiscal*) in 1990.[114] Furthermore, corporations were encouraged to issue new share capital by granting the dividends on new capital a complete income tax exemption in 1969–78.[115] Additionally, the firms' effective tax rates were generally quite low given an increasing number of deductions granted in their taxation especially from the late 1960s onward. These deductions, often known as tax reserves, were granted on grounds of inventory undervaluation, investment needs, labour expenditure, credit default, losses and so on. The corporations' tax burden was further reduced by the removal of their wealth tax in 1968.[116] These exceptions granted in business taxation have allowed firms to engage in comprehensive tax planning and to choose relatively autonomously the amount of profit to be shown in taxation as taxed income and subjected to the relatively high business tax rates of the day.[117]

Prior to the 1990s, the double taxation of dividends had been mitigated mainly at the firms' end. Although the firms' owners had also been granted first a dividend deduction in 1956 and then a more comprehensive property income deduction in 1980, their levels were generally speaking quite low, so that their effect on high income earners' taxation was mostly unimportant.[118] These deductions were replaced with the introduction of a dividend imputation in 1990. This imputation equalled around 82 percent of the firms' dividends, effectively cancelling the double taxation at the shareholders' end. However, it was also instrumental in securing the single taxation of the firms' profits in situations where the previous legislation had allowed room for various forms of tax arbitrage.[119]

Both the Social Democrat–National Coalition Party led Holkeri government (1987–91) and its more right-wing successor, the Center Party–National Coalition Party led Aho government (1991–5) set out to reform the Finnish income taxation. The explicit aim of the former was to lower the nominal MTRs in state taxation and the business tax while retaining the state's revenues by broadening the tax base by removing many of the aforementioned deductions and exemptions.[120] Thus the aim of the Holkeri government's reform in particular was not to lower the tax rates *per se*

[112]Myrhman et al., 1995, 2.

[113]Wikström, 1985, 21,22,56,65,117.

[114]Niskakangas, 2011, 111. According to Niskakangas (as in Lehtonen (1991, 28,29–30)), the dividend imputation system had been planned already in the mid-1970s. The author gives a simple example on its functioning prior to the 1993 tax reform. If a firm's before-tax profit was FIM 100 and the tax rate was 40 percent and the firm paid its profit *in toto*, then the dividend received was FIM 60. The imputation would thus equal FIM 40 (the firm's tax). Now, if the shareholder was taxed at a 55 percent rate with the firm's total profit being 100 FIM, the shareholder's tax would be reduced to 15 FIM after the dividend imputation. If the shareholder's taxable income was lower and taxed at a, say, 20 percent rate, she was entitled to a FIM 20 refund. Since 1993, when both the corporations (but not all firms') tax rate was set at 25 percent this being also the rate for capital income, a 25-percent compensation (imputation) on a FIM 100 profit and income would result in a FIM 25 tax for the firm and an equal refund for the shareholder, effectively cancelling the tax altogether at the shareholder's end.

[115]Laki elinkeinotulon verottamisesta, 1968, 18.4 §, 61 §.

[116]Tikka, 1990, 392.

[117]Rautajoki, 1984, 11. In the 1960s, the average business tax rate (including the state, municipal and church taxes) was around 55 percent. In the 1990s, the same rate was around 28 percent. However, the effective tax rate has actually risen since the 1980s, given the broadening of the tax base in the aforementioned reforms (see Appendix).

[118]Hallituksen esitys Eduskunnalle laiksi elinkeinotulon verottamisesta ja eräiksi siihen liittyviksi laeiksi, 1967, 28; Allén, 1984, 80,85,93.

[119]For example, the comprehensive deduction rights granted on interest expenditures meant that firms may have raised debt in order to reduce their tax towards zero by deducting the subsequent interests (Niskakangas, 1995, 20)—even if the creditors were the firms' owners and the intrest a hidden form of dividend payment. This latter form of arbitrage, however, has been sanctioned by the tax authorities.

[120]Turkkila, 2011, 63. The term "business tax" is used here universally for both non-incorporated businesses such as trade names and partnerships as well as corporations. It should be noted, however, that these entities' tax treatment has differed throughout the research period. In the 1990s and 2000s, the trade names' income, for example, has been taxed solely at their owners' end. For partnerships, the income has been split between capital

but to improve the match between the nominal and effective tax rates. The same applies extensively also to the Aho government's 1993 reform.[121] The tax base was also broadened on capital gains. Since 1920, capital gains had been taxed rather sporadically, had the tax authorities considered the buying and selling of real estate and securities as a "professional" activity. In general, securities could be sold after a five-year withholding period and real estate after a ten-year period without taxes.[122] The consequence of this practice was that the income and tax statistics lack data on capital gains prior to the late 1980s and early 1990s. Capital gains taxation was introduced step by step in 1986–9.[123] Although the impact of the lack of data in the 1960s and 1970s is hard to gauge without circumstantial evidence on major sales, it seems probable that the tax base was broadened in the 1980s to cover newly-emerging capital gains given the housing and stock market booms which contributed significantly to the socio-economic turmoil of the early 1990s. In 1989, the capital gains tax concerned only relatively high profits of over FIM 200,000 (approximately € 55,000 in 2016) which were taxed at a 40-percent rate.[124] In 1993, the Aho government integrated capital gains taxation in its common 25-percent capital income tax.[125] Similar changes applied also to the taxation of interest income. Interest had been widely tax-free in Finland since the 1940s and 1950s. In 1943, the government aimed to increase the demand for its war bonds by making them tax-free. Common bank deposits were given the same exemption in 1956 in order to encourage savings.[126] In 1991, Finland moved to an interest withholding tax as a part of the Holkeri government's reform. The initial 10-percent tax was later on raised to 25 percent by the Aho government. Although a part of these governments' effort to broaden the tax base, interest taxation has also been a response to the ending of interest rate regulation in the 1980s.

The Holkeri government's so-called comprehensive tax reform (in Finnish, kokonaisverouudistus) with its introduction of the dividend imputation system, capital gains and interest taxation as well as the removal and lowering of many exemptions and deductions, has been somewhat overshadowed by its successor. In 1993, Finland moved to a system of dual income taxation in which the taxation of earned income (mainly wages and entrepreneurial income) was separated from capital income. A universal 25-percent capital income tax was introduced to practically all forms of capital or property income (rents, interest, dividends, capital gains, withdrawals, etc.). Earned income continued to be taxed at a progressive schedule in state taxation and it was also subjected to the municipal tax. Thus, especially at relatively high income levels, the treatment of capital income has become rather favourable relative to earned income. However, given the effects of the previous tax system's deductions and exemptions, both the Aho and the Holkeri governments' reforms helped to secure at least a single taxation of dividends.[127] One of the explicit aims of the 1993 tax reform in particular was to make the system neutral and to lessen the impact of it on firms' behaviour. Although this aim has not been met on a number of grounds[128], the reforms did simplify the tax system considerably and helped to re-integrate it after decades of deduction- and exemption-induced entropy. As Tikka (1993) has stated, the 1993 reform simplified business taxation significantly and have brought the firms' profitability in taxation closer to its "true" level.[129] Thus one can claim, albeit retrospectively, that these reforms have brought the Finnish tax system more in line with the recommendations by Saez et al. (2012) mentioned in the beginning of this section.

The Holkeri and Aho governments' reforms did not concern only individuals' taxation. They shaped also the taxation of firms by removing almost all of the previously given deductions and tax provisions. According to Andersson (1993),

income and wages. For corporations, the profits have been treated solely as capital income and taxed accordingly.

[121] Heino (2015) provides a detailed overview of the preparation and parliamentary discussions around the 1993 reform.

[122] Andresson, 1989, 11,71,72–73.

[123] As Honkavaara (1985, 62) notes, inflation-adjusted capital gains taxation had been proposed by a governmental committee already in 1966–7, although their proposals did not bring about new tax legislation. Still, capital gains taxation, although initiated under a Social Democrat led government in the mid-1980s, can be seen a part of the 1980–90s process of re-integrating the tax system (see (1989, 8) on the groundwork for capital gains taxation in Finland).

[124] Andresson, 1989, 10–11,13.

[125] Myrhman et al., 1995, iii.

[126] Tarkka, 1988, 193.

[127] Lehtonen, 1991, 40.

[128] See Hietala et al., 2004, 13.

[129] Tikka as in Lehtonen, 1993, 56.

the Holkeri government broadened the tax base quite significantly by lowering or removing the inventory undervaluation and investment credit default provisions.[130] These changes helped to bring the firms' effective taxation closer to its nominal level.[131] According to Pohjola (1996), the tax treatment of capital in general was quite light in the initial post-WWII decades prior to the 1990s. The state's tax policies were aimed at promoting large investments and rapid growth.[132] In this sense, the 1989–91 and 1993 tax reforms did reduce the tax system's favoritism towards investments and treated the firms' profits more evenly regardless of their eventual usage.

The post-1993 treatment of different business entities and owners has, however, been less even. This has been particularly consequential for small partnerships with a low turnover and income, as their income has been split between an imputated profit share and a wage share. Although the former has been tied to these firms' net assets (*i.e.*, the profit payout has been taxed at a flat, initially 25-percent rate up to a certain percentage of these firms' net assets and at a progressive schedule should the payout have exceeded this computational threshold), it has meant an increase in these firms' overall tax burden. At the same time, the listed corporations' owners could, for a while in 1993–5, receive their dividends practically tax-free, as these owners' own, 25-percent capital income tax rate matched the corporations' 25-percent tax rate and the dividend imputation system, by compensating the shareholders for the corporations' tax, effectively cancelled the tax altogether. [133] The tax treatment of partnerships, non-listed corporations and entrepreneurs operating under a trade name was partially set to limit these companies' payout to the level of an estimated average profit rate relative to their aforementioned net assets. The higher the firms' net assets, the greater the volume of payout could be under the flat capital income tax rate. Firms could, of course, pay even higher shares of their profits, but only in wages and salaries. This may have been a contributing factor behind the rise in the popularity of corporations over other types of business in the 1990s, although the corporations' share of all firms' turnover and labour force had been quite high already before.[134] It has presumably also encouraged partnerships to become incorporated and thus increased income shifting.[135] Therefore, the 1993 reform did not merely simplify the tax system—by introducing dual taxation of capital and earned income, the reform did add a novel layer of complexity to the Finnish tax system relative to the previous, progressive state income taxation of both types of income, while it did away with some of the complexity in the form of the aforementioned deductions and exemptions.

The following figure shows the development of the top 1 percent MTR and before- and after-tax income shares in 1961–2005. As can be seen, the MTR rose quite profoundly from the early 1960s until its peak in 1974–5. This peak has probably much to do with rapid inflation and a rise in the taxable value of many top taxpayers' wealth, so that the increase in wealth tax has brought about a sharp increase in this groups' total marginal taxation. After the introduction of the inflation checks to the state progressive income tax schedule in 1975–6 as well as the mid-1970s recession, the top 1 percent MTR has again settled at a lower level. This group's marginal taxation has become lower from the mid-1980s onward, with a visible drop in 1992–3. Since the mid-1990s, the changes in the MTR have been less profound in character. The top 1 percent income shares fell from the early 1960s until the late 1970s and stabilized or recovered slightly in the 1980s. From the early 1990s onward, and in the latter half of the decade, in particular, the top 1 percent shares rose steeply before peaking in 1999–2000. Since then, the changes have been smaller, although there is a clear drop in the group's shares in 2004–5, which has presumably had to do with the cancellation of the dividend imputation.

[130] Andersson, 1993, 68.

[131] See Appendix on the data for the nominal and effective business tax rate in Finland.

[132] Pohjola, 1996, 46.

[133] Siikarla, 1993, 38–39,89–90; Lehtonen, 1993, 53.

[134] See Appendix.

[135] As mentioned by Siikarla (1993, 37), and as documented by Heino (2015), this potential shifting effect was already widely anticipated before the 1993 reform was stipulated. At the same time it is important to note that income shifting as such has been going on in Finland already before, especially prior to the initiation of capital gains taxation in 1986–9. Prior to this, it was often advantageous for owners to put their shares in holding companies, as dividends between companies have been exempted in taxation and the shares could be sold after a five-year withholding period. Additionally, the holding companies' assets—including the capital gains on the profitable sales of stocks and other securities—could be returned to the holding companies' owners tax free upon the disbanding of the company (see Seppänen and Taanila (1983, 68–69) on the usage of holding companies among wealthy Finns in the 1970s and early 1980s).

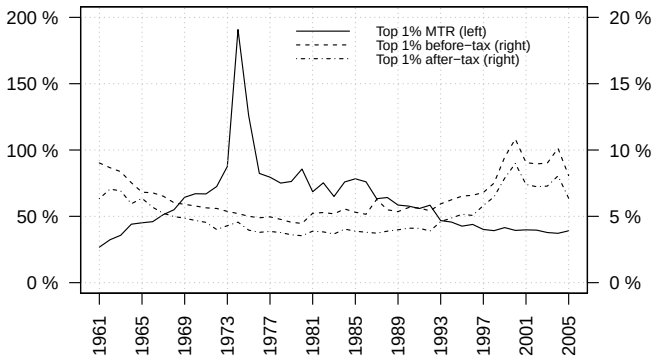


Figure 4: Top 1 percent MTR and before- and after-tax income shares, 1961–2005

Sources: see Appendix

As the previous paragraphs show, the late 1980s and early 1990s tax reforms did shape the Finnish income tax system quite profoundly. The tax base was broadened by removing and lowering a number of important deductions and exceptions which had until then lowered the effective tax rates on many forms of income, property and capital income in particular. By splitting the taxation of capital and earned income, the Aho government's 1993 reform opened, at least on paper, a significant gap between these income types' tax treatment. However, given the narrowness of the tax base prior to the late 1980s, it can be argued that the reform's practical consequences on capital income taxation have been less dramatic. Although the (initially) 25-percent capital income rate was significantly below the highest marginal rate in state taxation, and earned income was subjected to the municipal tax, as well, the aforementioned narrowness of the tax base has meant that the transition has been ostensibly smoother than suggested by the proponents of the taxational explanation on the rise in income inequality since the 1991–3 depression. The question thus remains, how can these changes in the tax system be assessed against the nearly simultaneous changes in the firms' avearge profit rate, that is, the growth in their profits and the subsequent growth in their volume of payout in the 1990s and early 2000s.

6 Assessing the impact of the late 1980s and early 1990s tax reforms

Assessing the effects of the 1993 tax reform is, as mentioned previously, quite a challenge due to the socio-economic turmoil the country was going through in the early 1990s. Given the haste the Aho government went through in order to push the reform in amidst this crisis means that its timing, if not its content, was highly endogenous.[136] Although similar reforms had been done in the other Nordic countries within a few years' interval, none of the other Nordics experienced a crisis as deep as that of the Finnish 1991–3 depression.[137] The Finnish companies' average profit rate as well as the GDP started to recover in 1992–3 as the new tax laws were put into action. As mentioned in the section on

[136]See Heino (2015) on the preparation of the Aho government's reform. Many contemporaries saw the reform as an answer to the crisis and a mitigation for ostensible capital flight as many Finnish parliamentary parties and interest groups, such as employer organizations were pushing Finland toward greater European Community integration after the fall of the neighbouring Soviet Union. A part of this integration's groundwork was the lifting of all restrictions on foreign ownership of Finnish companies in 1993.

[137]Sweden went through a recession in the early 1990s, as well, but its consequences were much milder than those of the Finnish depression.

the firms' profitability, the increase in the profit rate average hinged to at least some extent on the failure of the least profitable and most indebted companies during and after the depression. The annual unemployment rate reached 16.6 percent in 1994, having been around 3.1 percent during the previous trough in 1989.[138] In addition to the improvement in profitability, Finnish exporters were given a short-term (relative) price and competitiveness push by the devaluation and eventual floating of the FIM. Labour unions also contributed to the recovery by consenting to effective cuts in the workers' average real wage in the collective bargaining rounds during the crisis, as maintaining employment was seen more important than maintaining the real wages unchanged. The firms' investment or capital accumulation rate contracted during the depression and did not recover afterwards. This has been one of the contributing factors behind the persistence of unemployment in the 1990s and early 2000s. Unemployment, again, has most likely had an impact on the workers' wage demands, which has been seen as a slowdown in the growth rate of the per capita real wage after the early 1990s. As Kiander (2001) notes, the 1991–3 depression was a collection of crises—a crisis in production, finance, public debt, exchange ratios, unemployment, and poverty. The simultaneousness of these crises and their different duration has meant that the depression's "tail" has extended well into the new millennium.[139] After the crisis, the surviving firms recovered rather quickly, and the GDP growth rate was relatively high from the late 1990s up until the early 2000s. The firms' profit rate average exceeded its late-1980s level in the mid-1990s and grew up to levels not seen since the mid-1960s. By the early 2000s, many companies enjoyed strong profitability, low indebtedness and cost increases as well as strong foreign competitiveness. Although much of this rested on Nokia's success as the world's leading mobile phone manufacturer, the success concerned also more traditional industries such as forestry, pulp and paper as well as metallurgy and shipbuilding.[140]

This lack of socio-economic tranquility before and after the 1993 tax reform means that isolating its effects from all the other prominent contributing factors is quite difficult. In this sense, it is hard to draw comparisons to the "classic" example of the U.S. 1986 Tax Reform Act and its income-shifting or "real" consequences, as noted by the likes of Slemrod (1995), Piketty and Saez (2003) and Saez et al. (2012). The 1993 reform was neither a unique nor a single-time event in the sense that the Holkeri government's 1989–91 reforms had already changed many taxpayers'—including firms—treatment in similar ways. Thus, the effects of the 1993 reform have to be assessed against these preceding reforms, the issue being the gradual introduction of the reforms over a three-year period (for example, the dividend imputation or *avoir fiscal* system was stipulated in 1990 and was first applied in the following year). Even before these reforms, the introduction of more comprehensive capital gains taxation in 1986–9 had brought about changes in some taxpayers' treatment. Pinpointing the beginning is thus difficult to begin with. This is a major issue for assessing the short-term treatment effects of the 1993 reform, not to mention the medium- to long-term cumulative effects given the post-depression recovery and improvement in many firms' situation and the overall change in the environment.[141] Thus, one has to be cautious when engaging in statistical analysis. As Atkinson et al. (2011) have stated, while statistical testing "can help us identify independent variation ... it rarely proves fully conclusive", which leaves room for statistical inference and other methods of inquiry.[142]

The statistical assessment on the effects of the 1993 tax reform are carried out using a medium term perspective. The

[138] See Appendix for the sources. This unemployment rate average has been calculated on the basis of Statistics Finland's monthly labour force survey (in Finnish, työvoimatutkimus) which is based on interviews. The classifications and definitions of this survey differ somewhat from the registry-based data provided by the Ministry of Labour (in Finnish, työ- ja elinkeinoministeriö). For example, not all unemployed have been registered at employment offices and some may have forgotten to announce the ending of their unemployment which means that there can be lag between these sources. The "official" unemployment statistics tend to underestimate its extent as the data excludes underemployed people (*e.g.*, those who only work for a few hours a week) and those who do not for various reasons look for work.

[139] Kiander (2001, 5) states that prolonged unemployment, poverty and social exclusion have been the most persistent consequences of the crisis.

[140] As Häikiö (2002, 20,28,30–31) notes, the initial reasons behind Nokia's success are to be found in the deregulation of operators in telecommunications equipment as well as the replacement of analog communications with digital and the introduction of the pan-European GSM standard in 1991, Nokia having invested heavily in the development of this technology and its predecessor, the NMT. The share of electric and electronic equipment exports had been around 4 percent in 1980. In 2000, the same figure was 32 percent.

[141] Major changes include the European Union (EU) and European Monetary Union (EMU) membership in 1995 and the previous deregulation of the financial system in the 1980s and early 1990s.

[142] Atkinson et al., 2011, 57.

1993 tax reform's effects are measured using a difference-in-differences (DiD) estimation on different percentiles' effective MTRs and elasticity of taxable income (ETI). As these estimations are ostensibly quite sensitive to the composition of the treatment and reference groups, different specifications are used for both in order to control for these compositional effects. The first specification takes the top 1 percent (p99–100) as the treatment group and a number of lower percentiles (p49–50, p74–75, p89–90 and p94–95) as the reference group. In the second specification, the treatment group includes two additional percentiles (p98–99 and p94–95). The third speficiation widens the spread of groups within the treatment group (p99–100, p94–95, p89–90 and p74–75). The reference group comprises of a number of groups further down the distribution (p24–25, p32–33, p49–50, p65–66 and the remaining groups should they not be included in the treatment group). Additionally, as pinpointing the beginning of the treatment is difficult, a few dates are used to mark the beginning of the relevant tax reforms—should there have been any. These alternative dates used are 1989 (the first year of the new 1988 income tax law), 1991 (the first year of the dividend imputation system) and 1993 (the Aho government's reform). These specifications are then used to estimate the ETI effects of the reform(s) following the methodology presented in Saez et al. (2012). The elasticity is estimated for the years 1988–9, 1990–1 and 1992–3. As the effects of these tax reforms may have taken time to appear, the treatment period is extended all the way to 2005. The payout rate of response $\overline{\phi}'_t$ is used to control for these short term MTR and elasticity impacts alongside a few additional variables, such as the unemployment rate, as unemployment has not only pushed individuals down the rank but also affected their MTRs, as the withholding tax rates on unemployment benefits have differed from those on, for example, wages, having historically been quite high in comparative terms with relatively low wages.

The longer-term effects of the 1993 tax reform are assessed using a cumulative dynamic effects model where the top 1 percent before- and after-tax income shares are regressed on the payout rate of response using a number of lag lengths for robustness checking. This method seeks to identify the longer-term effects of this dual income tax reform against the impact of the payout rate of response, which again rests on not only the firms' previous year's profits but also their more medium-term profitability, given the evidence on the prevalence of a smooth payout policy as described in the literature. As such, this methods seeks to address at least some of the notions on the longer term effects of profitability in the vein of marginal taxation as mentioned by Piketty and Saez (2003) and the adherents of the taxational explanation in Finland. This strategy also allows one to seek whether the changes in profitability have had an immediate or a more gradual impact on income distribution via lags in payout response due to the firms' conservatism and ability to regulate their payout especially since the 1991–3 depression and the change in their average capital structure, as paying dividends has rested on a more flexible basis than paying interest on maturing debt.[143]

[143] See Appendix on the firms' equity-to-debt ratios in manufacturing, construction, wholesale and retail.

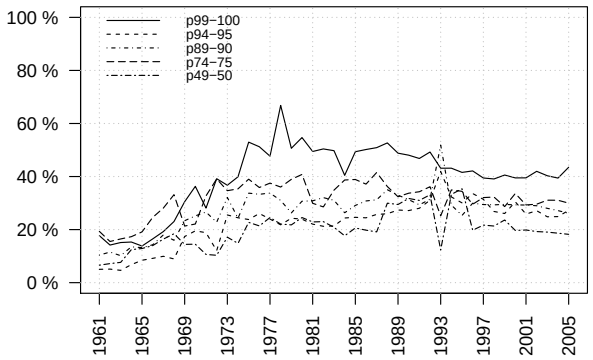


Figure 5: Different percentiles' effective tax rates, 1961–2005

Sources: see Appendix
Note: the effective tax rates have been calculated for the percentiles' taxable income, excluding deductions from the taxed income. The 1961–86 tax rates have been derived from the tabulations in income and wealth statistics. The 1987–2005 tax rates have been calculated from micro data. The data has been chained from 1987 backward. The i-th percentile's tax rate has been estimated in $\tau'_{it} = \frac{(\overline{\tau}_{it}\theta_{it})}{(\overline{y}_{it}s_{it})}$, where $\overline{\tau}_{it}$ is the percentile's average income tax (including the state and municipal taxes, the church tax and social security payments), θ_{it} is the percentile's share of total income taxes, $\overline{y}_{it}$ is the percentile's average taxable income and s_{it} is its share of taxable income. As the 1987–2005 micro data file contains the percentile sums of both taxable income and taxes paid, calculcating the percentile-specific average tax rates has been more straightforward than with the tabulations (see the section on data and methods in this article)

Before engaging in actual statistical testing, it is good to take a quick look at the development of different percentiles' effective tax rates throughout the research period. Figure 5 shows the top 1 percent's tax rate relative to four other brackets. Although there are clear differences between the tax rates, it can be seen that their growth has been quite substantial from the mid-1960s until the late 1970s, the top 1 percent tax rate exceeding 60 percent for a brief moment in 1978. The tax rates remained relatively trendless for around a decade until the late 1980s. The top 1 percent tax rate declined from 1988–9 to the late 1990s. Although there is a clearly discernible drop in this fractile's tax rate in 1992–3, it does not appear as a major break in the previous trend, the tax rate having gone down since the late 1980s. In the early 2000s, the top 1 percent tax rate seems quite stationary with a small increase in 2004–5 which has probably to do with the removal of the dividend imputation in 2005. The other groups' tax rates exhibit a relatively high degree of unevenness throughout the period. This is particularly visible during the 1991–3 depression, when temporary changes in state income taxes have lead to peaks and drops in the groups' tax rates. From the early 1990s onward, however, it can be seen that the middle groups' (p74–75, p89–90 and p94–95) tax rates have declined and continued to do so in the early 2000s while the top 1 percent's rate has remained around the 40-percent level. What this means is that the parallel trends assumption, crucial to the validity of DiD models to begin with, may not hold, even if the reference group's tax rates are averaged. What this graph suggests additionally is that the 1993 tax reform may have been part of a longer development initiated by the Holkeri government already four years before. Although the circumstances have been highly unfavourable for isolating the effect of these tax reforms from those of other relevant variables, this does not yet deny the possibility of a clear impact of the 1993 reform on a given treatment group's effective MTRs or before-tax income shares' elasticity either via income shifting or "real" behavioural changes.

The impact of the late 1980s and early 1990s tax reforms and the 1993 reform in particular on the given groups' MTRs are estimated in Table 1. The test equation is expressed in

$$\ln(1 - \Delta\tau'_{it}) = \alpha_{it} + \beta_t + \gamma I(.)_t + X_t + \varepsilon_{it}, \tag{3}$$

where α_i is the treatment and reference groups' intercept, β_t is their common time trend, γ is the treatment variable, $I(.)$ stands for the model's dummies (here the 1989, 1991 and 1993 tax reforms), X_t is the vector of controls and ε_{it} the group-specific residual, $\gamma I(.)_t$ being the model's difference-in-differences interaction. The controls are the unemployment rate, cumulative change in the per capita real wage, surplus and organic composition of capital, as well as capital cost. The first control seeks to address for the increase in unemployment-induced poverty and loss of taxable income. The cumulative change controls look out for the effects of these respective variables change on the MTRs indirectly via the groups' taxable income (*e.g.*, the growth in top groups' dividends) given the increase in the average profit rate and the payout rate of response after the 1991–3 depression. Finally, the capital cost variable seeks to find out whether this variable has affected the firms' payout via their capital structure (debt v. equity) and subsequently the MTRs through the groups' taxable income and its composition (capital income and wages).

Equations (1) and (2) in Table 1 estimate specifically the effects of the 1993 tax reform on the treatment and reference groups' MTRs. There are three different treatment groups and three respective difference-in-differences variables included in the model. This specification checks for the sensitivity of the results relative to the composition of the treatment group. Equation (2) includes controls missing in the first equation. Equations (3) and (4) include the two other tax reforms of the era and control for the effects of the 1993 reform accordingly. The latter of these includes the controls.

Table 1: DiD model for marginal tax rates

$\ln(1-\Delta\tau'_{it})$	(1)	(2)	(3)	(4)
Intercept	0.726***	-1.888	-0.768***	4.972
	(0.051)	(2.944)	(0.080)	(3.484)
Treatment (1)	0.199*	0.199*	0.282**	0.282**
	(0.079)	(0.081)	(0.100)	(0.101)
Treatment (2)	0.161*	0.161*	0.198	0.198
	(0.079)	(0.080)	(0.105)	(0.107)
Treatment (3)	0.203**	0.203**	0.202*	0.202*
	(0.063)	(0.064)	(0.090)	(0.091)
Time (1989)			0.077	0.124*
			(0.040)	(0.055)
Time (1991)			-0.026	0.031
			(0.026)	(0.035)
Time (1993)	0.178***	0.119	0.170***	0.109
	(0.050)	(0.068)	(0.036)	(0.070)
DiD 1 (1989)			-0.081	-0.081
			(0.054)	(0.055)
DiD 2 (1989)			-0.087	-0.087
			(0.062)	(0.063)
DiD 3 (1989)			-0.005	-0.005
			(0.084)	(0.085)
DiD 1 (1991)			-0.087*	-0.087*
			(0.042)	(0.042)
DiD 2 (1991)			0.064	0.064
			(0.044)	(0.045)
DiD 3 (1991)			0.015	0.015
			(0.042)	(0.043)
DiD 1 (1993)	-0.056	-0,056	0.030	0.030
	(0.101)	(0.106)	(0.075)	(0.081)
DiD 2 (1993)	-0.045	-0.045	-0.058	-0.058
	(0.089)	(0.085)	(0.064)	(0.061)
DiD 3 (1993)	-0.105	-0.105	-0.113*	-0.113*
	(0.060)	(0.059)	(0.047)	(0.045)
T	19	19	19	19
F	55.13***	33.22***	25.77***	20.24***
Degrees of freedom	7 + 163	12 + 158	15 + 155	20 + 150
R^2	0.703	0.716	0.714	0.730
Adj. R^2	0.690	0.695	0.686	0.694
Controls	No	Yes	No	Yes
Robust SEs	Yes	Yes	Yes	Yes

Sources: see Appendix
Note: $^{***} < 0.001$, $^{**} < 0.01$, $^{*} < 0.05$
Heteroskedasticity and autocorrelation robust standard errors (HAC)
Treatment (1): p99–100; Treatment (2): p94–95, p98–99 and p99–100; Treatment (3): p74–75, p89–90, p94–95 and p99–100
Controls: cumulative changes in per capita real wage, surplus and organic composition of capital; unemployment rate; cost of capital

The treatment variables in the first pair of equations show that the estimations are somewhat sensitive to the composition of the treatment group, although their MTRs have apparently differed from the reference groups in all three specifications at a 5 percent significance level (or higher). The time effects seem more ambiguous given the inclusion of controls in Equation (2). More importantly, the difference-in-differences variables (DiD) are insignificant at the 5 percent level in all three treatment group specifications. What this means is that the 1993 tax reform's effect on the treatment groups' MTRs has not differed significantly from those of the reference groups. It is therefore questionable to what extent the 1993 tax reform has impacted the treatment groups' taxation differently from those of the reference groups, and, given these groups' composition, whether the MTRs of those further up the distribution have changed differently from those further down the line. Although the 1993 reform may certainly have had a differing impact on different taxpayers' MTRs, the effect does not either seem to have been sufficient to carry out until 2005 or has remained small enough given the narrowness of the income tax base prior to the late 1980s and early 1990s. These results may also indicate that the identification presented here fails to capture the effects of the tax reform either due to its group specifications or because of the socio-economic turbulence of the era in general, as described earlier in this section.

The latter two equations control for the 1993 tax reform by introducing the previous two reforms as independents. This time it can be seen that the estimations are more sensitive to the treatment and reference group specifications than in the former two equations, the second specification indicating no differences in the groups' pre-treatment MTRs. The 1993 reform is again associated with a positive and significant time effect, although the addition of controls renders the linear relationship insignificant. The same can be seen in the case of the 1989 reform, although again, the significance of the relation seems to hinge on the inclusion of the controls. The effects of the tax reforms on the between-group MTRs seem again highly ambiguous. While the 1991 reform seems to have lowered the treatment group's MTR relative to the reference groups in one specification (DiD 1 (1991)), the effect remains highly dependent on the specification. The same applies to the 1993 reform, the third treatment group specification showing a significant difference in the groups' tax rates' change, but the effect remaining insignificant in the case of the first two specifications. This applies even to the sign of the estimates, which adds further to the ambiguousness of the tax reforms' respective effects in the medium term up to the mid-2000s.

The lack of support for the 1993 tax reform's impact is supported by the apparent violation of the parallel trends assumption as shown in Figure 6 below. This figure plots the treatment and reference groups' MTRs in 1987–2005. It can easily be seen that the treatment group's—in this specification, the top 1 percent's— MTR was already declining in 1988–9, four years prior to the 1993 tax reform. Although there is a clearly discernible drop in this group's MTR in 1992–3, its slope has been steeper partially due to the small recovery in the tax rate's value in 1991–2. The similarity in the treatment and reference groups' MTRs is corroborated by the drop in the latter's value in 1992–5. Although these changes may not have hinged as strongly on the actual tax reform than other socio-economic causes, such as post-depression unemployment, the groups' trends have clearly differed both before and after the 1993 reform.

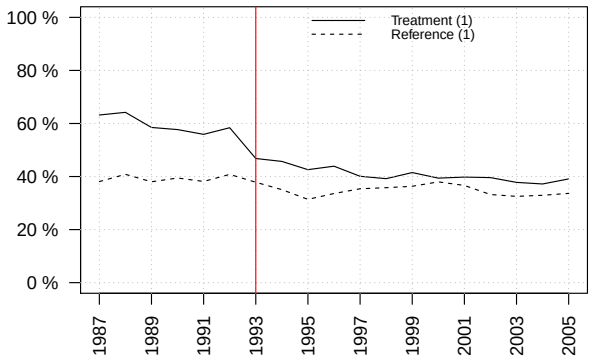


Figure 6: Treatment and reference groups' marginal tax rates (specification 1), 1987–2005

Sources: see Appendix
Note: the treatment group is p99–100 and the reference group comprises of p24–25, p32–33, p49–50, p65–66, p74–75, p89–90, p94–95 and p98–99

The MTRs presented in the previous DiD model may have also been influenced by changes in the groups' taxable income and vice versa. Thus the impact of the 1993 tax reform may have also shown up as changes in the taxpayers' propensity to "show" their income in taxation either via income shifting between tax bases or by increasing their actual income by other means. This so-called elasticity of taxable income (ETI) can be expressed in a difference-in-differences setting following Saez et al. (2012) as

$$\begin{aligned} e = \; & ([E(\ln s_{i1}|T) - E(\ln s_{i0}|T)] - [E(\ln s_{i1}|R) - E(\ln s_{i0}|R)]) \, / \\ & ((e^*[E(\ln(1-\Delta\tau'_{i1})|T) - E(\ln(1-\Delta\tau'_{i0})|T)]) - [E(\ln(1-\Delta\tau'_{i1})|R) - E(\ln(1-\Delta\tau'_{i0})|R)]) \, , \end{aligned} \tag{4}$$

where s_{i1} is the i-th group's taxable income, 1 stands for the treatment year and 0 for the preceding year, $\Delta\tau'$ is the respective groups' MTR, T stands for treatment and R for the reference group and e^* is the elasticity of the treatment groups' taxable income share.[144] The inclusion of this latter parameter assumes that the groups' ETI values have differed, having ostensibly been higher in the treatment group given the late 1980s and early 1990s reforms' impact on top MTRs and capital income taxation and the concentration of the firms' ownership at the very top of the distribution.

Table 2 presents the ETI estimates for the three tax reforms in 1988–9, 1990–1 and 1992–3 using the previous treatment and control group specifications from the MTR estimations.

[144] Saez et al., 2012, 26.

Table 2: ETI estimates for three reforms and group specifications, 1989, 1991 and 1993

Reform	(1)	(2)	(3)
1988–9	-0.023	-0.015	-0.026
1990–1	-0.002	-0.010	-0.017
1992–3	0.095	0.066	0.092

Sources: see Appendix
Note: the treatment group composition varies between estimates: (1): p99–100; (2): p94–95, p98–99, p99–100; (3): p74–75, p89–90, p94–95, p99–100

The ETI estimates for the first two reforms (the Holkeri government's new income tax law stipulated in 1989 and the dividend imputation first applied in 1991) give slighly negative elasticity estimates ranging between -0.2 and -2.6 percent. Although these estimates cannot isolate the effect of the respective tax reform from other factors—the groups' taxable income shares being contingent on the other groups' development—they seem to indicate that the Holkeri government's reforms would have had a negative effect on the treated taxpayers' propensity to show their income in taxation. These estimates should, as has been mentioned, be taken with a grain of salt (or two) because of the circumstances in the pre-depression Finnish economy. Contrary to these estimates, the Aho government's 1993 reform seems to have brought about a positive elasticity effect ranging between 6.6 and 9.5 percent depending on the treatment group specification. Again, given the circumstances in Finland at the time, these figures do not presumably reflect merely the effects of taxation but also various other factors which most likely inflate or deflate these estimates at least somewhat.

The ETI estimations are calculated in a two-stage least squares (2SLS) model using the previous MTR estimations' difference-in-differences specification. Given the potential endogenousness of the MTRs *vis-à-vis* the model's residual—as well as the probability of reverse causality, taxable income shares affecting the tax rates—the interaction between the previous elasticity estimates and the MTRs are instrumented on the DiD interaction term $\gamma I(.)_t$ following the method presented in Saez et al. (2012). The following estimations have been produced using the first treatment group specification. That is, the late 1980s and early 1990s reforms have been assumed to impact mostly the taxpayers within the top 1 percent. The same estimations have been done using the two other treatment group specifications as a robustness check.[145] The estimations have been controlled using the same set of controls as in the previous MTR estimations. The controls have checked for endogeneity by regressing the models' residuals on the controls leads, current values and lags ($E(\varepsilon_{it}|X_{t+h}, ..., X_{t+1}, X_t, X_{t-1}, ..., X_{t-h})$). The test equation is expressed in:

$$s_{it} = e(\ln(1 - \Delta\tau'_{it})) + \alpha_{it} + \beta_t + X_t + \varepsilon_{it}, \tag{5}$$

where e is elasticity estimate (see previous Table). The estimations have been produced separately for the 1989, 1991 and 1993 reforms with and without controls. The results are presented in the following table.

[145]The estimations are available via the author. They yield, in general, insignificant results indicating the impact of the given reforms on top taxpayers' income shares and MTRs.

Table 3: 2SLS DiD estimates on ETI

s_{it}	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.028*	0.033	-0.056***	0.019	-0.082***	0.258
	(0.012)	(0.174)	(0.017)	(0.384)	(0.017)	(0.542)
$e(\ln(1-\Delta\tau'_{it}))$	2.871**	2.871***	65.986**	65.986***	-1.659***	-1.659***
	(1.083)	(0.792)	(20.686)	(15.994)	(0.419)	(0.411)
α_{it}	0.081***	0.081***	0.098***	0.098***	0.112***	0.112***
	(0.010)	(0.007)	(0.012)	(0.008)	(0.010)	(0.011)
β_t	0.009***	0.002	0.014***	-0.001	0.020***	0.011
	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)	(0.006)
T	19	19	19	19	19	19
Wald	66.78***	26.27***	38.09***	14.81***	26.24***	9.80***
Degrees of freedom	3 + 167	8 + 162	3 + 167	8 + 162	3 + 167	8 + 162
R^2	0.375	0.417	-0.112	-0.047	-0.646	-0.609
Adj. R^2	0.364	0.389	-0.132	-0.098	-0.675	-0.689
Controls	No	Yes	No	Yes	No	Yes
Robust SEs	Yes	Yes	Yes	Yes	Yes	Yes
Reform	1989	1989	1991	1991	1993	1993

Sources: see Appendix
Note: $^{***} < 0.001$, $^{**} < 0.01$, $^{*} < 0.05$
Heteroskedasticity and autocorrelation robust standard errors (HAC)
Treatment (1): p99–100
Controls: cumulative changes in per capita real wage, surplus and organic composition of capital; unemployment rate; cost of capital

The DiD-instrumented elasticity ($e(\ln(1-\Delta\tau'_{it}))$) is significant at the 1 or 0.1 percent level in all three reforms with or without the controls. The positive signs in front of the 1989 and 1991 coefficients, given the definition of the ETI variable, seems to indicate that both the income groups' taxable income shares and MTRs have moved in a similar direction after these two reforms. For reasons most likely related to the timing of the 1991 dividend imputation reform, the coefficient is much higher than for the other two reforms. The 1993 reform, however, seems to have had an opposite effect, the top 1 percent's taxable income share growing and the MTR declining in relation to the reference groups' shares and MTRs. The addition of the controls seems to remove the effect of time (β_t) on the groups' income shares. Although these estimations seem to lend support for the thesis on the elasticity effects of the given reforms, it is again quite difficult to separate the effect of the tax reforms themselves from other relevant causes. These results rest on the elasticity estimates presented in Table 2 which show a clear difference between these reforms' ostensible effects. Whether these effects have then been a result of income shifting between tax bases or the consequence of various "real" changes (including profitability) in the taxpayers' income remains to be assessed in future research, although recent evidence on another important tax reform as well as the taxational explanation literature gives more support for the income shifting than real effects.[146]

The proponents of the taxational explanation, following the example set by Piketty and Saez (2003), have pointed out to the medium- and long-term effects of the 1993 tax reform. Emphasis has been particularly put on its cumulative effects, or the top taxpayers' ability to increase their investments and returns on capital over time due to the reduction in their MTRs. The same can be expected to apply to the firms' profitability, with increasing profits enabling their owners and creditors to acquire new capital and thus potentially increase their relative income. A cumulative dynamic

[146]Harju et al., 2016, 642 introduce a methodology for discerning between income shifting and real elasticity effects. They find that about two thirds of the responses to the Finnish 2005 tax reform (the cancellation of the dividend imputation) were due to income shifting.

causal effects model may thus capture the impact of both the tax reform and the firms' profitability via the payout response rate better than models which estimate these variables' simultaneous effects on income shares or other variables of interest.

An assessment of the cumulative dynamic effects of a variable on the other rests on the assumption of cointegration. Unfortunately for the top 1 percent MTR and its relation to the group's taxable income share, this assumption does not seem to hold. However, the assumption seems to hold water for the relation between the top 1 percent taxable income share and the payout rate of response. As the data on these variables is available for the entire 1961–2005 research period, assessing their relationship does not hinge on as short a time period as in the case of the 1987–2005 micro data set. Thus, the following table presents a cumulative dynamic effects estimation of these two variables using a number of lags ranging from $t-3$ to $t-6$. The additional table underneath shows the so-called cumulative dynamic multipliers (CDM). As both the top 1 percent income share and the payout rate of response are percentages, assessing these multipliers' values is relatively straightforward.

The test equation for the model is expressed in

$$s_{it} = \delta_0 + \delta_1 \Delta\overline{\phi}_t' + \delta_2 \Delta\overline{\phi}_{t-1}' + ... + \delta_h \Delta\overline{\phi}_{t-h}' + \varepsilon_t, \tag{6}$$

where δ_1 is the so-called impact effect and $\delta_2, ..., \delta_{t-h}$ are the two- to h-period dynamic multipliers (*e.g.*, $\delta_2 = \beta_1 + \beta_2$) and Δs refer to first-order differences. The results are presented in the following table for the given lag lenghts.

Table 4: Dynamic linear model estimation for the top 1 percent income share

s_{it}	(1)	(2)	(3)
Intercept	-0.018*	-0.020*	-0.018
	(0.008)	(0.009)	(0.010)
$\overline{\phi}'_t$	0.496**	0.536**	0.544*
	(0.168)	(0.194)	(0.204)
$\overline{\phi}'_{t-1}$	0.397***	0.374**	0.376**
	(0.109)	(0.112)	(0.106)
$\overline{\phi}'_{t-2}$	0.648**	0.694**	0.694**
	(0.202)	(0.222)	(0.221)
$\overline{\phi}'_{t-3}$	0.826***	0.694***	0.693***
	(0.078)	(0.098)	(0.099)
$\overline{\phi}'_{t-4}$		0.847***	0.863***
		(0.090)	(0.160)
$\overline{\phi}'_{t-5}$			0.864***
			(0.189)
$\overline{\phi}'_{t-6}$			0.830***
			(0.098)
T	44	44	44
F	43.70***	34.11***	21.76***
Degrees of freedom	4 + 37	5 + 35	7 + 31
R^2	0.825	0.830	0.831
Adj. R^2	0.806	0.805	0.793
Robust SEs	Yes	Yes	Yes

Sources: see Appendix
Note: $^{***} < 0.001$, $^{**} < 0.01$, $^{*} < 0.05$
Heteroskedasticity and autocorrelation robust standard errors (HAC)

Table 5: Cumulative dynamic multipliers (CDM) for the payout rate of response on the top 1 percent income share

CDM_t	CDM_{t-1}	CDM_{t-2}	CDM_{t-3}	CDM_{t-4}	CDM_{t-5}	CDM_{t-6}
0.544	0.921	1.614	2.307	3.169	4.033	4.863

Sources: see Appendix

Both the impact effect (the contemporaneous relationship between the payout rate of response and the top 1 percent share) and the six-period dynamic multipliers are significant at the 5 percent level or higher. The dynamic effect of the payout response rate seems to have been particularly significant at a two-year lag and beyond which may be one of the reasons why the top 1 percent taxable income share did not begin its ascent before the late 1990s although the before-payout rate of profit and the payout response rate had done so already since 1992–3. The cumulative dynamic multipliers indicate that an increase (decrease) in the payout rate of response has lead to a 4.9 point change in the top 1 percent taxable income share over the 1961–2005 period. This, along with the regression coefficients in the previous dynamic causal effects estimation, indicate that both the current year's and the previous years'—*t*–3 to *t*–5 in this model in particular—have had an impact on the top 1 percent share. Although this may be indicative of short-term cyclicality

in the payout response rate, it also lends support to the Lintner (1956) thesis on the firms' payout policies' stability as well as to more recent findings by Brav et al. (2005) and others. Although this assessment does not allow one to control for the effect of the top 1 percent MTR, the lack of support for the precondition of cointegration as well as the uncertainty of the previous MTR and ETI estimates in the difference-in-differences setting lends some support to the presumptive importance of profitability—and payout—on the top 1 percent income share over the changes in income taxation in the late 1980s and early 1990s.

Although the lack of cointegration between the top 1 percent taxable income share and the group's MTR prevents a direct comparison of the cumulative impact of the payout rate of response and marginal taxation, the two variables can be taken as independents in an ordinary least squares setting. As noted by Roine et al. (2009) and Bengtsson and Waldenström (2018), the relevant time series data in this field tends to be quite "noisy". These authors have thus resorted on using n-year averages in order to capture underlying trends from the impact of interfering, random factors. In a time series setting, one can also apply nonparametric filtering methods, such as the LOESS (locally estimated scatterplot smoothing). This method is, of course, sensitive to the amount of filtering applied on the series. Too low a smoothing parameter value may not capture an underlying connection between the variables. Too much smoothing then again may filter away relevant variance and lead to issues with autocorrelation. The sensitivity of the data to the chosen smoothing parameter value (α) is therefore important to gauge in advance. Table 6 shows an example of this phenomenon by producing estimates of a simple single explanatory variable model in which the top 1 percent taxable income share (s_{it}) is regressed on the payout rate of response ($\overline{\phi}'_t$).

Table 6: Assessing the variables' sensitivity to LOESS smoothing parameter values

s_{it}	(1)	(2)	(3)	(4)
Intercept	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)
$\overline{\phi}'_t$	0.161	0.378	0.607**	0.852***
	(0.126)	(0.208)	(0.187)	(0.068)
T	44	43	43	43
F	1.71	14.00***	54.75***	214.00***
Degrees of freedom	1 + 43	1 + 42	1 + 42	1 + 42
R^2	0.039	0.250	0.566	0.836
Adj. R^2	0.016	0.232	0.556	0.832
Robust SEs	Yes	Yes	Yes	Yes
LOESS	No	Yes	Yes	Yes

Sources: see Appendix
Note: $^{***} < 0.001$, $^{**} < 0.01$, $^{*} < 0.05$
Heteroskedasticity and autocorrelation robust standard errors (HAC)
LOESS smoothing parameter (α) values: (2): 0.20; (3): 0.30; (4): 0.50

The table shows clearly that higher the smoothing parameter value chosen, the more statistically significant the linear relationship between these variables is and the higher the goodness-of-fit and explanatory power become. The α value 0.30 has been chosen as a middle ground between insufficient and excessive filtering.

The following model estimates the linear relationship between the top 1 percent taxable income share, payout rate of response and the given group's MTR. Whereas the dynamic linear model presented above estimated the medium-term impact of the payout response rate on the top 1 percent share, this model provides an estimation of a more immediate response. Although the application of LOESS filtering sets these models apart in terms of data, the previous model's

impact effect (δ_1) seems to indicate that there has been a contemporaneous response in the top 1 percent share to the payout response rate, although the cumulative effect has seemingly been stronger, which has been seen as evidence of the stability of the firms' payout (*i.e.*, a lack of sudden responses to changes in profits). The question then remains, is this relationship stable when controlled with the group's MTR and other variables. The following model's equation is

$$s_{it} = \beta_0 + \beta_1 \overline{\phi}'_t + \beta_2 \ln(1 - \Delta\tau'_{it}) + \beta_3 X_t + \varepsilon_t, \tag{7}$$

where $\overline{\phi}'_t$ and $\ln(1 - \Delta\tau'_{it})$ are the payout rate of response and the top 1 percent MTR, X_t is the vector of controls and ε_t is the residual. The controls in this model are the unemployment rate, cumulative change in the per capita real wage, capital cost and the effective business tax rate which is a quotient of the firms' business tax over their profits in the national accounts, that is, before deductions and exemptions.[147] Following the conventional Gauss–Markov assumptions, the series have been either differenced or detrended. Heteroskedasticity and autocorrelation robust standard errors have been used in order to mitigate for the remaining autocorrelation in the residual. The model's equations have also been checked for multicollinearity using the variance inflation factor (VIF) methodology.

Table 7: An OLS model of the top 1 percent income share

s_{it}	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.000	0.000	-0.001	0.001	-0.000	0.004
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
$\overline{\phi}'_t$	0.607**		0.721***	0.840**	0.660*	
	(0.187)		(0.137)	(0.255)	(0.276)	
$\ln(1 - \Delta\tau'_{it})$		0.001	-0.002*	-0.005***		-0.000
		(0.001)	(0.001)	(0.001)		(0.003)
T	43	43	43	43	43	43
F	54.75***	0.65	30.16***	14.16***	11.85***	2.78*
Degrees of freedom	1 + 42	1 + 37	2 + 36	6 + 32	5 + 38	5 + 33
R^2	0.566	0.017	0.626	0.726	0.609	0.297
Adj. R^2	0.556	-0.009	0.606	0.675	0.558	0.190
Controls	No	No	No	Yes	Yes	Yes
Robust SEs	Yes	Yes	Yes	Yes	Yes	Yes

Sources: see Appendix
Note: $^{***} < 0.001$, $^{**} < 0.01$, $^{*} < 0.05$
Heteroskedasticity and autocorrelation robust standard errors (HAC)
LOESS smoothing parameter (α) value: 0.30
Five observations have been omitted due to missingness in equations with the MTR due to methodological issues: as the top 1 percent MTR has exceeded 100 percent in 1973–5, the variable cannot be estimated as a natural logarithm for negative values
Controls: unemployment rate, cumulative change in real wage per capita, capital cost and effective business tax rate ($\ln(1 - \Delta\tau(k)'_t)$)

The payout rate of response remains significant at the 5 percent level despite the addition of the top 1 percent MTR and controls. The coefficients' positive value indicates that the top 1 percent income share has risen (fallen) in following the increases (decreases) in the response rate's value, although both the composition or structure of the households'

[147] See Appendix for further elaboration on the business tax rate.

capital income and the share of capital income at the very top of the distribution have changed dramatically in the 1990s and early 2000s.[148] This may again be indicative of a degree of substitution between wages and capital income among top taxpayers—whereas wages have been deductible in the firms' taxation, the same has not applied to dividends but to a limited degree prior to the cancellation of their double taxation in the early 1990s. Thus, it has probably been more advantageous for firms to remunerate their top managers by via wages and fringe benefits or for top shareholders to cycle their income via holding companies in order to avert the income tax. Since the early 1990s, it has become more advantageous for top managers and shareholders to take dividends. Their share has also grown, of course, due to the improvement in the firms' profitability as well. The relationship between the top 1 percent MTR and its taxable income share remains more uncertain. Although equations (2) and (3) indicate that there has been an inverse relation between these variables (*i.e.*, the top 1 percent income share growing as the MTR descents, and vice versa), the connection does not seem stable, as the omission of the payout rate of response in equations (2) and (6) makes the MTR statistically insignificant. Although the previous ETI estimates have lent support for a positive relation between the 1993 tax reform and the treatment group's taxable income share, the uncertainty associated with the MTRs which was evidently shown in the preceding MTR estimations is supported by these time series results as well for the longer, 1961–2005 period.

7 Conclusions

The impact of profitability has often been neglected in income inequality research. This article has sought to mitigate this deficiency by looking at the development of profitability in relation to income taxation in Finland during its recent history. Emphasis has been paid in particular on the late 1980s and early 1990s tax reforms. The introduction of dual income taxation in Finland, the Aho government's 1993 Income Tax Act, has been contextualized and analyzed in terms of its MTR and ETI effects. Although the reform has clearly lowered top taxpayers' marginal rates, the impact has apparently not been limited to the given treatment group(s), but has concerned lower-income taxpayers, as well, even if not to the same extent. Given the socio-economic turmoil the country was going through in the early 1990s, it seems that the emphasis given to this 1993 tax reform by the proponents of the so-called taxational explanation has relied more on statistical inference and timely succession than more thorough data analysis. Although the estimations produced in this article are by no means the final word on these questions, they nonetheless provide evidence for the importance of profitability and its fluctuations as a causal factor behind top incomes and inequality in general.

One noteworthy feature is the relative stability in the firms' profit payout throughout the period. Although the payout ratios, as shown in Figure 3, have fluctuated over time, especially during the early-1990s crisis, the firms' payout to households has, in relative terms, been lower in the early 2000s than in the 1960–80s. While the firms' total payout ratio has increased slightly from the early 1960s, it does not seem that the late 1980s or early 1990s tax reforms would have made firms to increase their relative payout, as the explosive growth in the payout ratios can be explained by partially unrelated factors, such as the collapse in the before-payout profit rate, interest rates and, perhaps to a lesser extent, the firms' willingness to maintain their payout despite the collapse in their average profitability. These factors seem to indicate that the growth in top taxpayers' income, particularly their capital income, has been more due to an increase in the firms' average profitability than payout.

The difference-in-differences estimations for the treatment and reference groups' MTRs and ETIs have shown the difficulty of assessing the impact of the late 1980s and early 1990s tax reforms. A part of the tax reforms' insignificance may rest on the model identification, such as the use of percentile shares instead of individual data. Still, the rejection of the parallel trends assumption alongside with the aforementioned insignificance of the DiD variables in Table 1 means that many groups' and individuals' MTRs have changed throughout this period not only contingent on their level of income, but presumably also due to its composition (wages, dividends, etc.). The ETI estimates of the late 1980s and early 1990s tax reforms have produced opposite results between the Holkeri and Aho government. Whereas the ETIs

[148] See Appendix on the households' capital income structure in 1961–2005.

of the former government's 1988 income tax law and the introduction of the dividend imputation system in 1990 (first applied the following year) showed a negative elasticity, the Aho government's reform has seemingly brought about a positive elasticity effect. The 2SLS DiD estimations in Table 3 seem to corroborate these results. However, as with the MTR estimates, the coincidence of the 1993 reform with the 1991–3 depression leaves a number of stones unturned in terms of depression-related controls. Additionally, these short-term estimates are agnostic about the impact of the given tax reforms on rising income inequality in the late 1990s and early 2000s.

Unfortunately for the assessment of MTRs cumulative dynamic effects on income inequality, the assumption of cointegration between the marginal tax rates and the top 1 percent taxable income share does not seem to hold for the entire duration of this study. However, the assumption does appear to hold for the interaction of the before-payout rate of profit and the payout ratio, the so-called payout rate of response $\overline{\phi}'_t$. By using three different lag lengths, the dynamic linear model estimations in Table 4 show the highly significant and statistically powerful connection between this payout response rate and the top 1 percent taxable income share. Although a parallel estimation of a relation of the top 1 percent MTR and taxable income share would have enabled on to compare the effects of both profitability and taxation in a more straightforward manner—given the relative stability of the payout ratio shown in Figure 3—it seems probable in the light of the literature reviewed in this article that the longer-term impacts of marginal taxation are, in general, difficult to ascertain in the first place, although the MTR and ETI estimations have used observations up to 2005. These results are, of course, by no means exclude one another. Quite to to the contrary, it seems plausible that the lower top 1 MTR in the 1990s and early 2000s has had an amplifying effect on the rising profitability and payout rate of response. In other words, the "signal", that is, the payout response rate, has been "amplified" by the tax reforms, enabling immediate after-tax top income shares as well as subsequent before-tax or taxable income shares to rise more rapidly than would have otherwise been the case. Integrating these two variables in a single model may thus be a fruitful way forward in future research on the topic.

Alongside with the contribution on the given tax reforms' MTR and ETI effects as well as the cumulative dynamic effects estimation on the payout response and top 1 percent income share this article has also shown the importance of a detailed knowledge of tax history. By highlighting the pre-reform era tax system's entropy—the narrowness of its base, its uneven treatment of taxpayers and the plethora of deductions and exemptions added to the tax code over time—the article casts doubt on the character and impact of the introduction of the Nordic dual income tax in Finland in 1993 as well as its immediate predecessor reforms in the late 1980s and early 1990s. Although these reforms have certainly had favourable results in terms of capital income taxation, it is shown that the dual taxation of dividends had been mitigated before the early 1990s, even if at the firms' end. Thus, the introduction of the dual income tax does not seem to have been as great a break in Finnish tax history as has been proposed by the exponents of the taxational explanation.

Putting emphasis on profitability has allowed this article to pursue income inequality beyond taxation. Although profitability, payout and taxation have certainly been in a reciprocal relationship with dynamic medium- to long-term effects between one another, it has been shown in this article that they are also independent from one another in significant ways. For example, the recovery in Finnish companies' average profit rate after the 1991–3 depression has largely hinged on non-taxational variables, such as bankruptcies, mergers, layoffs, unemployment, devaluation of the FIM, the success of telecommunications companies, and so on, which have resulted in a slowdown in the growth rate of the per capita real wage and given the firms a greater share of the value added (surplus value). A useful way forward would be to engage in cross-country comparison as well as the inclusion of tax reforms in different times. For example, a comparison between the Nordic countries could shed light on the relationship between profitability, dual income taxation and inequality, given the different trajectories these variables have taken in this relatively homogeneous group of countries.

Appendix

This Appendix presents the data sources used in the article's figures and tables as well as the supplementary data on business taxation, company types, unemployment and equity-to-debt ratios in Finnish construction, manufacturing, wholesale and retail, and the households' capital income structure in 1961–2005.

Figures and tables

Figure 1:

Statistics Finland (1984). National accounts. Timeseries for 1960–1981. Statistical Surveys Nro 75. Helsinki: Statistics Finland
Table 5.1.A (pp. 50–55)
Table 5.2. (pp. 62–69)
Table 10.5. (pp. 132–133)

Statistics Finland (1985). Capital stock in 1960–1983. KT 1985:6. Helsinki: Statistics Finland
Table 2.1. (pp. 46–47)

Statistics Finland (2020). Income and production by sector and industry, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_123h.px/` [accessed on April 24, 2020]

Statistics Finland (2020). Investments and fixed capital, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_124l.px/` [accessed on April 24, 2020]

Figure 2:

Statistics Finland (1984). National accounts. Timeseries for 1960–1981. Statistical Surveys Nro 75. Helsinki: Statistics Finland
Table 5.1.A (pp. 50–55)
Table 5.2. (pp. 62–69)
Table 12.1. (pp. 198–199)

Statistics Finland (1985). Capital stock in 1960–1983. KT 1985:6. Helsinki: Statistics Finland
Table 2.1. (pp. 46–47)

Statistics Finland (2020). Investments and fixed capital, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_124l.px/` [accessed on April 24, 2020]

Statistics Finland (2021). Prices and Costs. Statistics Finland StatFin database `https://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__kan__vtp/` [accessed on November 2, 2021]

Statistics Finland (2021). Employment and hours worked, annually, 1975–2020. Statistics Finland StatFin database `https://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__kan/` [accessed on November 2, 2021]

Figure 3:

Statistical Office of Finland/Statistics Finland (1960–89). Statistics of income and property, 1960–1987. OSF IV B:27–51; Income and Consumption 1988:6–1989:4 (published annually)
Individuals, etc. and their income and income taxes by income classes (various tables)

Statistics Finland (1984). National accounts. Timeseries for 1960–1981. Statistical Surveys Nro 75. Helsinki: Statistics Finland
Table 5.1.A (pp. 50–55)
Table 5.2. (pp. 62–69)
Table 10.1. (pp. 104–105)
Table 10.5. (pp. 132–133)

Statistics Finland (1985). Capital stock in 1960–1983. KT 1985:6. Helsinki: Statistics Finland
Table 2.1. (pp. 46–47)

Statistics Finland (2019). Percentile-distributed micro data on taxable income, 1987–2005 (in author's possession)

Statistics Finland (2020). Income and production by sector and industry, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_123h.px/` [accessed on April 24, 2020]

Statistics Finland (2020). Investments and fixed capital, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_124l.px/` [accessed on April 24, 2020]

Figure 4:

Statistical Office of Finland/Statistics Finland (1960–89). Statistics of income and property, 1960–1987. OSF IV B:27–51; Income and Consumption 1988:6–1989:4 (published annually)
Individuals, etc. and their income and income taxes by income classes (various tables)

Statistics Finland (2019). Percentile-distributed micro data on taxable income, 1987–2005 (in author's possession)

Figures 5 and 6:

Statistical Office of Finland/Statistics Finland (1960–89). Statistics of income and property, 1960–1987. OSF IV B:27–51; Income and Consumption 1988:6–1989:4 (published annually)
Individuals, etc. and their income and income taxes by income classes (various tables)

Statistics Finland (2019). Percentile-distributed micro data on taxable income, 1987–2005 (in author's possession)

Tables 1–7:

Statistical Office of Finland/Statistics Finland (1960–89). Statistics of income and property, 1960–1987. OSF IV B:27–51; Income and Consumption 1988:6–1989:4 (published annually)
Individuals, etc. and their income and income taxes by income classes (various tables)

Statistical Office of Finland/Statistics Finland (1963–2006). *Statistical Yearbook of Finland 1962–2006.* Various tables

on unemployment

Statistics Finland (1984). National accounts. Timeseries for 1960–1981. Statistical Surveys Nro 75. Helsinki: Statistics Finland
Table 10.5. (pp. 132–133)

Statistics Finland (1985). Capital stock in 1960–1983. KT 1985:6. Helsinki: Statistics Finland
Table 2.1. (pp. 46–47)

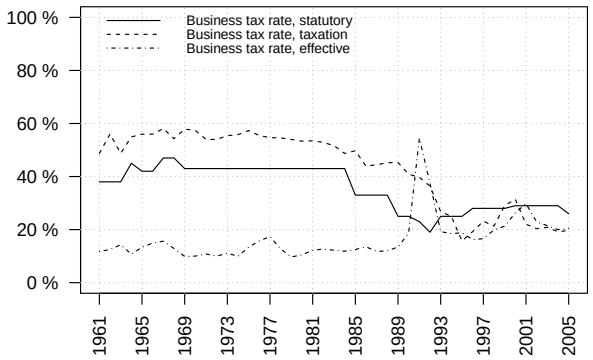
Statistics Finland (2019). Percentile-distributed micro data on taxable income, 1987–2005 (in author's possession)

Statistics Finland (2020). Income and production by sector and industry, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_123h.px/` [accessed on April 24, 2020]

Statistics Finland (2020). Investments and fixed capital, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_124l.px/` [accessed on April 24, 2020]

Business taxation

The following figure presents the statutory, so-called taxational and effective business tax rates in Finland, 1961–2005. The statutory tax rate excludes the municipal tax on businesses and corporations. This explains, in part, the gap between this rate and the taxational rate. This second, taxational rate measures the total business taxes paid by Finnish companies regardless of type over their profits shown in taxation (*i.e.*, after deductions and exemptions). The third measure, the so-called effective business tax rate, measures the previous measure's nominator over the firms' profits in national accounts (that is, before deductions, exemptions, transfers, etc.). The gap between these latter two business tax rate measures gives an impression on the scale of tax planning the firms were able to engage in (legally) especially prior to the late 1980s and early 1990s.



Statutory, taxational and effective business tax rates in Finland, 1961–2005

The sources for the business tax figure:

Statistical Office of Finland/Statistics Finland (1960–2006). Statistics of income and property, 1960–1992. OSF IV B:27–51; Income and Consumption 1988:6–2005:12; Income and Consumption 2006
Individuals, etc. and their income and income taxes by income classes (various tables)

Statistics Finland (2019). Tulonsaajien luku, tulot, varat, vähennykset ja verot valtionveronalaisten tulojen mukaan 2005, 1000 euroa. Statistics Finland StatFin databases (archived) `https://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin_Passiivi/StatFin_Passiivi__tul__tvt/statfinpas_tvt_pxt_001_200500_fi.px/` [accessed on November 2, 2021]

Statistics Finland (1984). National accounts. Timeseries for 1960–1981. Statistical Surveys Nro 75. Helsinki: Statistics Finland
Table 5.2. (pp. 62–69)

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Table 2.1. (pp. 46–47)

Statistics Finland (2020). Income and production by sector and industry, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_123h.px/` [accessed on April 24, 2020]

Statistics Finland (2020). Investments and fixed capital, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_124l.px/` [accessed on April 24, 2020]

Business entities by type in Finland, 1984–2005

The following table shows the growth in joint stock companies turnover-weighted share of all business entities in Fin-

land in particular in the mid-1990s. This changes reflects partially the growing popularity of this entity over others after the 1993 tax reform's favourable position on privately held corporations as well as the impact of the dividend imputation (*avoir fiscal*) on listed corporations' dividend taxation (*i.e.*, the cancellation of double taxation).

Business entities by type, weighted by turnover, %

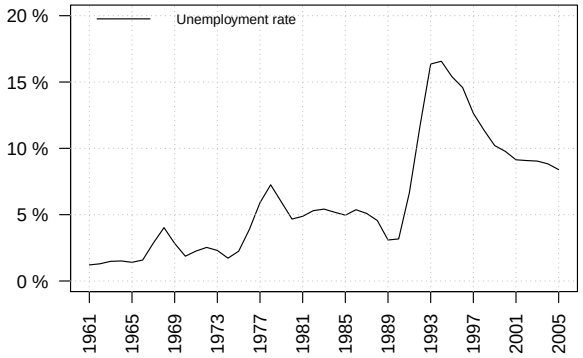
	1984	1988	1992	1996	2000	2004
Trade name	5.0	4.3	3.4	3.5	2.8	2.9
Open company	1.9	1.6	1.3	0.9	0.6	0.6
Limited partnership	7.8	8.9	7.6	4.0	2.4	2.0
Joint stock	70.7	73.3	79.3	87.4	89.5	88.9
Co-operative	11.4	8.8	4.9	3.3	2.7	2.9
Other	3.2	3.1	3.5	1.0	1.9	2.7

The sources for the entity table:

Statistics Finland (1990–2007). Corporate enterprises and personal businesses in Finland 1988–2005. Enterprises 1990:8–2003:1; Enterprises 2007

Unemployment

The following figure presents the annual unemployment rate average in Finland in 1961–2005 based on Statistics Finland's monthly labour force survey. The data differs from the figures in the employment office statistics due to the survey methodology.



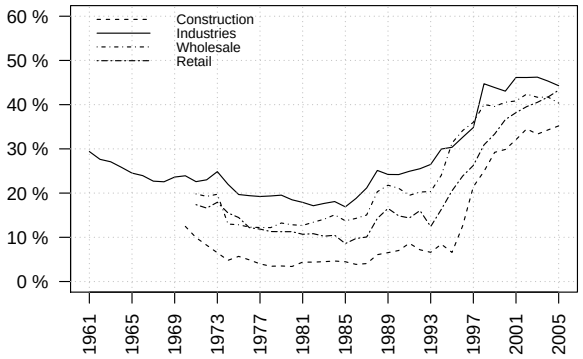
Unemployment rate in Finland, 1961–2005

The sources for the unemployment rate:

Statistical Office of Finland/Statistics Finland (1963–2006). *Statistical Yearbook of Finland 1962–2006.* Various tables on unemployment

Equity-to-debt ratios

The following figure gives the equity-to-debt ratios in construction, industries, wholesale and retail in Finland in 1961–2005. The figure shows clearly the growth in these branches' indebtedness in the 1960s, 1970s and 1980s, as well as the growth in equity funding since the mid-1980s and especially in the 1990s and early 2000s. This development has been reflected in the relative growth of dividends in relation to interest, capital withdrawals and other forms of capital income. Unlike dividends, interest has been historically deductible in the firms' taxation, although corporations have been granted different dividend deductions in the 1960–80s before the introduction of the dividend imputation in 1990 and the dual income tax in 1993.



Equity-to-debt ratios in construction, industries, wholesale and retail in 1961–2005

The sources for the equity-to-debt ratios:

Statistics Finland (1988–92). Teollisuusyritysten tilinpäätöstilasto 1986–1991. Yritykset 1988:2–1992:25. Helsinki: Statistics Finland

Statistics Finland (1993–2000). Financial statements statistics 1991–2000. Enterprises 1993:1–2002:2. Helsinki: Statistics Finland

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Statistics Finland (2020). Teollisuuden ja rakentamisen tilinpäätöstiedot 1999–2005. Statistics Finland StatFin databases (archived) `https://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin_Passiivi/StatFin_Passiivi__zzz__tetipa/060_tetipa_tau_106_fi.px/` [accessed on November 3, 2021]

Statistics Finland (1973–6). Statistics of profit and loss and balance sheet accounts of wholesale and retail trade in 1971–1973. YR 1973:14–1976:1. Helsinki: Statistics Finland

Statistics Finland (1975). Statistics of profit and loss and balance sheet accounts of the activities of bycontractors and subcontractors for the years 1970 and 1971. YR 1975:15. Helsinki: Statistics Finland

Statistics Finland (1978–95). Enterprise statistics of construction 1974–1994. YR 1978:4–1987:10; Enterprises 1988:1–1995:15

Statistics Finland (1978–87). Enterprise statistics of wholesale and retail trade 1974–1985. YR 1978:5–1987:14. Helsinki: Statistics Finland

Statistics Finland (1988–98). Enterprise statistics of wholesale trade 1986–1996. Enterprises 1988:10–1998:2. Helsinki: Statistics Finland

Statistics Finland (1988–98). Enterprise statistics of retail trade 1986–1996. Enterprises 1988:3–1998:3. Helsinki: Statistics Finland

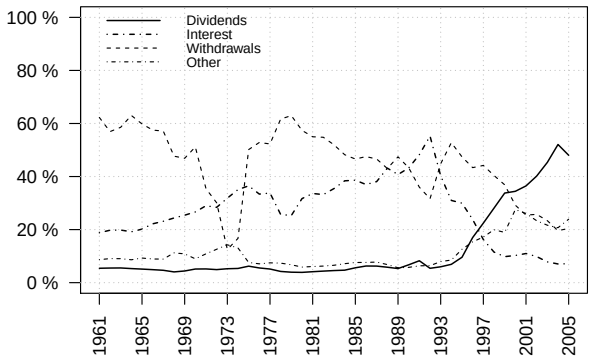
Statistics Finland (1989). Talonrakennusyritysten tilinpäätöstilasto 1987–1988. Yritykset 1989:3 and 1989:12. Helsinki: Statistics Finland

Statistics Finland (1997–2000). Financial statements statistics 1995–1998. Enterprises 1997:4–2000:4. Helsinki: Statistics Finland

Statistics Finland (2020). Kaupan tilinpäätöstiedot 1999–2005. Statistics Finland StatFin databases (archived) `https://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin_Passiivi/StatFin_Passiivi__zzz__katipa/009_katipa_tau_105_fi.px/` [accessed on November 3, 2021]

Households' capital income structure

The Finnish households' capital income structure has gone through significant changes throughout the research period. The previously dominant interest and capital withdrawals have since the mid-1990s given away to emerging dividends and other investment income (*e.g.*, returns on investment funds, private pension insurances, etc.). In the 1960–80s, the former two forms of capital income "competed" for dominance which means that they have been at least partial substitutes for one another in terms of business and corporate finance and subsequent payout. The rising share of interest until the 1991–3 depression is also indirect evidence of the firms' growing indebtedness, even though the households' interest income has been based only partially on, for example, corporate bonds, and partially on deposits. The rise in dividends until 2004 seems to be good evidence of the impact of both profitability and taxation. As the firms' average profit rate increased, their ability to fund their investments on retained profits increased, thus reducing the need for lending. The 1993 tax reform has also made equity funding more lucrative from the firms' and investors' viewpoint, as interest has no longer enjoyed a tax benefit over dividends at the latters' end. This shift tells also about the contraction in real interest rates in the 1990s and early 2000s in comparison to the late 1980s and the depression years in the early 1990s. Although dividends have not been deductible in the firms' taxation throughout the research period (unlike interest), the previous reasons have probably increased share emissions, as well. Finally, the collapse in the share of capital withdrawals speaks about the rising prominence of corporations over partnerships and other business entities, as well as about the corporations' shift in emphasis from debt to equity in the 1990–2000s.



Households' capital income structure, 1961–2005

Sources for the capital structure:

Statistics Finland (1984). National accounts. Timeseries for 1960–1981. Statistical Surveys Nro 75. Helsinki: Statistics Finland
Table 10.5. (pp. 132–133)

Statistics Finland (2020). Income and production by sector and industry, annually, 1975–2018. Statistics Finland StatFin database `http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin__kan__vtp/statfin_vtp_pxt_123h.px/` [accessed on April 24, 2020]

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