Accounting for Business Income in Measuring Top Income Shares: Integrated Accrual Approach Using Individual and Firm Data from Norway

Annette Alstadsæter, Martin Jacob, Wojciech Kopczuk and Kjetil Telle
NMBU, WHU, Columbia University, Statistics Norway and Norwegian Institute of Public Health

September 23, 2021

1We thank Dirk Krueger (the Editor) and three anonymous referees for very valuable comments and suggestions. We also benefited from comments from Rolf Aaberge, Alan Auerbach, Richard Burkhauser, Patrick Driessen, Roger Gordon, Agnar Sandmo, David Seim, Joel Slemrod, Jan Södersten, Thor Olav Thoresen, Binzhen Wu and Junsen Zhang as well as various seminar and conference participants. Financial support from the Research Council of Norway, grants 239225 and 283322, is gratefully acknowledged.

2Corresponding author: wojciech.kopczuk@columbia.edu
Abstract

Using linked individual and firm administrative data from Norway, we are able to look through layers of holding companies and attribute corporate profits to the ultimate individual owner as they accrue. We show that our new measure changes the level and trend of income inequality over time, and that this measure eliminates sensitivity of measures of inequality to changing payout policies in response to tax reforms. After a tax reform in 2005 that incentivized retention of earnings within businesses, the total income share of the top 0.1% more than doubles in some years when comparing with ordinary realization-based income measures. We further utilize our rich data to show that 1) our comprehensive income measure reduces the elasticity of taxable income, and 2) observed capital income flows on individual tax returns do not reflect the overall corporate profits, so that any imputation method based on realized income performs poorly. We discuss implications for measured top income inequality in other countries as well, in particular for the United States.
1 Introduction

There is renewed attention on income inequality among scholars and policy makers alike, in particular in light of the recent Covid-19-induced economic crisis. Studies of income inequality routinely rely on administrative tax data to provide detailed coverage of the very top of the distribution (for example Piketty, 2003; Piketty and Saez, 2003; Atkinson, Piketty and Saez, 2011; Aaberge and Atkinson, 2010; Piketty, Saez and Zucman, 2018; Auten and Splinter, 2019). Naturally though, administrative tax data reflect the design of the tax system by including only information that is collected by tax authorities. Such data are also affected by reporting behavior of taxpayers. Reliance on administrative data thus influences the concept of income that researchers can measure and may result in limited comparability both over time (as reporting or income shifting incentives change) and across countries (as tax regimes and incentives differ).

One key issue in measuring income inequality relates to income of corporations and how this income is allocated to owners. Since capital gains and dividends are taxable on the individual level, they are usually observable and often the only feasible way of allocating corporate income to owners. We will refer to this dominant approach to measuring income related to business activity as the “realization approach”. Our proposed accrual-based approach attributes all corporate profits to shareholders when they are earned, independent of dividend payout policy. This is important because dividend payout is affected by the incentives set by the tax system. Our approach thus represents a substantial step towards better inequality measures that are less sensitive to behavioral responses to taxes and better reflect accrued but not realized income of the owners.

Using rich Norwegian administrative data that links firms and owners through a comprehensive shareholder register, we attribute firm level income to owners when it accrues. We document the importance of business income for the income composition, especially at the top. The total income share of the top 0.1% more than doubles in some years, compared to realization based estimates. We also show that not only the level of inequality is mis-measured when unrealized income within the firm is not accounted for, but also that the trend over time is affected and that the impact persists for at least eight years after a reform that changed the incentives to pay dividends. Another benefit of our accrual approach is that it allocates people to top groups in a much more stable way despite changes in the composition of income. This gives us confidence that our income measure is closer to an economically meaningful definition of income. To our knowledge, we are the first to show the tax sensitivity of the realization-based approach in measuring top income shares using
administrative tax.

Our main results for Norway are illustrated in 1. Relying on individual income tax reports only and excluding capital gains (the red line), as is commonly done in the literature, implies that the top 1% income share is growing before 2005, spikes up in that year to almost 14%, only to drop in 2006 to under 7% where it stays until the end of the decade, and — after the 2005 reform — it is similar to the income measure that excludes dividends altogether (blue line). The pre-reform dynamics correspond to massive dividend payouts in 2005 in response to the announced dividend tax reform. Under our integrated accrual approach where we allocate corporate income to shareholders (in black), the top 1% share is larger — 8% to 17% — and with a stronger cyclical component and a different temporal pattern. In particular, the correction for corporate income has little effect on the share of the top group before 2005, when exemption of dividends from taxation allowed for free pass-through of available corporate income. After 2005, however, the dividend tax provided strong incentives to retain earnings in the firm, introducing a substantial difference between individual income measured under the traditional realization approach and under our integrated accrual approach. Given the importance of corporate income, it is natural that a reform incentivizing retention of earnings has a large impact on inequality measures using the realization approach.

While it is tempting to think of large publicly traded firms as driving business incomes and inequality, we show that these large changes in inequality are accounted for by the behavior of non-listed, closely held firms with relatively few owners and, correspondingly, by major shareholders in such firms. We also document that most of the post-2005 increase in retained earnings at the top happens through firms that are not owned directly, illustrating that, at least in Norway, allocating business profits to individuals critically requires the ability to see through multiple layers of ownership and to have information on retained earnings by privately held companies.

Three prior papers were able to allocate profits to shareholders in Norway (Thoresen et al., 2012), Canada (Wolfson et al., 2016), and Chile (Fairfield and Jorratt De Luis, 2016), and document implications for income distribution, the level of inequality, and effective tax rates at a given point in time. We differ from their approach in several ways. First, we utilize panel data and exploit a comprehensive tax reform in the middle of our sample period to explore the impact of tax policy changes on measured and actual inequality. Second, we are able to look through multiple layers of holding companies and attribute corporate profits to the ultimate individual owner as they accrue. This is relevant because of the prevalence of holding structures among top income earners. These
features allow us to demonstrate sensitivity to changing tax regime and characterize compositional shifts that are behind the effects on inequality.

Our findings have several other implications. First, we demonstrate that realization-based income measures greatly overestimate the behavioral responses to tax changes, measured by the elasticity of taxable income. The reason for this is that such measures are very sensitive to income shifting between tax bases, when only realized individual income is observed and not firm level unrealized income. Our comprehensive accrual based income measure reduces that elasticity significantly, as it is less prone to mis-measurement due to profit shifting between the individual and corporate income tax base. We show this by utilizing the 2005 reform to estimate the elasticity of (taxable) income that effectively can jointly account for both income and corporate bases of taxation and investigate its sensitivity to the definition of income used.

Second, there is increased awareness of the role of unobservable business level income for the measurement of inequality in the literature. Recent papers try to deal with this by imputing retained earnings based on realized dividends (see for instance Piketty, Saez and Zucman (2018) and Auten and Splinter (2019)). This approach, however, requires a positive correlation between dividend distributions and retained earnings. We assess the validity of this assumption in our rich Norwegian data and show that the capital income flows that are observed on individual tax returns do not come close to reflecting the overall corporate profits, not even with a lag. Thus, the imputation method based on realized income performs quite poorly and underestimates top income groups’ share of total overall income.

Third, and most speculatively, we consider the implications of all of this for the United States based evidence about inequality. While we use Norwegian data, we believe the main points apply broadly. Given the importance of capital income for top income inequality and its trend in other countries, our approach will likely alter the conclusions about the evolution of top income inequality in other countries as well. To illustrate, we discuss the case of top income shares in the United States (Piketty and Saez, 2003). Until 1986, there were strong tax incentives to be organized as a C-corporation — effectively, the equivalent approach to the dominant current organizational form in Norway. Hence, inequality in the United States until 1986 was measured in a way that was comparable to the uncorrected Norwegian data. In particular, given high top personal income tax rates that applied to dividend income, there were strong incentives against explicitly paying out dividends and toward alternative uses of fund such as retaining earnings, similarly as in Norway after 2005. Reduction of personal income tax rates introduced by the Tax Reform Act of 1986 led
to a massive conversion from C- to S-corporate form, the latter being subject to the pass-through treatment (Auerbach and Slemrod, 1997; Gordon and Slemrod, 2000). Since then, there has been a strong trend toward establishing new firms as pass-through entities (either S-corporations or, more recently, limited liability partnerships; see Clarke and Kopczuk, 2017 for a description of these trends). Hence, after 1986, reporting of income in the United States is effectively closer to our accrual approach and, in particular, the work of Cooper et al. (2016) and Smith et al. (2019) demonstrates that pass-through income accounts for most of the trend in inequality.

2 Background and data

2.1 Challenges with the realization approach

In developed countries, business income is generally taxed in one of two ways, either at owner level through passed-through income from the firm, or at entity level, with personal income taxation at some later date (e.g., when dividends are paid out). Under the pass-through concept, income of a firm is allocated to its owners and reported in individual income tax returns. This is the usual treatment of self-employed individuals and partnerships without limited liability, but may apply more broadly. In some countries, the pass-through approach also applies to some firms with limited liability. Most notably, in the United States, this approach is applied to S-corporations and limited liability partnerships. Recent literature suggest that these types of businesses are very important at the top of the income distribution and have played a big role in the increase of the income inequality of the United States (Cooper et al., 2016; Clarke and Kopczuk, 2017; Smith et al., 2019; Kopczuk and Zwick, 2020). In contrast, most countries apply separate taxation of firms and their owners, as the corporate tax is imposed on the entity level on firm’s profits and, subsequently and separately, dividends or capital gains are taxed at the individual level at the time of payout or capital gains realization. Usually, even with administrative data, researchers cannot directly assign corporate profits to shareholders so that allocating income to owners in a way comparable to the pass-through approach is in practice not possible. Since capital gains and dividends are taxable at the individual level, they are usually observable and often the only feasible way of allocating corporate income to owners.

However, the realization approach involves many conceptual difficulties for the purpose of in-

---

1See Clarke and Kopczuk (2017) for a discussion of changes in the structure of business taxation in the United States over time, and Cooper et al. (2016) for in depth evidence on the structure and importance of partnerships in the United States.
equality measurement. First, dividends and capital gains are observed when paid or realized, which is, in general, at a different point in time than when profits accrue.\textsuperscript{2} Hence, income derived from immediately taxable sources such as wages, interest, pass-through entities, and income derived from (non-pass-through) corporate tax base, are in general observed at different points in time — potentially resulting in different income and thus inequality patterns over time. Second, realization of income influences ranking of individuals in any particular year and, hence, interacts with measurement of inequality. For example, it is well-known that capital gains tend to be realized in a lumpy manner (for example, corresponding to sales of businesses or life events that result in portfolio changes) and, hence, individuals move temporarily up the distribution in the year when capital gains are realized without substantial changes in their underlying economic position.\textsuperscript{3} Third, some of the corporate income may never show up on individual tax returns. Gains that are followed by subsequent losses would correspond to positive and then negative income under a pass-through approach, while only the net amount shows up under a (non-pass-through) realization approach.\textsuperscript{4} Unrealized capital gains held until death may not be taxed at all (step-up approach in place in the United States and Norway) or may be taxed as beneficiaries’ income (carry-over basis).\textsuperscript{5} Fourth, tax incentives influence realization decisions and the choice of organizational form (e.g., Gordon and MacKie-Mason, 1994; Gordon and Slemrod, 2000; Romanov, 2006). Hence, changes in tax incentives can potentially affect measurement of inequality by modifying the mix of realization and accrual sources of income that researchers rely on.

### 2.2 The Norwegian tax system and the 2005 reform

The pre-2006 Norwegian dual income tax system levied a proportional tax of 28% on all income, both on individual level and corporate level, and an additional progressive surtax on individuals’

\textsuperscript{2} This also naturally generates deferral tax incentives that affect the timing of realizations. Some theoretical solutions for addressing this issue within a realization-based system have been proposed (Auerbach, 1991; Auerbach and Bradford, 2004) but have not been tried in practice.

\textsuperscript{3} In particular, there is substantial churning among the top income taxpayers. For example, among 4474 taxpayers who were among 400 returns with highest adjusted gross income in the United States in one of the years between 1992 and 2013, 3213 were on the list just once and only 129 were on the list for 10 years or more (Internal Revenue Service, 2015).

\textsuperscript{4} Relatedly, corporate spending that benefits owners (see Alstadsæter, Kopczuk and Telle, 2014, for indications of such behavior) would also lead to realized income understating the underlying economic income of owners. However, such spending corresponds to inflating costs and mis-measurement of corporate income as well, so this is not necessarily addressed by our approach (although, it may be reflected to some extent if temporal patterns of profits and inflated costs are not perfectly aligned).

\textsuperscript{5} It has been the leading alternative proposal in the United States (it was enacted but never implemented and ultimately repealed in the late 1970s, and then briefly in effect during the 2010 “repeal” of the estate tax). An alternative is “constructive realization” that is used in Canada — under that approach, capital gains are deemed realized at the time of death of the taxpayer and show up as a single lump-sum income realization at that time.
wage income. Net capital gains were also included in taxable income until 2006, but dividends were tax-exempt in the same period. To protect creditors from owners excessively extracting assets from the corporation, the dividends that could be paid in a calendar year were restricted, among others, by the accumulated retained earnings in the (publicly available) balance sheet of the previous calendar year — implying that profits accruing within a calendar year could not be distributed before the next calendar year (this restriction was largely lifted in 2013). The shareholder income tax was introduced on January 1, 2006, and levies capital income tax on all personal shareholders’ return to shares, both dividends and capital gains, exceeding the after-tax risk-free interest rate. The so-called rate of return allowance (RRA) is tax exempt (but observable as dividends when utilized) and it is calculated as the price of the share (face value if not traded) times the after-tax interest rate on government bonds. If received dividends are below the RRA, the remainder is carried forward with interest and added to the imputed RRA in the following year. Dividends paid to corporations as well as corporations’ capital gains from realization of shares are tax exempt. Corporations no longer receive tax deductions for capital losses from shares. In order to prevent large behavioral effects in the timing of realizations of gains and losses by corporations, this tax exemption of capital gains was implemented without warning on March 26, 2004. This means that by holding shares through a holding company, a person may defer capital gains as well as dividend taxation until income is distributed to the personal level. A special regulation during 2005 actually allowed individuals to transfer their shares to a holding company, without triggering capital gains taxes that would otherwise apply. As documented by Alstadsæter, Kopczuk and Telle (2019), more than 8% of Norwegian shareholders transferred their shares to new holding companies during the last months of 2005. In addition, the tax-preferred way to organize a new corporation after 2006 is to establish indirect ownership structure with the main corporation responsible for the economic activity and a holding company that owns the individual owner’s shares of the main corporation. Such ownership allows for deferral of dividends and capital gains on the individual level, while permitting flexibility to disburse dividends and make changes to ownership of the main firm. We account for this in our empirical analysis by seeing through multiple layers of indirect ownership when distributing firm level earnings to the personal owner.

The tax reform was already announced in late 2004 and led to widespread timing effects in dividend payments as documented by Alstadsæter and Fjærli (2009), Thoresen et al. (2012), and Alstadsæter, Kopczuk and Telle (2014). Figure 3 illustrates that there was a strong timing effect in dividend payments to individual owners around the reform, with large dividends in the years.
leading up to the reform and very low in the years after. It also illustrates that dividends paid to individual owners are much smaller than overall dividends that are distributed by firms. Overall distributions actually do not plummet after 2005 (or at least not permanently): firms still pay out substantial dividends after the reform, but they do so to non-individual owners such as holding companies rather than to ultimate owners who are personal income tax payers. Figure 3 also illustrates that personal capital gains are small in Norway. This is likely because capital gains were not particularly preferentially treated and the possibility of indirect ownership allows for realizing capital gains (and dividends) without immediate taxable realization at the personal level, so that later payout of income from a holding company may be characterized as dividends rather than as capital gains.

2.3 Data

We use detailed administrative data from Statistics Norway (information originating from the Norwegian Tax Authorities) covering the universe of Norwegian corporations, self-employed, and adult individuals (aged 16 and above) over the period 2000-2013. Every resident in Norway is assigned a unique personal identifier that is present in all databases, enabling us to follow every individual over time and across datasets. The same holds for corporations. We use three main data sources.

First, we use Individual Data that cover all Norwegian residents (about 5 million) for each calendar year 2000 to 2013. It is mandatory for adult Norwegian residents to submit a tax statement every year, and we have all these statements. Individual tax information comprises income, e.g., labor income, business income, and capital income (including dividends). We include all individual-year observations where the individual’s age is at least 16. In total, our statistics are based on 54,423,145 observations and 4,930,201 individuals.

The Corporation Data comprise all businesses incorporated and taxable in Norway over the 1999-2013 period (including also corporations like banks, insurance companies and financial holding companies, but not public mutual funds). This data cover the balance sheet with detailed equity and debt information as well as the profit and loss statement of each corporation. Using these data, we construct a panel of 313,249 corporations for which we can compute the change in accumulated retained earnings for the period 2000-2013. In total, we have 2,059,972 corporation-year observa-\footnote{The dip in dividend receipts by households in 2001 is due to a temporary dividend tax that was in place for that one year.}
tions with changes in accumulated retained earnings that can be attributed to individual income tax statements.

To link retained corporate earnings from the *Corporation Data* to the *Individual Data*, we use the shareholder register (*Ownership Data*). These data cover every shareholding of each corporate and individual shareholder. For example, in 2011, we have 2,051,354 unique shareholder-corporation pairs for 213,484 corporations, with 689,050 (direct) individual shareholders and 90,590 corporate shareholders. The retained earnings are attributed to the corporate and individual shareholders. As individuals can indirectly hold shares in a firm, we account for 10 layers of indirect ownership. The final individual shareholding of each individual in each firm accounts for such indirect shareholdings. We then sum the change in accumulated retained earnings across all shareholdings for an individual and then merge this information to the *Individual Data*.

Even though we have information on foreign ownership, this is limited to the country of the direct owner. On average, foreign shareholders account for about 11% of aggregated accumulated retained earnings in Norway. We are thus only able to attribute Norwegian corporate level retained earnings to ultimate Norwegian individuals. This also means that any retained earnings in foreign corporations owned by Norwegian tax payers will not be included in the analysis. Also, we are not able to observe offshore income or wealth, which *Alstadsæter, Johannesen and Zucman (2019)* show is substantial at the top of the Scandinavian wealth distribution. This latter point implies that, if anything, our accrual approach could still underestimate true top income shares.

### 3 Income concepts

The standard Haig-Simons approach to personal income is to define it as the sum of a person’s consumption and the increase in his/her consumption opportunities over a time period. Some elements of consumption and consumption opportunities are inherently difficult or even impossible to measure, so that applied work typically relies on an equivalence of the change in ability to consume and the sum of labor income and the change in net wealth over a calendar year (*Simons, 1938*). This is often operationalized as the sum of earnings (return to labor) and return on assets. However, income from business remains a prominent example of an income flow that is difficult to measure adequately and timely in available data, especially under the common realization-based tax regime.\(^7\) It is also a prominent example of an income flow that blurs the line between capital

---

\(^7\)Another wealth-related income flow that is hard to measure, is consumption of housing. Unless realized in the calendar year (and not reinvested in the same year) and thus captured as capital gain, we are not measuring this in
and labor income — the distinction that needs not to be made when the conceptual approach is based on the Haig-Simons definition, which is an important empirical advantage of this approach.

Specifically, the advantage of our approach is that we can allocate business income on a timely basis. To do so, we allocate corporate level income to each personal shareholder according to his/her total ownership share in the corporation in the year when corporate income is earned. The total ownership share is the sum of direct and indirect ownership shares. The indirect ownership is calculated as the product of the shareholder’s direct ownership share in firm A and firm A’s total direct and indirect ownership share in firm B. In the simple case of two layers illustrated in the picture,

the person holds a 10% direct ownership share in firm B and a direct ownership share of 50% in firm A. Firm A also holds a 30% direct ownership share in firm B, rendering the person’s indirect ownership share in firm B to 15%. The person’s total ownership share in firm B is then 25%. Based on this, we will attribute 25% of the firm’s income to the person. Since firm B might hold shares in another firm C, the shareholder also owns part of firm C. In our approach, we also assign shares of firm C as well as any further subsidiaries up to ten layers of ownership to the shareholder.8

To illustrate the importance of business income for top income shares, we define several individual level income measures. The natural departure point is the administrative definition of “taxable income net of deductions” as defined by The Norwegian Tax Act. Its main components are income from labor (salaries, in-kind benefits, work-related welfare like sick-leave money and unemployment benefits, business income from self-employment), income from capital (interest, dividends, realized capital gains, etc.) and taxable transfers (like disability pensions, elderly pensions, etc., but not tax exempt transfers like means-tested social assistance, child allowances, health-care subsidies, etc.),

8Our main results are similar when we restrict our analysis to two layers.
but net of tax deductions (interest on debt, capital losses, various employment related expenses, some child care expenses, general deductions for pensioners, charitable contributions, etc.). To be able to estimate top incomes in Norway all the way back to 1875, Aaberge and Atkinson (2010) rely on this income measure and they discuss the advantages and disadvantages of income measures from tax assessments. In particular, due to differences in tax systems across countries, as well as changes in the definitions and deductions over time, it is not straightforward to compare results on top income shares based on such measures across time and countries. Aaberge and Atkinson (2010), among others, question the meaningfulness of such measures in the presence of income shifting related to tax reforms, and they show that substituting dividends with imputed average long-term returns on households’ stocks yields more moderate increases in top income shares between 1986 and 2005. Similarly, Thoresen et al. (2012) also find that income inequality increases more moderately when dividends and capital gains are replaced by profits of directly owned firms. To pursue a systematic analysis, we rely on a number of alternative measures that single out specific income components and disallow transfers and deductions. Consequently, we will also rely on before tax individual income measures. The four definitions are as follows:

1. \( I_C \) = Overall income before capital gains and dividends
2. \( I_B = I_C + \) dividends
3. \( I_{BG} = I_B + \) capital gains\(^9\)
4. \( I_D = I_B + \) individual’s share (\( s \)) of corporate income (\( \pi \))

We proceed as follows to capture the individual’s share of corporate income. Denote a corporation’s profits in a given year \( t \) by \( \pi_t \) and an individual’s (combined direct and indirect) share of those profits by \( s \). We are going to focus on after corporate-tax profits. We would like to assign \( s\pi_t \) to an individual as income. In the case of a pass-through approach, like for self-employed or for partnerships or S-corporations in the United States, this is exactly what happens by default. When the business-source income is not subject to the pass-through treatment, a corporation may pay a dividend of \( d_t \) (and an individual’s share of it is \( sd_t \)). Assuming for the moment a direct ownership of the firm, an approach that relies on income realization (\( I_B \) or \( I_{BG} \)) will account for income of

\(^9\)To clarify, when implementing income measure \( I_{BG} \), this includes i) income from labor, i.e. earnings and other benefits from employers (like private use of employer’s car, newspapers, phone, child care), as well as net income from self-employment; ii) capital income, i.e. interest, dividends, capital gains and losses, net income from renting of real estate, etc.; and iii) taxable transfers, like unemployment benefits, sick leave benefits and pensions (see Steinkellner 2003 p. 40 for details)
$sd_t$ in year $t$ and will reflect (at least to some extent and augmented by return) the remainder of year $t$ profits $s \pi_t - sd_t$ if and when additional dividends are paid in the future or when capital gains are realized. Note in particular that the level of dividend in year $t$ does not have to bear any direct relationship to profits in that particular year: it purely reflects realization decisions, and dividends in any particular year may reflect current profits, past profits or (within some legal limitations) future expected profits.

Conceptually, we would like to allocate $s \pi_t$ directly to the individual. We do observe profits so this would be a straightforward task in case of direct ownership. However, since individuals could own firms through other firms, we need to ensure that we do not count the same profits more than once. For example, if a firm B pays dividend to its corporate owner firm A, this dividend will comprise a part of firm A’s profits (which will again contribute to the change in firm A’s accumulated retained earnings). To handle this, we rely on the (Norwegian) accounting concept of “earned equity”, which we will refer to as accumulated retained earnings. The accumulated stock of retained earnings in year $t$, $R_t$, is equal to $R_t = R_{t-1} + \pi_t - d_t$, i.e additional accumulation reflects this year’s profits (or losses) with deduction for any dividends. Hence, the change in accumulated retained earnings, $\Delta R_t = \pi_t - d_t$, captures the income component that would have been passed-through to the owning individual(s) in a pass-through regime (S-corporation or self-employed). Aggregating changes in accumulated retained earnings across all firms corresponds to aggregating profits net of dividends to non-corporate shareholders. As a result, the sum of changes in accumulated retained earnings and dividends to non-corporate shareholders is equal to the economic profits of the corporate sector. We proceed by implementing this approach: an individual’s share of corporate profits is equal to his/her ownership share of the year’s change in accumulated retained earnings (through direct and indirect ownership) and any dividends received on the personal level.\footnote{While this use of balance sheet information on accumulated corporate earnings handles the problem of double counting dividends to corporate owners, it involves some drawbacks. Norwegian corporate finance law prescribes corporate holding of listed shares to be valued at stock market prices and not at costs of acquisition in the balance sheet. As illustrated in the following, this implies that an increase in the value of holdings of listed shares might be double counted. Assume that a holding firm H, which is fully owned by a person P, holds s percent of the shares in a listed firm L. Further, assume that the listed firm L has profits of A during the year, and — to simplify — that the profits are exactly reflected in the stock market value, i.e. that the value of L increases by A during the year. We will then first count P’s share of the change in accumulated retained earnings of L (sA). However, because of the finance law valuation prescription, the accumulated retained earnings of H will also increase by sA, implying that we count sA twice when calculating P’s corporate income. However, since retained earnings from large or listed companies only comprise a small fraction of total retained earnings of top incomes (see Figure 6 and related discussion at the end of Section 4.2), the potential measurement error might not be large. Indeed, we created the top income share plots excluding accumulated retained earnings of listed firms, and the results are barely distinguishable from those in Figure 1.}
We also considered constructing an additional measure of income \( I_E = I_D + \text{capital gains net of previously allocated corporate income} \) that would partially account for capital gains while retaining the virtues of accrual-based approach when possible. However, this measure cannot be constructed unless accrued income over the whole holding period is observed. In practice, we can only observe it for assets that were purchased during the coverage of our data. Given the small quantitative importance of capital gains for the top shares in Norway visible on Figure 1, we opted against pursuing a, necessarily imperfect, implementation of this type of approach.\(^{11}\)

4 Results

Our main results, showing the income of the top 0.1 and 1% as a share of the total income (sum of the same income measure for everyone aged 16 and above), are presented in Figure 1. In the post-2005 tax regime, when incentives to pay dividends were weak and firms instead retained earnings (as we will illustrate shortly), allocating corporate earnings to shareholders (accrual approach) has dramatic impact on the level of top income shares, more than doubling them relative to the realization-based approach when one looks at the top 0.1% of the distribution. In contrast, the effect of accounting for retained earnings is minor in the pre-2006 period (with the exception of 2005 that already reflects the impact of the reform, as discussed below). Since nearly all profits were paid out pre-2005 due to the tax exemption, the realization and the accrual approach yield similar results until 2004. Hence, our results strongly suggest that the tax regime in place has a major effect on the inequality measures when using realization-based information from personal income tax returns.

\(^{11}\)It is still useful to note though how capital gains might be accounted for in principle. Capital gains give rise to an additional set of problems. The value of the firm \( V_t \) reflects expectations of future profits (let us denote discounted value of future profits as \( \pi^E \)) and the market value of any marketable assets \( M_t \) such as cash or other tradeable assets (in particular, the value of non-tangibles is reflected in the future profit component and — to the extent that they might be traded beyond its value of generating future profits — the remaining part should be included in \( M_t \)). The capital gain \( V_{t+j} - V_t = \Delta \pi^{E,t+j} + \Delta M^{t+j}_t \) over holding period \( j > 0 \) represents the change in the value of these two components. For non-publicly traded firms, we have no ability to observe changes in prices, and we can only observe changes in ownership and capital gains at the time of realization, so that we cannot assign capital gains to individuals on an accrual basis. However, our approach to allocating corporate profits actually does account for part of the capital gain by allocating earnings as they accrue. If instead earnings were paid out as dividends at the time of accrual, the value of the firm would have been reduced and future capital gains would be lower. Naturally, the value of funds within and outside of the firm is not the same, but evaluating it is the question of use (similarly as consumption or investment decisions of an individual) rather than income. Hence, our preferred approach to incorporating capital gains would be to adjust them for earnings that have been already assigned to individuals over the holding period — effectively, adjusting capital gains for unpaid dividends so that the remaining component would reflect the increase in value of the firm beyond mechanical effect of past earnings. Under such an approach, actual realized capital gains are very likely to be adjusted downward for individuals who are at the top of the distribution (upward adjustment would correspond to losses).
One unexpected feature of our results is that despite strong incentives to pay dividends in 2005 (in fact, they were at the all time high, Figure 3), we see that the retained earnings already contributed to the top income share in that year. This is because the legal restrictions in the Norwegian tax system imply that dividends generally can only reflect profits in prior years and cannot be paid out of current-year profits. As a result, most of the 2005 profits were effectively subject to the post-reform taxation on personal income tax returns. This limits the ability to pay out profits as dividends in the same year when they are earned, so that a portion of high (for cyclical reasons) 2005 profits effectively could not be distributed under the preferential tax regime. Aggregate profits were in fact very high in 2005 (see Figure 3 and discussion below) and hence, due to the legal restrictions, both dividends (reflecting pre-2005 profits) and retained earnings (reflecting 2005 profits) were major contributors to top shares in that year. Nevertheless, we document in Section 4.3 below that taxpayers were in fact aggressively maximizing dividends paid out in 2005, subject to legal limits that they faced.

Our results also show that capital gains from individuals’ tax reports play a relatively minor role in shaping measurement of top income shares in Norway. When included in the realization-based measure of top income shares \( I_{BG}^{CG} \), they shift up both the top 0.1\% and top 1\% measures by between 0.2 and 1.4 percentage points, with elevated values in 2000 and 2006-7, but otherwise with no clear temporal pattern and no important qualitative effect on the overall evolution over the time. In particular, whether or not they are accounted for makes little difference for the comparison of the inequality patterns arising from our accrual- and the realization-based approaches.

4.1 Relationship to aggregate changes

In order to understand these adjustments to inequality, it is useful to first illustrate the behavior of aggregate series. Figure 4 shows that the Norwegian economy was generally growing during this period although with more pronounced fluctuations when the very important oil sector is

\[12\] To protect creditors from owners’ excessively extracting assets from the corporation, the dividends that could be paid in a calendar year were legally restricted, primarily by the accumulated retained earnings in the publicly available balance sheet of the previous year. This means that in most cases corporations could not pay more dividends in 2005 than what the balance sheet of 2004 allowed. Indeed, our data show that the share of corporations that did in fact maximize dividends according to the limits following from the balance sheet of the previous year peaked at 73 percent in 2005. In Section 4.3 we discuss evidence on dividend maximization in more detail and, in particular, Figure A.1 shows that it was widespread at the top percentile just before the reform.

\[13\] Corporate capital gains in Norway have not been generally tax advantaged — they were taxed as ordinary income before 2006 and at the same rate as dividends after the reform. As the result, the Norwegian shareholders of privately held firms may simply realize dividends instead of pursuing strategies to convert them into capital gains for tax purposes. Another reason is that capital gains on privately owned and used real estate are tax exempt in Norway, and thus not captured in our data. This is not so in e.g. Sweden (Roine and Waldenström, 2012).
included than when it is not. The 2003-2008 period was a rapid expansion followed by a short-lived recession. The figure shows that the stock of accumulated retained earnings grows rapidly after 2005, increasing from about 50% to 80% of total GDP. Accumulated retained earnings are unpaid dividends held in the corporate sector that correspond to past earnings and their stock can in principle be converted to the flow of dividends. They are massive relative to the overall income and, hence, the pattern and changes in their realizations are bound to confuse realization-based inequality statistics.

Figure 3 shows total after-tax profits, aggregate dividend payouts, and aggregate change in accumulated retained earnings in our micro data. Total profits were volatile over the period and, in particular, they rapidly increased between 2003 (pre-reform) and 2007 (post-reform). This effect partially reflects a booming economy, but also double counting of dividends in chains of corporate ownerships. In many, mostly non-recession years after 2005, newly retained earnings are multiple times greater than dividends and capital gains combined. Hence, accounting for income retained on the corporate side is extremely important and there is little hope that capital gains and dividends can proxy well for it. In fact, there is no indication that capital gains and dividends can even account for it with a lag — a critical assumption that is necessary when relying on income tax information to study the income distribution.

These aggregate patterns should be contrasted with the effect that accounting for the change in accumulated retained earnings has on the top shares in Figure 1. The volatility of the change in accumulated retained earnings does translate to some extent into volatility of top shares, but the effect is not mechanical and it is quite subtle. In particular, in the post-reform period, accounting for corporate profits has a massive effect on top shares throughout, even though the change in aggregate accumulated retained earnings in some of the years (2008 and 2011) was very small: the aggregate over the whole corporate sector masks substantial inequality across firms since some firms have large losses while others are successful. In particular, it suggests that imputation approaches based on allocating aggregate retained earnings or profits are unlikely to accurately capture the distribution unless heterogeneity in profitability can be accounted for. We will compare our approach to an imputation approach in Section 6.

4.2 Composition of top groups and shares

Based on our preferred integrated income measure we construct the top 1% and 0.1% groups, and then decompose income of these individuals into its sources (Figure 5). Not surprisingly, given
our previous discussion, the importance of dividends for the top groups declined after 2005, while the importance of accumulated retained earnings increased. In fact, the relative importance of realized and unrealized dividends has flipped. Supporting our approach to measuring income and its usefulness in accounting for inequality patterns, the overall contribution of corporate income from all sources (dividends and retained earnings) to the income share of the top groups has remained fairly stable. In particular, smoothness of the combined share of corporate income provides no indication that this integrated way of accounting for corporate source income might be systematically affected by the tax regime in place. It is also worth noting that dividends and the change in accumulated retained earnings are by far the most important component of top income at the very top. For the top 0.1%, they generally account for about 80% of top incomes, while wages account for at most 15%.

The left panel of Figure 6 documents that the adjustment for retained earnings is driven by closely-held firms. For each firm, we know both the retained earnings and the number of individual owners, and we can thus separately attribute retained earnings from firms with up to 10 owners and more than 10 owners. Virtually all of the retained earnings that we allocate at the top of the distribution have their source in firms with 10 or fewer owners. This result is consistent with Jacob and Michaely (2017) who show that payout of firms held by few owners is more sensitive to changes in dividend taxation than firms with dispersed ownership. The right panel of Figure 6 further shows that the bulk of adjustment is attributable to owners that have large ownership share in their businesses.

4.3 Evidence of tax avoidance

In the left panel of Figure 7, we show that earnings retentions took place primarily (though not exclusively) through indirect ownership. The introduction of the dividend tax encourages all firms to retain earnings, but indirect ownership offers additional benefits by allowing the flexibility of directing future realization of corporate income (through dividends or capital gains) to the holding company and continuing to defer recognition of that income on personal tax return. The figure separates two different types of ownership: through so-called E-firms and the rest. E-firms are holding companies that could be created in 2005 by relying on a transition rule: owners of existing companies were allowed to transfer their shares into a new holding company (E-firm) without

\[\text{ Owners had to meet certain conditions. They had to transfer all their shares and the holding company had to own at least 10\% of the original firm. The new holding company had to be registered by December 31st 2005.}\]
it being considered a sale and, thus, without triggering capital gains tax liability (Alstadsæter, Kopczuk and Telle, 2019). For our purposes, E-firms simply represent conversion of direct ownership to an indirect one in 2005.\textsuperscript{15} The figure shows that such conversions were quantitatively important at the top of the distribution, and that they result in indirect ownership accounting for the majority of business income of the well-off. As a result, the ability to see through such indirect structure is critical for appropriately allocating business income to the ultimate owners.

One key element of the small difference between the realization-based income definition ($I_B$) and our accrual-based income definition ($I_D$) prior to the 2005 dividend tax reform is that owners received large dividend payouts. We expect corporations to maximize dividends in 2005, the last years before the introduction of the dividend tax. To check this, we follow the approach of Alstadsæter, Kopczuk and Telle (2014). To define dividend maximizers, we operationalize the two main legal restrictions on dividends. First, only accumulated earned equity from the balance sheet of the previous year can be distributed in the given year. Our operationalization of earned equity is a proxy, since there are additional factors (which we do not have data to incorporate) that should be deducted from our measure of earned equity to find the exact legal limit on dividends. Second, remaining equity after dividend payments needs to be at least 10\% of total assets, again as stated in the balance sheet of the previous year.

Some corporations have no earned equity (because they have paid it out in the past or have accumulated losses) or their equity level is below 10\% of assets. Such corporations have no ability to legally pay any dividends. The remaining corporations can pay dividends. We define as maximizers corporations that have the equity/asset ratio of between 0.09 and 0.11 after proposing the positive dividend or that propose a dividend exceeding 95\% of its earned equity.

In all years, about 40\% of the corporations had no earned equity or their equity level is below 10\% of assets. Such firms have no ability to legally pay any dividends. In 2005, nearly half of the corporations that have the ability to pay dividends decide to maximize their payouts. Overall, 39\% of firms pay any dividends in 2005 and 62\% of those maximize their payout. The median corporation that pays dividends in 2005 does so to the maximum extent possible (see Alstadsæter, Kopczuk and Telle, 2014, for more extensive discussion). Appendix Figure A.1 shows these patterns focusing on the top of the distribution. Maximization of dividends was widespread in the top 1\% just before the reform. At least 60\% of individuals in the top 1\% owned firms that did so and 20\%

\textsuperscript{15} We identify E-firms by the NACE-code 65.238: Portfolio Investments. That code was rarely used before 2005, so the vast majority of such firms are created under the transition rule. The small amount of ownership labeled as E-firms before 2006 visible on Figure 7 corresponds to those rare cases.
owned a majority stake in such firms. The incidence of dividend maximization dropped sharply immediately after the reform. Further, Figure 7 shows that pre-reform the majority of dividends received by the top group was accounted for by dividend maximizers. These results highlight two things. First, they reinforce our finding about strong influence of taxation on the patterns of reported income. Second, they indicate that top taxpayers were facing a legal constraint in their dividend payouts suggesting that sizable retentions just before the reform (in 2005) were not by choice but rather due to legal constraints on the ability to pay dividends.

### 4.4 Persistence of top income groups

We also examine the persistence of income groups under different income definitions. An income measure that is differentially affected by tax incentives over time is bound to lead to re-ranking of individuals, while a comprehensive income measure that does not suffer from such problems should not result in such re-ranking, unless there is quantitatively important and heterogeneous behavioral response (Kopczuk, Saez and Song, 2009; Aaberge, Atkinson and Modalsli, 2013). The left panel of Figure 8 displays persistence of individuals in top income groups over time. It shows the likelihood that an individual who is at the top of the distribution in year $t$ was also at the top of the distribution in year $t-1$. It is clear that when the realization-based income measure $I_B$ is used, the tax reform in 2005 results in significant re-ranking — this is another manifestation of the problems that this method has in properly accounting for corporate sources of income across tax regimes. This re-ranking has been observed before by Aaberge and Atkinson (2010) and studied further by Aaberge, Atkinson and Modalsli (2013).

In contrast, the persistence of the top group using our preferred accrual-based approach $I_D$ is very stable over time. In particular, it does not exhibit a significant trend and does not show any important adjustment around the tax reform. It seems that our approach to allocating firm profits to individuals has indeed made the composition of the group robust to the change in tax regime. We interpret it as a strong indicator that our approach is in fact able to much more closely approximate the underlying income of individuals than the purely personal income tax-based alternative. We also note that persistence of individuals in the top income groups is lower when using our approach relative to the realization approach using $I_B$. This is because $I_B$ effectively misses the more volatile business incomes and the top group based on income $I_B$ consists to a larger extent of the more stable wages and dividends. While our approach using $I_D$ is not sensitive to tax changes, mobility is sensitive to recessions due to the nature of volatile corporate profits. For example, top incomes
are less persistent during the economic downturn in 2008 and 2009.

The right panel of Figure 8 shows the effect on persistence over three years. We plot the likelihood on being in the top 1% (or 0.1%) conditional on being there in year t-3. The likelihood of staying in the top group is naturally lower compared to one-year effects. As before, using our preferred income definition \( I_D \) stabilizes the persistence of individuals in the respective income group. As with the single year approach, the accrual approach eliminates the effect of the dividend tax reform on the persistence of top incomes. There is a (delayed) break in the persistence of top incomes only when using personal income tax return definition \( I_B \). Furthermore, using the accrual-based definition of income (\( I_D \)) results in somewhat smaller declines in persistence from 1 to 3 years, likely reflecting the ephemeral nature of dividend payouts.

Given these differing persistence patterns, it is clear that the top groups under each of the approaches are likely to consist of different individuals. In Figure 9, we illustrate it in more detail by showing the shares of the top 0.1 and top 1% group that are in the top group regardless of the approach. Before the reform, almost 80% of the top 0.1% and 90% of the top 1% of individuals under the integrated approach would also be at the top using the realization based approach. The overlap between the top groups breaks down dramatically after 2005 and the effect is massive for the very top group where the methods agree on assigning membership to the top group in less than 50% of cases.

Taken together, the integrated accrual approach induces an important re-ranking of individuals at the top of the distribution. By doing so, it stabilizes the year-to-year persistence of the top groups and corrects tax-reform driven swings in measurement of top income shares. Coupled with the conceptual rationale for this approach that highlights consistent treatment of earnings as they accrue, we conclude that this approach provides a much more realistic picture of the evolution of top income shares over time.

5 Implications for the elasticity of taxable income

An influential older literature stimulated by Feldstein (1995) and summarized in Saez, Slemrod and Giertz (2012) focused on measuring the responsiveness of taxable income to taxation, following theoretical arguments that highlight this parameter as the sufficient statistic for the efficiency cost of income taxation. One weakness of the empirical literature on the topic, which has been recognized since its early days (Slemrod, 1998), is that the complete measure of responsiveness
should account for all taxable bases (most critically, individual income and corporate base) and that, in particular, welfare consequences of the response driven by income shifting between different tax bases are different than those that are due to a real change in behavior, because their tax implications are different.\textsuperscript{16} This is however a difficult task to investigate empirically, because it requires simultaneously observing different tax bases that reflect the behavior of a taxpayer. Our data allows for overcoming this difficulty.

The change in taxation of business incomes led to retaining income within businesses. How elastic are different measures of income to taxation? The responsiveness of $I_B$, $I_B^{CG}$ and $I_C$ correspond to different forms of “broad income” analyzed in that literature — the aggregate of all income reported on individual tax returns (a broader and somewhat less responsive measure than “taxable income” that would not include income that is not subject to taxation and subtract any tax preferences). Our measure $I_D$ is unusual because it allows for accounting for income that remains on the business side.

We use the reform to show, to our knowledge for the first time, the importance of accounting for the business-side income. We pursue a variant of the approach advocated by Saez, Slemrod and Giertz (2012): a difference-in-differences approach that relies on comparing repeated cross-sections of the fixed-size slices of the income distribution. The idea behind this approach is the assumption of no rank-reversal. While the identity of individuals in, say, the top 1% of the distribution is changing from one year to another, under the assumption of ergodicity of the income distribution, the composition of the group would not. The benefit of this assumption is that it allows for abstracting from thorny issues of mean reversion of income that complicate strategies that exploit variation in income tax rate that is related to individual income level.\textsuperscript{17}

The fact that the tax reform affected business owners, but not people without business incomes, underlies the variation in tax rates that we exploit. We want to compare business owners to others, focusing on the top of the distribution to supplement our analysis of top income shares. The composition of the top of the distribution is changing when business owners report or earn lower income as the result of the reform and it violates the non-rank-reversal assumption. Therefore, we

\textsuperscript{16} Chetty (2009) takes a somewhat different approach but reaches a related conclusion that the distinction between “taxable” and “real” response is important.

\textsuperscript{17} The second conceptual approach, due to Gruber and Saez (2002) relies on the panel aspect of the data and models individual response of income, with controls for income dynamics that allow for exploiting income-dependent variation in tax rates. However, this approach requires multiple tax reforms so that conditional on income level, the effect of tax changes can be distinguished from the mean-reversion that is related to the income level. In our case, there is only a single reform so that we do not pursue this strategy although we test whether our approach is robust to inclusion of mean-reversion controls.
modify the approach suggested by Saez, Slemrod and Giertz (2012) and implement our strategy by comparing the top income group in each year of those who owned a business to the top income group in each year of those who did not own a business, selected to keep the relative sizes of the two groups constant over time. Specifically, we anchor this procedure in 2003 when the overall top 1% consisted of 82% who owned a business and 18% who did not. In all other years, we define the groups so that they add up to the 1% of the population with their relative sizes at the ratio of 82:18.\(^{18}\)

Each of our specifications regresses ln(\(I\)), for different concepts of \(I\), on the reform indicator or on the net-of-tax rate (ln(1 - t), where 1 - t is the marginal tax rate), instrumented by the reform indicator. The reform affected corporate business owners. Therefore, our reform indicator is defined as a dummy for business owners post-2006. Of course, being a business owner may be itself endogenous to the policy change so that we define the the groups based on ownership of a business between 2003-2005 (with robustness checks using 2001-2003 ownership). We define the marginal tax rate for business owners as corresponding to dividend tax rate and the marginal tax rate for non-business owners as the maximum wage income tax rate.\(^{19}\)

Table 1 contains the results. In the first panel, we focus on just a treatment dummy for being affected the reform (business owners starting in 2006). We first compare 2004 to 2007, years that are not adjacent to the reform, in order to eliminate any effect of temporal shifting of income. The difference-in-differences estimate of the reform on \(I_B\) and \(I_{CG}^B\) is large, as expected – the reform reduces income observable on individual income tax returns by 0.45 or 0.57 log points. The effect on \(I_C\) is much closer to zero, and the effect on \(I_D\) is has the opposite sign. The following two specifications change the period that we consider. We first include three years before and after and then include all of the years in our data (2000-2013). The results are similar, with the exception of the effects of \(I_D\) that are now negative. These results indicate, as expected, that the reform had a much larger impact on income as visible on individual income tax returns than on the full economic

\(^{18}\)In the alternative approach we instead look at the top 1% of the income distribution each year and split it into those who owned and did not own a business before the reform, as control and treatment. The drawback of this approach is that the composition of the groups may be endogenous to the reform as people with business income drop out of the top 1% as the result of the reform. See the Online Appendix Table A.1.

\(^{19}\)The dividend tax (used as marginal tax rate for the treatment group) is zero in all years, except in 2001 (11%) and from 2006 onward (28%). The total top tax rate on wages (used as marginal tax rate for the comparison group) is 55.3 % in 2000-2004, 51.3 % in 2005 and 47.8% starting from 2006. In both cases we use the marginal tax rate bracket, without considering the actual tax position of the individual in the given year. However, we also include a robustness check where we use the actual wage income of the individual in the given year to attribute the correct marginal wage income tax rate (it is zero for very low wage income, 35.8% for typical wage income and then increases at two thresholds). While the actual wage income may be endogenous to the marginal tax rate, results from this procedure are very similar to our main findings.
income represented by $I_D$ or on $I_C$ that excludes business incomes altogether.

In the second panel, we turn this specification into an IV approach. Given the structure of the reform, the first stage is extremely strong — in the first three specifications we simply use the top ordinary income and dividend tax rates (see Footnote 19) that have little variation over time except for the reform itself; in the last one we use personal tax rate that additionally incorporates minor progressivity and deductions implications at the top. The estimated elasticity is over 0.9 when using the $I_B$ or $I_B^{CG}$ definitions. It is still significant and non-trivial for the other two definitions of income, but it is only about 0.5 for $I_D$ — the bulk of the response to taxation that one would have obtained based on income seen on individual tax returns disappears when considering the overall income. In the following specifications we control for lagged income and the lagged income growth — controls for mean reversion and inequality trends considered in Gruber and Saez (2002) and Kopczuk (2005) — and they do not have meaningful impact on the results. The final specification controls for the personalized individual tax rate and the estimated elasticities are about the same.

The approach applied here is the simplest strategy to estimate the elasticity of income, but appears robust and produces findings that are qualitatively consistent with the patterns of top inequality we discussed before. The elasticity of personal taxable income ($I_B$ and $I_B^{CG}$) is economically very large, at the top end of estimates in the literature but follows logically as the consequence of shifts from dividends to retained earnings. The much smaller elasticity of $I_C$ corresponds to what one could obtain if business income is ignored (for example, some papers in the United States have excluded owners of S-corporations). The elasticity of overall income $I_D$ of about 0.5 is non-trivial but in the range of “broad” income elasticities estimated in the literature (Saez, Slemrod and Gertz, 2012). This parameter captures the effect on economic rather than taxable income of individuals. All of these estimates are specific to the top and to business owners and our main message here is that accounting for (non-realized) business income has large impact on the results.

6 Shortcomings of the imputation approach

The problem with retained earnings is not limited to measurement of inequality. Driessen (2014) notes that the approach that ignores retained corporate income is nowadays common in estimating distributional consequences of tax policy. However, absent ownership information, addressing this

---

20 The objections to it have been recognized for a long time. For example, the celebrated 1984 United States Treasury tax proposal that paved the way for the Tax Reform Act of 1986 (Department of the Treasury, 1984) accounted for corporate income in its distributional analysis noting that "Economic income reflects the view that corporations are not separate from their stockholders, but that the income of corporations is income of its stockholders; therefore,
issue requires some imputation-based approach to assigning corporate side income to shareholders. One can imagine various imputation methods that can address the lack of precise information about ownership. For example, Armour, Burkhauser and Larrimore (2014) use asset information from the SCF and rates of returns across broad asset classes to impute accruing capital gains at various points across the distribution. Alternatively, one can rely on observed capital gains or dividends to infer ownership. Saez and Zucman (2016) follow this path in order to allocate ownership of corporate equities in their wealth distribution estimates, Piketty, Saez and Zucman (2018) and Auten and Splinter (2019) do so to adjust United States income inequality series in Piketty and Saez (2003), and Thoresen et al. (2012) rely on a related approach to understand distributional implications of the 2005 Norwegian reform.

We investigate whether imputations based on dividends can account for retained earnings adequately in Figure 10. To do so, we assign ownership of aggregate retained earnings that belong to individuals (calculated from micro data) according to observed received dividends. As the figure shows, this approach to imputation results in understatement of retained earnings at the top of the distribution, with the exception of 2005 when both retentions and dividends were large. Mechanically, the approach does particularly poorly in years when aggregate retained earnings of households were negative because it cannot discriminate between losses to the general public and gains at the top. However, even in other years, such imputations can account for only between 20 and 60% of retained earnings that should be allocated to the top 0.1%. This is driven by the combination of losses and the imperfect correlation of dividends and retained earnings.

Figure 11 shows correlation of dividends ($D$) and retained earnings ($R$) for the 10 top percentiles of the income distribution. For percentiles starting from the 90th through 99th, when individuals are ranked by income as reported on personal tax returns, $I_B$, the correlation is effectively equal to 0. When individuals are ranked by their true economic income, $I_D$, that correlation becomes negative and it is more negative before the reform than after it. When one zooms in on the very top of the distribution, the top 1%, the correlation is volatile and close to 0 under both ways of ranking individuals and more noisy when personal income ranking is used. Although not presented directly in this figure, the correlation of dividends and earnings for the full population is very similar to that for the top 1%, reflecting that this is where majority of dividends and profits accrue.

---

21 One can of course imagine a simple adjustment to this procedure if aggregate profits and losses are observed separately. Note though that negative retained earnings do not necessarily correspond to losses.
What is the explanation for these patterns? Given firm's profits, dividends and retained earnings are *mechanically inversely related*. An owner who increases dividends reduces retained earnings. Within a group of individuals, that relationship may turn positive if individuals with higher dividends own more profitable firms. Which effect dominates is an empirical question that depends on the distribution and the notion of the group. It turns out that empirically this relationship is very weak and when restricted to individuals with similar economic income (ranking by $I_D$) the inverse relationship dominates except at the very top where it becomes close to zero. While the fact that the correlation at the top of the distribution can be close to zero or even negative may be surprising, note that very high dividends may in fact mean not just high profits in a particular year but instead a lump-sum payout of retentions accumulated in the past. Thus, the notion that in a given year, looking at individuals with high observed capital income corresponds to looking at those with very high profits does not need to hold even when the differences in income are large.

These patterns account for the poor performance of imputation based on dividends visible in Figure 10. That approach ranks individuals based on income as reported on personal tax returns and then assigns retained earnings based on dividends but given the weakness of the correlation of dividends with retained earnings, it does not come close to assigning retained earnings to the right people. The negative correlations visible in Figure 11 suggest that hypothetical improvements in how people are ranked would not help and may even hinder this approach.

To sum up, imputing retained earnings based on dividends still leads to a significant underestimation of inequality and that is despite the fact that our use of micro data (rather than assigning imputed income to groups) allows for re-ranking of individuals. Furthermore, our previous analysis highlights that it is closely held firms that are important and we have seen that the possibility of negative retained earnings (and more generally losses) makes the imputations difficult (and also casts doubt on relying on average rate of return to impute income based on asset values). By relying on precise ownership information, we can avoid these pitfalls.

7 Implications for other countries

7.1 Implications for the United States

In the final step, we discuss the implications of our findings for the United States based evidence about inequality and potentially other countries. While we use Norwegian data, we believe the main points apply broadly. To illustrate, Figure 2 shows top income shares in the United States
(Piketty and Saez, 2003). Until 1986, there were strong tax incentives to be organized as a C-corporation — effectively, the equivalent approach to the dominant current organizational form in Norway. Hence, inequality in the United States until 1986 was measured in a way that was comparable to the uncorrected Norwegian data. In particular, given high top personal income tax rates that applied to dividend income, there were strong incentives against explicitly paying out dividends and toward alternative uses of fund such as retaining earnings, similarly as in Norway after 2005. Reduction of personal income tax rates introduced by the Tax Reform Act of 1986 led to a massive conversion from C- to S-corporate form, the latter being subject to the pass-through treatment (Auerbach and Slemrod, 1997; Gordon and Slemrod, 2000) and, since then, there has been a strong trend toward establishing new firms as pass-through entities (either S-corporations or, more recently, limited liability partnerships; see Clarke and Kopczuk, 2017 for a description of these trends). Hence, after 1986, reporting of income in the United States is effectively closer to our corrected approach.

Focusing on the series that excludes capital gains, the striking feature of the overall trend in the United States is that the top income shares jumped dramatically from 1986 to 1988. To be more precise: measured income share of the top 1% jumped between 1986 and 1988 by 4.1 percentage points about equal to the whole change between 1988 and 2010 (4.2 percentage points). A non-trivial part of the 1986 jump is believed to reflect shifting between income and corporate base (Saez, Slemrod and Giertz, 2012). Our Norwegian results indicate that this jump is likely to correspond to a permanent difference in how top income shares are measured under a realization based (C-corporations) and an accrual based (S-corporations and partnerships) system, so that the level of inequality before 1987 is likely to be understated relative to that afterwards.\footnote{Furthermore, because the shift toward pass-through treatment continued after 1986 as new firms were increasingly established to benefit from lower personal income tax rates, this raises the possibility that part of the post-1986 increase further reflects that more of the corporate income is passed-through and measured in the individual tax reports. See Auten and Splinter (2019) and Clarke and Kopczuk (2016) for recent attempts to systematically adjust the top income shares in the United States for corporate retained earnings.} We show that the approach relied on in a recent paper by Piketty, Saez and Zucman (2018) to address this issue by imputing retained earnings using dividends continues to severely underestimate inequality when retained earnings are large. The rationale for that is simple to understand once one realizes that \textit{ceteris paribus} within a firm retained earnings and dividends move in the opposite directions, so that those who choose to realize dividends have low rather than high retained earnings.

Mindful of this one-time jump, Piketty and Saez (2003) point to the series that includes capital gains as corroborating evidence of a secular growth in inequality. However, we show that at least
in the Norwegian case, there is little correspondence between realized capital gains and accrual income. As Figure 2 demonstrates, the growth in the importance of capital gains at the top in the United States begins in 1979, after top capital gains tax rate reduction from almost 40% to 28%. The importance of capital gains appears to be reinforced after 1982, following the Economic Recovery Tax Act of 1981 that reduced the capital gains tax rate from 28% to 20% and exhibits very strong reaction to the Tax Reform Act 1986 that brought rates back to 28%. Together, this suggests that realization incentives played an important role (see Lindsey, 1987; Feldstein, 1995, for evidence of reported income response to the 1980s reforms that accounts for capital gains). Hence, the evolution of capital gains over the late 1970s and 1980s is consistent with changing incentives to realize, and thus need not reflect a secular trend. The contribution of capital gains to the top income shares in Figure 2 shows that the early 1980s — the period of changing incentives — is only comparable to the period of very strong stock market dynamics in the late 1990s and mid-2000s. The role of capital gains during this era again highlights that the approach to allocating corporate profits to individuals is bound to matter. A more compelling alternative to realized capital gains is to use accrued capital gains. Armour, Burkhauser and Larrimore (2014) study implications of imputing accrual for the evolution of inequality in the United States since 1989 and Burkhauser, Hahn and Wilkins (2015) do so for Australia. Figure 2 also shows a measure of the aggregate retained earnings — income net of deductions and dividends — of the United States corporate sector (other than S-corporations). It is clear that capital gains at the top of the distribution do not co-move with this accrual measure of non-realized corporate income. While not all of corporate retained earnings belong at the top of the distribution, their magnitude is large relative to changes in top income shares.

Alternatively, the Tax Reform Act of 1986 may also have had an effect on reported incomes through behavioral response and not just reporting. A large body of work on tax responsiveness of taxable incomes was recently surveyed by Saez, Slemrod and Giertz (2012). This literature usually focuses on reported incomes — stripped of S-corporation source income and capital gains — to analyze the effect on the remaining “stable” component. To illustrate the potential of behavioral response here, the top 1% share in 1986 according to Piketty and Saez (2003) data was 0.091 in 1986 and 0.132 by 1988. The top marginal tax rate changed from 50% to 28%, corresponding to the change in the log net-of-tax rate of \[
\log(1 - 0.5) - \log(1 - 0.28) = -0.364.
\] This net-of-tax rate change multiplied by the estimate of taxable income elasticity (which is customarily computed with respect to the net-of-tax rate) yields the implied percentage change in top income share for the
given strength of behavioral response. According to Saez, Slemrod and Giertz (2012), the upper bound of their preferred range of estimates of elasticity of responsiveness is about 0.4, which would then imply an increase in top 1% income share from 0.091 to 0.105 — explaining only about 1/3 of the observed increase between 1986 and 1988. The higher end of the estimates in the literature is about 1 — such large responsiveness could in fact explain all of the increase (it implies an increase from 0.091 to 0.131). In fact, the most prominent of such estimates (Feldstein, 1995) effectively does amount to interpreting the 1986-1988 increase as the response to tax rate changes. It is important to note that the reporting and behavioral response explanations are in fact not distinct because behavioral response measured in the literature may in fact be reflecting reporting rather than real effects.

More broadly, this discussion suggests that simultaneous claims of a large increase in inequality before the 1990s and low behavioral responses are mutually inconsistent. If behavioral responses are small, then almost the whole increase in inequality took place immediately after 1986. Absent real response to taxation, one would be left with either the belief that inequality somehow happened to experience a one time jump right after 1986 — a very arbitrary explanation — or that the effect is due to the effective shift from realization-based toward accrual-based approach that the reform corresponded to, so that top income shares before and after 1986 are measured in a different way. Our Norwegian evidence suggests that such a shift has potential to have large effects. Alternatively, the behavioral response may have also played a role, but one would need massive real responses to tax rates in order to explain this change without appealing to problems with measurement of inequality. Furthermore, capital gains do little to correct realization-based measurement problems in Norway, because they are small relative to changes in accumulated retained earnings (both in aggregate — Figure 3 — and at the top — Figure 1) and show little correlation with that volatile series. There is definitely much more action involving capital gains in the United States around 1986, but it seems unlikely that they correspond to profits as they accrue, rather than reflecting profits over longer holding periods realized at opportune timing.

7.2 Implications for other countries

The key advantage of our Norwegian data is ability to allocate profits to shareholders. We are not able to do the same for other countries. One may still, though, shed some light on the importance of these types of issues by evaluating the importance of accumulated retained earnings (undistributed profits) relative to dividends as well as the importance of pass-through entities elsewhere. This
exercise is still limited by data availability: in the Norwegian case, we observe balance sheets of all firms while the evidence that follows is based only on large publicly traded firms with — naturally — dispersed ownership.

Firm level profits that are retained in the corporation and not distributed to owners are considerable in most developed economies. Firms retain earnings, for example, to fund investments internally (Auerbach and Hassett, 2002) and, thus, a substantial part of profits is not distributed as dividends. Figure 12 illustrates trends in changes in accumulated retained earnings and dividends that are conceptually similar to series presented on our Figure 3 for Norwegian firms, although we need to rely on a different set of firms in the international sample. The bulk of the corrections in the Norwegian case was driven by closely-held businesses. Here, we instead use data on listed firms for nine large economies from Compustat over the period 1991–2019. We include all listed firms that had i) information on accumulated retained earnings in the current and previous year, and ii) information on dividends. We then sum changes in accumulated retained earnings as well as dividends over all firms in a year and convert to nominal billion USD.

We see that the two series are of the same order of magnitude so that not accounting for retained earnings is likely to be problematic in many countries. Further, the issue of (not) accounting for retained earnings varies considerably over time. For instance, for 1997 in the United States, the listed firms in the sample distributed about 170 billion USD to shareholders, but about the same amount was retained in the firms. As this paper indicates, this is income earned by shareholders, but not registered in the personal income statistics, leading to underestimation of their income, and disproportionately so compared to lower income individuals if not explicitly accounted for in some other fashion. Furthermore, dividends are very smooth (consistent with conventional wisdom in the literature), while accumulated retained earnings are much more volatile, similar to what we have seen in the Norwegian case and suggesting that the realization based approach may have problems accounting for business-cycle changes in inequality. Finally, the relative importance of dividends versus retained earnings varies across countries. Dividends appear particularly small in Japan outside recession years. In countries such as France, Germany, Italy, or Spain, dividends and retained earnings are on aggregate relatively similar in most years. Other countries such as Australia, Canada, or the United Kingdom are characterized by greater aggregate dividends in most sample years. Put differently, the issue of retained earnings exists in many countries, but to a

\[23\] We include the countries that had sufficient coverage of the listed firms included in the database, unfortunately that was not the case for Norway.
different extent. This suggests that comparisons of inequality across countries (e.g., Japan versus Canada), comparisons over time across countries (e.g., the rather stable dividend-retained earnings relation in Japan versus the volatile relation in Germany) or even time-series comparisons within a country (e.g., Germany or France) may be sensitive to these types of issues. In addition, the tax system in these countries can have large effects on the measurement of inequality because dividend and capital gains taxation has not only large effects on the level and channel of payout, but also on the fraction of internally generated cash flows that is paid as dividends (Jacob and Jacob, 2013a,b).

This is of particular importance because there is substantial cross-country variation in the importance of unincorporated and corporate businesses (roughly, a proxy for pass-through vs corporate tax treatment, although S-corporations in the United States are an important example that does not fit in that classification). Table 2 presents statistics on the importance of different organizational forms based on Eurostat data for 2011. The share of employment is concentrated in the corporate sector in countries such as Sweden, Norway, or the United Kingdom. Other countries such as France, Italy, Germany or Hungary have substantial employment in unincorporated businesses. Of course, unincorporated firms may have their own issue for measuring inequality, for example if they are more prone to tax evasion.

8 Concluding remarks

We show that accounting for retained earnings is important both for measuring the level and — when tax incentives evolve — changes in inequality. Doing so also indicates that re-ranking due to changes in observability of income was quantitatively important, but a comprehensive income measure that accounts for retention does not suffer from the same problems and results in more persistent income groups with respect to the underlying tax regime. We explore complete business register information that allows us to see through multiple layers of ownership — this is important because retained earnings hidden behind indirect ownership account for half of the total incomes of individuals in the top 0.1% after 2005.

There are some limitations of our integrated accrual approach. First, there may still be re-timing of corporate profits, and a non-announced tax exemption on corporate capital gains from mid 2004 may thus contribute to explaining some of the high dividends and retained earnings in 2005. Such re-timing is a potential issue for pass-through entities as well. Second, capital gains may reflect expectations of future profits before they accrue so that allocation based on capital
gains realization amounts to accounting for profits early and (potentially) to a different party than under the corporate profits based accrual approach. However, as seen in Figure 1, capital gains in Norway were quite small during the period we consider, so that the way of accounting for capital gains does not have large quantitative implications. Third, we only observe domestic ownership and firms, such that any retained earnings in foreign corporations owned by Norwegian taxpayers will not be included in the analysis. Also, we are not able to observe offshore income or wealth, which Alstadsæter, Johannesen and Zucman (2019) show is substantial at the top of the Scandinavian wealth distribution. Thus, our accrual approach estimates of the top income share is probably still an underestimate of the true top income shares.

To summarize, the importance of corporate-source unrealized income for inequality measurement differs across countries which substantially reduces comparability of inequality statistics across countries and the Norwegian evidence makes it clear that issues of comparability are important even within a country. A careful evaluation of the role of corporate income for inequality in other countries is an important direction for future work.
References


Figure 1: Top 1% and Top 0.1% in Norway using different approach to measuring income

The figure shows the share of overall income realized by the top 1% and the top 0.1% over the period 2000–2013. We report top income shares based on (1) overall income before dividends and capital gains ($I_C$), (2) overall income with dividends but before capital gains ($I_B$), (3) overall income with dividends and capital gains ($I_B^{CG}$, the dashed red line), and (4) overall income with dividends and retained earnings but before capital gains ($I_D$).
The figure shows the share of income realized by the top 1% over the period 1970–2010 using data from the United States. We report top income shares based on (1) overall income before capital gains and (2) overall income with capital gains. The solid gray line is the difference between these two income shares. The dashed gray line plots total corporate receipts net of deductions and dividends.
The figure shows aggregate profits after tax, aggregate dividends, the aggregate change in retained earnings, total dividends paid to individuals and total capital gains realized by individuals over the period 2000–2013 (and 1999–2013, if available) in billions of NOK.
The figure shows aggregate GDP, aggregate GDP excluding the oil sector, and aggregate retained earnings over the period 1990–2013 (and 1999–2013, respectively for total retained earnings).
This figure presents statistics on the income composition of the Top 1% and the Top 0.1% based on the total income distribution of income $I_D$. The dark gray area represents income related to retained earnings, the white shared area represents the income from dividends, and the light gray shaded area represents the income stemming from other income sources (wages, self-employment income, or rental income). We report the statistics over the period 2000–2013.
The figure presents statistics on the income composition of the Top 0.1% based on the total income distribution of income $I_D$. The white shared area represents income from dividends and the light gray shaded area represents income stemming from other income sources (wages, self-employment income, or rental income). In the left panel, we further split retained earnings into those stemming from firms with up to 10 owners and those with more than 10 owners. In the right panel, we split retained earnings according to the ownership share (50% ownership and more, 10% to 50% ownership share, and less than 10% ownership). We report the statistics over the period 2000–2013.
Figure 7: Accumulated retained earnings in the top 0.1% by direct/indirect ownership and dividends by dividend-maximizing firms

The figure presents statistics on the income composition of the Top 0.1% based on the total income distribution of income $I_D$. The light gray shaded area represents the income stemming from other income sources (wages, self-employment income, or rental income). In the left panel, we split retained earnings into those related to: indirect ownership through E-Firms, other indirect ownership, and direct ownership. In the right panel, we decompose dividends into those stemming from dividend maximizers and those from all other firms. We report the statistics over the period 2000–2013.
The figure presents statistics on the persistence of the top income groups after one year (left panel) and after three years (right panel). We report the probability of staying in the top 1% and in the top 0.1% according to income $I_D$ and to income $I_B$. 
The figure presents statistics on the overlap of membership in top income groups across different income definitions. The blue line (with circles) represents the share of individuals that are in the top 0.1% and top 1% according to income $I_D$ and according to income $I_B$. 
The figure shows the share of overall income realized by the top 0.1% over the period 2000–2013. We report top income shares based on overall income with dividends and retained earnings but before capital gains ($I_D$) and based on overall income before capital gains ($I_B$). We also report the share of top income, where we impute retained earnings based on the amount of received dividends. Specifically, we assign ownership of aggregate retained earnings that belong to individuals (calculated from micro data) according to observed received dividends.
The figure plots the correlation between dividend income and retained earnings at the individual level for the top 1% of the income $I_B$ distribution and the income $I_D$ distribution, respectively. The thinner darker (lighter) gray lines represent this correlation for other percentiles of the top decile of the income $I_B$ distribution (income $I_D$ distribution). We report the correlation over the period 2001–2013.
This figure plots aggregate changes in retained earnings (solid black line) and aggregate dividends (dashed gray line) in nine countries over the period 1991–2019 in billion USD. We use data from Compustat North America and from Compustat Global.
Table 1: Response of income — top business owners vs others

<table>
<thead>
<tr>
<th></th>
<th>$I_B^{CG}$</th>
<th>$I_B$</th>
<th>$I_C$</th>
<th>$I_D$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004 vs 2007</td>
<td>-0.335</td>
<td>-0.373</td>
<td>-0.056</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>$N$</td>
<td>76,294</td>
<td>76,294</td>
<td>76,294</td>
<td>76,294</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.025</td>
<td>0.022</td>
<td>0.101</td>
<td>0.120</td>
</tr>
<tr>
<td>2003-5 vs 2006-8</td>
<td>-0.399</td>
<td>-0.441</td>
<td>-0.068</td>
<td>-0.161</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.004)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>$N$</td>
<td>228,249</td>
<td>228,250</td>
<td>228,250</td>
<td>228,250</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.079</td>
<td>0.086</td>
<td>0.096</td>
<td>0.107</td>
</tr>
<tr>
<td>Post-2005 dummy</td>
<td>-0.438</td>
<td>-0.449</td>
<td>-0.139</td>
<td>-0.250</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>$N$</td>
<td>465,666</td>
<td>467,083</td>
<td>467,000</td>
<td>466,793</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.077</td>
<td>0.084</td>
<td>0.158</td>
<td>0.105</td>
</tr>
</tbody>
</table>

**Instrumental variable**

|                                |            |       |       |       |
| **No controls**                | 0.948      | 0.973 | 0.301 | 0.541 |
|                                | (0.009)    | (0.009)| (0.008)| (0.010)|
| $N$                            | 465,666    | 467,083| 467,000| 466,793|
| First stage F-stat             | $508 \cdot 10^6$ | $545 \cdot 10^6$ | $170 \cdot 10^6$ | $472 \cdot 10^6$ |
| Control for $I_{t-1}$          | 0.914      | 0.945 | 0.289 | 0.521 |
|                                | (0.009)    | (0.009)| (0.008)| (0.010)|
| $N$                            | 465,666    | 467,083| 467,000| 466,793|
| First stage F-stat             | $242 \cdot 10^8$ | $416 \cdot 10^8$ | $805 \cdot 10^9$ | $950 \cdot 10^7$ |
| Control for $I_{t-1}$ and $\Delta I_{t-1}$ | 0.912 | 0.945 | 0.289 | 0.521 |
|                                | (0.009)    | (0.009)| (0.008)| (0.010)|
| $N$                            | 465,666    | 467,083| 467,000| 466,793|
| First stage F-stat             | $718 \cdot 10^7$ | $882 \cdot 10^7$ | $549 \cdot 10^8$ | $993 \cdot 10^7$ |
| As above, personal tax rate    | 0.922      | 0.957 | 0.293 | 0.509 |
|                                | (0.009)    | (0.009)| (0.008)| (0.009)|
| $N$                            | 465,666    | 467,083| 467,000| 466,793|
| First stage F-stat             | $442 \cdot 10^5$ | $495 \cdot 10^5$ | $621 \cdot 10^5$ | $262 \cdot 10^5$ |

Treatment and control group size adds up to 1%, groups consist of top business owners and others selected to keep 82:18 ratio anchored by the composition of the top 1% in 2003. All regressions include time and group dummies.
Table 2: Share of employment: Corporations vs. pass-through entities

<table>
<thead>
<tr>
<th>Country</th>
<th>Sole Proprietorships</th>
<th>Partnerships</th>
<th>Corporations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>22%</td>
<td>20%</td>
<td>58%</td>
</tr>
<tr>
<td>Belgium</td>
<td>9%</td>
<td>6%</td>
<td>85%</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>12%</td>
<td>4%</td>
<td>84%</td>
</tr>
<tr>
<td>Cyprus</td>
<td>9%</td>
<td>6%</td>
<td>85%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>25%</td>
<td>5%</td>
<td>71%</td>
</tr>
<tr>
<td>Denmark</td>
<td>13%</td>
<td>5%</td>
<td>82%</td>
</tr>
<tr>
<td>Estonia</td>
<td>3%</td>
<td>2%</td>
<td>94%</td>
</tr>
<tr>
<td>Finland</td>
<td>5%</td>
<td>8%</td>
<td>87%</td>
</tr>
<tr>
<td>France</td>
<td>11%</td>
<td>58%</td>
<td>31%</td>
</tr>
<tr>
<td>Germany</td>
<td>18%</td>
<td>27%</td>
<td>55%</td>
</tr>
<tr>
<td>Hungary</td>
<td>13%</td>
<td>28%</td>
<td>59%</td>
</tr>
<tr>
<td>Ireland</td>
<td>12%</td>
<td>14%</td>
<td>73%</td>
</tr>
<tr>
<td>Italy</td>
<td>24%</td>
<td>22%</td>
<td>53%</td>
</tr>
<tr>
<td>Latvia</td>
<td>4%</td>
<td>15%</td>
<td>81%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>12%</td>
<td>2%</td>
<td>87%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>4%</td>
<td>6%</td>
<td>90%</td>
</tr>
<tr>
<td>Malta</td>
<td>19%</td>
<td>10%</td>
<td>71%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>12%</td>
<td>16%</td>
<td>72%</td>
</tr>
<tr>
<td>Norway</td>
<td>8%</td>
<td>7%</td>
<td>85%</td>
</tr>
<tr>
<td>Poland</td>
<td>42%</td>
<td>10%</td>
<td>49%</td>
</tr>
<tr>
<td>Portugal</td>
<td>19%</td>
<td>3%</td>
<td>78%</td>
</tr>
<tr>
<td>Romania</td>
<td>6%</td>
<td>1%</td>
<td>93%</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>26%</td>
<td>5%</td>
<td>69%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>20%</td>
<td>2%</td>
<td>78%</td>
</tr>
<tr>
<td>Spain</td>
<td>21%</td>
<td>8%</td>
<td>71%</td>
</tr>
<tr>
<td>Sweden</td>
<td>12%</td>
<td>7%</td>
<td>80%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>6%</td>
<td>5%</td>
<td>89%</td>
</tr>
</tbody>
</table>

This table presents the share of aggregate private sector employment stemming from sole proprietorships, partnerships, and corporations.
Figure A.1: Share of individuals in the top 1% who are shareholders of firms that maximize dividends.

This figure plots the fraction of individuals in the top 1% of the income $I_D$ distribution that (1) have an equity stake in a dividend maximizing firm (black line) and (2) are the majority owner in a firm that maximizes dividend payout. We report results over the period 2000–2013.
Table A.1: Response of income — groups within the top 1% of the distribution

<table>
<thead>
<tr>
<th></th>
<th>$I^G_B$</th>
<th>$I_B$</th>
<th>$I^C_B$</th>
<th>$I_D$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 vs 2007 Treatment effect</td>
<td>-0.447</td>
<td>-0.568</td>
<td>0.070</td>
<td>0.372</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.007)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>$N$</td>
<td>76,292</td>
<td>76,293</td>
<td>76,293</td>
<td>76,293</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.70</td>
<td>0.69</td>
<td>0.56</td>
<td>0.74</td>
</tr>
<tr>
<td>2003-5 vs 2006-8 Treatment effect</td>
<td>-0.603</td>
<td>-0.729</td>
<td>-0.042</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.005)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>$N$</td>
<td>228,248</td>
<td>228,249</td>
<td>228,249</td>
<td>228,249</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.71</td>
<td>0.69</td>
<td>0.55</td>
<td>0.73</td>
</tr>
<tr>
<td>Post-2005 dummy Treatment effect</td>
<td>-0.608</td>
<td>-0.672</td>
<td>-0.106</td>
<td>-0.047</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.007)</td>
<td>(0.005)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>$N$</td>
<td>461,749</td>
<td>462,865</td>
<td>462,761</td>
<td>462,488</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.68</td>
<td>0.68</td>
<td>0.56</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Instrumental variable

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No controls Treatment effect</td>
<td>0.948</td>
<td>0.973</td>
<td>0.301</td>
<td>0.541</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>$N$</td>
<td>465,666</td>
<td>467,083</td>
<td>467,000</td>
<td>466,793</td>
</tr>
<tr>
<td>First stage F-stat</td>
<td>508 · $10^6$</td>
<td>545 · $10^6$</td>
<td>170 · $10^6$</td>
<td>472 · $10^6$</td>
</tr>
<tr>
<td>Control for $I_{t-1}$ Treatment effect</td>
<td>0.914</td>
<td>0.945</td>
<td>0.289</td>
<td>0.521</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>$N$</td>
<td>465,666</td>
<td>467,083</td>
<td>467,000</td>
<td>466,793</td>
</tr>
<tr>
<td>First stage F-stat</td>
<td>242 · $10^8$</td>
<td>416 · $10^8$</td>
<td>805 · $10^9$</td>
<td>950 · $10^7$</td>
</tr>
<tr>
<td>Control for $I_{t-1}$ and $\Delta I_{t-1}$ Treatment effect</td>
<td>0.912</td>
<td>0.945</td>
<td>0.289</td>
<td>0.521</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>$N$</td>
<td>465,666</td>
<td>467,083</td>
<td>467,000</td>
<td>466,793</td>
</tr>
<tr>
<td>First stage F-stat</td>
<td>718 · $10^7$</td>
<td>882 · $10^7$</td>
<td>549 · $10^8$</td>
<td>993 · $10^7$</td>
</tr>
<tr>
<td>As above, personal tax rate</td>
<td>0.922</td>
<td>0.957</td>
<td>0.293</td>
<td>0.509</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>$N$</td>
<td>465,666</td>
<td>467,083</td>
<td>467,000</td>
<td>466,793</td>
</tr>
<tr>
<td>First stage F-stat</td>
<td>442 · $10^5$</td>
<td>495 · $10^5$</td>
<td>621 · $10^5$</td>
<td>262 · $10^5$</td>
</tr>
</tbody>
</table>

Treatment and control groups consist of business owners and others, respectively, from the top 1% of the distribution. All regressions include time and group dummies.