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INTEGRATED ACCRUAL APPROACH USING INDIVIDUAL
AND FIRM DATA FROM NORWAY

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

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ABSTRACT

Using linked individual and firm administrative data from Norway, we look through layers of holding companies and attribute corporate profits to the ultimate personal owner as the profits accrue rather than when they are realized. We show that our accrual-based measure of income inequality changes the level and trend of income inequality over time and eliminates the sensitivity of measures of inequality and income persistence 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 doubled in some years, compared with ordinary realization-based income measures. We further utilize rich data to show that 1) using our accrual-based measure of personal income reduces the estimated tax elasticity of income, and 2) observed capital income in individuals' tax returns do not proxy well for overall corporate profits, so that an imputation method based on realized dividends, which is commonly used in the literature, performs poorly. We discuss implications for top income inequality measures in other countries. We also document the importance of indirect ownership as a mechanism behind our findings and its relevance in other developed countries and discuss implications for debates on capital income and wealth taxation.

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1 Introduction

Inequality within and across countries is a major input in policy discussions, with arguments, for example, about how it affects the desired extent of redistribution, political stability and feasibility of national and international policies to address spending challenges. As a first step, a comprehensive picture of income inequality is required. Unfortunately, this is more challenging than we often are led to believe when inequality levels are compared across time and countries, as we illustrate in this work. In particular, we focus on implications of the flexibility that closely-held business owners – the group that constitutes much of the top of the distribution – have in recording business earnings as personal income and how this is shaped by tax incentives.

Business profits are not automatically personal income in most tax systems. Retained earnings in a corporation usually do not give rise to taxable personal income of the owner, until they are paid out as dividends or until the owner sells the shares. This treatment makes some economic sense, because corporate retained earnings are not necessarily liquid and accessible for consumption from the owners' point of view. This treatment is also important from the legal perspective because of the legal separation of a corporation and its owners.

The conceptual line between personal and business income becomes blurred 1) when firms have few owners, who can make strategic payout decisions and 2) when firms have the choice of an organizational form with different personal income implications of corporate profits, as is the case in the United States. Most importantly, these decisions are sensitive to legal structure and tax incentives, which vary over time and across countries, so that ignoring corporate income can shape an inaccurate picture of inequality in accordance with these factors.¹

Studies of income inequality routinely rely on administrative tax data to provide 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, 2024](#)). Naturally, though, administrative tax data reflect the design of the tax system at any given point in time by including only information that is collected by tax authorities. Such data are also affected by the reporting behavior of taxpayers. Most importantly, income tax data only reflects income that is paid out to the individual. Reliance on administrative data thus influences the concept of income that researchers can measure and could result in limited comparability both over time (as reporting or income-shifting incentives change) and across countries (as tax regimes and

¹See [Kopczuk \(2023\)](#) for a discussion of related issues

incentives differ).

One key issue in measuring income inequality relates to the profits of corporations and how these profits are allocated to owners. Since capital gains and dividends are taxable at the personal level, they are usually observable and are often the only feasible way of allocating corporate profits to owners. We refer to this dominant approach to measuring income related to business activity, as *the realization approach*.² However, profits retained in the firm may be – directly or indirectly, fully or partly – made available to the owner for consumption. Our proposed *accrual-based approach* attributes all corporate profits to the shareholder 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 toward more accurate inequality measures that are less sensitive to behavioral responses to taxes and better reflect the accrued, rather than realized, income of owners. Put differently, we treat distributed and undistributed profits symmetrically. A pass-through approach, which applies to a large share of businesses in the United States, is conceptually close to our accrual approach and, thus, our exercise may also be interpreted as the picture of inequality obtained when comprehensively using a pass-through-like accounting approach for all firms.

The accrual-based approach aligns with the Haig-Simons definition of personal income as the sum of the individual’s consumption and the increase in the individual’s consumption opportunities over a period (Simons, 1938). Since many elements of consumption and consumption opportunities are inherently difficult to measure, a natural approach is to rely on the equivalence of the change in ability to consume and the sum of labor income and changes in net wealth over a calendar year. The natural way to operationalize it is as the sum of labor earnings and observed return on assets, but this operationalization is difficult to implement for owners of firm, especially closely-held firms, due to the presence of undistributed profits – this is the gap that we fill. However, our approach is not a full implementation of the Haig-Simons approach for business-connected income, because it does not account for changes in valuation of firms that go beyond retained earnings. It is though consistent in that respect with the Distributional National Accounts (DINA) approach, which also does not include this component of unrealized capital gains. It differs from practical

²“Realization” is a legal term of art that does not always correspond to a sale, follow economic intuition, or is interpreted in the same way everywhere. Departing from it is at the core of prominent tax proposals for mark-to-market capital gains taxation and wealth taxation. Its legal importance for the design of taxation is also not completely settled — the 2024 Moore v. United States Supreme Court case is a recent high profile case in this context (which left the broader issue of whether realization is constitutionally required for taxation in the United States unanswered).

implementations of DINA (Piketty, Saez and Zucman, 2018) due to the richness of the Norwegian data that allows for precise allocation of retained earnings rather than reliance on imputations.

Using rich Norwegian administrative data that link firms and owners through a comprehensive shareholder register, we attribute profits in each firm to its owners when the profits accrue. We document the importance of business profits for income composition. The total income share of the top 0.1% more than doubles in some years, compared to realization-based estimates. Our time period spans a major tax reform that introduced a 28% dividend tax in 2006. Dividends were tax-exempt prior to 2006. Given the importance of corporate income, it is natural that a reform incentivizing the retention of earnings has a large impact on inequality measures using the realization approach. We show that not only is the level of inequality mismeasured when unrealized income from 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 the reform. Another benefit of our accrual approach is that it allocates individuals 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. 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 data.

Our main results for Norway are illustrated in Figure 1. Relying on individuals' income tax reports only and excluding capital gains, as is common in the literature, implies that the top 1% income share is growing before 2005, spikes in 2005 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. The pre-reform dynamics corresponds to massive dividend payouts in 2005 in response to the announced dividend tax reform. Under our accrual approach, where we allocate corporate profits to shareholders, 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 profits has little effect on the share of the top group before 2005, when the exemption of dividends from taxation allowed for the free pass-through of available corporate profits. After 2005, however, the dividend tax provided strong incentives to retain earnings in the firm, introducing a substantial difference between personal income measured under the traditional realization approach and that measured under our integrated accrual approach. Given the importance of corporate profits, especially for the very rich (Cooper et al., 2016; Smith et al., 2019). it is natural that a reform incentivizing the retention of earnings in the firm has a large impact on inequality measures using the realization approach.

While it is tempting to think that large publicly traded firms drive business income and inequality, we show that these changes in inequality are accounted for by the behavior of non-listed, closely held firms with relatively few owners and, correspondingly, by the major shareholders in such firms. This is also reminiscent of recent findings from the United States (Cooper et al., 2016; Clarke and Kopczuk, 2017; Smith et al., 2019) that show the importance of closely held firms for trends in inequality. 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 the ability to see through multiple layers of ownership is critical to integrate the retained earnings of privately held firms in the personal income measure. A pass-through approach that applies to a large share of businesses in the United States is conceptually close to our accrual approach and, thus, our exercise may also be interpreted as the picture of inequality obtained when comprehensively utilizing pass-through-like accounting approach for all firms.

Three prior papers have been 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 two major 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 personal owner as they accrue. This is relevant because of the high use of holding companies among the affluent. Following our work, other papers have shown related evidence in France (Bach et al., 2024) and the Netherlands (Lejour, 2024).

Our findings have several other implications. First, we demonstrate that realization-based income measures greatly overestimate the behavioral responses to tax changes, as measured by the elasticity of taxable income. This is because such measures are very sensitive to income shifting between tax bases when only firm earnings that are realized on the individual's tax returns are observed, and not earnings retained in the firm. We use the 2005 reform to estimate the elasticity of taxable income to taxation, and show that our accrual-based income measure significantly reduces that elasticity, since it is less prone to mismeasurement due to profit shifting between the personal and corporate income tax base.

Second, there is increased awareness of the role of unobserved business-level income in the measurement of inequality in the literature. Recent papers try to address this by imputing retained

earnings that are known in aggregate based on realized dividends (e.g., [Piketty, Saez and Zucman, 2018](#); [Auten and Splinter, 2024](#)). This approach, however, requires strong relationship 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 individuals' tax returns do not come close to reflecting the overall corporate profits, not even with a lag. Furthermore, for a particular firm in a given year, dividends and retained earnings are mechanically inversely related. Thus, how an imputation based on observed dividends performs is very much an empirical question. We find that the imputation method based on realized income performs quite poorly and significantly underestimates top income groups' share of total overall income.

Third, we document how the realization approach and our accrual approach differ with respect to the persistence of people in top income groups. The accrual approach allocates people to top groups in a much more stable way when tax reporting incentives change, despite changes in the composition of income. We illustrate it by showing stability of the likelihood that a person who was in a top income group this year also was in the same group in the past. This gives us confidence that our accrual-based income measure is closer to the economically meaningful definition of income as defined by Haig-Simons.

Fourth, although we use Norwegian data, we believe the main points apply broadly. Given the importance of business income in top income inequality and its trend in other countries, our approach might alter the conclusions about the evolution of top income inequality in other countries as well. In particular, the growth of pass-through businesses in the United States, which played an outsized role in top trends ([Cooper et al., 2016](#); [Smith et al., 2019](#)), commenced following the Tax Reform Act of 1986 that effectively shifted large parts of business profits to an accrual-like approach ([Auerbach and Slemrod, 1997](#); [Gordon and Slemrod, 2000](#); [Clarke and Kopczuk, 2017](#)). This event corresponds to a sharp increase in inequality according to the series constructed by [Piketty and Saez \(2003\)](#) and [Piketty, Saez and Zucman \(2018\)](#). We provide suggestive evidence that the shift from the realization to the accrual approach, may play a role in accounting for these patterns, especially by underrepresenting inequality before 1986.

Fifth, based on data on large listed firms across a number of countries, we document the general importance of indirect ownership via holding companies. This indirect ownership creates similar difficulties in allocating income to individuals. Moreover, we find that dividend shares are likely to be a poor proxy for shares of retained earnings in many countries.

Finally, issues related to recognition of business profits in personal income measures are also

central to current policy debates. Taxation of capital gains is the key weakness of modern attempts to tax income of the wealthy (Slemrod and Chen, 2023), and it has stimulated an interest in taxing gains on accrual instead of realization or in taxing wealth instead of income. Yet, all of these approaches face difficulties precisely because firms that retain earnings cannot be easily valued. Standard realization-based taxation of capital gains creates deferral advantages, magnified by generous treatment when shareholder dies in some countries, as well as by opportunities for misappropriating company funds for personal benefit. Taxation on accrual and taxation of wealth require regular valuation of businesses: a task that is difficult and costly in the case of closely-held companies. In practice, and in recognition of these difficulties, countries that use taxation of wealth usually provide preferential treatment for business assets (e.g., Norway and Spain), countries that tax capital gains often treat them preferentially, and countries that tax dividends either offer preferential rates (like the United States nowadays or Norway, with mainly tax free dividends before 2006 and a tax free element nowadays, as described in footnote 8) or struggle with retentions.

We proceed as follows. We discuss the motivation for the realization approach, Norwegian background and the data in Section 2. We introduce different income concepts and their construction in Section 3. Our main results for measurement of inequality in Norway are in Section 4, where we also document what categories of income and businesses account for the results, how it all relates to the composition of top groups, and the role of tax avoidance. In section 5 we illustrate implications of these patterns for the implied tax elasticities of various measures of income. Section 6 considers the performance of an alternative imputation method. We provide evidence on the importance of retained earnings and holding companies in other countries, speculate on the implications, and conclude in Section 7.

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 the owner level, through pass-through income from the firm, or at the corporate level, with personal income taxation at some later date (e.g., when dividends are paid out). Under the pass-through concept, a firm's income is allocated to its owners and reported on individuals' income tax returns. This is the usual treatment of self-employed individuals and partnerships without limited liability, but can 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.³ Recent literature suggests 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). The alternative approach is to separate the taxation of firms and that of their owners by imposing the tax on firm profits at the corporate level, and, subsequently and separately, imposing taxes on dividends and capital gains at the personal level at the time of payout or capital gains realization. The relative importance of the two types of taxing businesses varies across countries. Corporate level taxes apply to 65-80% of business incomes in the United Kingdom, Canada and Australia, but only 50% in Japan, 40% in the United States and 34% in Germany, with the rest subject to pass-through taxation as personal income instead (Joint Committee on Taxation, 2013; Clarke and Kopczuk, 2017).

Usually, even with administrative data, researchers cannot directly assign corporate profits to shareholders, so that allocating income to owners (comparable to the pass-through approach) is not possible in practice. Since capital gains and dividends are taxable at the personal 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 inequality measurement. First, dividends and capital gains are observed when paid or realized, which is generally at a different point in time than when profits accrue.⁴ Hence, income derived from immediately taxable sources, such as wages, interest, or pass-through entities, and income derived from the (non-pass-through) corporate tax base, are generally observed at different points in time, potentially resulting in different aggregate composition of income and thus inequality patterns over time. Second, the realization of income influences the ranking of individuals in any particular year and, hence, interacts with the measurement of inequality. For example, it is well known that capital gains tend to be realized in a lumpy manner (e.g., corresponding to the sale 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

³See 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. See also Kopczuk (2023) for the discussion of implications of alternative ways of taxing business income.

⁴This also generates deferral tax incentives that affect the timing of realization. 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.

economic position.⁵ Third, some of the corporate income may never show up on individuals' 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.⁶ Unrealized capital gains held until the death of the owner might not be taxed at all (due to the step-up approach in place in the United States and the United Kingdom and, for assets other than shares, in Norway until 2014) or their taxation could be further delayed, potentially indefinitely, until future beneficiaries realize them (with a carry-over basis of the initial valuation, as in Norway nowadays for all asset classes).⁷ 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 the measurement of inequality by modifying the mix of realization and accrual sources of income on which researchers rely.

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, at both the personal and corporate levels, and an additional progressive surtax on individuals' wage incomes. 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 other things, 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).

Shareholder income tax was introduced on January 1, 2006, and it levies capital income tax on all personal shareholders' returns to shares, both dividends and capital gains, exceeding the

⁵In particular, there is substantial churning among the top income taxpayers. For example, of the 4,474 taxpayers who had among the 400 returns with the highest adjusted gross income in the United States in one of the years between 1992 and 2013, 3,213 were on the list just once, and only 129 were on the list for 10 years or more ([Internal Revenue Service, 2015](#)).

⁶Relatedly, 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 to the mismeasurement of corporate income as well, so this aspect is not necessarily addressed by our approach (although it could be reflected to some extent if the temporal patterns of profits and inflated costs are not perfectly aligned).

⁷This has been the leading alternative proposal in the United States (it was enacted but never implemented and ultimately repealed in the late 1970s, but then was briefly in effect during the 2010 so-called repeal of the estate tax). An alternative is the "constructive realization" that is used in Canada. Under that approach, capital gains are deemed realized upon the taxpayer's death and show up as a single lump sum income realization at that time.

after-tax risk-free interest rate.⁸

Although realization of capital gains themselves will not play a major role in what follows, rules that govern corporate and personal capital gains affected firms' ownership structure. Dividends paid to corporations and corporations' capital gains from the realization of shares, are tax exempt. This means that, by holding shares through a holding company, an owner can sell shares or distribute profits from the main company while deferring taxable realization of capital gains as well as dividend taxation, until income is distributed to the personal level.⁹ Such ownership allows for the deferral of dividends and capital gains at the personal level, while permitting flexibility to disburse dividends and make changes to the ownership of the main firm. We account for this phenomenon in our empirical analysis by seeing through multiple layers of indirect ownership in the distribution of 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 2 illustrates a strong timing effect in dividend payments to personal owners around the reform, with large dividends in the years leading up to the reform and very low dividends in the following years. The figure also illustrates that dividends paid to personal owners are much smaller than the overall dividends distributed by firms. Overall distributions do not plummet after 2005 (at least not permanently): firms still pay out substantial dividends after the reform, but they do so to non-personal owners, such as holding companies, rather than to owners who are personal income taxpayers.¹⁰ Figure 2 also illustrates how small capital gains realized by individuals are in Norway. This is likely because capital gains were not preferentially treated, and because the possibility of indirect ownership allows for sales and payouts without taxable realization on the personal level.

Norway also has a wealth tax. The statutory top rate for the wealth tax (that combines municipal and national components) during the period of our study was 1.1%. Business assets

⁸The 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 shares (their 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.

⁹A special regulation during 2005 allowed individuals to transfer their shares to a holding company without triggering the 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.

¹⁰The dip in household dividend receipts in 2001 is due to a temporary dividend tax that was in place for that one year.

were taxed more lightly than many other types of wealth (though higher than real estate). The wealth tax does not play a direct role in our analysis, because the value of business shares was included in personal wealth throughout so that incentives for retaining earnings to avoid that tax were not changing. See [Alstadsæter et al. \(2022\)](#) for a discussion of the structure and effects of wealth taxation in Norway.

2.3 Data

We use detailed administrative data from Statistics Norway (i.e., information originating from the Norwegian tax authorities) covering the universe of Norwegian corporations, the self-employed, and adults (aged 16 and above) over the period 2000–2013 ([Statistics Norway, n.d.](#)). Every resident in Norway is assigned a unique personal identifier that is in all databases, allowing us to follow every person over time and across datasets. The same holds for corporations. We use three main data sources.

First, we use *Individual Data* that cover all (about 5 million) Norwegian residents for each calendar year from 2000 to 2013. All adult Norwegian residents must submit a tax statement every year, which are all available for this study. Individual tax information comprises income, for example, 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 period 1999–2013 (including corporations such as banks, insurance companies, and financial holding companies, but not public mutual funds). These data cover balance sheet information, with detailed equity and debt information, as well as the profit and loss statements of each corporation. Using these data, we construct a panel of 313,249 corporations for which we can compute changes in accumulated retained earnings over the period 2000–2013. In total, we have 2,059,972 corporation-year observations 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 all the shareholdings of all corporate and individual shareholders. 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 corporate and individual shareholders. Since

individuals can indirectly hold shares in a firm, we account for 10 layers of indirect ownership. This enables us to calculate the final shareholding of each individual in each firm, accounting for both direct and indirect shareholdings. We then sum the change in accumulated retained earnings across all shareholdings for an individual and then merge this information with the *Individual Data*.

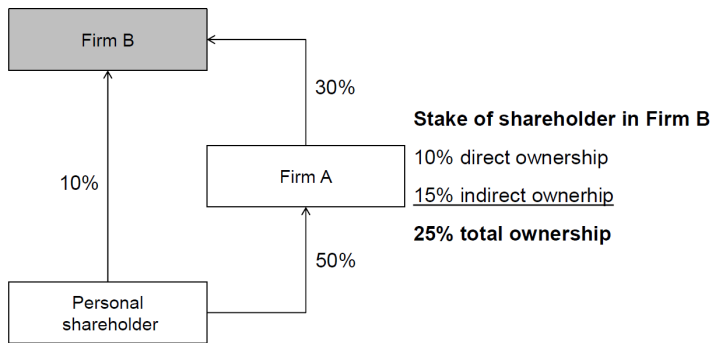
Even though we have information on foreign ownership, it is limited to the country of the direct owner since we do not have information about the identity of foreign owners. On average, foreign shareholders account for about 11% of aggregated accumulated retained earnings in Norway. We are thus only able to attribute Norwegian corporate-level retained earnings to Norwegian ultimate individuals. This also means that any retained earnings in foreign corporations owned by Norwegian residents will not be included in the analysis. Our inability to observe such offshore income or wealth, which [Alstadsæter, Johannesen and Zucman \(2019\)](#) show is substantial at the top of the Scandinavian wealth distribution, implies that, if anything, our accrual approach could underestimate true top income shares.

3 Income concepts

The standard Haig–Simons approach to personal income is to define it as the sum of an individual’s consumption and savings in order to approximate the increase in the individual’s consumption opportunities over a period. Some elements of consumption and consumption opportunities are inherently difficult or even impossible to measure, so applied work typically relies on an equivalence of the change in ability to consume and the sum of labor income and changes in net wealth over a calendar year ([Simons, 1938](#)). This definition is often operationalized as the sum of earnings (return to labor) and the return on assets. However, income from business remains a prominent example of an income flow that is difficult to measure adequately and in a timely manner with the available data, especially under the common realization-based tax regime.¹¹ It is also a prominent example of an income flow that blurs the line between capital and labor income, a distinction that need not be made when the conceptual approach is based on the Haig–Simons definition.

Specifically, the advantage of our approach is that we can allocate business income on a timely basis. To do so, we allocate corporate-level profits to each personal shareholder according to his/her total ownership share in the corporation in the year corporate earnings accrue. The total ownership

¹¹Another wealth-related income flow that is hard to measure is housing consumption. Unless realized in the calendar year (and not reinvested in the same year) and thus captured as capital gains, we are not measuring this flow in our data. However, net income flow from the rental of real estate that is not the home will typically be measured.



share is the sum of direct and indirect ownership shares. The direct ownership of a firm B is simply the sum of shares the owner holds in firm B. The indirect ownership of a firm B is calculated as the product of the shareholder’s direct ownership share in a firm A and firm A’s total direct and indirect ownership shares in firm B. In the simple case of the two layers illustrated in the figure, the personal owner holds a 10% direct ownership share in firm B and a 50% direct ownership share in firm A. Firm A also holds a 30% direct ownership share in firm B, such that the individual’s indirect ownership share in firm B is 15%. The individual’s total ownership share in firm B is then 25%. Accordingly, we will attribute 25% of firm B’s profits to this shareholder. Since firm B could 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 10 layers of ownership, to the shareholder.¹²

To illustrate the importance of business income for top income shares, we define several individual-level income measures. The natural point of departure 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 such as sick leave money and unemployment benefits, and business income from self-employment), income from capital (interest, dividends, realized capital gains, etc.), and taxable transfers (e.g., disability pensions, elderly pensions, but not tax exempt transfers such as means-tested social assistance, child allowances, and health care subsidies), 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.). [Aaberge and Atkinson \(2010\)](#) rely on this income measure to estimate the top incomes in Norway all the way back to 1875, and they discuss the advantages and disadvantages of income measures from tax assessments. In particular, due to differences in tax systems across countries,

¹²Our main results are similar when we restrict our analysis to two layers.

as well as changes in the definitions and deductions over time, comparison of the results for the top income shares based on such measures across time and countries is not a straightforward task. [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. \(2012\)](#) find that income inequality increases more moderately when dividends and capital gains are replaced by the profits of directly owned firms.

We focus on four alternative measures of individual's pre-tax income measures that single out specific income components and disallow transfers and deductions. The four definitions are as follows:

1. I_P = Overall personal income before capital gains and dividends
2. $I_R = I_P$ + dividends to the personal shareholder from directly owned firms (Realized income)
3. $I_R^{CG} = I_R$ + capital gains¹³
4. $I_A = I_P$ + individual's share (s) of corporate profits (π) (Accrual income)

To capture each individual's share of corporate profits, we need to include both dividends paid directly to the personal shareholder, as in I_R , and both corporate profits in directly and indirectly owned firms that are not paid as dividends to the personal owner. We denote a corporation's overall profits in a given year t by π_t and an individual's (combined direct and indirect) share (in year t) of those profits by s_t . We are going to focus on profits after corporate taxes. We would like to assign $s_t\pi_t$ to an individual as income. In the case of a pass-through approach, such as for the self-employed or in partnerships and S corporations in the United States, this is exactly what happens by default. When business income is not subject to the pass-through treatment, a corporation can pay a dividend of d_t (and an individual's share of it is $s_t d_t$). Assuming, for the moment, direct ownership of the firm, an approach that relies on income realization (I_R or I_R^{CG}) will account for an income of $s_t d_t$ in year t and will only reflect (at least to some extent and augmented by the return on reinvested retained earnings) the remainder of year t profits, i.e. $s_t\pi_t - s_t d_t$, if

¹³To clarify, when income measure I_R^{CG} is implemented, it includes i) income from labor, that is, earnings and other benefits from employers (e.g., private use of the employer's car, newspapers, phone, child care), as well as net income from self-employment; ii) capital income, that is, interest, dividends, capital gains and losses, net income from the rental of real estate, and so forth; and iii) taxable transfers, such as unemployment benefits, sick leave benefits, and pensions (for details, see [Steinkellner 2003](#) p. 40).

and when additional dividends are paid in the future or when capital gains are realized. Note, in particular, that the level of dividends in year t does not have to bear any direct relation to profits in that particular year: it purely reflects realization decisions, and dividends in any particular year can reflect current profits, past profits, or (within some legal limitations) future expected profits.

Conceptually, we would like to allocate $s_t\pi_t$ directly to the individual. We do observe profits, so this would be a straightforward task in the case of direct ownership. However, since individuals can own firms through other firms, we need to ensure that we do not count the same profits more than once. For example, if firm B pays dividends to its corporate owner firm A, these dividends will comprise a part of firm A's profits (which will again contribute to the change in firm A's accumulated retained earnings). To address this issue, 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 $R_t = R_{t-1} + \pi_t - d_t$; that is, additional accumulation reflects this year's profits (or losses), possibly including dividends received from a subsidiary firm, with a deduction for any dividends distributed to the firm's owners (including corporate owners). 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 from this particular firm and does not overlap with either subsidiaries' or owners' retained earnings. Aggregating changes in accumulated retained earnings across all layers of firms corresponds to aggregating profits net of dividends to personal shareholders. The sum of changes in accumulated retained earnings and dividends to personal shareholders is therefore equal to the economic profits of the corporate sector. We proceed by implementing the following approach: an individual's share of corporate profits is equal to the individual's ownership share of the year's change in accumulated retained earnings (through direct and indirect ownership) and any dividends received at the personal

level.^{14,15}

4 Inequality 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. For each measure of income, individuals are ranked according to that measure and the shares are constructed accordingly, so that identities of individuals in, say, top 1% may change with the income measure.

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 a dramatic impact on the level of top income shares, more than doubling them

¹⁴While this use of balance sheet information on accumulated corporate earnings handles the problem of double-counting dividends to corporate owners, it involves some conceptual, but empirically minor, drawbacks. Norwegian corporate finance law prescribes the corporate holdings of listed shares to be valued at stock market prices, and not at the cost of acquisition in the balance sheet. As illustrated in the following, this implies that an increase in the value of holdings of listed shares could be double-counted. Assume that a holding firm H that is fully owned by an individual I holds s percent of the shares in a listed firm L in the year. Further, assume that the listed firm L has profits A during the year, and, for simplification, that the profits are exactly reflected in the stock market value, that is, that the value of L increases by A during the year. We will then first count individual I's share of the change in accumulated retained earnings of listed firm L (sA). However, because of the finance law valuation prescription, the accumulated retained earnings of holding firm H will also increase by sA , implying that we count sA twice when calculating I's corporate income. However, since retained earnings from large or listed companies only comprise a small fraction of the total retained earnings of the top incomes (see Figure 5 and related discussion at the end of Section 4.2), the potential measurement error might not be large. Indeed, we created plots of the top income shares excluding the accumulated retained earnings of listed firms, and the results are barely distinguishable from those in Figure 1.

¹⁵We also considered constructing an additional measure of income " $I_E = I_A +$ capital gains net of previously allocated corporate income", that would partially account for capital gains while retaining the virtues of the accrual-based approach when possible. However, this measure cannot be constructed unless accrued income over the entire holding period is observed. In practice, we can only observe this for assets that were purchased during our data's coverage period. Given the small quantitative importance of capital gains for the top shares in Norway noted in Figure 1, we opted against pursuing a necessarily imperfect implementation of this type of approach.

It is still useful to note, though, how capital gains could 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 (denoting the discounted value of future profits as π^E) and the market value of any marketable assets M_t , such as cash or other tradable assets (in particular, the value of non-tangibles is reflected in the future profit component, and—to the extent that they could be traded beyond its value of generating future profits—the remaining part should be included in M_t). The capital gain $V_{t+j} - V_t = \Delta\pi_t^{E,t+j} + \Delta M_t^{t+j}$ over holding period $j > 0$ represents the change in the value of these two components. For non-publicly traded firms, we cannot observe changes in prices and 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 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 a question of use (similar to the 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 the 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 adjustments would correspond to losses).

relative to the realization-based approach in which 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, which already reflects the impact of the reform, as discussed below). Since nearly all profits of closely-held firms were paid out before 2005 due to the tax exemption, the realization and accrual approaches yield similar results until 2004. Hence, our results strongly suggest that the tax regime has a major effect on inequality measures when realization-based information from personal income tax returns is used.

One unexpected observation is that, despite strong incentives to pay dividends in 2005 (which were then at an all-time high; see Figure 2), we see that retained earnings already contributed to the top income share in that year. This is because legal restrictions in the Norwegian tax system imply that dividends can generally only reflect profits in prior years and cannot be paid out of current-year profits.¹⁶ Therefore, most of the 2005 profits were effectively subject to the post-reform taxation of personal income tax returns. This limits the ability to pay out profits as dividends in the same year as they are earned, so that a portion of high (for cyclical reasons) 2005 profits could not be effectively distributed under the preferential tax regime. Aggregate profits were very high in 2005 (see Figure 2 and the discussion below); hence, due to the legal restrictions, both dividends (reflecting pre-2005 profits) and retained earnings (reflecting 2005 profits) were major contributors to the 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 the legal limits that they faced.

Our results also show that capital gains from individuals' tax reports play a relatively minor role in shaping the measurement of the top income shares in Norway.¹⁷ When included in the realization-based measure of top income shares (I_R^{CG}), capital gains shift both the measures of the top 0.1% and top 1% up by between 0.2 and 1.4 percentage points, with elevated values in 2000 and 2006–2007, but otherwise with no clear temporal pattern and no important qualitative

¹⁶To protect creditors from owners' excessive extraction of 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% in 2005. In Section 4.3, we discuss evidence on dividend maximization in more detail, and, in particular, Figure A.1 shows that dividend maximization was widespread among the top percentile just before the reform.

¹⁷Corporate 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. Therefore, the Norwegian shareholders of privately held firms could 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 the case in, for example, Sweden (Roine and Waldenström, 2012).

effect on overall evolution over time. In particular, whether or not capital gains are accounted for makes little difference for the comparison of the inequality patterns arising from our accrual-based approach and the realization-based approach.

4.1 Relationship to aggregate changes

To understand these adjustments to inequality, it is useful to first illustrate the behavior of aggregate series. Figure 3 shows that the Norwegian economy was generally growing during this period, although with more pronounced fluctuations when the very important oil sector is included than when it is not. The 2003–2008 period was one of 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 the total gross domestic product (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 overall income, and, hence, the pattern and changes in their realization are bound to confuse realization-based inequality statistics.

Figure 2 shows total after-tax profits, aggregate dividend payouts, and aggregate changes 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 the 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 individual-level capital gains and dividends can proxy for it well. 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, shown in Figure 1. The volatility of the change in accumulated retained earnings does translate to some extent into the volatility of the top shares, but the effect is not mechanical and quite subtle. In particular, in the post-reform period, accounting for corporate profits has a massive effect on the 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, this effect 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 the imputation approach in Section 6.

4.2 Composition of top groups and shares

For our preferred integrated accrual-based income measure (I_A), we decompose income of top groups into its sources (Figure 4). 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, the smoothness of the combined share of corporate income provides no indication that this integrated way of accounting for corporate source income could be systematically affected by the tax regime. It is also worth noting that dividends and the change in accumulated retained earnings are by far the most important component of the income at the very top. For the top 0.1%, they generally account for about 80% of the top incomes, while wages account for 15% at most.

Figure 5 shows that the adjustment for retained earnings is driven by firms with few owners and concentrated ownership, which we refer to as “closely-held firms”. For each firm, we know the retained earnings, the number of individual owners and their ownership shares, and we can thus separately attribute retained earnings from closely held firms vs firms with dispersed ownership. For example, the left panel shows that 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 that of [Jacob and Michaely \(2017\)](#), who show that the payout of firms held by few owners is more sensitive to changes in dividend taxation than that of firms with dispersed ownership. The right panel of Figure 5 further shows that the bulk of the adjustment is attributable to those who have a large ownership share in their businesses.

4.3 Evidence of tax avoidance

In the left panel of Figure 6, we show that earnings retention took place primarily (though not exclusively) through indirect ownership. The introduction of the dividend tax encouraged all firms

to retain earnings, but indirect ownership offers additional benefits by allowing the flexibility of directing the future realization of corporate income (through dividends or capital gains) to the holding company and continuing to defer the recognition of that income in personal tax returns, while removing it from the reach of creditors. The figure distinguishes indirect ownership through so-called E firms, other forms of indirect ownership, and direct ownership. E firms are holding companies that were created precisely in 2005 by relying on a transition rule that was introduced specifically to facilitate adjustment of ownership in response to the reform: owners of existing companies were allowed to transfer their shares to a new holding company (E firm) without it being considered a sale and, thus, without triggering capital gains tax liability. For our purposes, E firms simply represent the conversion of direct ownership to indirect ownership in 2005, a tax planning strategy.¹⁸ The figure shows that such tax-motivated conversions are quantitatively important at the top of the distribution and that they result in indirect ownership accounting for the majority of the business income of the wealthy. There is also quantitatively important indirect ownership that is not structured as E firms (in particular, most often not starting in 2005) — this may or may not have been directly tax motivated, although after the reform there are strong incentives to set up holding companies for new firms in general. Therefore, the ability to see through such an 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_R) and our accrual-based income definition (I_A) 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 \(2014\)](#) and define dividend maximizers by relying on 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 (for which we do not have the data to incorporate) that should be deducted from our measure of earned equity to determine the exact legal limit on dividends. Second, the equity remaining 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 paid it out in the past or have accu-

¹⁸The new holding company had to be registered by December 31, 2005. See [Alstadsæter, Kopczuk and Telle \(2014\)](#) for details. We identify E firms by the NACE code 65.238, for portfolio investments. That code was rarely used before 2005, so the vast majority of such firms were created under the transition rule. The small amount of ownership labeled as E firms before 2006, noted in [Figure 6](#), corresponds to those rare cases.

mulated losses) or their equity level is below 10% of assets. Such corporations have no ability to legally pay dividends. The remaining corporations can pay dividends. We define as maximizers those corporations that have an equity-to-asset ratio of between 0.09 and 0.11 after proposing a positive dividend or that propose a dividend exceeding 95% of their earned equity.

In all years, about 40% of the corporations have 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 had the ability to pay dividends decided to maximize their payouts. Overall, 39% of firms paid dividends in 2005, and 62% maximized their payout. The median corporation that paid dividends in 2005 did so to the maximum extent possible (see [Alstadsæter, Kopczuk and Telle, 2014](#), for more extensive discussion). Figure [A.1](#) in the Appendix shows these patterns focusing on the top of the distribution. Dividend maximization was widespread in the top 1% just before the reform. At least 60% of individuals in the top 1% owned firms that maximized dividends, and 20% owned a majority stake in such firms. The incidence of dividend maximization dropped sharply immediately after the reform. Further, Figure [6](#) shows that, before the 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 the strong influence of taxation on patterns of reported personal income. Second, they indicate that the top taxpayers were facing a legal constraint in their dividend payouts, suggesting that a sizable retention just before the reform (in 2005) was 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 a re-ranking of individuals, whereas we expect that our integrated accrual-based income measure (I_A) should not suffer from such problems and should not result in a large amount of such re-ranking, unless there are quantitatively important and heterogeneous behavioral responses (other mobility studies make similar arguments, see [Kopczuk, Saez and Song, 2009](#); [Aaberge, Atkinson and Modalsi, 2013](#)). The left panel of Figure [7](#) displays the persistence of individuals in the top income groups over time. It shows the likelihood that an individual at the top of the distribution in year t is also at the top of the distribution in year $t - 1$. It is clear that, when the realization-based income measure I_R is used, the tax reform in 2005 results in significant re-ranking, which 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 is studied further by [Aaberge, Atkinson and Modalsi \(2013\)](#).

In contrast, our preferred integrated accrual-based measure I_A makes the composition of the group robust to the change in the tax regime. We interpret this result as a strong indicator that our approach is able to much more closely approximate the underlying economic income of individuals than the purely personal income tax-based alternative. We also note that the persistence of individuals in the top income groups is lower when using our approach, relative to the realization approach using I_R . This is because I_R effectively fails to capture more volatile business incomes, and the top group based on income I_R consists to a larger extent of more stable wages and dividends. While our approach using I_A 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 7](#) 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_A 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. The decline in the persistence of top incomes around the reform is present only when using the personal income tax return definition I_R . Furthermore, using the accrual-based definition of income (I_A) results in somewhat smaller declines in persistence from one to three 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 8](#), we illustrate this effect in more detail by showing the overlap of the top groups (top 0.1% and top 1%) under different approaches. 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 under 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 result in the same membership in the top group in less than 50% of cases.

Taken together, the integrated accrual approach induces an important re-ranking of individuals in the top of the distribution relative to the realization approach. By doing so, it stabilizes the year-to-year persistence of the top groups and corrects tax reform-driven swings in the measurement

of the top income shares. On their own, more stable but less persistent mobility patterns are not the proof that this is the right concept to focus on, but coupled with the conceptual rationale for this approach that highlights the consistent treatment of earnings as they accrue, we interpret it as supporting evidence that this approach provides a more realistic picture of the evolution of top income shares over time.

5 Implications for measuring the responsiveness to tax incentives

An influential older literature stimulated by [Feldstein \(1995\)](#) and summarized by [Saez, Slemrod and Giertz \(2012\)](#) focuses on measuring the elasticity of taxable income to taxation following theoretical arguments that highlight this elasticity as a sufficient statistic for the efficiency cost of income taxation. One weakness of the empirical literature on the topic, recognized since its early days ([Slemrod, 1998](#)), is that the complete measure of responsiveness should account for all taxable bases (most critically, individual incomes and the corporate base) and that, in particular, the welfare consequences of the response driven by income shifting between different tax bases are different from those due to a real change in behavior.¹⁹ This is, however, a difficult task to investigate empirically, because it requires simultaneously observing different tax bases that reflect taxpayer behavior. Our data allow us to overcome this difficulty.

The 2005 change in the taxation of business incomes led to retaining income within businesses. How elastic are different measures of income to taxation? Responsiveness of measures like I_R , I_R^{CG} or I_P has been analyzed in the literature — these are aggregates of most/all income categories reported on individual tax returns. Our measure I_A is novel in allowing accounting for income that remains on the business side.

We use this income measure and the tax reform to illustrate for the first time, to the best of our knowledge, the importance of accounting for business-side income. We pursue a simple variant of the approach advocated by [Saez, Slemrod and Giertz \(2012\)](#): a difference-in-differences approach that relies on comparing repeated cross sections of fixed slices of the income distribution. The idea behind this approach is the assumption of no rank reversal. While the identity of individuals in,

¹⁹[Chetty \(2009\)](#) takes a somewhat different approach, but reaches a related conclusion of the importance of the distinction between the so-called taxable and real responses. Using the same Norwegian 2005-tax reform as we do, [Alstadsæter, Kopiczuk and Telle \(2014\)](#) show that firms with few owners increased their holdings of assets that can be used for private consumption, like cars, boats and air planes, from before to after the reform. This may be taken to suggest that personal consumption is being shifted from income reported at the individual level to profits retained in the firm, illustrating how reliance on traditional realization based income measures may overstate behavioral responses to tax reforms compared to more comprehensive income measures like our accrual-based one.

say, the top 1% of the distribution is changing from one year to another, under the assumption of the ergodicity of the income distribution, the composition of the group is not changing. The benefit of this assumption is that it allows for the abstraction from thorny issues of the mean reversion of income that complicate strategies which exploit variation in the income tax rate related to individual income levels.²⁰

The fact that the tax reform affected business owners, but not those 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 the top income shares. The composition of the top of the distribution changes when business owners report or earn lower incomes due to the reform, which violates the non-rank reversal assumption. Therefore, we modify the approach suggested by [Saez, Slemrod and Giertz \(2012\)](#) and implement our strategy by comparing the top income group (when ranked using our comprehensive income measure I_A) in each year among those who owned a business in the reference period (treatment group) to the top income group in each year among those who did not own a business (control group), selecting the top groups to keep their relative sizes constant over time.

Of course, being a business owner could itself be endogenous to the policy change, so we define the groups based on ownership of a business during the reference period 2003-2005. In order to keep the relative sizes of groups constant, 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 the number of people in them adds up to the 1% of the population, with relative sizes of the groups fixed at the 82:18 ratio. In particular, this means that while exactly 1% of the population is included every year, this is not the same as the top 1% of the unconditional distribution. The group-specific income threshold for inclusion is based on retaining the 82:18 ratio.

Each of our specifications regresses $\ln(I)$, for different measures of personal income (I), on the reform indicator (reduced form) or — to convert the results into elasticities — on the net-of-tax rate $\ln(1 - t)$ instrumented by the reform indicator. The reform affected corporate business owners and, therefore, our reform indicator is defined as a dummy for business owners after 2005. We

²⁰The second conceptual approach, due to [Gruber and Saez \(2002\)](#), relies on the panel aspect of the data and models the individual response of income with controls for income dynamics that allow for the exploitation of income-dependent variations in tax rates. However, this approach requires multiple tax reforms so that, conditional on the 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 we do not pursue this strategy, although we test whether our approach is robust to the inclusion of mean reversion controls.

define the marginal tax rate for business owners as corresponding to the dividend tax rate, and the marginal tax rate for non-business owners as the maximum wage income tax rate.²¹

Table 1 presents the results. In the first panel, we focus on just the treatment dummy representing having been affected by the reform (business owners starting in 2006). We first compare 2004 to 2007, years that are not adjacent to the reform, to eliminate any effect from the temporal shifting of income. The difference-in-differences estimate of the reform on I_R and I_R^{CG} is large, as expected: the reform reduces incomes observable on individual income tax returns by 0.45 or 0.57 log points. The effect on I_P is much closer to zero, and the effect on I_A has the opposite sign. The following two specifications include additional years. We first include three years before and after the reform and then include all of the years in our data (2000–2013). The results are similar, with the exception of the effects on I_A , which are now negative. These results indicate, as expected, that the reform had a much larger impact on income as observed in individual income tax returns, than on the full economic income, represented by I_A , or on I_P , which excludes business incomes altogether.

In the second panel, we show the results from IV specifications, in order to give a taxable income elasticity interpretation to the results. All of these specifications use all years of data, as in the last reduced-form specification. 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 21), which have little variation over time, except for the reform itself. In the last specification, we use the personal tax rate, which additionally incorporates minor progressivity and deductions implications at the top. The estimated elasticity is over 0.9 when we use the I_R or I_R^{CG} income definitions. It is still significant and nontrivial for the other two definitions of income, but it is only about 0.5 for I_A . A large part of the response to taxation that one would have obtained based on income seen on individual tax returns disappears when we consider overall income. In the following specifications, we control for lagged income and lagged income growth — controls for mean reversion and inequality trends considered by Gruber and Saez (2002) and Kopczuk (2005). We find they do not have a meaningful impact on the results. The final specification controls for

²¹The dividend tax (used as the 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 the 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 (which is zero for a very low wage income, 35.8% for a typical wage income, and then increases at two thresholds). While the actual wage income could be endogenous to the marginal tax rate, results of this procedure are very similar to our main findings.

the personalized individual tax rate, and the estimated elasticities are about the same.

The approach applied here is the simplest strategy for estimating the elasticity of income, but it appears robust to the period considered and produces findings that are qualitatively consistent with the patterns of top inequality we discussed before. The elasticity of personal taxable income (I_R and I_R^{CG}) is economically very large, at the top end of the estimates in the literature, but follows logically as the consequence of shifts from dividends to retained earnings. The much lower elasticity of I_P corresponds to what one could obtain if business incomes were ignored (e.g., some papers in the United States exclude the owners of S corporations). The elasticity of overall income I_A of about 0.5 is nontrivial, but in the range of broad income elasticities estimated in the literature (Saez, Slemrod and Giertz, 2012). This parameter captures the effect on the economic income rather than the taxable income of individuals. All of these estimates are specific to the top and to business owners, and our main message is that accounting for (non-realized) business income has a large impact on the results.

6 Shortcomings of the imputation approach

Driessen (2014) notes that approaches that ignore retained corporate income are nowadays common in estimating the distributional consequences of tax policy.²² However, absent ownership information, addressing this issue requires some imputation-based approach to assign 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 Survey of Consumer Finances 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 to allocate the ownership of corporate equities in their wealth distribution estimates, Piketty, Saez and Zucman (2018) and Auten and Splinter (2024) do so to adjust the United States' income inequality series of Piketty and Saez (2003), and Thoresen et al. (2012) rely on a related approach to understand the distributional implications of the 2005 Norwegian reform.

In Figure 9, we investigate whether imputations based on dividends can adequately account

²²Objections 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, economic income allocates pre-tax corporate profits both to individuals who own stock directly and to those who own stock indirectly (...)” (page 58).

for retained earnings. To do so, we assign the ownership of aggregate retained earnings (the total calculated from micro data) to individuals proportionally to observed received dividends. We retain ranking based on income as visible on tax returns (I_R) to mimic approaches used in the literature; in particular this choice is the only feasible one when relying on more aggregated data. As the figure shows, this approach to imputation results in an understatement of retained earnings at the top of the distribution with the exception of 2005, when both the levels of retention and dividends were large. Mechanically, the approach does particularly poorly in years when the aggregate retained earnings of households were negative, because it cannot discriminate between losses to the general public and gains at the top.²³ However, even in other years, such imputations can account for only between 20% and 45% of the retained earnings that should be allocated to the top 0.1%. This result is driven by the combination of losses and, as we will now illustrate, the imperfect correlation of dividends and retained earnings.

Figure 10 shows correlation of dividends (D) and retained earnings (R) for the top decile of the income distribution. For the 90th through the 99th percentiles, when individuals are ranked by income as reported in personal tax returns, I_R , the correlation is effectively equal to zero. When individuals are ranked by the comprehensive economic income measure, I_A , 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 finally becomes positive but it is volatile and close to zero under both ways of ranking individuals, and noisier 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 the majority of dividends and profits accrue.

What is the explanation for these patterns? Given firm profits, dividends and retained earnings are *mechanically inversely related* within a firm. An owner that increases dividends does so by reducing retained earnings. Within a group of individuals, that relation can become 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 relation is very weak, and, when restricted to individuals of similar economic income (ranked by I_A) the inverse relation 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 could

²³One 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.

be surprising, note that very high dividends can, 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 noted in Figure 9. That approach ranks individuals based on income as reported on personal tax returns and then assigns retained earnings based on dividends; however, 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 noted in Figure 10 suggest that hypothetical improvements in how individuals are ranked would not help and could even hinder this approach.

To sum up, imputing retained earnings based on dividends still leads to a significant understatement of inequality. 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 the *average* rate of return to impute income based on asset values). By relying on precise ownership information, we can avoid these pitfalls.

7 Other countries and conclusions

7.1 Implications for the United States

Although we use Norwegian data, we believe the main points apply broadly. In the United States, until 1986, there were strong tax incentives to be organized as a C corporation, effectively the equivalent approach to the current dominant organizational form in Norway. Hence, inequality in the United States until 1986 was measured in a way that was comparable to that for uncorrected (i.e. realization-based, I_R) Norwegian data. In particular, given the 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 funds, such as retaining earnings, similarly as in Norway after 2005. The reduction of personal income tax rates introduced by the Tax Reform Act of 1986 led to a massive wave of conversions from C to S corporations, the latter being subject to 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; for a description of these trends, see

Clarke and Kopczuk, 2017). Hence, since 1986, income reporting in the United States is effectively closer to our integrated accrual-based approach (I_A).

We find it striking that the top income shares jump dramatically from 1986 to 1988 both in the series based on Piketty and Saez (2003) and Piketty, Saez and Zucman (2018) approaches that are shown on Figure 11. This pattern is most pronounced in the Piketty and Saez (2003) approach that does not include capital gains, masked when volatile capital gains (that sharply peak in 1986) are included and is still present in the distributional national accounting approach of Piketty, Saez and Zucman (2018) that imputes retained earnings. As we discussed before and as recognized in the literature, the case for focusing on series that include capital gains is weak because their timing and magnitude do not correspond to annual incomes.²⁴ Guvenen and Kaplan (2017) make a related observation and note that work that focuses more narrowly on wage data shows smoother patterns, further highlighting the role that business incomes play in the evolution of inequality.

The effects around 1986 are large and they constitute a stepwise increase in the inequality series. The pre-capital gain fiscal income share of the top 1% in the left panel increases between 1986 and 1988 by 4 percentage points and in the right panel it increases by 2.9 percentage points (the change is 3.5 and 2.1 percentage points if one compares 1985 and 1989). According to the numbers of Piketty and Saez (2003), half of the increase in top 1% between 1980 and 2000 occurred between 1986 and 1988; according to Piketty, Saez and Zucman (2018) — after imputing retained earnings based on capital income — it is still 40% of the overall increase during this period. The top marginal tax rate fell in 1986 from 50% to 28%, corresponding to the change in the log net-of-tax rate of $\log(1 - 0.5) - \log(1 - 0.28) = -0.364$ and the change in the top shares between 1986 and 1988 using the Piketty-Saez approach was $\log(0.1317) - \log(0.0913) = 0.366$, so that if these observed changes around 1986 were the real result of the tax reform, the back-of-the-envelope calculation of the corresponding elasticity would be above one. Using the Piketty-Saez-Zucman numbers, the corresponding change in top shares was $\log(0.146) - \log(0.117) = 0.22$ for the implied elasticity of 0.6. According to Saez, Slemrod and Giertz (2012), the upper bound of their preferred range of the estimates of the elasticity of responsiveness is about 0.4 (our estimates for Norway in Table 1 hover around 0.5). The elasticity of about one is at the very high end of estimates in the literature²⁵ and would imply that the economy of the United States was around the peak of the

²⁴A more compelling alternative to reliance on realized capital gains is to focus on accrued capital gains. Armour, Burkhauser and Larrimore (2014) study the implications of imputing accruals for the evolution of inequality in the United States since 1989, and Burkhauser, Hahn and Wilkins (2015) do so for Australia.

²⁵In particular, this is the result in Feldstein (1995) which uses the same reform and effectively amounts to interpreting top income increases around 1986 as due to the tax effect.

Laffer curve before 1986. Note though that the elasticities estimated in the literature are based on taxable income or “broad” income (income reported on the tax returns without adjusting for tax preferences). Hence in order to account for changes in the top shares around 1986 as the response to the tax incentives, one would have to use the elasticities at the high end of estimates in the literature and, contrary to that literature, conclude that they represent *real* rather than primarily avoidance/shifting responses.

Our work suggests a different explanation: top income shares in all these series may be understated and, in particular, they may be understated more sharply before 1986 than afterwards because the data before 1986 is much more heavily tilted toward the realization approach. To illustrate the potential implications of allocation of retained earnings, Figure 11 shows what happens if all of the retained earnings and corporate tax liability²⁶ were allocated to the top 1%. The intention of this exercise is to think about it as an upper bound for what the top 1% share might be. The Piketty-Saez series does not include retained earnings at all and the Piketty-Saez-Zucman one imputes it based on dividends. The main observation is that this bound is large so that what share of retained earnings is allocated to the very top can matter, especially if — as our work suggests — one were to allocate a larger share of retained earnings to the top before 1986. The right panel additionally shows the implications of allocating to the top just all the retained earnings that are held directly by households and trusts, in particular not through pensions or life insurance (which are much more likely to be owned broadly and invested in public rather than private equities). This exercise makes it clearer that there are more retained earnings that could be allocated to the top before 1986 than afterwards.

To be sure, none of these allocations eliminates completely the large jump around the Tax Reform Act of 1986. However, the aggregate retained earnings plus corporate tax are volatile, as one would expect business incomes to be over business cycle frequency, so that changes in 1986 do not stand out but rather are a part of the pattern of volatility. The lack of business-cycle volatility in top income shares before 1986, using either of the methods in the literature, even when retained earnings are imputed, is a further hint that they may be missing business incomes. Our work raises the possibility that insufficient allocation of retained earnings may be the explanation why it is so.

Another distinguishing feature of the context in the United States that makes it different than

²⁶In accordance with the DINA approach, we include corporate tax liability in this figure. These calculations use numbers from online appendices to [Piketty, Saez and Zucman \(2018\)](#) updated until 2018, assigning 100% of retained earnings and corporate tax liability of domestically-owned C-corporations to the top 1% or, in one variant, assigning 100% of such income when owned directly by households and trusts, while leaving indirect ownership (pensions, life insurance, non-profits, government) allocated using the [Piketty, Saez and Zucman \(2018\)](#) imputation approach.

Norway, is that capital gains in the United States have usually been preferentially taxed while capital gains in Norway have not. This likely explains why capital gains are not an important part of top realized incomes in Norway while, at times, they were important in the United States. Still, as we discussed previously, observed capital gains are not a good substitute for retained earnings because of their realization aspect.

7.2 Implications for other countries

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

We note though that similar issues have been illustrated in other countries. As we noted before, three other 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. Many papers using the DINA approach attempt to do so as well, but usually without having access to the micro data. More recently and following this work, the importance of accounting for business profits that are not recognized on the personal level has been also documented in France ([Bach et al., 2024](#)) and the Netherlands ([Lejour, 2024](#)), as well as further elaborated on in Norway ([Aaberge et al., 2023](#)).

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 the series presented in [Figure 2](#) 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 from Compustat ([Standard & Poor's Compustat Service, 1998](#)) on listed firms for nine large economies over the period 1991—2019. We include all listed firms that had i) information on accumulated retained

earnings in the current and previous years and ii) information on dividends.²⁷ We then sum changes in accumulated retained earnings as well as dividends over all firms in a year and convert the results to billions of nominal U.S. dollars.

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, in 1997 in the United States, the listed firms in the sample distributed about USD 170 billion to shareholders, but about the same amount was retained by the firms. As this paper indicates, this is income earned by shareholders but not registered in 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, the dividends are very smooth (consistent with the 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 could have problems accounting for business cycle changes in inequality. Finally, the relative importance of dividends versus retained earnings varies across countries. Dividends appear to be particularly low in Japan outside of recession years. In countries such as France, Germany, Italy, and Spain, dividends and retained earnings are, in aggregate, relatively similar across most years. Other countries, such as Australia, Canada, and 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 different extents. 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), and even time-series comparisons within a country (e.g. Germany or France) could 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 a large effect not only on the level and channel of payouts, but also on the fraction of internally generated cash flows that is paid as dividends (Jacob and Jacob, 2013a,b).

This is particularly important because there is substantial cross-country variation in the prevalence of pass-through (like S-corporations in the United States) versus corporate tax treatment. Table 2 presents statistics on the importance of different organizational forms based on Eurostat

²⁷We include countries that had sufficient coverage of the listed firms included in the database; unfortunately, that was not the case for Norway.

data for 2022. The share of employment is concentrated in the corporate sector in countries such as Sweden, Finland and Romania. In other countries, such as Germany, Greece and Netherlands, businesses with pass-through taxation account for substantial levels of employment. Of course, firms with pass-through taxation can create their own problems for measuring inequality, for example, if they are more prone to tax evasion.

Using Compustat and Amadeus ([Bureau van Dijk, Moody's Analytics, 2023](#)) data, we can also elaborate on the importance of an additional point raised in this work: holding companies. We use the ownership data from Amadeus from July 2023 which provide information on large individual and corporate owners (more than 5% ownership) of European firms. Since the data enable us to go through multiple layers of ownership (with some imperfection, of course), we also identify holding companies, and, like above, we go through 10 layers of ownership.²⁸ Using the entire Amadeus database we approximate direct and indirect ownership of all available listed European firms. This results in a sample of 4,369 firms, of which 86% have at least one direct or indirect individual owner. Average individual ownership of these firms amounts to 29.97%, suggesting a substantial ownership of listed firms by families or large individual shareholders. We then apply these 2023 ownership shares to years 2003-2022 to calculate the corresponding dividends and retained earnings accruing to these owners – this calculation is hypothetical because the ownership shares are frozen in 2023, but it allows for illustrating how the changing flows of retained earnings and dividends interact with the structure of ownership.

The top panel of Figure 13 shows the aggregate fraction of dividends and retained earnings held directly by large shareholders in the data and, separately, the fraction that accounts for both direct and indirect ownership. The bottom panel shows analogous information in billions of EUR. We highlight several points based on these figures. First, most easily explained in the case of dividends, the indirect ownership is very large — direct ownership accounts for only 20 to 25% of overall dividends flowing to this group. Dividends paid to holding companies will not automatically show up on individual tax returns, so that relying on such data is unlikely to provide an accurate picture of total dividend flows. If relied upon for imputation of retained earnings, such observable dividends would lead to underestimation of the percentage of retained earnings to this group.

²⁸To cross-check validity of our approach, we manually double checked large shareholders of known companies such as BMW (the Klatten family through their holding), L'Oreal (the family Bettencourt via their holding), or LVMH (owned by Bernard Arnault via multiple layers of holdings). To illustrate our approach, see Figure A.2 in the Appendix where we highlight one example of such an ownership structure. This example shows that two large listed German companies (Lufthansa and Brenntag SE) and one Swiss firm (Kühne & Nagel AG) have a large individual shareholder (in this case, the individual Klaus-Michael Kühne through his holdings Kühne Invest AG and Kühne Holdings AG).

Second, the retained earnings shares, obtained using the same ownership structure, do not come close to mirroring the dividend patterns, and the deviations are sometimes very large. This is so, in particular, in 2014 when retained earnings of large shareholders account for nearly all of the retained earnings and in 2009 when they turn negative. Furthermore, the patterns of direct and total retained earnings shares also do not mirror each other.

The explanation lies in heterogeneity along two dimensions. One is due to the fact that the extent of direct and indirect ownership varies across firms so that weighting volatile retained earnings by these two different ownership patterns, can result in substantially different answers. The second has to do with negative values of retained earnings. About 30% of the observations across all years involve negative changes in retained earnings, which are mostly due to large losses but also due to large one-time corporate payouts. The unusually high percentage of retained earnings in 2014 corresponds to negative changes in retained earnings disproportionately accruing to firms not owned by large shareholders. The unusually low value in 2009 corresponds to large shareholders accruing negative retained earnings, while in aggregate retained earnings were positive.

The overall levels in the lower panel are less volatile, but also show large discrepancies between direct and indirect retained earnings measures. Superficially, dividends and retained earnings of large shareholders seem to follow a similar path in terms of aggregate values, but the top panel illustrates that they constitute different shares of the underlying totals (despite the same ownership structure).

We conclude that the lessons that we highlighted in microdata in Norway are likely to apply to other countries as well, including those where reliance on publicly traded equity is larger. Accounting for indirect ownership is critical. Dividend shares are a poor proxy for shares of retained earnings, because of heterogeneity across shareholders and firms.

7.3 Conclusions

Our analysis of Norwegian data shows that accounting for retained profits in the business sector is important for measuring both the level and, when tax incentives evolve, changes in personal income inequality. Also, using individual income measures that do not include retained profits, results in substantial re-ranking due to changes in the observability of personal incomes, while a comprehensive income measure that accounts for retention does not suffer from the same problems, and it results in income groups that are more persistent across tax regimes. We explore complete business register information that allows us to see through multiple layers of ownership, which is

important because retained earnings hidden behind indirect ownership account for half of the total income of individuals in the top 0.1% after 2005.

Our integrated accrual approach has limitations. First, there could still be a retiming of corporate profits, and an unannounced tax exemption on corporate capital gains from mid-2004 could thus contribute to explaining some of the high dividends and retained earnings in 2005. Such retiming is a potential issue for pass-through entities as well. Second, capital gains can 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. In addition, 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 share.

The importance of corporate source unrealized income for inequality measurement differs across countries, which substantially reduces the international comparability of inequality statistics, and the Norwegian evidence makes it clear that comparability is difficult even within a country. A careful evaluation of the role of retained corporate profits in inequality in other countries is an important direction for future work, but our analysis in Section 7.2 shows that the magnitudes are non-trivial and that the relevance of holding companies is pervasive.

Not including retained business profits in income inequality measures may thus not only mislead the national, international and global debates about income inequality, but also misguide policymakers pursuing tax reforms. As an example, by demonstrating the importance of retained earnings at the top of the distribution, the insights presented in the current paper led to increased recognition in the Norwegian policy debate that there is a need to consider the impact of various taxes in combination, and that the wealth tax plays an important role in its progressive tax system. The Shareholder Income Tax allows the affluent to realize substantial tax-free dividends and capital income at the personal level and the Exemption Model allows to store untaxed shareholder income in holding companies indefinitely. Thus, in this particular system, the wealth tax is the only tax tool that reaches, albeit imperfectly, wealth stored in firms.

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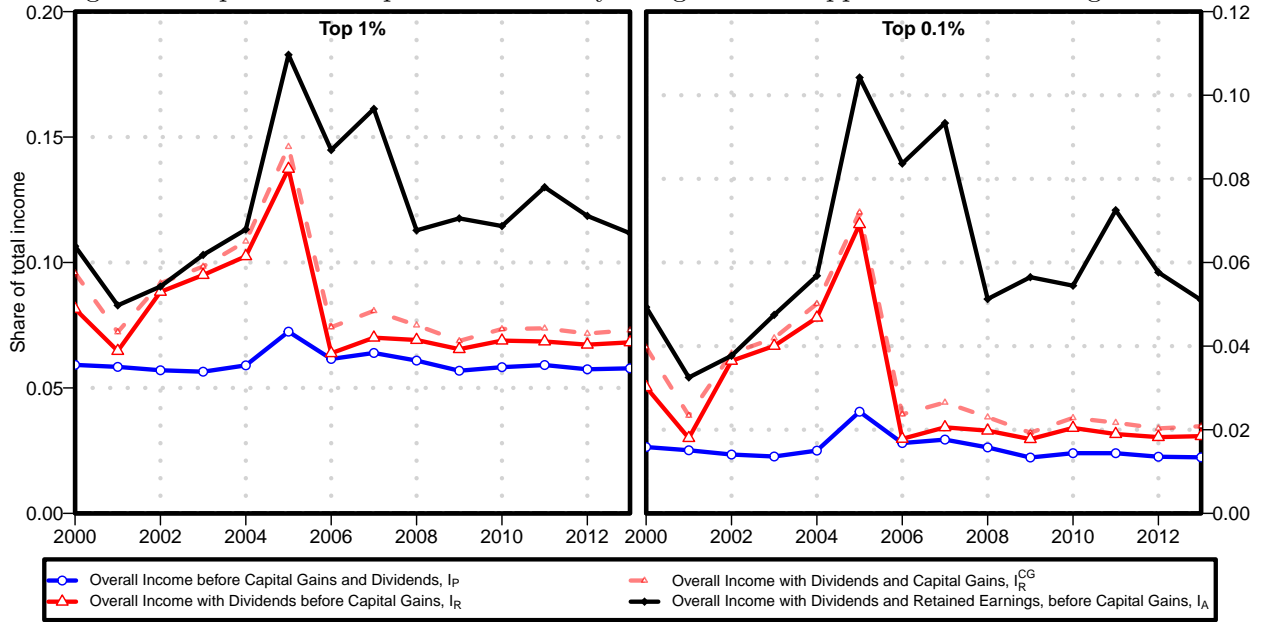
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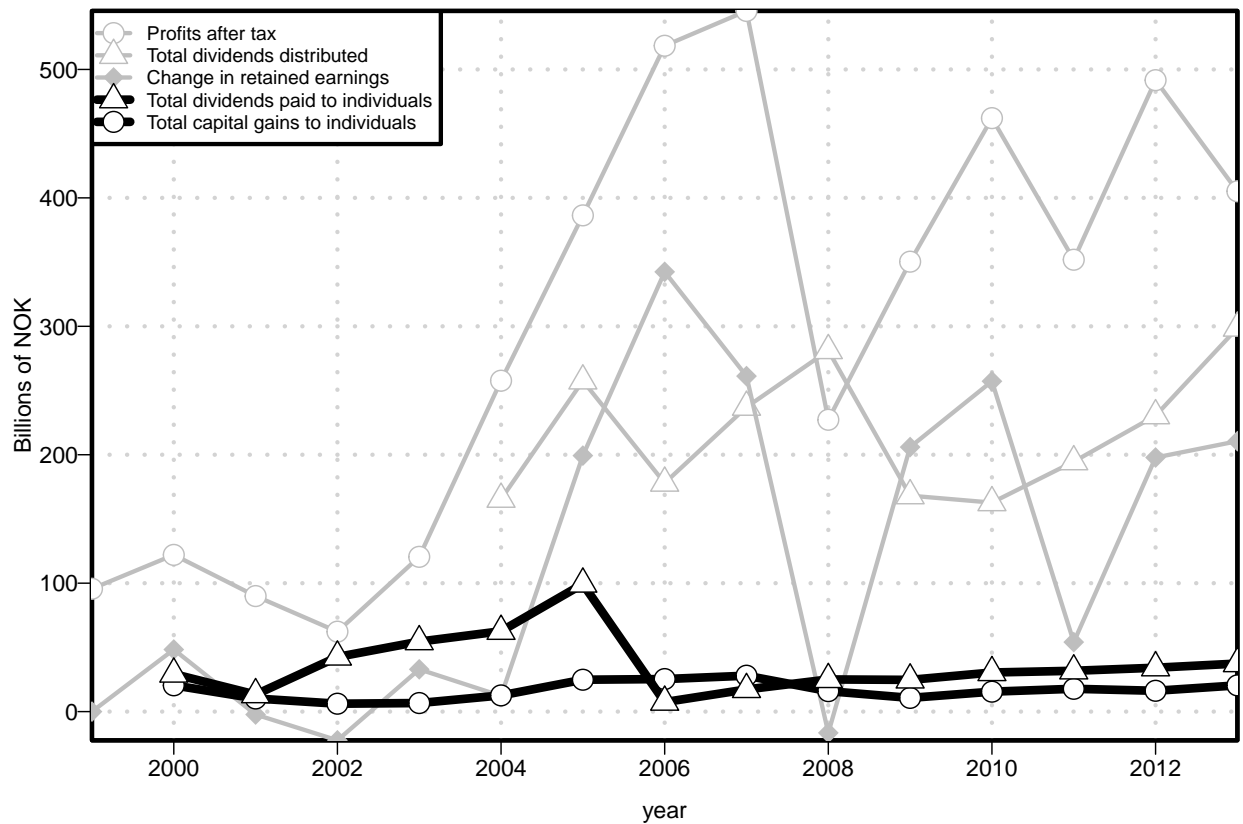
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Figure 1: Top 1% and Top 0.1% in Norway using different approach to measuring income



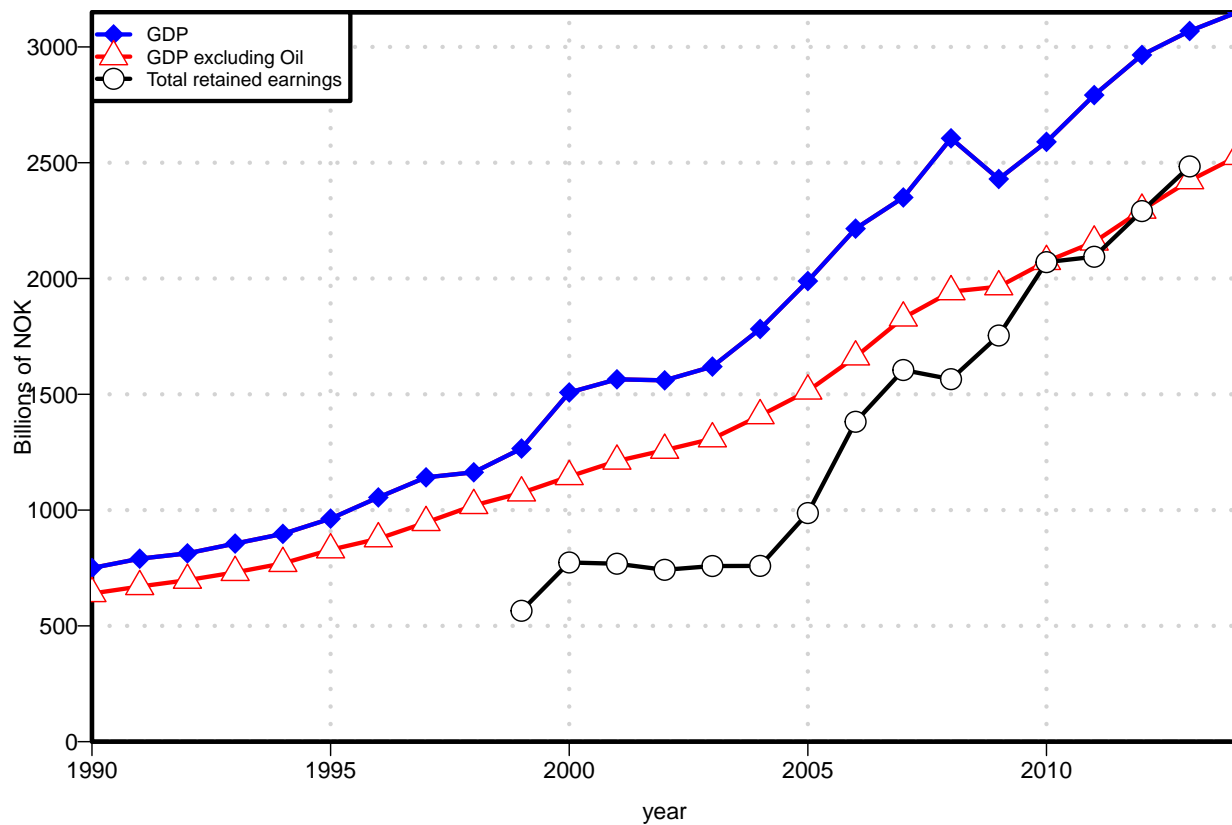
The figure shows the shares of overall income realized by the top 1% and the top 0.1% over the period 2000–2013. We report the top income shares based on 1) overall income before dividends and capital gain (I_P), 2) overall income with dividends, but before capital gains (I_R), 3) overall income with dividends and capital gains (I_R^{CG} , the dashed red line), and 4) overall income with dividends and retained earnings but before capital gains (I_A).

Figure 2: Aggregate dividends distributed and received, capital gains, retained earnings and profits



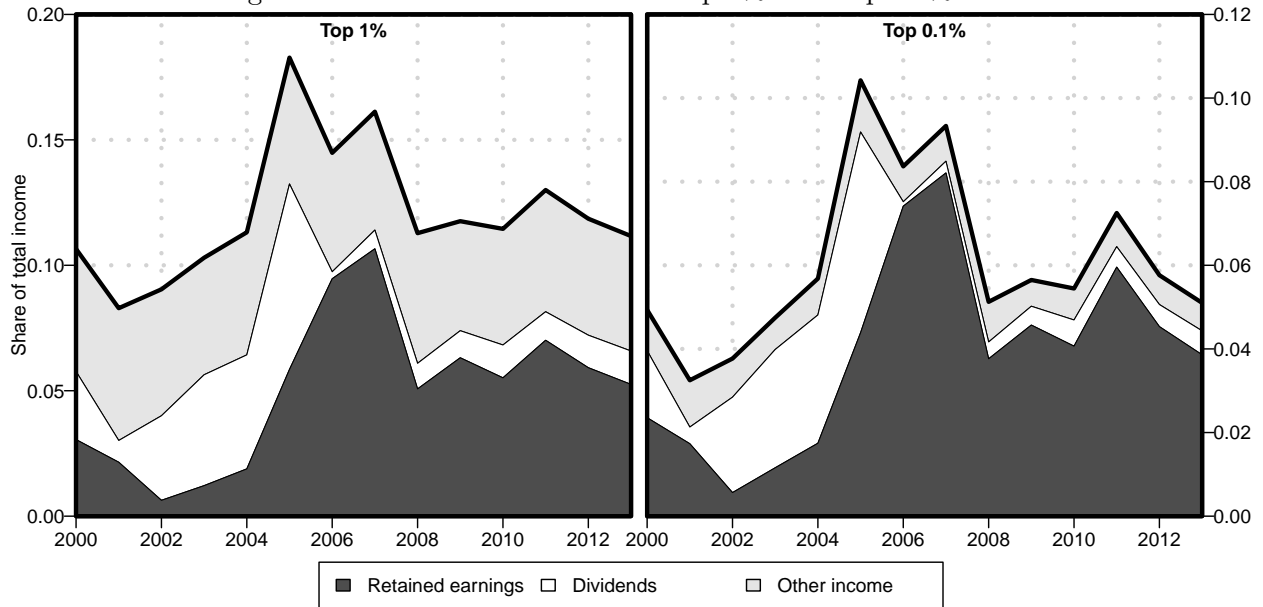
The figure shows the aggregate profits after tax, aggregate dividends, the aggregate change in retained earnings, total dividends paid to individuals, and total capital gains realized by individuals over the period 2000–2013 (and 1999–2013 if available) in billions of Norwegian kroner. Aggregate profits and aggregate dividends may include double-counting of dividends in chains of corporate ownership.

Figure 3: GDP and total accumulated retained earnings



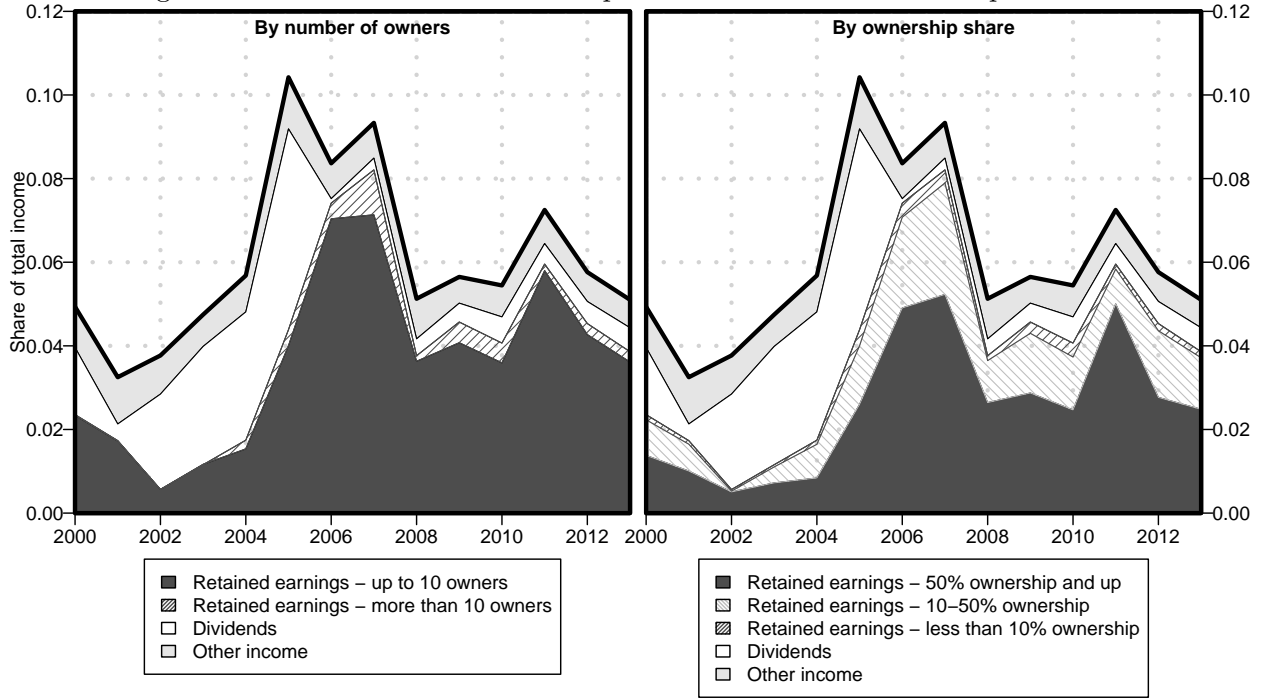
The figure shows the aggregate GDP, the aggregate GDP excluding the oil sector, and aggregate retained earnings over the period 1990–2013 (and 1999–2013, respectively, for total retained earnings).

Figure 4: Sources of income in the Top 1% and Top 0.1% shares



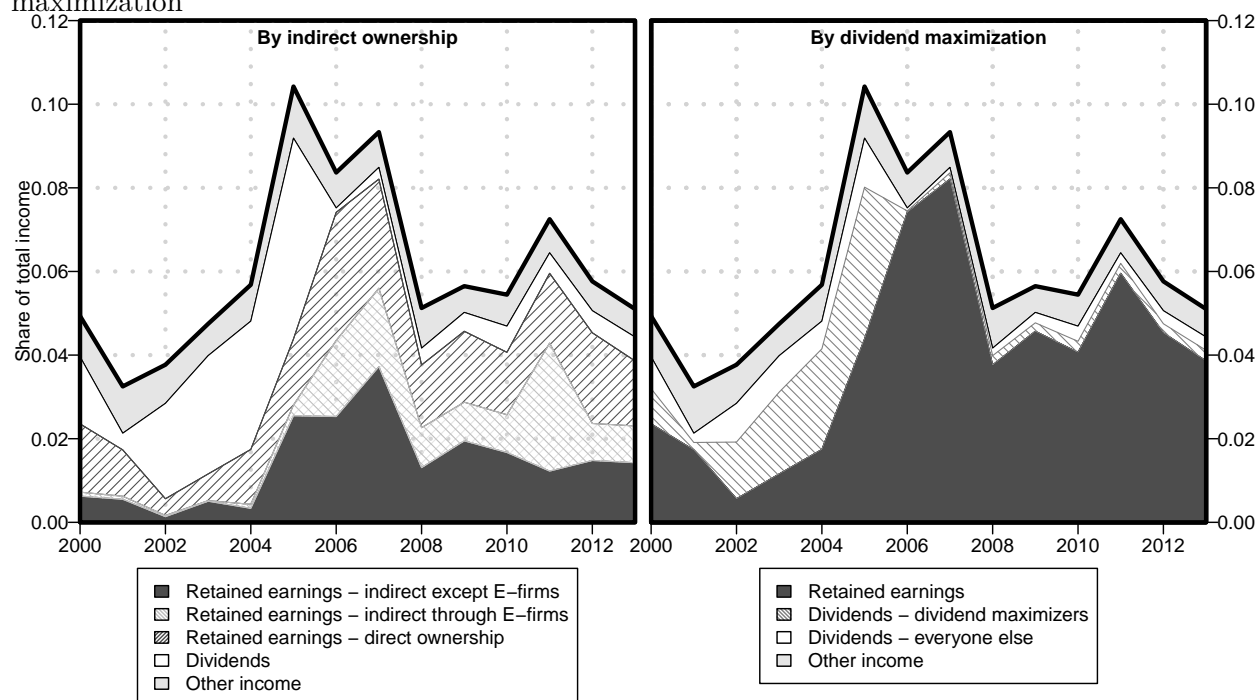
The figure shows the top 1% and 0.1% shares (based on the total income distribution I_A) split into their components. The dark gray area represents income related to retained earnings, the white area represents income from dividends, and the light gray area represents income stemming from other income sources (wages, self-employment income, and rental income). The statistics presented in the figure cover the period from 2000 to 2013.

Figure 5: Sources of income in the top 0.1% — the role of ownership structure



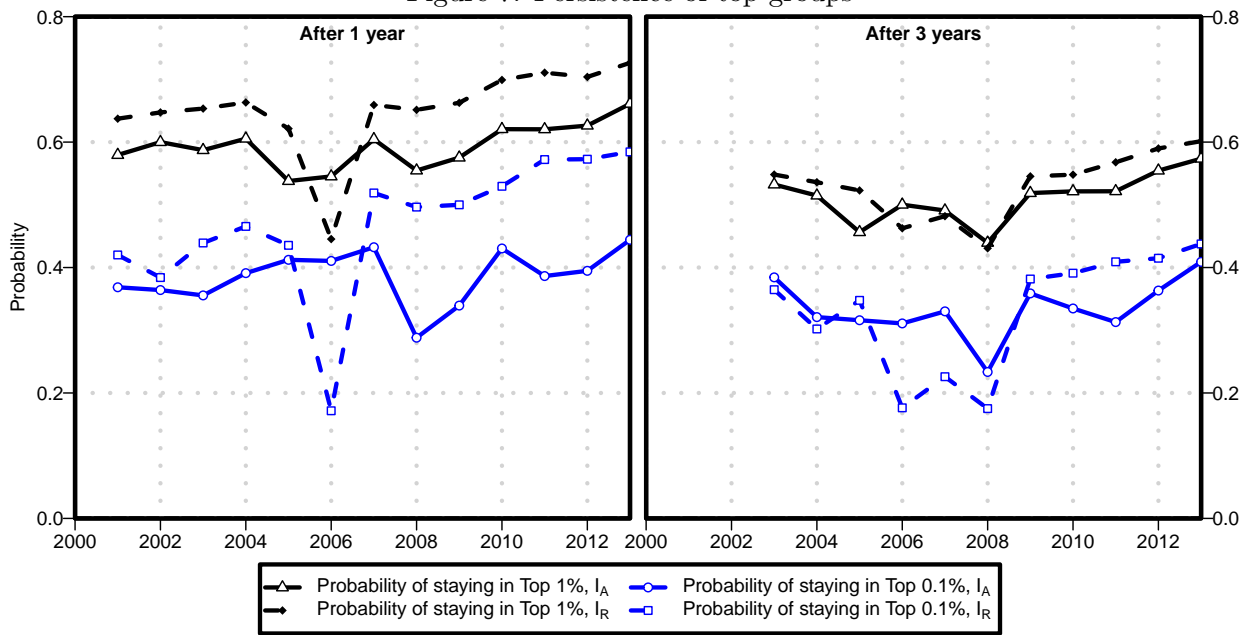
The figure shows the top 0.1% share (based on the total income distribution I_A) split into its components. The white areas represent income from dividends, and the light gray areas represents income stemming from other income sources (wages, self-employment income, and rental income). In the left panel, we further split retained earnings depending on the number of owners of the firm. In the right panel, we split retained earnings according to the ownership share. The statistics presented in the figure cover the period from 2000 to 2013.

Figure 6: Sources of income in the top 0.1% — the role of indirect ownership and dividend-maximization



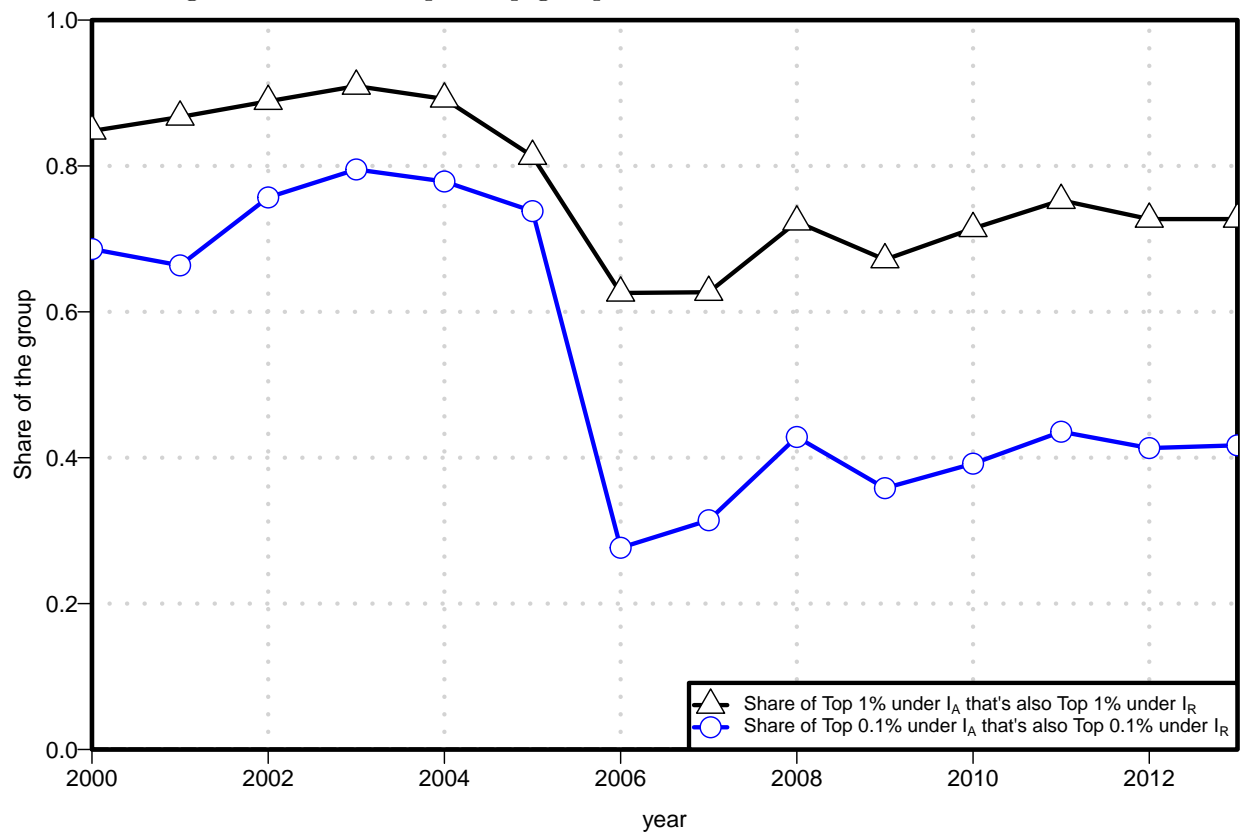
The figure shows the top 0.1% share (based on the total income distribution I_A) split into its components. The light gray areas represent income stemming from other income sources (wages, self-employment income, and rental income). In the left panel, we split retained earnings into those related to indirect ownership through E firms, other indirect ownership, and direct ownership. In the right panel, we decompose dividends into those reported by dividend-maximizers and those from all other firms. The statistics presented in the figure cover the period from 2000 to 2013.

Figure 7: Persistence of top groups



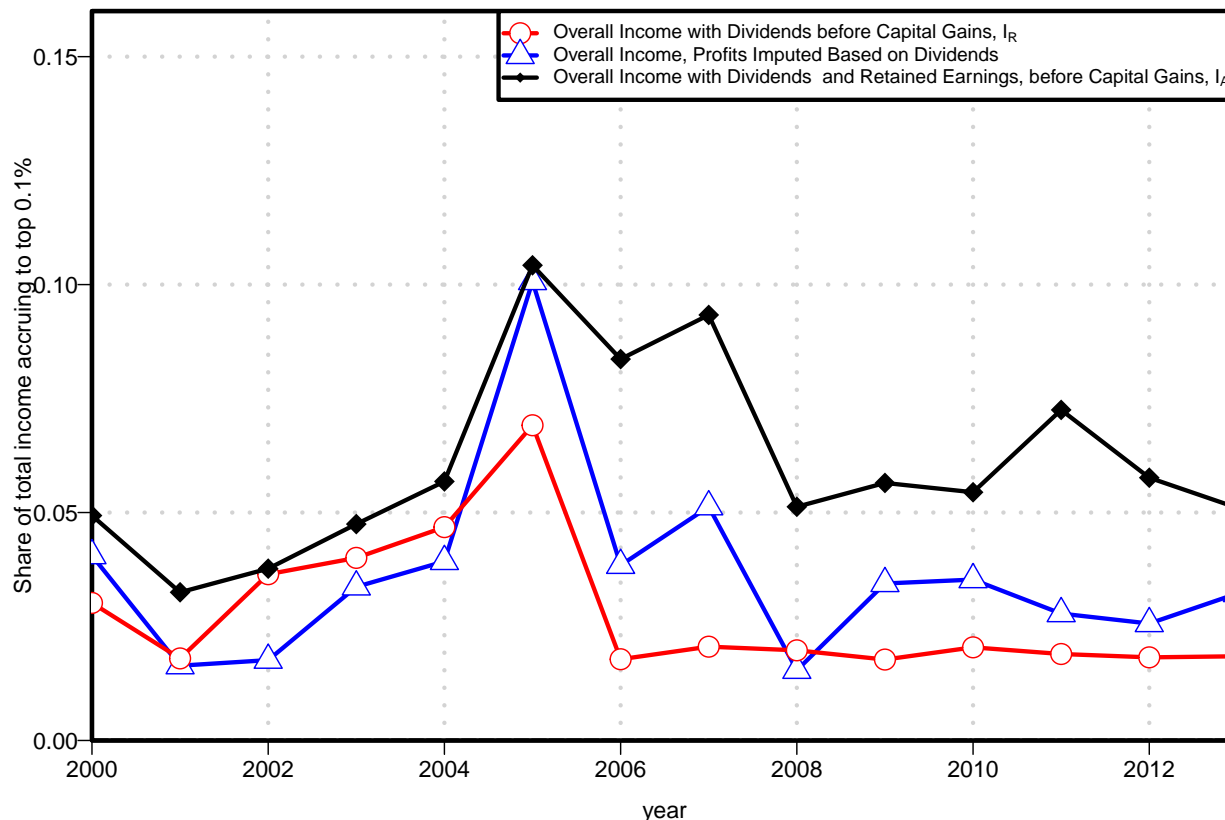
The figure presents statistics on the persistence of the top income groups after one year (left panel) and after three years (right panel). We report the probability of staying in the top 1% and in the top 0.1% according to income I_A and income I_R .

Figure 8: Membership in top groups under different definitions of incomes



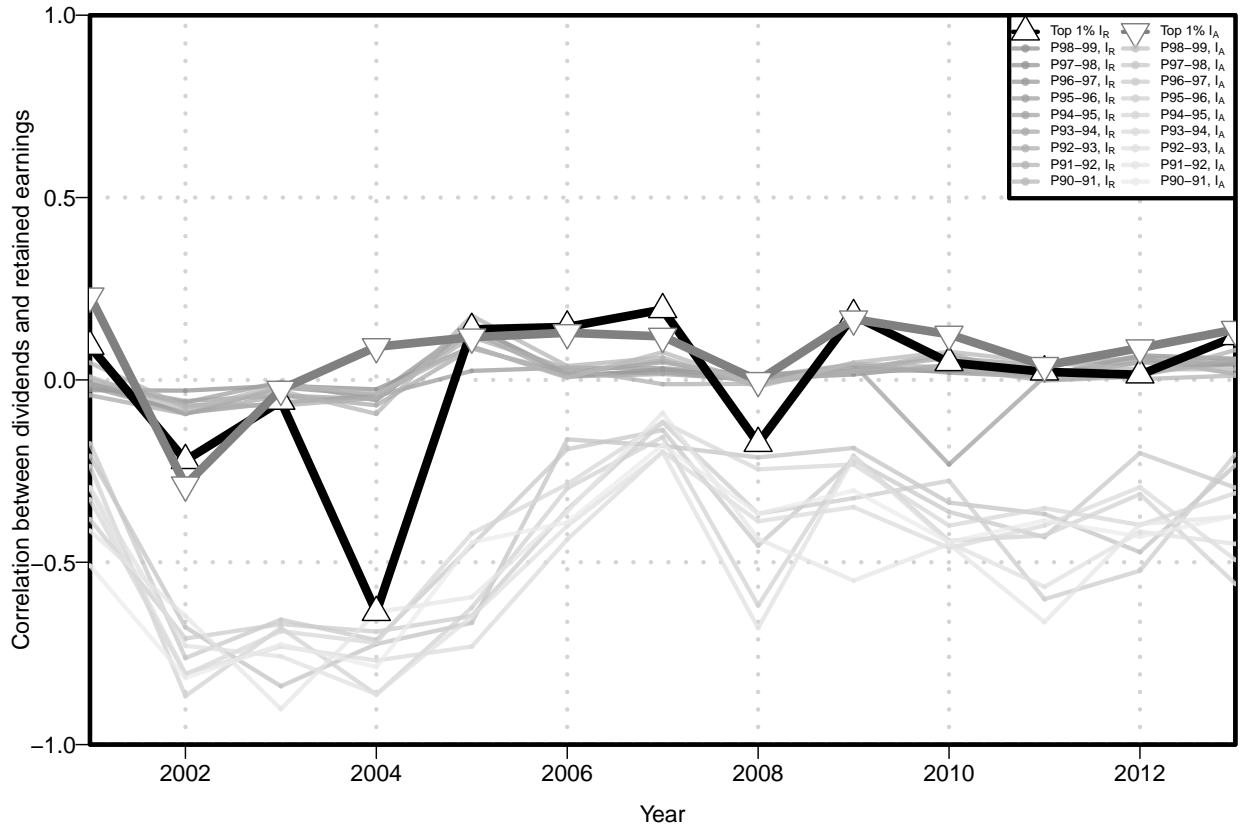
The figure presents statistics on the overlap of the members in the top income groups across different income definitions. The blue line (with circles) represents the share of individuals in the top 0.1% and top 1% according to income I_A and according to income I_R .

Figure 9: Imputation of retained income based on dividends



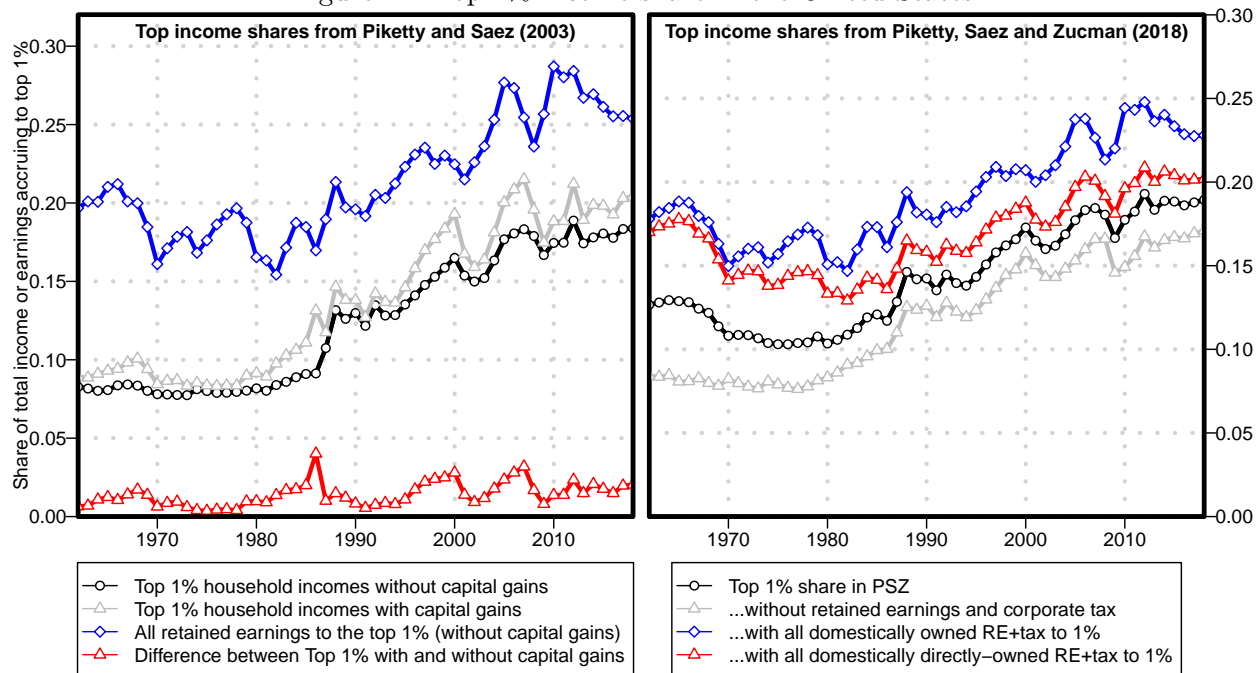
The figure shows the share of overall income realized by the top 0.1% over the period 2000–2013. We report top income shares based on overall income with dividends and retained earnings, but before capital gains (I_A) and based on overall income before capital gains (I_R). We also report the share of top incomes, where we impute retained earnings based on the amount of dividends received. Specifically, we assign the ownership of aggregate retained earnings that belong to individuals (calculated from micro data) according to observed received dividends.

Figure 10: Correlation between dividends and retained earnings



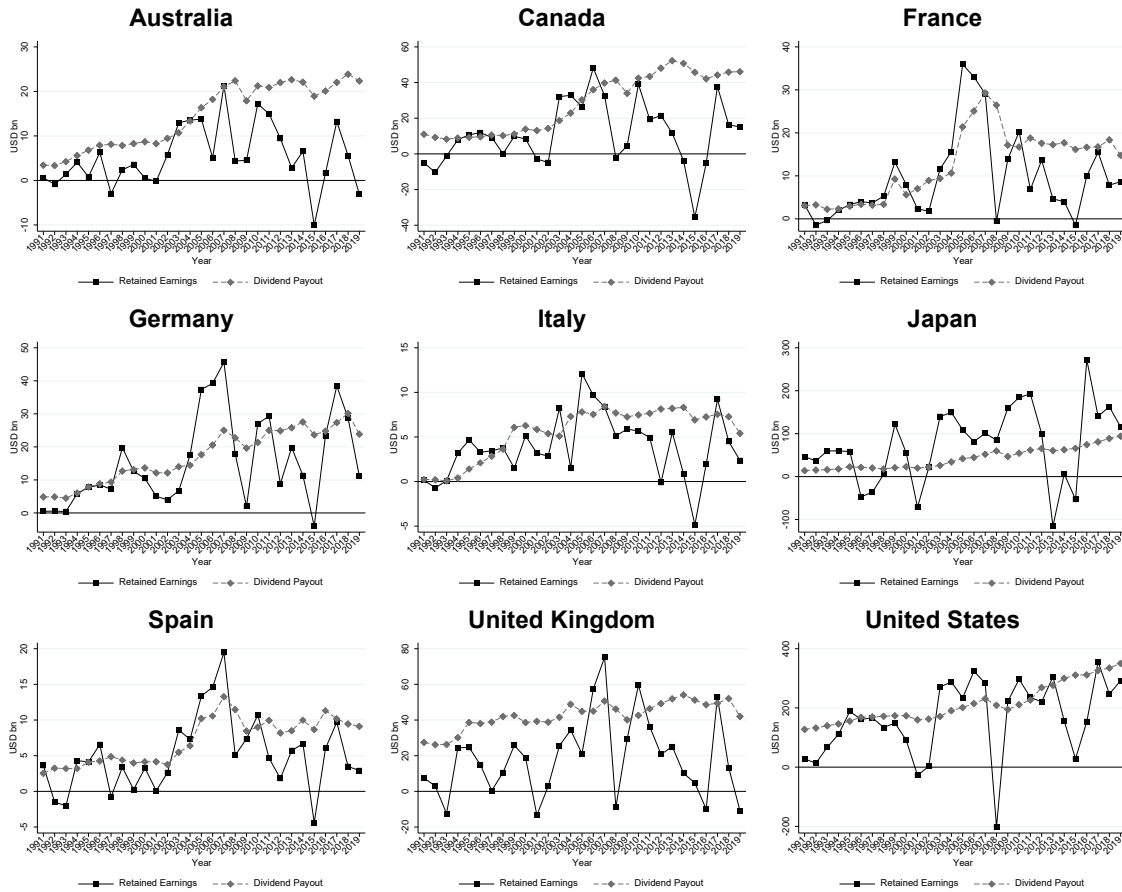
The figure plots the correlation between dividend income and retained earnings at the individual level for the top 1% of the I_R distribution and the income I_A distribution, respectively. The thinner darker (light) gray lines show this correlation for other percentiles of the top decile of the income I_R distribution (income I_A distribution). We report the correlation over the period 2001–2013.

Figure 11: Top 1% income share in the United States



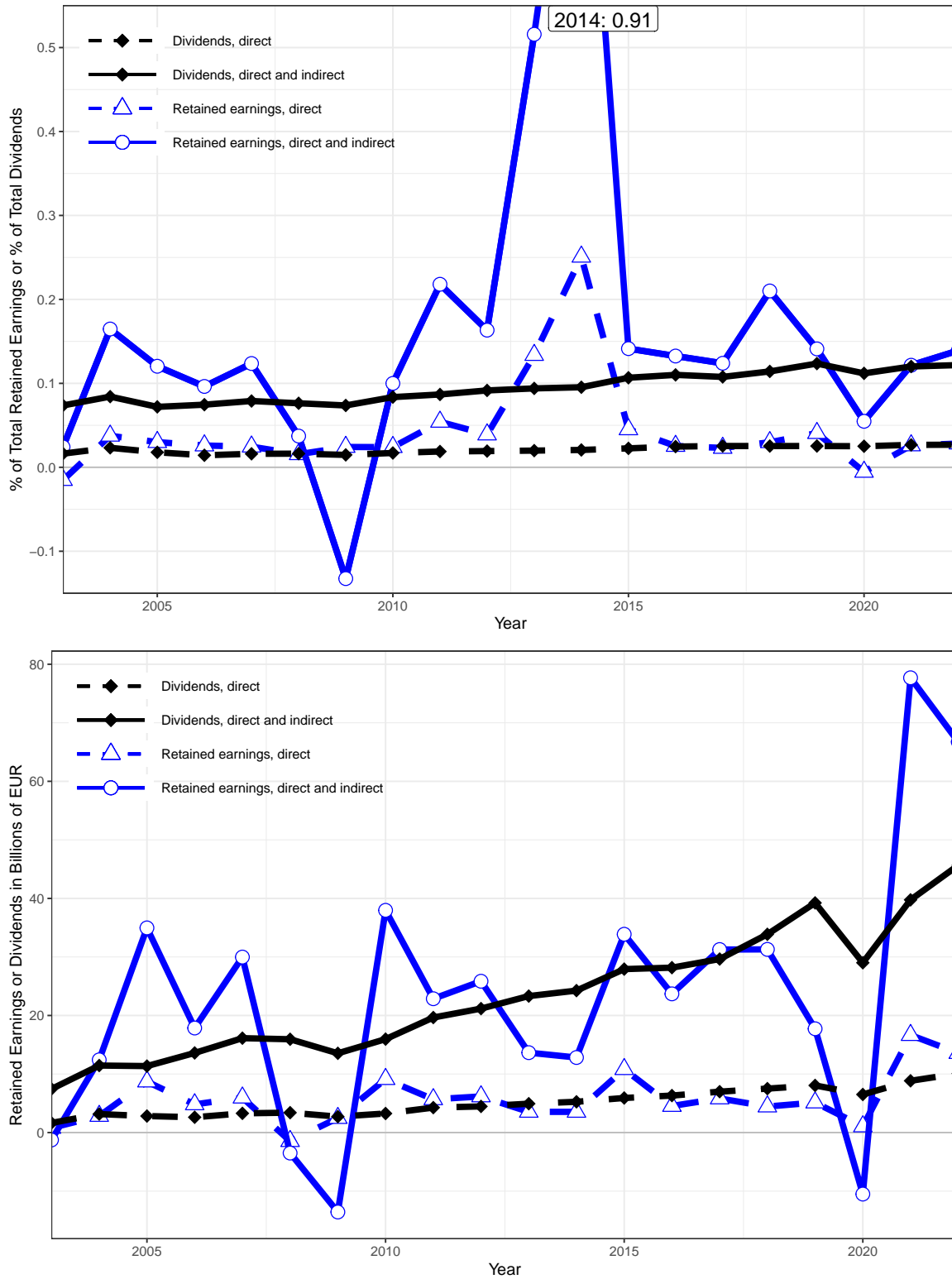
The figures show United States top 1% inequality series based on the work of [Piketty and Saez \(2003\)](#) and [Piketty, Saez and Zucman \(2018\)](#), taken from the online appendices for the latter that update both types of the series until 2018. The black lines show the baseline series over the period 1962–2018, the gray line in the left panel shows the series augmented by capital gains and the gray line in the left panel shows the series without retained earnings imputations. The left panel also shows the contribution of capital gains directly. The blue lines augments the two series by hypothetically allocating all of the domestically-owned C-corporate retained earnings and corporate tax liability to the top 1% (for consistency, this also involves including them in the denominator in the left panel). The red line in the right panel treats differently retained earnings and corporate tax liability of C-corporations that are owned directly by households and trusts than those that are owned indirectly (pensions, life insurance, non-profits, government). The former is assigned to the top; the latter continues to be allocated using the [Piketty, Saez and Zucman \(2018\)](#) imputation approach.

Figure 12: Dividends and changes in accumulated retained earnings in large economies



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 billions of U.S. dollars. We use data from Compustat North America and Compustat Global.

Figure 13: Direct and indirect dividends and retained earnings of large shareholders in Europe



The figures show shares and amounts of dividends and retained earnings related to family ownership or ownership by individuals, flowing through direct and indirect ownership. The data from Amadeus capture direct and indirect ownership of large shareholders (more than 5% ownership). The value of the unusually high share of total retained earnings in 2014 is explicitly displayed on the graph.

Table 1: Response of income — top business owners vs others

| | I_R^{CG} | I_R | I_P | I_A |
|--|--|-------------------|-------------------|-------------------|
| | Treatment effect | | | |
| 2004 vs 2007 | -0.335 (0.007) | -0.373 (0.006) | -0.056 (0.006) | 0.047 (0.008) |
| N | 76,294 | 76,294 | 76,294 | 76,294 |
| R^2 | 0.025 | 0.022 | 0.101 | 0.120 |
| 2003-5 vs 2006-8 | -0.399 (0.005) | -0.441 (0.005) | -0.068 (0.004) | -0.161 (0.005) |
| N | 228,249 | 228,250 | 228,250 | 228,250 |
| R^2 | 0.079 | 0.086 | 0.096 | 0.107 |
| Post-2005 dummy | -0.438 (0.004) | -0.449 (0.004) | -0.139 (0.004) | -0.250 (0.004) |
| N | 465,666 | 467,083 | 467,000 | 466,793 |
| R^2 | 0.077 | 0.084 | 0.158 | 0.105 |
| | Instrumental variable — elasticity estimates | | | |
| No controls | 0.948 (0.009) | 0.973 (0.009) | 0.301 (0.008) | 0.541 (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 (0.009) | 0.945 (0.009) | 0.289 (0.008) | 0.521 (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 ΔI_{t-1} | 0.912 (0.009) | 0.945 (0.009) | 0.289 (0.008) | 0.521 (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 (0.009) | 0.957 (0.009) | 0.293 (0.008) | 0.509 (0.009) |
| N | 465,666 | 467,083 | 467,000 | 466,793 |
| First stage F-stat | $442 \cdot 10^5$ | $495 \cdot 10^5$ | $621 \cdot 10^5$ | $262 \cdot 10^5$ |

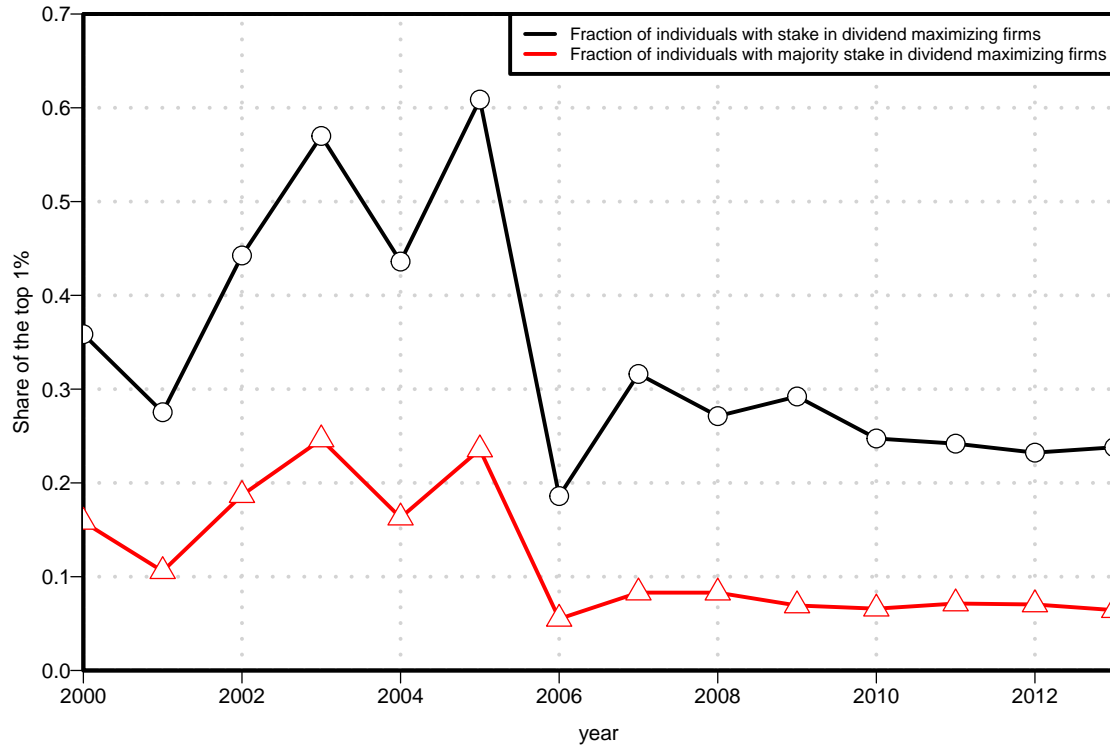
The treatment and control group sizes add up to 1%. The treatment group consists of the top business owners and the control group of those with only other sources of income, using income definition I_A , selected to maintain the 82:18 ratio, anchored by the composition of the top 1% in 2003. All regressions include time and group dummies.

Table 2: Share of employment: Corporations vs. pass-through entities

| Country | Share of Employment in | | |
|-----------------|------------------------|--------------|--------------|
| | Sole Proprietorships | Partnerships | Corporations |
| Austria | 21.3% | 14.8% | 64.0% |
| Belgium | 8.3% | 8.7% | 83.0% |
| Bulgaria | 4.5% | 2.4% | 93.2% |
| Croatia | 15.6% | 2.1% | 82.3% |
| Cyprus | 11.7% | 2.8% | 85.5% |
| Czechia | 20.2% | 3.9% | 75.9% |
| Denmark | 9.5% | 7.9% | 82.6% |
| Estonia | 2.1% | 1.4% | 96.5% |
| Finland | 6.3% | 5.5% | 88.2% |
| France | 11.5% | 3.2% | 85.3% |
| Germany | 18.7% | 25.6% | 55.7% |
| Greece | 37.1% | 22.7% | 40.1% |
| Hungary | 20.0% | 6.7% | 73.3% |
| Iceland | 10.1% | 5.2% | 84.7% |
| Ireland | 12.9% | 11.3% | 75.8% |
| Italy | 23.2% | 17.6% | 59.2% |
| Latvia | 8.5% | 12.1% | 79.3% |
| Lithuania | 16.3% | 1.5% | 82.2% |
| Luxembourg | 3.7% | 7.1% | 89.2% |
| Malta | 22.1% | 7.1% | 70.8% |
| Netherlands | 14.3% | 21.3% | 64.4% |
| North Macedonia | 5.7% | 10.1% | 84.2% |
| Poland | 40.3% | 9.8% | 49.9% |
| Portugal | 20.7% | 5.2% | 74.1% |
| Romania | 7.5% | 1.1% | 91.4% |
| Serbia | 18.5% | 0.1% | 81.4% |
| Slovakia | 25.0% | 2.4% | 72.6% |
| Slovenia | 22.1% | 3.3% | 74.6% |
| Spain | 19.7% | 7.4% | 72.8% |
| Sweden | 8.4% | 5.2% | 86.4% |
| Türkiye | 31.6% | 2.8% | 65.5% |

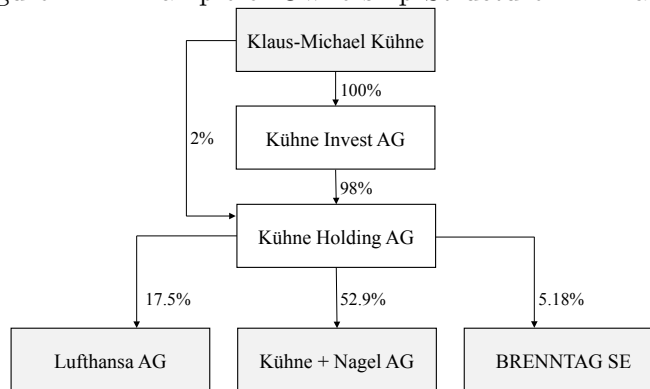
This table presents the share of aggregate private sector employment stemming from sole proprietorships, partnerships, and corporations. The source is Eurostat “Business demography by legal form and NACE Rev. 2 activity,” available at https://doi.org/10.2908/BD_L_FORM and as described in the data appendix.

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_A 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 payouts. We report the results for the period 2000–2013.

Figure A.2: Example of Ownership Structure in Amadeus



This figure shows the ownership structure of three listed companies, which we trace back to the individual Klaus-Michael Kühne through his two holding companies Kühne Invest AG and Kühne Holdings AG. Through these two holding companies, Mr. Kühne owns 17.5% of Lufthansa AG, 52.9% of Kühne and Nagel AG, 5.18% of Brenntag SE. The ownership statistics are static and are based on data from July 2023.