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DISCUSSION PAPER SERIES

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NOVEMBER 2024

ISSN: 2365-9793

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ABSTRACT

How Business Income Measures Affect Income Inequality and the Tax Burden*

This paper presents estimates of income concentration and inequality for Norway using a new comprehensive measure of income, which identifies business income as it is earned by companies rather than when it is paid out as dividends to owners. We assemble several sources of high quality register data that allow us to account for multiple layers of business ownership across all companies between 2001 and 2018. Compared to official statistics, the new measure implies that the share of income attributable to the top 1% of the distribution more than doubles and the Gini coefficient estimates increase by about 40%. Our new measure identifies substantial tax regressivity for individuals in the top percentile, a feature that cannot be detected by standard income measures. For instance, while the share of gross income paid in taxes by individuals at the 99th percentile is about 36% in 2016, the corresponding share paid by individuals in the top 1% is 19%.

JEL Classification: D31, D63, E01, H24

Keywords: income distribution, top income shares, Gini coefficient, dividends, retained earnings, tax burden

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* We thank Annette Alstadsæter, Sumit Dey-Chowdhury, Lasse Eika, Erik Fjærli, Stephen Jenkins, Dean Lillard, Kalle Moene, Magne Mogstad, Rebecca Riley, Alfonso Rosolia, Kjell Salvanes, David Splinter, Ernesto Villanueva, Daniel Waldenström, Floris Zoutman, and Erik Zwick, as well as seminar participants at several conferences, universities, research centers, and national statistical agencies for their helpful comments on earlier drafts of this paper. All opinions are those of the authors and should not be attributed to Statistics Norway or their staff.

1 Introduction

The last twenty years have witnessed a renewed interest in understanding how income inequality evolves, paying special attention to the role played by top income shares. Path-breaking progress in this area has been powered by insightful economic ideas and reliable tax statistics across several countries and over a long time span (e.g., Piketty, 2003; Piketty and Saez, 2003; Aaberge and Atkinson, 2010; Atkinson et al., 2011; Piketty et al., 2018; Smith et al., 2019; Kopczuk and Zwick, 2020; Larrimore et al., 2021; Auten and Splinter, 2024)). This pioneering strand of research has allowed us to unveil inequalities we could not identify in the past.

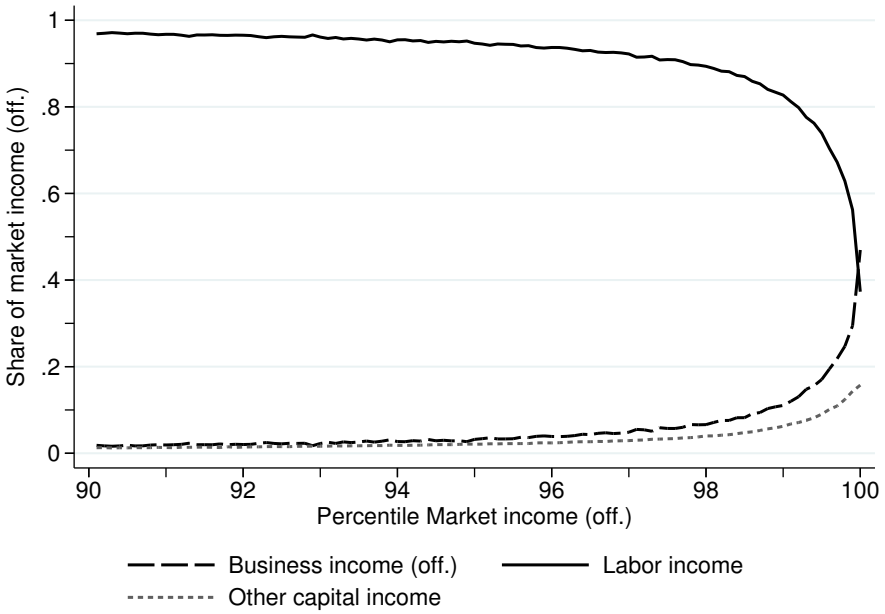
Most of the evidence from this literature is based on administrative tax records and national income accounts. Administrative records have the advantage of providing full coverage of the population with accurate third-party reporting on labor and transfer income. Harder-to-measure business income, however, has typically been imputed using assumptions on the relationship between retained earnings on the one hand and dividends and realized capital gains on the other (e.g., Piketty et al., 2018; Smith et al., 2019). Abstracting from issues related to tax evasion (Alstadsæter et al., 2019, 2022), imputed measures of business income can be heavily shaped by legitimate management decisions about corporate dividend policies — which may change from one year to the next, maybe even independently of corporations' actual economic activity — and indirect ownership of private firms, both being distinctive features of many advanced economies. Therefore, if individuals at the very top of the distribution receive relatively less labor and transfer income and disproportionately more business income, we may end up with a mistaken picture of income inequality levels and dynamics.

Concentration of business income is known indeed to be particularly high in rich countries (Kopczuk and Zwick, 2020; Saez and Zucman, 2020). For Norway, Figure 1 illustrates this point with official income statistics data for the top decile of the market income distribution averaged over 2001–2018.[1] Labor income plays a key role up to the 99th percentile, accounting for at least 80% of total market income. In the top 1%, however, labor income and business income make up 30–40% of total income individually, while 40–45% of the total income received by individuals in the top 0.1% is represented by business income alone.[2] As we shall document in this paper, our new measure identifies a substantially different income composition and uncover even greater income concentration at the top of the distribution.

[1] Below the 90th percentile (not shown for convenience), the shares of business income and other capital income are negligible. Labor income accounts for almost all market income in the hands of individuals from the third decile up.

[2] Interestingly, this distribution is similar to the distribution of aggregate fiscal income reported by Smith et al. (2023) for the United States.

Figure 1: The Composition of Market Income for the Top 10% of the Distribution According to Official Statistics, Means Computed over the 2001–2018 Period



Notes: This figure shows the composition of market income for individuals in the top 10% of the distribution of market income, when market income is divided into three broad sources (labor, business, and other capital income) and all components are measured as in official statistics. Labor income includes wage income and income from self-employment (plus sickness and parental leave benefits); business income includes dividends and realized capital gains on financial assets; other capital income includes interest income, realized capital gains on real estate, returns on life insurance, taxable rental income, and capital income from abroad. When calculating the shares, individuals in the top 10% of the distribution are divided into 100 equally sized groups, and each income component is summed over all individuals in each group and then divided by the sum of market income within the group.

The top 0.1% is a small group in Norway, comprising about 3,700 individuals in 2018. In that year, according to official statistics, each of them owned around four companies directly and about 40 if we include multiple levels of shareholdings, for a total of more than 22,000 firms. This corresponds to about 5% of all establishments in the country and 11% of all the limited liability companies. On average, in the same year, official statistics figures show that individuals in the top 0.1% received a total annual income of 12.1 million NOK (approximately $1.5 million), leading to an income share of nearly 4%. Accurately measuring total income for this group, and more generally for the top 1%, is therefore crucial to our understanding of economic inequality and the distribution of economic resources, as also emphasized by Saez and Zucman (2016) in the case of wealth concentration.

This evidence and our previous observations set the scene for this paper. We stress two key economic intuitions, which underlie our arguments. First, individuals at the very top of the income distribution are likely to be owners of multiple income-generating organizations. Second, they are also likely to legally hold large sums of retained business income,

i.e., profits that are not paid out as dividends to shareholders but remain within their companies.[3] These two insights, which correspond to two sets of specific management decisions, guide our data forensics and underpin our novel measure of business income. This new measure is more accurate and more comprehensive than what has been used so far and leverages highly reliable Norwegian administrative data that precisely identify individual shares of retained business income across all layers of ownership from 2001 to 2018.

Our measure allows us to uncover two novel substantive results. First, we show that this new assessment of income leads to a considerable revision *up* of top income shares and income inequality estimates as compared to what we would obtain with conventional official measures.[4] For instance, the share of income attributable to the top 1% of the population more than doubles and the Gini coefficient estimates increase by about 40% on average. Second, analyzing the distribution of the tax burden, we document that the new measure picks up pronounced regressivity at the very top of the income distribution, above the top 1%, a feature that cannot be detected by official estimates.

Relative to the growing literature that recognizes the importance of undistributed corporate profits (see Fairfield and Jorratt De Luis, 2016; Wolfson et al., 2016; Alstadsæter et al., 2023; Bach et al., 2023; Bruil et al., 2024, as well as the discussion below), our paper's value added is to provide a distinctive perspective on income inequality and the distribution of the tax burden, while consistently accounting for indirect company ownership among top income earners. The combination of the two sets of outcomes (inequality and taxes) and our simple insights (about retained earnings and multiple ownerships) leads to findings that challenge the conventional wisdom on the redistributive effects of current tax policies. Moreover, we use our new measure to analyze the composition of top income groups using a copula function approach. And for the first time, we provide evidence of the bias we would face if accurate measures of individual business income were unavailable and we had to invoke similar assumptions to those used by studies that combine individual tax returns with aggregate data from national accounts.

Income Measurement Issues — Much of the existing research in this area aims to use a concept of income close to the Haig-Simons standard, which essentially implies a measure based on consumption plus changes in net wealth. This standard implies that an ideal

[3]Retained earnings might be particularly relevant to owners of closely held firms, for whom the firms' investments in financial and durable assets (e.g., company cars, boats, planes, and art) are potential substitutes for private saving and consumption, respectively (see Alstadsæter et al., 2014). As emphasized by Piketty et al. (2018), wealthy individuals may avoid the dividend tax by investing in companies that do not distribute dividends, and they can avoid the capital gains tax by never selling their shares. We elaborate on this issue in Section 3.

[4]We should stress that the official standards used by Statistics Norway abide by the United Nations Statistics Division Canberra Group (2011) international guidelines for income definitions, which are meant to provide statistical agencies with consistent approaches for income measurement, especially capital stock statistics.

income tax should be imposed on "comprehensive" income, i.e., a measure that includes all sources of real income net of the expenses of earning that income, whether the income is realized or accrued, whether it is cash or in-kind, whether it is earned income or transfer income, and whether it is domestic or foreign generated.[5]

A precise measurement of income at the top is made difficult by the blurred boundary between wages (labor) and profits (capital) for individuals with ownership in limited liability companies as well as those in partnerships and executive boards, who are likely to be affected by changes in the tax treatment of business income. One prominent example of such changes is the 2006 Norwegian income tax reform that increased the tax on dividends received by personal shareholders from zero to 28%, while dividends to corporate shareholders remained untaxed (Alstadsæter and Fjærli, 2009). We shall document that our new measure, which unlike the official measure is based on both realized and unrealized business income, is not sensitive to the enactment of this reform and the subsequent upward revisions of the dividend tax.

To construct our comprehensive measures of income for all individuals and households in Norway, we begin with tax records on income, and use data on all owners of Norwegian limited liability firms to supplement the tax data with information from firm level income statements and balance sheets. For "pass-through" entities, such as partnerships and sole proprietorships, assigning business income to personal owners is relatively simple in the Norwegian context, since annual income is taxed at the owner level. For limited liability companies, which represent by far the main legal form in terms of employment and economic activity (see Section 2), this assignment procedure is more complicated and relies on ownership shares and detailed firm level income information to mimic a pass-through regime. With this approach, we obtain a measure of income that is closer to the Haig-Simons definition than the income estimates produced by official statistics and those based on a combination of individual tax records and aggregate data from national income accounts. Our measure includes items such as rental income, taxable employee fringe benefits, and retained business income, which represents an ideal yardstick for income measurement (as emphasized, among others, by Atkinson et al., 2011, p. 34).[6]

Our Results in the Context of the Existing Literature — The tax-insensitivity feature of our new measure has profound implications for our understanding of income inequality and the interpretation of its temporal evolution. Our first set of results shows that the new income measure leads to a two-fold increase in the share of income attributable to the top 1% and a five- and six-fold increase for the top 0.1 and 0.01%, respectively, since the

[5]Besides Haig (1921) and Simons (1938), Meade and Stone (1941) offer an interesting alternative perspective on the estimation of national income. For a critical appraisal of the Haig-Simons standard, see Alm (2018) and Larrimore et al. (2021).

[6]On this point, see also Larrimore et al. (2021) and references therein.

introduction of the dividend tax reform in 2006 up to the end of the period under analysis, relative to the income shares found using official measures of income.

As business income is particularly relevant to individuals at the very top of the distribution, conventional wisdom suggests it is unlikely to affect standard measures of inequality, such as the Gini coefficient, although it might affect estimates of top income shares (see, for instance, Piketty, 2014, pp. 266–267).[7] We compare Gini coefficient estimates obtained from the official income measure and from our preferred income measure, and show that views on inequality can be dramatically different even when the only departure from the official measure refers to business income. In particular, our new measure yields Gini estimates that are between 25 and 50% higher than those found with the official measure. Interestingly, when we use our preferred measure of business income, the time trends of the Gini estimates resemble the patterns found for the top 1, 0.1, and 0.01% shares.

These results speak directly to the burgeoning income inequality literature. The contributions by Piketty (2003) and Piketty and Saez (2003) are among the first seminal examples of papers using individual tax return data to study inequality (in France and the United States, respectively).[8] They show that labor income drove the rise in top incomes in the second half of the twentieth century in the US, while dividend income played a larger role in France.[9] Stemming from those contributions, more recent research has focused on the role of business and capital income, underlying the growing importance of financial wealth for top income shares. Piketty et al. (2018) estimate the distribution of national income and find that business income has been driving the twenty-first-century rise in top income shares and now exceeds labor income at the top. Smith et al. (2019) confirm this result using individual tax return data.

The ongoing debate arising from the work by Piketty et al. (2018), Smith et al. (2019), Saez and Zucman (2020), Smith et al. (2023), and Auten and Splinter (2024) points out the difficulties of measuring income at the top and estimating inequality from income measures which combine individual tax returns and aggregate data. Our paper avoids many of the data challenges faced in these studies by using linked individual and firm administrative data covering the entire Norwegian economy. This permits us to identify all levels of ownership of private companies and accurately attribute profits to each individual owner, without double counting income from indirectly held firms. In Sections 4 and 5, we discuss how our new estimates compare with those we would obtain if we had imputed individual business income from aggregate data.

We emphasize that our method does not rely on imputed business income, a prevalent

[7] See also the discussion in Atkinson et al. (2011).

[8] Earlier attempts include the works by Atkinson et al. (1995) and Smeeding et al. (2001).

[9] Atkinson and Piketty (2007, 2010) and Atkinson et al. (2011) confirm these results, i.e. that labor income played important roles in English speaking countries (such as Canada, Australia, New Zealand and the United Kingdom) as well as in India and China, but not in continental European countries or Japan.

(and challenging) feature of much of the US literature. Alstadsæter et al. (2023) apply a similar approach to ours to estimate top income shares based on Norwegian data, except that they use distributed dividends in a given year, while we construct a new measure using proposed dividends which are eventually paid to owners in the following year.[10] Unlike this earlier contribution, our study provides a new and more complete analysis of how the measurement of business income affects overall income inequality, the composition of top income groups, and the distribution of the tax burden.

Our evidence also corroborates the recent wave of papers that document a steep decline in the labor share of national income (e.g., Elsby et al., 2013; Karabarbounis and Neiman, 2014; Piketty and Zucman, 2014). Existing explanations for this decline include technological change, capital accumulation, increased globalization, the economic emergence of China, changes in the relative price of capital, greater market power by large corporations operating in concentrated product markets, and workers' lower bargaining power. These explanations suggest that firms have substituted expenditures on labor inputs with expenditures on capital inputs and propose alternative drivers of this substitution.[11] Closer to the results documented by Barkai (2020), our findings point to yet another rationale, namely, a large increase in the share of pure profits, what Karabarbounis and Neiman (2019) call "factorless income". This emphasizes the importance of the capitalists' decision to retain business income within their firms, and not to distribute it to shareholders in the form of taxable dividends, in response to strong tax (dis)incentives.[12]

Our second set of results pertain to the distribution of the tax burden, for which we focus on both taxes paid as a fraction of gross income and shares of total taxes paid. Omitting retained business income leads not only to a substantial mismeasurement of inequality, but also to a profound misunderstanding of the tax treatment of individuals at the top of the distribution. The already-mentioned 2006 income tax reform played a key role by changing legal defaults and increasing tax incentives for business owners to retain income within their private businesses and off their personal tax returns. Before the 2006 reform, there is evidence of severe regressivity at the very top of the income distribution according to both our preferred measure and the official measure of income.

[10] A predecessor of the Alstadsæter et al. (2023) paper was disseminated in 2016. We shall elaborate more on our approach and explain why proposed dividends are preferable in Section 3. Other related studies, which allocate profits to shareholders and confirm the importance of retained earnings among the wealthy, include Fairfield and Jorratt De Luis (2016), Wolfson et al. (2016), and Bruil et al. (2024), for Chile, Canada, and the Netherlands, respectively.

[11] Grossman and Oberfield (2022) provide a critical overview of this literature.

[12] See also Smith et al. (2022), which emphasizes the rise of business activity in pass-throughs. The importance of retained earnings also speaks to the growing literature that questions the maximization of the firm's public value as the most appropriate representation of companies' behavior (e.g., Hart and Zingales, 2017; Gillan et al., 2021). Rather than pointing to shareholder welfare or corporate social responsibility as alternative objective functions, however, our results emphasize the key role played by ownership structure and the way in which holding companies or closely held businesses may serve as tax shelters.

After the reform, however, the official measure reveals a progressive tax burden throughout the entire distribution of gross market income, including the very top. Our new accrual based measure, however, continues to detect strong regressivity.

This result, which confirms the findings by Bach et al. (2023) for France, emphasizes that individuals at the very top pay a lower effective tax rate due to the composition of their income, which includes significant undistributed corporate profits taxed at the corporate level rather than as personal income (see also Yagan, 2023; Bozio et al., 2024; Bruil et al., 2024). It also emphasizes that the quality of top income data is essential for the evaluation of tax policies that target the rich (Saez, 2017; Saez and Zucman, 2020; Smith et al., 2023).

Roadmap — Section 2 presents the data. Section 3 discusses how we set out to assign business income to personal owners and documents the salience of our business income measure in relation to the 2006 dividend tax reform. Section 4 shows our main results on top income shares and explores the composition of top income groups. It also compares our new estimates with those obtained with imputation methods used by studies that combine individual tax returns with aggregate data from national accounts. Section 5 presents the evidence on the Gini coefficient, its decomposition, and the relationship between income shares and inequality, while Section 6 presents the results on the distribution of the tax burden. Section 7 concludes.

2 Data

The Norwegian context is attractive to study for at least three important data-related reasons. First, tax records from the Norwegian tax authorities cover the universe of adult individuals (aged 16 and above) and corporations. Second, income information is not topcoded. This is crucial, as accurate measurement of income at the very top of the income distribution can have a considerable impact on the reliability of the estimated income distribution. Third, the data do not suffer from differential attrition due to nonresponse, except individual death or firm destruction.[13]

[13]Clearly, there are issues of tax evasion. Alstadsæter et al. (2019) show that offshore tax evasion is highly concentrated among the rich in Scandinavian countries. Using a unique dataset of leaked customer lists from offshore financial institutions, they estimate that the 0.01% richest households evade about 25% of their taxes, about five times more than what can be detected in random tax audits. In a follow-up paper, Alstadsæter et al. (2022) provide evidence on substitution between tax evasion and tax avoidance at the top of the wealth distribution by exploiting the 2008 Norwegian tax amnesty program, under which taxpayers who voluntarily disclose assets hidden abroad pay no penalties and suffer no criminal sanctions. They find marked increases in reported income, net wealth, and taxes paid as a result of the amnesty program. They also find evidence suggesting low or zero substitution between evasion and avoidance. We do not address such issues. Accounting for them, however, is likely to lead to greater inequality estimates and a more severe regressivity of the tax burden. Our results then could be seen as lower bounds of the true estimates.

For the period 2001–2018, we use three main administrative data sources: (a) micro-data from the individual income tax register files; (b) detailed information on corporate ownership; and (c) income statements and balance sheet data covering *all* limited liability firms. The first data source provides us with precise information on labor income and benefit (transfer) income used in official statistics, as well as dividends received from directly held firms and realized capital gains and losses. The other two sources combined provide us with information on all the additional components needed to construct a comprehensive measure of business income, namely firms' profits and proposed dividends, as well as ownership shares across all firms in the economy. A unique personal identification number identifies each individual over time and across registers, and likewise a unique firm identifier pins down each corporation over time and across registers. We thus have highly detailed administrative data covering the universe of Norwegian adult individuals and corporations.

The income tax register files contain tax information on all adult Norwegian residents for each calender year over the sample period. Specifically, we have precise data on each individual's labor income (i.e., earnings and employer's benefits – such as car, phone, and child care – as well as net income from self-employment), capital income (i.e., interest income, dividends, tax reported realized capital gains and losses, and net income from real estate renting), and taxable transfers (such as unemployment benefits, sick leave benefits, and pensions). From the original files, we have 59,522,740 person-year observations between 2001 and 2018 for 4,634,724 individuals (approximately 13 years per individual), with full information on all personal income sources.

Table 1: Number of Enterprises, Turnover and Persons Employed in 2015, by Legal Form

	Enterprises		Turnover		Employment	
	N	%	Mill. NOK	%	*N*	%
All legal forms	453,762	100.00	5,100,374	100.00	2,036,818	100.00
Partnership (ANS, DA)	12,797	2.82	47,342	0.92	32,532	0.59
Sole proprietorship (ENK)	220,740	48.65	133,312	2.61	219,265	10.77
Private limited company (AS)	200,480	44.18	4,544,247	89.10	1,558,059	76.49
Public limited company (ASA)	160	0.04	100,657	1.97	36,629	1.80
Other	19,585	4.32	274,816	5.39	190,333	9.34

Source: StatBank (source table 08228).
Notes: Figures in the table refer to all active enterprises in 2015, except public administration. Turnover is defined as the sum of sales plus gross income from other business activity (including income from rent and commission income, excluding government subsidies). For partnerships and sole proprietorships, employment is defined as the sum of employees and owners. ASA companies are private limited liability companies that are traded on the stock exchange. AS private limited liability companies are unlisted.

The data on businesses, which cover the universe of businesses incorporated and tax-

able in Norway, contain each firm's balance sheet with detailed information on equities, debts, profits, and loss statement. Using this unique source, we have a total of 491,015 businesses with full information on all the components of business income, including proposed dividends and retained earnings. This information is key as it underpins our new income measure.

Table 1 shows the distribution of firms by legal form in 2015. The distribution in other years is qualitatively similar. Besides the frequency of enterprises across legal forms, the table also reports turnover, i.e., sales income plus gross income from other business activities, and total employment, which is the sum of the number of employees and owners (for partnerships and sole proprietorships). Sole proprietorships are large in terms of the number of firms (almost half of all enterprises in the country), but represent only a small share of the economic activity (less than 3%) and a modest share of employment (close to 11%). Partnerships are very small on all three measures. Limited liability firms, which make up about 45% of all firms, account for 90% of turnover and almost 80% of employment. With fewer than eight employees on average, private limited liability companies are small compared to their public counterparts, which employ an average of 230 workers. This underlines the importance of closely held businesses in the Norwegian context.

Our last source is the shareholder register, which contains information on every shareholding for each corporate and individual shareholder and allows us to link the information on business income from corporations to individuals. Importantly, the shareholder register allows us to account for all layers of indirect ownership. By iterating through the multiple levels of ownership we observe in the register, our final data on the shareholdings of each individual in each firm account for all shareholdings, both direct and indirect.

3 Measuring Business Income: Issues and Alternatives

3.1 The Official Measure of Market Income

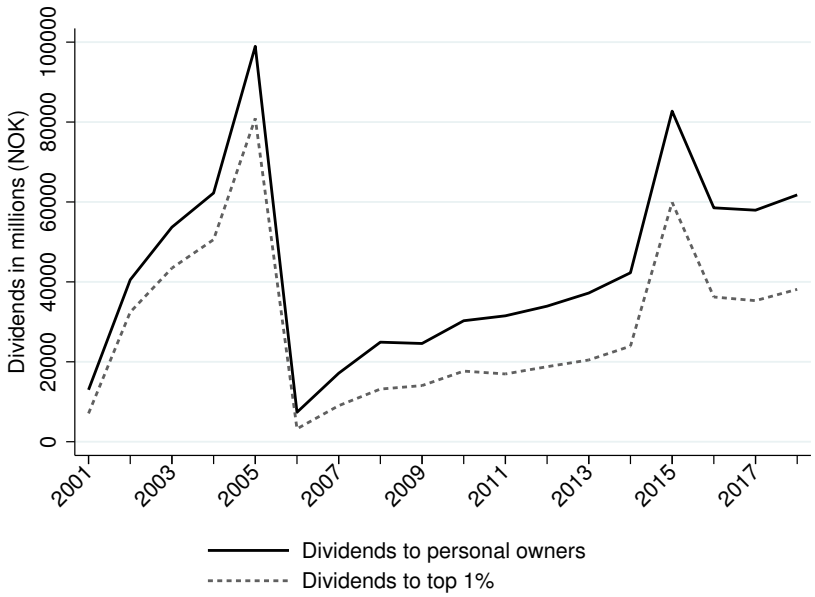
The official measure of market income, adopted by most of the statistical agencies in advanced economies, consists of three components taken directly from the personal income tax records. Norway is one of the countries using this convention, which defines individual market income Y as

$$Y \equiv L + B + K, \tag{1}$$

where L refers to labor income, which includes wage income and income from self-employment; B denotes business income that contains dividends and realized capital gains on financial assets; while K is other capital income and includes interest income, the taxable part of realized gains on real estate, returns on life insurance, taxable rental income, and capital income from abroad. These are the three components shown in Figure 1.

A key limitation of how Y is defined lies in the official (Canberra Group complying) measure of business income, B, which consists of dividends and realized capital gains on financial assets. This is an incomplete measure, as it captures only the part of business income that happens to be realized or paid out to personal owners in a given year. Realization decisions are likely to be influenced by a variety of factors, such as changes in the tax treatment of business income and the resulting changes in organizational forms and how business income is paid out over time (Kopczuk and Zwick, 2020).

Figure 2: Dividends Received by Personal Owners, 2001–2018

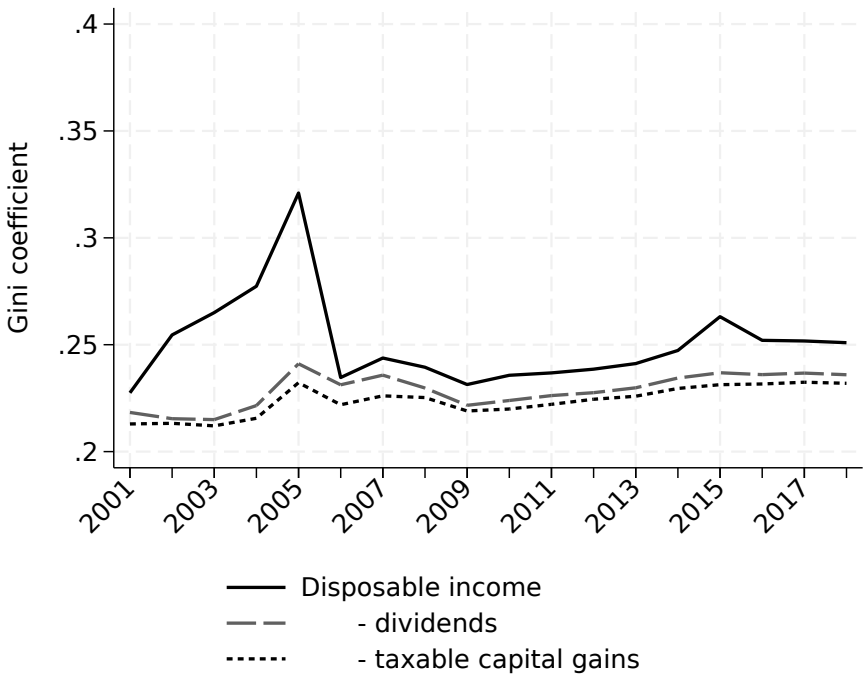


Notes: The figure shows total dividends received by personal shareholders from Norwegian limited liability firms and total dividends received by households in the top 1% of the distribution of disposable income each year (official measure).

For the case of Norway, Figure 2 provides clear evidence on the sensitivity of dividends payment decisions to tax incentives. The figure shows the amount of dividends distributed to personal owners from 2001 to 2018. Norway enacted two relevant reforms over this period, one in 2006 and another in 2016. The 2006 dividend tax reform represented a fundamental change in incentives, as it increased the tax on dividends to *personal* shareholders from 0 to 28%, while dividends to *corporate* shareholders remained untaxed.[14] This

[14]Before the reform, the Norwegian dual income tax system implied a proportional tax of 28% levied on all income, both at the individual and corporate level, and an additional progressive surtax on individual labor income. Net capital gains were included in taxable income, but dividends were tax exempt. Since

Figure 3: Estimated Gini Coefficients with and without Dividends and Realized Capital Gains, 2001–2018 (Official Measures)



Notes: The figure shows estimated Gini coefficients using the official measure of household disposable equivalent income (solid line), the official measure of household disposable equivalent income net of dividends (long-dashed line), and the official measure of household disposable equivalent income net of dividends and realized capital gains on financial assets (short-dashed line).

intervention was announced in the spring of 2004. Arguably, the spike in dividends to personal owners in 2005 could be almost entirely explained by the fact that such dividends would be taxed from 2006 onwards.[15] The 2016 reform, which was announced in 2014, increased the tax on dividends to personal owners from 28 to 31.68% over a period of four years, starting at 28.75% in 2016. Although this represented a much smaller increase than that implied by the previous reform, it led to another substantial spike in the amount of dividends distributed to personal shareholders in 2015, just before the implementation in the following year.[16]

Another point to take from Figure 2 is that the lion's share of total dividends paid to personal shareholders is received by individuals in the top 1%. Even though the top 1% comprises only a small group of individuals, the large fluctuations in dividends to personal shareholders around dividend tax reforms have large impacts on inequality as measured

2013, the corporation tax rate has been smoothly reduced down to 22% at the end of the sample period. See <https://www.nho.no/tema/skatter-og-avgifter/artikler/selskapsskatt/> for further details.

[15]On the same reform, see also Alstadsæter and Fjærli (2009) and Alstadsæter et al. (2023). For similar behavioral responses, see Auten et al. (2016) and Saez (2017) for the US, and Seim (2017) for Sweden.

[16]Over the same four-year period, Norway also reduced corporate taxes, from 27 to 22% and kept the marginal tax on dividends to *corporate* shareholders unchanged at 0%.

in official statistics.[17] Figure 3, which anticipates some of the issues of interest in our study, shows the evolution of the Gini coefficient using the official measure of household equivalent disposable income. The official Gini estimate, shown by the solid black line, is heavily influenced by the two dividend tax reforms. The picture changes dramatically if we turn to a measure of household disposable income net of dividends (the dashed line in Figure 3), while removing realized capital gains on financial assets has only modest impacts on inequality (dotted line).

It is worth emphasizing that the sharp decline in the official Gini estimate observed in 2006 is one of the largest in the last 100 years and comparable in size only to that recorded during the economic downturn at the end of World War I (see, for instance, the discussion by Aaberge et al., 2020). From the turn of the millennium until the 2008–2009 financial crisis, however, the Norwegian economy went through an economic boom (Statistics Norway, 2021, pp. 84–85). One interpretation of the 2006 decline in the Gini coefficient is thus linked to the reduction in the share of market income received by top income earners, an anticipatory effect of the 2006 dividend tax reform.[18] After the implementation of the reform, therefore, official statistics might have significantly underestimated top income shares and income inequality and provided an incorrect description of the distribution of the tax burden.

In sum, the official measure of B, which only refers to *realized* business income, cannot give but a poor representation of the total income generated in the economy in a given year. Incomplete measurement of B weakens the informational value of standard tax reported income data used in official statistics and mainstream economic research. A more appropriate measure, instead, would also capture unrealized business income, which is less sensitive to profit shifting between the individual and corporate income tax base and arguably provides a better reflection of economic activity and is less sensitive to firms' management decisions.

[17] To bolster this evidence, Figure A1 in Appendix A.1 plots the amount of (log) dividends received by individual shareholders in the top percentile of official market income against the amount received by individuals in the P98-P99 fractile. Despite the proximity of these two groups, the gap is striking. We quantify this by estimating a difference-in-differences model in which personal owners in the top 1% identify the treatment group while those in the P98–P99 fractile are the control group. Both groups are defined in 2003 (i.e., the year prior to the announcement of the 2006 reform) and followed from 2001, when our data begin, up to 2012 to avoid possible overlaps with subsequent reforms and their announcements. Appendix A.1 describes the research design with greater detail. The estimates from this exercise are reported in Appendix Table A1 and Figure A2. The results confirm a sharp reduction in dividend amount received and recipience rates among individuals in the top percentile of about 1.75 log points and 17%, respectively, as an immediate response to the reform. The reform had lasting effects, with a significantly smaller dividend recipience in levels and rates of approximately 1.4 log points and 14% up to seven years after the enactment of the reform.

[18] Another interpretation draws from the idea that income inequality is countercyclical (e.g., Bilbiie et al., 2022). If this were the case, however, we should observe a further reduction in inequality beyond 2006 when the economy was still growing, something which did not occur. We shall come back to this issue in subsection 5.1, where we compare the official Gini estimates with those found with our preferred measure of business income.

3.2 Introducing a More Comprehensive Measure of Business Income

One approach to capture both realized and unrealized business income is to use a combination of individual tax records and aggregate data from national accounts, along with some strong assumptions, to generate imputed individual measures of B.[19] This is the approach proposed, among others, by Piketty et al. (2018). They use measures of various wealth classes from tax returns or from surveys together with average yields by asset classes to impute capital income. Drawing from tax records and a combination of other data sources, Larrimore et al. (2021) provide new estimates of income inequality levels and trends using an income measure that comprises several income components, including imputations of real accrued capital gains. Smith et al. (2023) assemble new data that link individuals to their sources of capital income, capitalizing dividends and realized capital gains, to provide estimates of wealth concentration and composition in the United States between 2001 and 2016.[20]

We follow a different approach, which shares some similarities with the one implemented by Alstadsæter et al. (2023).[21] The idea is to complement tax records with detailed information on corporate ownership and firm level balance sheets and income statements to allocate corporate profits to personal owners directly, and to subtract dividends from indirectly held firms to avoid double counting of profits. Thus, this measure accurately identifies business income that is retained in private holding companies and records income as it accrues rather than when it is realized. In this way, therefore, it includes the entirety of unrealized business income and is less sensitive to changes in tax incentives than the official measure.[22] We discuss how our new measure compares to the estimates found with the

[19] An advantage of national accounts is that they include retained earnings. Retained earnings, however, are excluded from individual tax records. Therefore, the construction of *individual* market income from national accounts invariably depends on untestable assumptions, particularly on the relationship between retained earnings on the one hand and dividends and realized capital gains on the other.

[20] Saez and Zucman (2016) combine income tax returns with macroeconomic household balance sheets to estimate the distribution of wealth in the United States over a century since 1913. They estimate wealth by capitalizing the incomes reported by individual taxpayers, accounting for assets that do not generate taxable income. Aaberge and Atkinson (2010) use Norwegian data and measure business income as the product of the estimated market value of households' stocks (both quoted and unquoted) and the long-run average rate of return on the Oslo Stock Exchange. Their results differ substantially from those reported in this paper.

[21] Other studies that adopt a similar approach and utilize corporate registries to assign undistributed profits to individuals include Fairfield and Jorratt De Luis (2016) for Chile, Wolfson et al. (2016) for Canada, and Bruil et al. (2024) for the Netherlands.

[22] Note that our measure is based on after-tax profits and does not include unrealized capital gains. It does, however, take into account that dividends are taxable when distributed to individual shareholders, but tax free when distributed to corporate shareholders and holding companies. This provides an incentive for individuals to own shares through a holding company, since this would allow for deferral, in principle indefinitely, of taxes on the dividends received on the shares. Our measure therefore captures, in part at least, this dimension of tax avoidance through the deferral of dividend taxes. See also Alstadsæter et al. (2022).

approach that combines individual tax returns and aggregate data from national accounts in Sections 4 and 5.

Assigning business income to personal owners as income accrues while avoiding double counting of profits from indirectly held firms is straightforward in the Norwegian context for "pass-through" entities, whose annual income is taxed at the owner level. This is the case for partnerships and sole proprietorships, for which we observe annual net income directly from personal tax returns.[23] From Table 1, we know that these two types of enterprises make up about 50% of all firms in Norway, but represent only 11% of total employment and less than 4% of turnover.

For limited liability companies, which represent by far the main legal form in terms of employment and economic activity, the allocation of business income to individual owners is more complicated, but the general idea is simple: we use ownership shares and information from firm-level income statements and balance sheets to mimic a pass-through regime.[24] We illustrate this through an example. Despite its simplicity, the example allows us to highlight the role played by the indirect ownership structure, whereby one main private company is responsible for the economic activity and another private (holding) company owns the individual owner's shares of the main corporation.

Consider a personal owner i who owns a share s_{ij} of firm j and a share s_{ik} of firm k, while firm j in turn owns a share r_{jk} of firm k. Firm j's after-tax profits Π_j, which is observed in the balance sheet data, can be decomposed into two sources, i.e.,

$$\Pi_j = \widetilde{\Pi}_j + r_{jk}\tau_k\widetilde{\Pi}_k,$$

where $\widetilde{\Pi}_j$ is the net income (or economic profits) from firm j's own economic activities, while the second term captures the dividends received by firm j from firm k. To keep the example simple, we assume that firm k sets dividends as a given fraction $\tau_k > 0$ of its own profits. We also assume that firm k does not own any other firm, and hence that firm k's after-tax profits consists only of the net income from its own economic activity, $\Pi_k = \widetilde{\Pi}_k$.

If we aggregate after-tax profits across firms, we end up with a measure that is larger than total economic profits in this economy (when profits are positive). That is, $\Pi_j + \Pi_k = \widetilde{\Pi}_j + r_{jk}\tau_k\widetilde{\Pi}_k + \widetilde{\Pi}_k > \widetilde{\Pi}_j + \widetilde{\Pi}_k$. By the same argument, if we use after-tax profits to allocate business income to personal owner i according to their direct and indirect ownership shares

[23] While sole proprietorships are owned by personal owners only, partnerships can be owned by both personal owners and corporate entities.

[24] This is in line with the recommendations for future research suggested by Smith et al. (2019).

in the two firms, we obtain

$$\begin{aligned} B_i^{\Pi} &= s_{ij}\Pi_j + s_{ik}\Pi_k + s_{ij}r_{jk}\Pi_k \\ &= s_{ij}(\widetilde{\Pi}_j + r_{jk}\tau_k\widetilde{\Pi}_k) + s_{ik}\widetilde{\Pi}_k + s_{ij}r_{jk}\widetilde{\Pi}_k \\ &= s_{ij}\widetilde{\Pi}_j + s_{ik}\widetilde{\Pi}_k + s_{ij}r_{jk}\widetilde{\Pi}_k(1+\tau_k), \end{aligned}$$

which means that we assign personal owner i with more than their shares of the total net income generated by the two firms, because a fraction of firm k's profits is double counted.

To solve this problem, we simply subtract dividends from indirectly held firms, and end up with a measure of business income that equals the individual owner's shares of the total net income generated by the two firms. Specifically, this measure is given by

$$\begin{aligned} B_i^{*} &= s_{ij}\Pi_j + s_{ik}\Pi_k + s_{ij}r_{jk}\Pi_k - s_{ij}r_{jk}\tau_k\widetilde{\Pi}_k \\ &= s_{ij}(\widetilde{\Pi}_j + r_{jk}\tau_k\widetilde{\Pi}_k) + s_{ik}\widetilde{\Pi}_k + s_{ij}r_{jk}\widetilde{\Pi}_k - s_{ij}r_{jk}\tau_k\widetilde{\Pi}_k \\ &= s_{ij}\widetilde{\Pi}_j + s_{ik}\widetilde{\Pi}_k + s_{ij}r_{jk}\widetilde{\Pi}_k. \end{aligned} \tag{2}$$

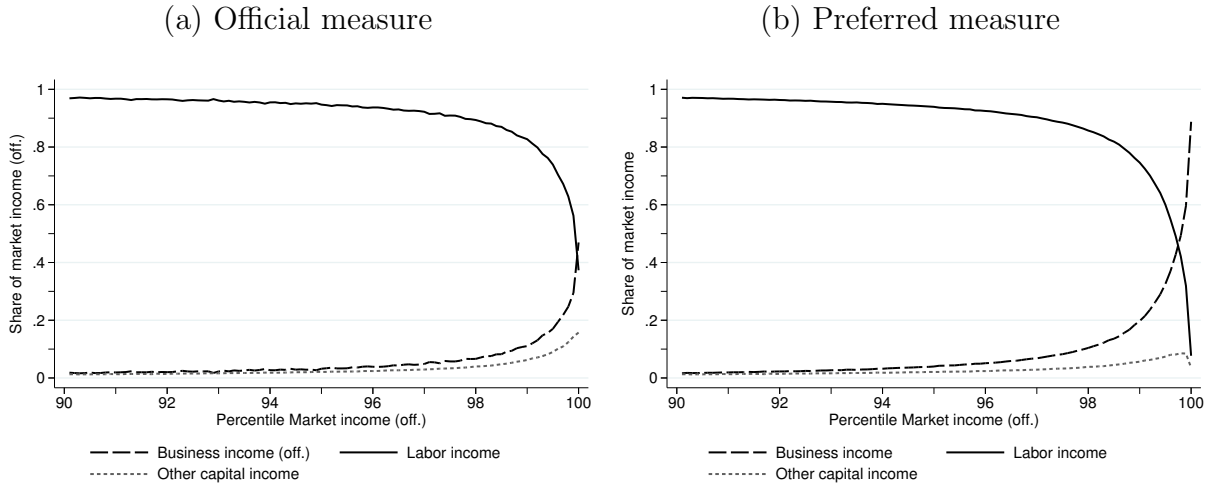
Two observations on the measurement of B^* are in order. First, for all private and public limited liability companies whose business income is not subject to pass-through treatment, it is useful to think of our measure of after-tax profits as being made up by the sum of the change in accumulated retained earnings and year t *proposed* dividends, which are paid to owners in year $t+1$.

Second, proposed dividends are the component of after-tax profits that distinguish our measure B^* from the measure of business income introduced by Alstadsæter et al. (2023). Rather than proposed dividends, they use *distributed* dividends in year t, which relate to realization decisions in the previous year. It has long been established, however, that dividends in a given year do not have a tight relationship with current profits and may reflect past and possibly future profits (e.g., Lintner, 1956; Auerbach, 1991). This means that the dividends terms in expression (2) do not cancel out, leading to an imprecise measure of business income. More on this issue is available in Appendix A.2.[25]

We illustrate how our new accrual approach measure affects the composition of market income for the top decile of the distribution of gross income. To do this, we recompute income shares with the same three sources of income used in Figure 1, namely labor,

[25]To summarize the key differences between these two alternative business income concepts, Appendix Figure A4 compares the shares of individual total gross market income accruing to the top 10, 1, 0.1 and 0.01% obtained with our preferred measure of business income, B^*, and those found with the measure of business income based on distributed dividends. Across all income groups, the latter measure (but not that based on B^*) peaks in 2005, the year before the implementation of the 2006 dividend tax reform. Our preferred measure instead is larger during the economic growth period of 2006 and 2007, before the financial crisis that triggered the Great Recession. From 2012 onwards, when the Norwegian economy recovered and business activities expanded, our preferred measure is consistently above the distributed-dividend-based measure, possibly better reflecting the improved business cycle.

Figure 4: The Composition of Total Market Income for the Top 10% of the Distribution Using the Official Measure and Our Preferred Measure of Business Income, Means Computed over the 2001–2018 Period



Notes: The figure shows the composition of market income for individuals in the top 10% of the distribution of market income, when market income is divided into three broad sources of income. Panel (a) replicates Figure 1, where all income measures are defined as in official statistics. In panel (b), the official measure of business income is replaced by our preferred measure of business income. For other details, see the note to Figure 1.

business, and other capital income. The results are displayed in Figure 4. Panel (b) reports the distribution found with our new measure of business income, B^*. To ease the comparison, panel (a) shows the distribution using the official measure of business income as in Figure 1. The two distributions are very similar up to the top 3%, where they start to diverge. At the 99th percentile, business income accounts for about 20% of total income according to our measure and 12% according to the official measure. At the very top, the business income share increases to about 50% in official statistics and to 90% using our new measure.

Before turning to our main results, Table 2 shows descriptive statistics for individuals in the top 1% in the distribution of gross market income in 2018, defined according to either the official measure or our new measure B^*.[26] Using B^* to define income, we observe that more than five out of six individuals in the top 1% are men, just over two-thirds of them are married, and they are on average 52 years old. We obtain a similar picture if we use the official measure of business income to identify the top 1%, with all the differences being invariably negligible.

The differences are substantially more marked in the case of income and its components. Using our measure of business income, the average total market income accruing to the top 1% is in excess of 8.3 million NOK per capita, around 2.2 times greater than the

[26] Although we deal with data for the entire population, we report standard deviations as a measure of spread, so that the table provides information on the first two moments of the cumulative distribution function.

Table 2: Individuals in the Top 1% According to Two Different Measures of Market Income, 2018

	Official measure (a)	Preferred measure (b)	Difference (a)–(b)
Individual characteristics			
Age (years)	52.52	51.93	0.59
	(10.14)	(10.56)	
Male (yes=1)	0.84	0.84	0.00
	(0.36)	(0.37)	
Married (yes=1)	0.69	0.67	0.02
	(0.46)	(0.47)	
Number of children	0.76	0.77	–0.01
	(1.04)	(1.04)	
Income components			
Labor income	2,105,746	1,912,020	193,727
	(2,133,023)	(2,177,052)	
Business income	1,421,049	6,170,158	–4,749,109
	(5,081,590)	(52,191,624)	
Other capital income	251,512	235,363	16,149
	(1,570,238)	(1,557,348)	
Market income	3,778,307	8,317,540	–4,539,233
	(5,564,647)	(52,272,843)	
Number of individuals	36,718	36,718	

Notes: The table reports means (standard deviations) in columns (a) and (b). Column (c) shows the difference, (a)–(b). All figures on income are in 2018 NOK.

corresponding mean found with the official measure. This is entirely driven by business income, which according to our preferred measure is close to 6.2 million NOK as opposed to 1.4 million NOK according to the official measure. The difference of almost 4.8 million NOK per capita translates into 173 billion NOK for the whole pool of individuals in the top percentile, which corresponds to a staggering 4.8% of GDP in 2018.

The differentials in labor income and other capital income between the official standard and our preferred assessment are instead much smaller in magnitude. We should emphasize, nonetheless, that according to the official measure, average labor income is about 2.1 million NOK, and hence almost 50% *higher* than average business income for people in the top 1%. On the contrary, using our preferred measure, the average business income accruing to the top 1% is more than 3 times *greater* than the corresponding average labor income. These diverse figures will become relevant in subsection 4.2, where we analyze the composition of top income segments in greater detail.

4 Re-evaluating Income Concentration Estimates

4.1 Top Income Shares

Figure 5 traces out the evolution over the sample period of the shares of individual total gross market income accruing to the top 10, 1, 0.1 and 0.01% in panels (a), (b), (c), and (d), respectively. In each panel, the continuous line refers to the shares found with the official measure of income as in equation (1). The dotted line reports the shares found when the official measure of business income is replaced by our improved measure B^*, while the L and K components remain unchanged.

Let us first consider the results for the top 1% in panel (b). The two measures deliver similar shares prior to 2005, the year before the reform that increased the tax on dividends received by personal shareholders from 0 to 28%, while leaving dividends to corporate shareholders untaxed. As illustrated in subsection 3.1, Norwegian firms distributed a considerable amount of dividends to personal owners in 2005 in order to avoid the tax hike in the following year. This explains the spike found with the official measure. Similar considerations apply to the (smaller) spike in 2015 in anticipation of the new increase in the dividend tax enacted with the 2016 reform.

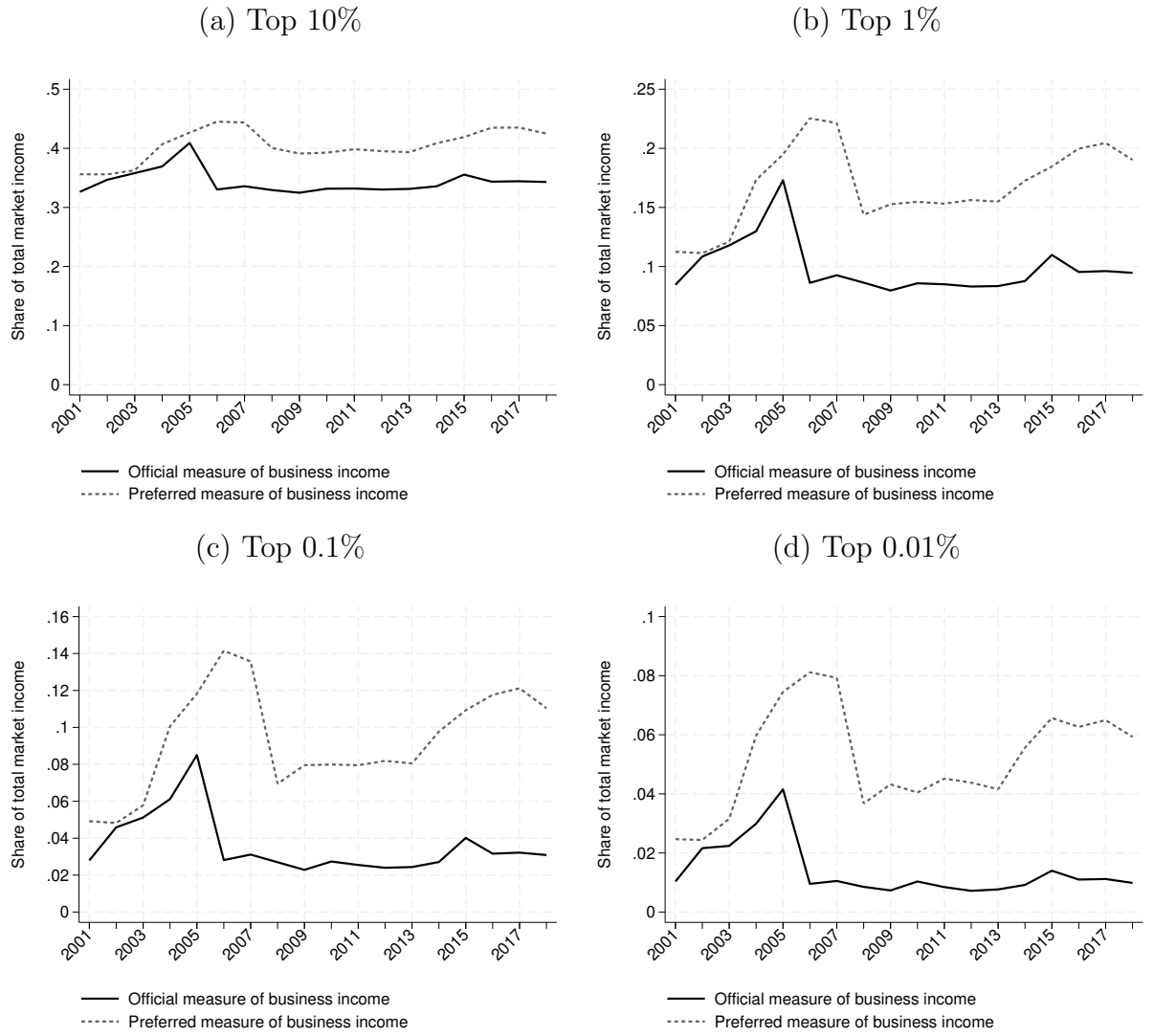
From 2006 onwards, our measure yields substantially greater top income shares than the official measure does. Over this period, the share of pre-tax income received by the top 1% is between 15% and 22% (18% on average), nearly two times more than what is found with the official measure. This level of income concentration is comparable to the one documented by Piketty (2003) and Piketty et al. (2018) for the United States.[27] Our preferred estimates are more sensitive to the business cycle, as indicated by the sharp drop in top income shares in 2008–2010, a result of the financial crisis. This should be expected, given that B^* reflects profits measured exactly when they accrue.

Similar patterns emerge when we consider the income shares of individuals in the top decile, although unsurprisingly the differences between our new measure and the official one are more modest. Business income plays a similar role according to both measures for a large fraction of the top decile, up to about the 97th percentile. The gaps are much more pronounced further up in the distribution, because of the greater role played by business income in those higher fractiles. Post 2005, the top 0.1% receives 11% of total pre-tax income, and the top 0.01% close to 6%, i.e., five and six times more, respectively, than the official estimates reveal.

As emphasized earlier, an important dimension related to business income is indirect ownership. We find clear empirical evidence of its importance. Figure A5 in Appendix A.3 plots top income shares obtained with our preferred measure B^* and those found when

[27] Our estimates for Norway are at least twice as large as those reported in the recent study by Blanchet et al. (2022), which does not account for retained business income.

Figure 5: Shares of Total Market Income Accruing to the Top 10, 1, 0.1, and 0.01%, 2001–2018.



Notes: The figure shows the shares of total market income accruing to individuals in the top 10%, 1%, 0.1%, and 0.01%, using the official measure of business income and our preferred measure.

we allocate business income to personal owners based on direct ownership only. Large discrepancies between those two figures become apparent in 2005 (in anticipation of the 2006 reform) and persist over the rest of the sample period. The underestimation of total income concentration when looking only at direct ownership grows monotonically with income and is massive, corresponding to around 12%, 25%, 40%, and 65% of the income shares at the top 10, 1, 0.1, and 0.01%, respectively. Disregarding indirect holding of multiple private firms accounts for about half of the difference between the income concentration estimates found with the official income measure and those found with our preferred measure.

4.2 Composition of Top Income Groups

Before moving on to the analysis of overall income inequality, we ask whether the rise in top income shares coincides with a growing dispersion in labor income and a surge in wage earnings among business executives and top managers. Specifically, are top wage earners replacing capital owners at the upper end of the income distribution? Or are we witnessing a fusion of capital and labor income at the top? In a pure class model, the correlation between labor and capital income is expected to be zero. Instead, should there be no sharp distinction between top earners and capitalists, we expect to observe a much greater correlation, possibly close to one.

The available evidence from France and the United States suggests that, with the surge in top wage earnings, the working rich are to be found along with top capital owners in the upper echelons of the income distribution (e.g., Piketty, 2003; Piketty and Saez, 2007). Smith et al. (2019) argue that about 70% of the business income generated by pass-through corporations and received by the top 1% in the United States is labor income in disguise, as profit income in pass-through entities carries a smaller tax burden than labor income by avoiding 4% in Medicare expenses.[28] The existing evidence is different for Scandinavian countries, where capital owners are found to be over-represented in the top 1% of the income distribution (e.g., Roine and Waldenström, 2008; Jäntti et al., 2015; Aaberge et al., 2013), and — as shown in Table 1 — pass-through businesses (partnerships and sole proprietorships) represent only a small fraction of turnover.

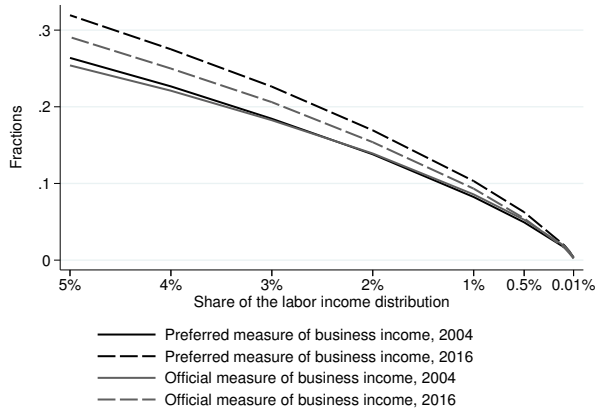
We check if the Scandinavian evidence still holds when we use our new measure of business income. In particular, we apply the approach introduced by Aaberge et al. (2018) based on copula functions of top labor and business incomes. This provides us with a nonparametric, rank-dependent cross-association of labor income with business income, which is independent of changes in the marginal distributions of the two income sources. In one exercise, we focus on individuals in the top 1% in the distribution of business income and measure the proportions of these individuals who are among the top 5% of wage earners. In another exercise, we focus on the top 1% in the distribution of labor income and measure the proportions of these individuals who are among the top 5% of business income recipients. In both exercises, we consider 2004 and 2016 separately, and contrast the estimates obtained with the official measure of business income with the estimates obtained using our preferred measure. The results are displayed in Figure 6.

Only about 10% of individuals in the top percentile in the distribution of business income are also among the top one percent of wage earners, and less than 5% are in the top 0.5%, according to our preferred measure of income. Looking at the receipt of

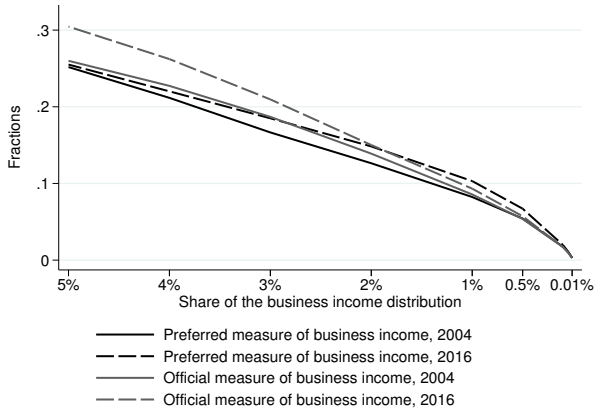
[28] The business income measure used by Smith et al. (2019), unlike ours, does not use directly observed retained earnings for C-corporations and has to rely on imputations to figure out what share of income should be considered labor income rather than capital income.

Figure 6: Conditional Survival Copula Functions for Business and Labor Income, 2004 and 2016

(a) Top 1% of business income recipients



(b) Top 1% of wage earners



Notes: Panel (a) shows the conditional survival copula function of the top 1% of business income recipients for various groups of top wage earners, while panel (b) shows the same but for the top 1% of wage earners. Both panels report the estimates for 2004 and 2016 based on the official measure and our preferred measure of income.

capital income among top wage earners leads to similar evidence. There are, therefore, relatively few working rich at the top of the business income distribution, and vice versa. Given that the top percentile of the total market income distribution is dominated by capital income, our evidence indicates that the working rich in Norway have not replaced capital owners at the very top. Interestingly, the evidence found with the official measure of business income is similar. Thus, despite the discrepancies in *levels* between the two business income measures (as shown in Table 2) and despite the different patterns in the *shares* of total market income accruing to the top 1%, this similarity reflects the fact that the *ranking* of individuals by business income is largely independent of whether we use the official measure or our more comprehensive new measure. Put differently, the individuals who populate the top of these two distributions are by and large the same.[29]

Using the same top copula estimates of Figure 6, we also compute the degree of association between capital and labor income at different segments of the joint distribution of capital and labor income, e.g., P95-P99 and top 1%, based on the local Spearman coefficient discussed in Appendix A.4. The results in Table 3 show that, regardless of whether we focus on individuals in the top percentile of business income or labor income, the cor-

[29] Alternative executive compensation, such as stock options, could allow a few top managers to become business owners (Edmans et al., 2017). If stock options — which are identifiable as part of wealth and not income and, and thus excluded from our analysis — were a regular non-cash pay practice, the boundary between labor and capital would become less clear-cut and we would expect to see a fusion of business and wage income at the top. Unsurprisingly, the fraction of individuals who are paid with stock options increases over time and over the income distribution. Even at the end of the sample period, however, fewer than 3% of all the individuals in the highest percentile of market income receive stock options and the stock options value as a whole is less than 0.1% of the total gross income accrued to the top 1% segment. Stock options, therefore, do not seem to change our results.

Table 3: Local Spearman Coefficient of the Association between Labor and Business Income for the Top 1% in the Joint Distribution, 2004 and 2016

	Year	
	2004	2016
Top 1% income segment for:		
Labor income	0.089	0.102
Business income	0.090	0.107

Notes: Each cell reports the degree of association between labor and business income at a given segment of the joint distribution of the two income components. The first row focuses on individuals in the top percentile of labor income, while the second row focuses on individuals in the top percentile of business income.

relation is small, around 0.09 in 2004 and 0.10–0.11 in 2016, when we consider the top 1% segment of the joint distribution.[30] This finding confirms the evidence that only a small fraction of top capitalists are also top earners and, vice versa, only a tiny fraction of the working rich are top business income recipients.

This, in turn, reiterates the point that the upper echelon of Norwegian society is still dominated by top capitalists, whose average business income is at least three times larger than the labor income accruing to the top 1% of the working rich (see Table 2). If we consider individuals who are in the top 1% of both distributions, we find that their mean business income according to our preferred measure is six times greater than their mean labor income in both 2004 and 2016. For owners of pass-through companies, who play a key role in the analysis by Smith et al. (2019), things are different, as their total income sources tend to be equally split between business and labor. By and large, however, they are under-represented in the top percentile of the gross market income distribution in Norway.

4.3 Top Income Shares When Business Incomes Is Imputed

As mentioned throughout the paper, a standard approach to measure both realized and unrealized business income at the individual level is to use an imputation procedure which combines individual tax returns with aggregate data from national accounts (e.g., Piketty and Saez, 2003; Piketty et al., 2018; Smith et al., 2019). This imputation invokes untestable assumptions on the relationship between retained earnings on the one hand and dividends

[30]The corresponding figures for the P95-P99 segment are around 0.18–0.19 in 2004 and 0.20–0.24 in 2016 and thus still far from one. The fact that they are larger, however, suggests that the separation between capitalists and working rich is particularly strong at the very top of the distribution.

and realized capital gains on the other. Auten and Splinter (2024) call into question the typical assumptions that are used to allocate aggregate income to individuals in the underlying data, and argue that the imputed top income shares using standard methods are overestimated.

Our highly detailed data allow us to mimic this approach by assessing the effect of some basic assumptions routinely used in the imputation of business income, which subsection 4.1 has shown to be a key contributor to income concentration. Our aim is to see how different assumptions on the distribution of retained business income compare to our main results, which are estimated using accurate individual ownership shares and reported in Figure 5.

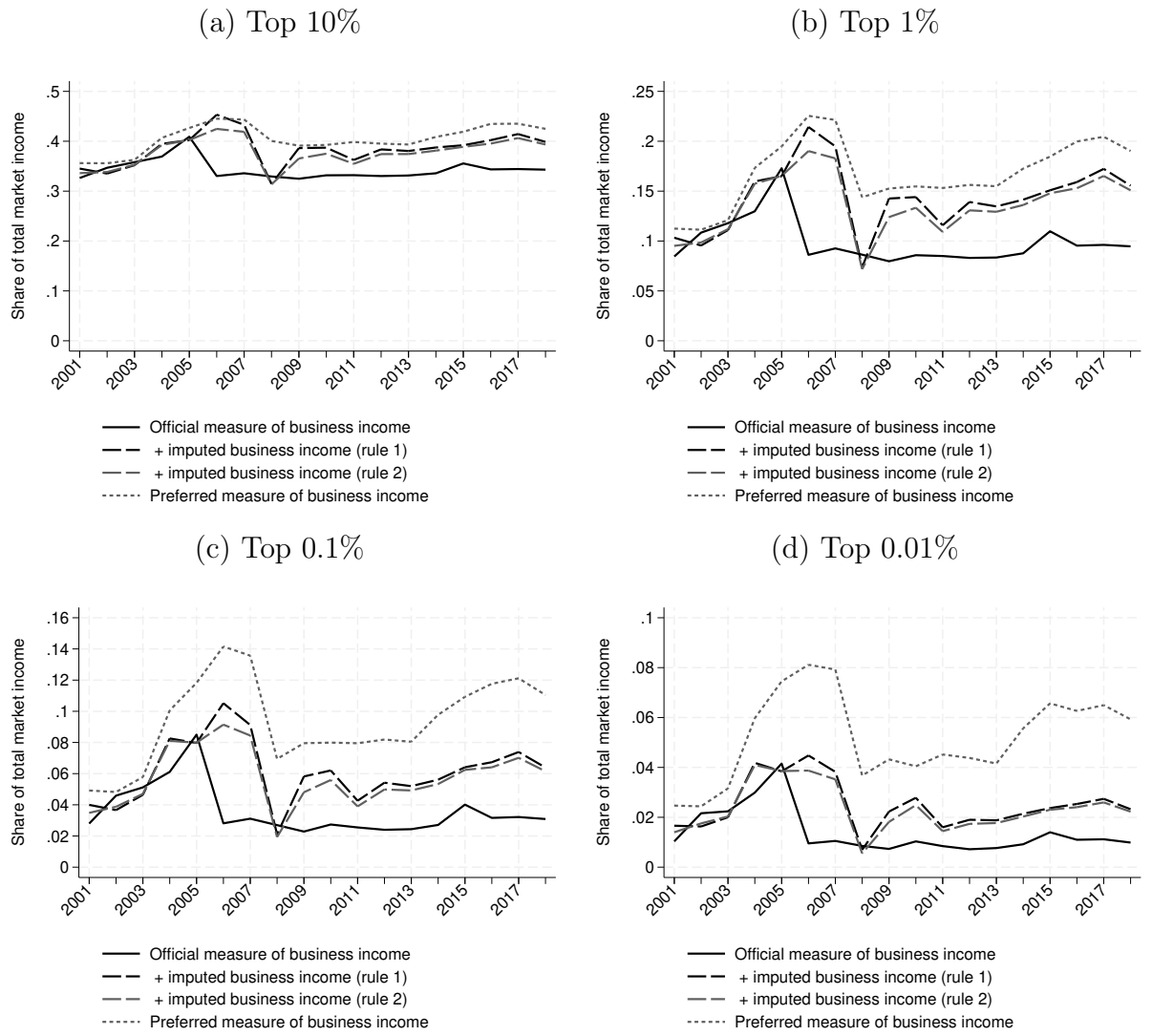
Suppose we know the total of the (true) business income, that is, the total of our preferred measure $B^* = \sum_i B_i^*$, while each individual B_i^* (which is defined in equation (2)) is unknown. Suppose also that we observe the official measure of business income (and its components) both at the aggregate and at the individual level, i.e., that we observe both B and B_i (see their definitions and relevant discussion in Section 3.2). With this information, we can recover the total amount of business income that is underreported in the individual data, that is, $\mathcal{U} = B^* - B$, and devise a procedure for distributing $\mathcal{U}$ across all individuals in the economy. Such an allocation is at the core of the methodologies used by all the distributional national accounts studies mentioned above.

In our exercise, we use two alternative allocation rules. In the first (labeled 'rule 1'), we assume that underreported business income $\mathcal{U}_i$ is distributed proportionally to B_i, i.e., those who have high levels of realized business income also have high levels of retained business income. One limitation of this rule is that some individuals with large negative realized business income may hold a considerable number of businesses and own valuable assets, which could correlate with high levels of retained business income. Allocating underreported income to these individuals, in proportion to their negative realized B, would lead to negative imputed business income that is further away from their true B^* than their realized counterpart. To avoid this potential drawback, we use a second rule ('rule 2'), according to which underreported income $\mathcal{U}_i$ is proportionally allocated only to those with *positive* observed official business income, and not to those with $B_i \leq 0$.[31]

Once underreported business income is allocated to individuals, we can repeat the analysis performed in subsection 4.1 and obtain new estimates of top income shares. The results are summarized in Figure 7, which displays the shares of individual total gross

[31] Another alternative is to allocate $\mathcal{U}$ proportionally to total income, Y_i, instead of business income B_i. In this case, the imputed top income shares would be equivalent to the official top income shares, because all individuals would have their incomes adjusted by the same share. Yet another alternative is to allocate more unobserved incomes to those with negative incomes. Based on a method developed by Auten and Langetieg (2023), Auten and Splinter (2024) allocate unobserved income to various deciles based on data from audit studies performed in the United States. This would mean that some negative income groups receive a substantial share of unobserved income.

Figure 7: Shares of Total Market Income Accruing to the Top 10, 1, 0.1, and 0.01%, Using Imputed Business Income. 2001–2018.



Notes: The figure shows the shares of total market income accruing to individuals in the top 10%, 1%, 0.1%, and 0.01%, using imputed business income (in the dashed lines). In the case of imputation, we report the official income measure plus underreported business income, using two different allocation rules. With allocation 'rule 1', underreported business income is allocated proportionally to the official measure of business income. With allocation 'rule 2', underreported business income is allocated only to individuals with positive values of official business income (proportionally to their share of total positive official business income). The top income shares obtained from the official measure of business income and our preferred measure as reported in Figure 5 are also displayed.

market income accruing to the top 10, 1, 0.1 and 0.01% in panels (a), (b), (c), and (d), respectively. Besides the estimates obtained with our two imputation rules, the figure also reports the shares based on official statistics and our preferred income measure as shown in Figure 5.

Focusing on the results for the top 1% in panel (b), the four series produce broadly similar estimates up to 2005, the year before the dividend tax reform. From 2006 onward, the two imputed series are generally bounded below by the shares found with the official income measure and above by those found with our preferred measure. If we take the latter estimates as a benchmark, both imputed income concentration figures underestimate the share of total market income accruing to the top 1% by about 20%. The underestimation is particularly severe in 2008, at the outset of the economic downturn. Excluding or including negative business income in the imputation does not make much of a difference.

Similar evidence emerges when we either zoom out to the whole top decile (see panel (a) of Figure 7) or move closer to the very top of the distribution (panels (c) and (d)). Within the top percentile, however, the shares estimated with imputed business income suffer from a larger downward bias, ranging between 40 and 50% of the preferred estimates. This suggests that the proportion of individuals with underreported business income is particularly large among those at the very top of the distribution, and standard imputation methods are unlikely to provide an accurate correction.

To corroborate this point, Figure A6 in Appendix A.5 plots the share of households with negative business income over time according to the official income measure. This is between 5 and 10% up to the financial crisis and below 5% from 2010 to the end of the sample period. Appendix Figure A7 shows how underreported income $\mathcal{U}_i$ is distributed across the distribution of official disposable income. In line with our expectations, underreported income is concentrated at the very top of the distribution. But there is a large concentration also at the very bottom, with those at the bottom 1% receiving approximately two-fifths of the amount of retained business income received by those at the top 1%. This reveals that there are high-income individuals at the lower end of the official income distribution when retained business income is included. Such individuals may simply have large year-on-year variation in their reported business income, including negative or very low values in some years. High retained earnings among some of the apparently low-income individuals indicate that a proportional allocation of underreported business income across the distribution may yield an inadequate representation of the true income distribution.

In sum, our imputation strategies lead to downward biased estimates of top income shares, with the size of the bias increasing as we move towards the very top of the income distribution. This result underlines the importance of the assumptions introduced when accurate measures of individual business income are unavailable, which is the case for all

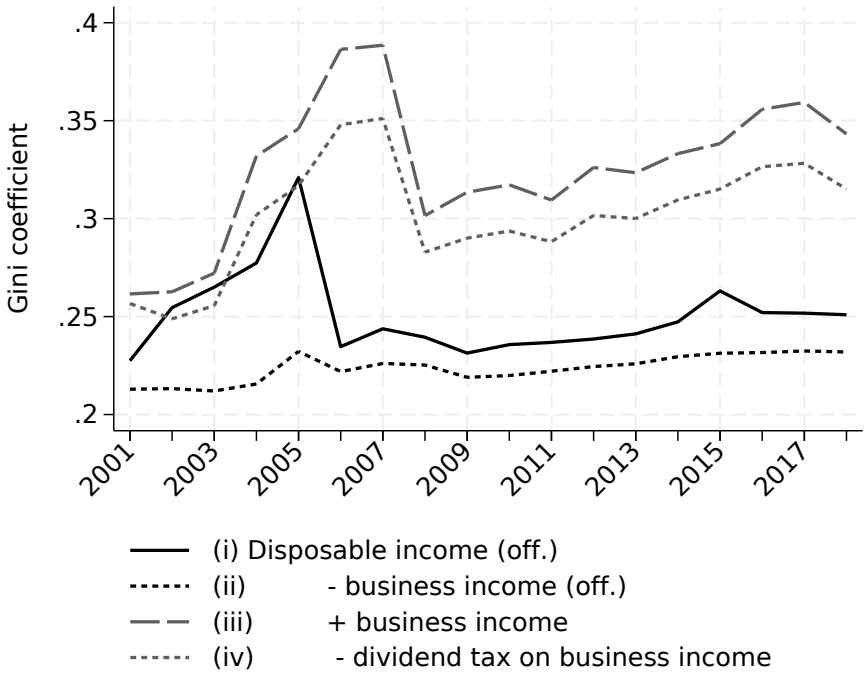
the studies based on a combination of individual tax returns and aggregate data from national accounts. How the imputation exercise could be improved to align its estimates with our preferred income concentration measures is an interesting area for future research.

5 Re-evaluating Overall Income Inequality

5.1 Key Results Using the Gini Coefficient

From the concentration of individual market incomes we now turn our attention to inequality in the distribution of economic well-being. To this end, we start from the household post-tax income and account for economies of scale in consumption by assessing the equivalent income of each household.[32]

Figure 8: Estimated Gini Coefficients with Different Measures of Business Income, 2001–2018



Notes: The figure shows estimated Gini coefficients for four different measures of income: (i) refers to disposable income measured the same way as in official statistics; (ii) is disposable income net of the official measure of business income (dividends plus realized capital gains); (iii) = (ii) + our preferred measure of business income, B^*; (iv) = (iii) – a hypothetical tax on business income.

Our evidence is summarized in Figure 8, which shows Gini coefficient estimates for four

[32]As standard in the income distribution literature, we use the OECD-modified equivalence scale to account for variation in needs among households who differ in size and composition and assign each household member the household equivalent income.

different measures of equivalized household disposable income.[33] The first uses the official measure of household disposable income that includes the official measure of business income (shown by the solid line). The second measure uses the same measure of disposable income but subtracts dividends and taxable capital gains on financial assets, i.e., it measures disposable income net of the business income as reported in tax returns (dark dotted line). The third uses household disposable income but replaces the official measure of business income with our preferred measure B^* (dashed line). For the fourth measure, we use again our new measure of disposable household income and subtract a hypothetical tax on retained earnings, i.e., on the part of business income that is retained within firms rather than paid out as dividends (light dotted line).[34]

We draw attention to four important findings. The first is an obvious point, but worth emphasizing nonetheless: the Gini coefficient estimates based on the official measure of income perfectly replicate those published by Statistics Norway. Second, business income plays a key role in the evolution of income inequality, especially in conjunction with the announcement of the two dividend tax reforms. Compared to the case when business income is excluded (dotted line (ii)), accounting for business income using the official measure of business income (line (i)) implies Gini estimates that are approximately 50% and 15% greater in the years leading up to the 2006 and 2015 reforms, respectively. In other years, excluding business income leads to estimates with a 10% downward bias.

Third, the Gini estimates found with our new accrual based measure B^* (dashed line (iii)) are in general substantially larger than those found with the official measure. This is particularly evident after the announcement of the dividend tax reform in 2004. At its implementation in 2006, the difference in the estimates was 65%, confirming the interpretation we put forward in subsection 3.1. At the start of the financial crash in 2008, our preferred measure yields a Gini estimate of 0.3, approximately 25% greater than that obtained using the official income measure. Ten years later, the estimate found with our measure of B^* soared to 0.35 while the official Gini index remained almost unchanged at 0.25, leading to a difference between the two estimates of about 40%.

How large is such a difference? Abstracting from behavioral responses, a 40% increase in the Gini coefficient corresponds to introducing an equal-sized lump sum tax of 40% of the mean household net income and redistributing the derived tax revenue as proportional transfers where each household receives 40% of its own net income (Aaberge, 2019).[35]

[33] Besides the Gini coefficient, we also estimated two other rank-dependent inequality measures. One is the Bonferroni index, which is sensitive to changes in the lower tail of the income distribution, and the other is sensitive to changes in the upper tail. The key results from these two alternative measures are virtually identical to those shown below. They are therefore not reported, but available upon request.

[34] For the years when dividends to personal shareholders were taxable, we use the dividend tax rate for the relevant year, and for the years without dividend tax (2001–2005) we use a tax rate of 28%.

[35] As an example, in 2018, the mean equivalized net household income was around \$60,000, with the corresponding lump sum tax of 40% being \$24,000. The hypothetical policy experiment related to a 40%

Interpreted in this way, the difference in the two Gini series implies a massive impact on the distribution of income among Norwegian households.[36]

Fourth, with the light dotted line (iv) in Figure 8 we illustrate the evolution in income inequality in the counterfactual scenario in which there is a full dividend tax on B^*, regardless of whether this income is paid out as dividends or not, and in which we disregard behavioral changes in response to the tax. The figure shows that this counterfactual tax leads to a marked reduction in the Gini coefficient, aligning it to the official Gini coefficient up to 2005. From 2006 onward, however, the level of income inequality becomes again significantly higher than what appears from the official statistics series.[37]

To summarize, our new measure of business income leads to a substantial increase in income inequality estimates as compared to what is reported by official statistics. This provides us with a different picture of inequality and reiterates the importance of unrealized business income. It is worth noting that the trends in the Gini index strongly resemble those found for the share of total gross market income accruing to the top 1%, and confirm that our preferred Gini estimates are insensitive to changes in tax policies but responsive to the business cycle, while the official Gini estimates are highly sensitive to managerial decisions related to retained earnings, which in turn depend on tax incentives.

5.2 Decomposition of the Gini Coefficient by Income Source

To provide further evidence on the importance of business income for the evolution of income inequality, we decompose the Gini coefficient into the inequality contribution of each of the main components of household disposable income, which includes the three components given in equation (1) plus transfer income and taxes. In the analysis, we use B^* as our measure of business income. Following Rao (1969), the Gini coefficient G at any point in time admits the following decomposition (see also Aaberge et al., 2019):

$$G = \sum_{c=1}^{5} v_c(G) = \sum_{c=1}^{5} \left(\frac{\mu_c}{\mu} \right) \gamma_c, \tag{3}$$

increase in the Gini coefficient estimate implies that a household with \$30,000 would *lose* \$12,000, while another household with \$600,000 would *gain* \$216,000.

[36] As in the case of the top income shares, indirect ownership of business income has crucial implications for the Gini estimates. Accounting only for direct ownership of business income would lead to an average underestimation of inequality of 15–20% from 2006 up to the end of the sample period.

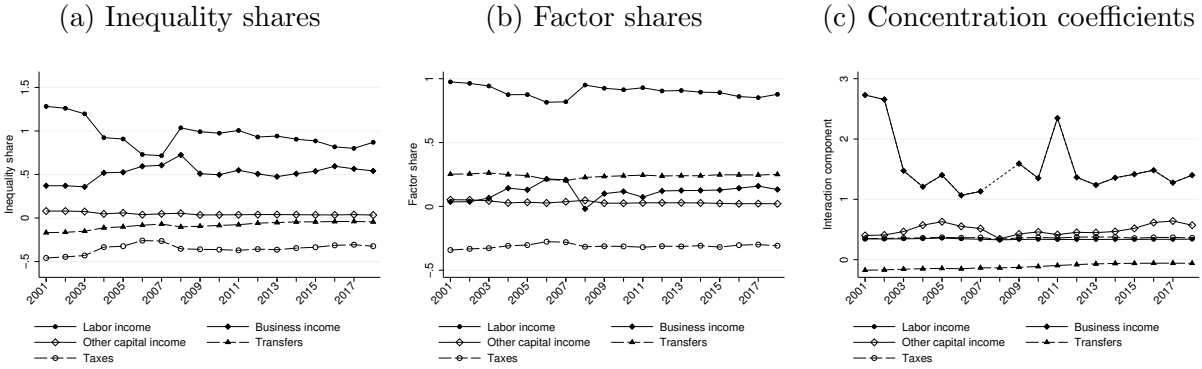
[37] Following the exercise described in subsection 4.3, we checked how the two allocation rules to impute underreported business income would change our estimates. Echoing the results found for top income shares, Figure A8 in Appendix A.5 confirms that the imputation produces downward biased Gini coefficients, especially from 2008 to the end of the sample period, when the imputed Gini estimates are about 15–20% lower than those found with our preferred income measure. This may be surprising if one expects that allocating underreported income in proportion to observed official business income would exaggerate inequality.

where μ_c is the mean of each of the five income components c, μ is the overall mean income, and the ratio μ_c/μ is the income (or factor) share of component c. The concentration coefficient γ_c can be interpreted as the conditional Gini coefficient of component c given the rank order in disposable income. The inequality contribution $v_c(G)$ is the product of the income share and the concentration coefficient.

Let $\theta_c = \left(\frac{\mu_c}{\mu}\right)\frac{\gamma_c}{G}$ denote the inequality share of component c. Now, if the mean of an income component is positive ($\mu_c > 0$), then a negative value of the concentration coefficient γ_c represents an equalizing contribution from that income component. A positive γ_c instead implies that the contribution of component c is disequalizing, while $\gamma_c = 0$ corresponds to the case where an equal amount of income component c is received by every individual. Whether a component is equalizing or disequalizing depends on the sign of the associated concentration coefficient, while the strength of the equalizing or disequalizing effect depends on the magnitudes of both the concentration coefficient and the income share. Taken together, the factor share μ_c/μ, the concentration coefficient γ_c, and the inequality share θ_c fully describe the distributional impacts of the five income components under analysis.

We apply the decomposition given in equation (3) to our five income components and display the results of this exercise in Figure 9. Panel (a) documents that labor income and business income are the two components that contributed the most to overall inequality. The strong disequalizing contributions of the two components have become more similar over time, with the contribution of labor income declining and the contribution of business income increasing. As expected, both taxes and government cash transfers have equalizing impacts, but slightly less so towards the end of the period than at the beginning. Other capital income has a negligible influence on overall inequality.

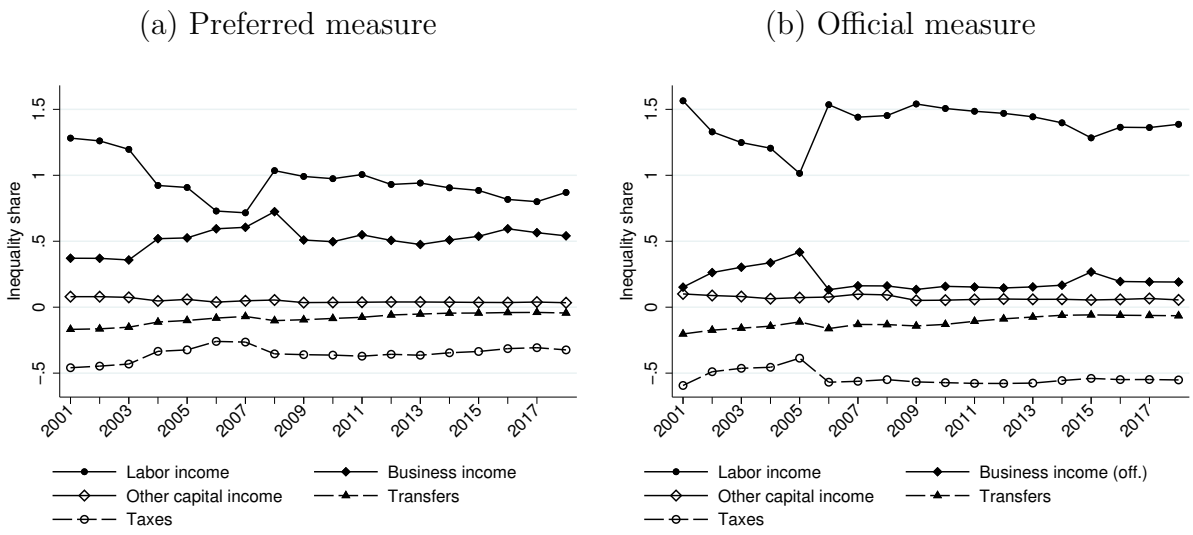
Figure 9: Decomposition of the Gini Coefficient: Inequality Shares, Factor Shares, and Concentration Coefficients, 2001–2018



Notes: The figure shows inequality shares, factor shares, and interaction components for each of the five broad components of our preferred measure of household disposable income. The inequality share of component c is given by $\theta_c = \left(\frac{\mu_c}{\mu}\right)\frac{\gamma_c}{G}$, where μ_c/μ denotes the income (or factor) share of component c, G denotes the Gini coefficient for disposable income, and γ_c denotes the concentration coefficient, which can be interpreted as the conditional Gini coefficient of component c given the rank order in disposable income.

Decomposing the inequality shares into factor shares and concentration coefficients, we find that the business income share fluctuates with the business cycle, although it is only slightly higher at the end of the period than at the beginning (panel (b)). All the other factor shares are instead fairly stable over time. Since the tax share is always negative, the positive γ found in panel (c) for taxes suggests that the progressive nature of the Norwegian tax system makes the distribution of net household income more equal. This is the case even if, as we shall document in Section 6, the tax system is severely regressive at the very top of the income distribution. The equalizing contribution of transfer income tends to be smaller than that of taxes; the concentration coefficient associated with transfers is typically small and gets closer to 0 towards the end of the sample period. Finally, the concentration coefficient for business income is positive and quantitatively large, emphasizing that the disequalizing effect of business income is one of the key features in the income distribution in Norway.[38]

Figure 10: Inequality Shares: Comparing Official and New Measures of Business Income, 2001–2018



Notes: The figure shows inequality shares for each of the five broad components of our preferred measure of household disposable income, which uses B^* (panel (a)) and the official measure of household disposable income (panel (b)). For other definitions, see the text and the notes to Figure 9.

The inequality shares obtained with the official measure of business income are reported in panel (b) of Figure 10,[39] while in panel (a) we show again those found with our preferred measure for comparison. Labor income is assigned a much higher inequality share with the official measure than with our preferred measure, especially after the enactment of the 2006 dividend tax reform. In comparison, the inequality share of business income is

[38]Notice that the γ component for business income in panel (c) is censored when the corresponding factor share in panel (b) is close to 0, which is the case in 2008.

[39]The corresponding estimates for income shares and concentration coefficients are reported in Figure A9 in Appendix A.6.

considerably lower, and close to 0 after the 2006 reform. Over-emphasizing the role played by labor income, the results based on the official estimates lead to a severe underestimation of the disequalizing contribution of business income.

5.3 The Relationship between the Top 1% Income Share and Overall Inequality

The findings in the two previous subsections indicate that both labor and business income play a key role in the distribution of equivalized net household income. Business income has a particularly acute disequalizing effect on inequality, largely driven by its exceptionally high concentration in few hands. Even though this might be obvious when we look at the distribution of personal gross market income, it is not so obvious when we focus on equivalized after-tax household income, where a number of redistributive channels are at play. Some of these channels include progressive taxation of labor income, equalizing public transfers, and household formation. If there is positive assortative mating on income, this last mechanism might reinforce the disequalizing effect found with personal market income.[40]

To help our understanding of the evolution of inequality, it is therefore important to examine the degree of association between concentration at the top of the income distribution and overall inequality and investigate whether this relationship varies over time. To this end, for each year in the sample, we use the following approximation to the Gini coefficient (see Atkinson, 2007; Alvaredo, 2011):

$$G \approx G_{99}(1 - S) + S, \tag{4}$$

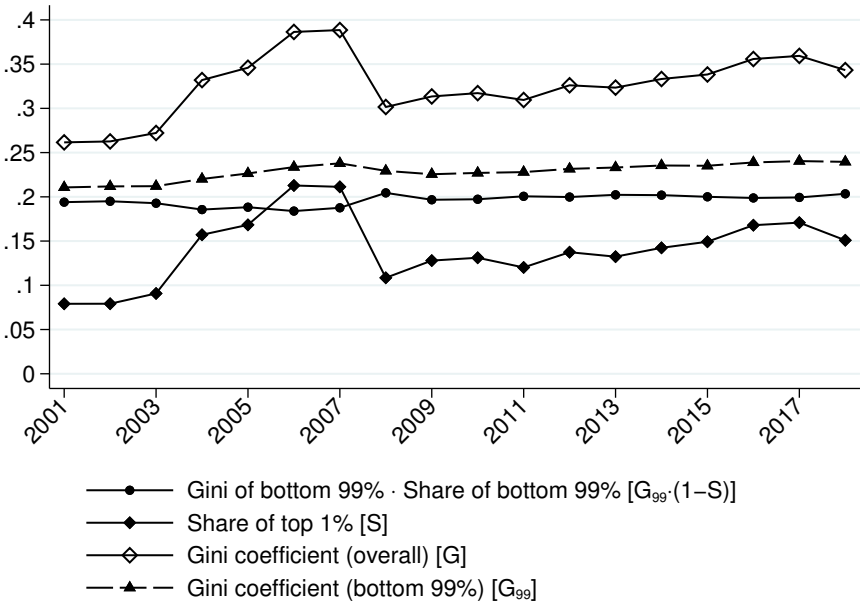
where S is the income share of the top 1% and G_{99} is the Gini coefficient of the bottom 99%. For each component in (4), we use our preferred measure of business income, B^*. The results of this exercise are summarized in Figure 11.

The figure demonstrates that the overall Gini coefficient, G, and the share of the top 1%, S, have co-moved strongly over the sample period. This suggests that the observed change in inequality is almost entirely explained by the change in the share of total equivalized household income accruing to the top 1%. On the contrary, G_{99} is relatively flat over the period and so is the first term on the right-hand side of expression (4).

To quantify the contribution of the change in S to the change in G, we consider a counterfactual scenario where we keep the income share of the top 1% fixed to its level in 2001, while the Gini coefficient for the bottom 99% is allowed to vary over time as we observe in the data. Figure 12 shows this counterfactual Gini index as well as the actual

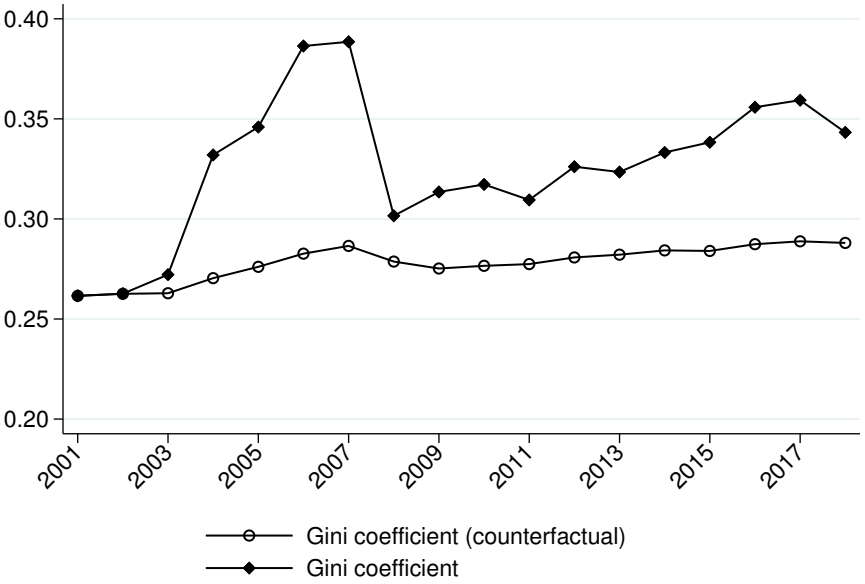
[40] Eika et al. (2019), however, find that changes in assortative mating over time barely move the trends in household income inequality in Norway.

Figure 11: Decomposition of the Gini Coefficient by the Income Share of the Top 1% and the Gini Coefficient of the Income Distribution Among the Bottom 99%, 2001–2018



Notes: The figure shows the Gini coefficient decomposed into two separate components, as described in (4), as well as the Gini coefficient for the bottom 99% and the overall Gini coefficient, using our preferred measure of total income.

Figure 12: Actual and Counterfactual Gini Coefficients, 2001–2018



Notes: The figure shows the development of the Gini coefficient, as well as a counterfactual development holding the top 1% income share constant, using our preferred measure of total income.

overall Gini index, G, both computed with our preferred measure of business income. From 2001 to 2007, G rose by nearly 50%, while the counterfactual Gini increased only by 9%. The Great Recession led to a fall in G by 22%, driven by the halving of the share of income accruing to the top percentile of equivalized net household income, from 21 to 11%. Finally, between 2008 and the end of the sample period, the rise in G was about 14%, whereas the counterfactual Gini increased by less than 4%. To put these estimates into perspective, we apply the same result by Aaberge (2019) already used in subsection 5.1, according to which the 26% higher actual Gini compared to the counterfactual scenario in 2007 corresponds to introducing an equal-sized lump sum tax of 26% of the mean household net income and redistributing the derived tax revenue as 26% of its own net income.[41]

6 The Distribution of the Tax Burden

In the previous section, we have documented that taxes play a key role in the evolution of income inequality, having a strong equalizing effect across households. We have also seen that our estimates of both top income shares and income inequality vary significantly with the measure of business income and with changes in the taxation of dividends. In this section, we analyze the impact of business income on the distribution of the tax burden.[42] We compare our preferred measure of business income, B^*, with the official income measure and see how this contrast evolves as we go through the 2006 and 2016 dividend tax reforms. We focus on two different concepts which are relevant to understand the distribution of the tax burden, both measured by percentile in the distribution of gross income, namely, taxes paid as a fraction of gross income and shares of total taxes paid.

Enhancing our understanding of how better measurement of business income affects the tax burden is desirable for several reasons. First, it makes tax authorities and policy makers aware of the potential tax revenues that the government can raise as the wealthiest taxpayers are likely to account for a large fraction of total taxes paid (Kopczuk and Zwick, 2020; Saez and Zucman, 2020; Delestre et al., 2024).[43] Second, it gives a clear indication of the progressivity of the tax system, which might be eroded by available opportunities among the wealthy for both legal tax avoidance and illegal tax evasion (Landier and Plantin, 2017; Alstadsæter et al., 2022). Third, while income retained in companies is not

[41] A mean equivalized net household income of around \$50,000 in 2007 means a 26% lump sum tax of \$13,000. The hypothetical policy experiment related to a 26% increase in G would lead to a world in which a household with \$25,000 loses \$6,500, while another household with \$500,000 gains \$117,000.

[42] The opposite exercise, i.e., estimating how top income shares respond to the top group marginal tax rate on income, has been the focus of a thriving strand of recent work. See, among others, Roine et al. (2009) and Saez et al. (2012).

[43] This point deliberately abstracts from a number of issues, such as the economics of superstars and the balance between redistributive fairness and economic incentives to entrepreneurial talent (Rosen, 1981; Goolsbee, 2000; Atkinson et al., 2011). Dealing with such issues is important but goes beyond the scope of this paper.

immediately available for consumption, it can be made available in the future, potentially without taxation. Even if immediate consumption would incur a tax bill, individuals can adjust their realized income patterns to changes in the tax system. For instance, dividends and capital gains are taxable when distributed to individual shareholders, but tax free when distributed to corporate shareholders. This provides an incentive for individuals to own shares through a holding company, as it allows for deferral, in principle indefinitely, of taxes on the dividends received on the shares (Alstadsæter et al., 2019). Finally, tax bills can be avoided by emigrating to countries that offer low tax rates to wealthy residents. This is in line with existing evidence that taxation shapes migration decisions at the top (e.g., Kleven et al., 2013; Akcigit et al., 2016). There are several high-profile cases in the Norwegian media describing prominent business people relocating to countries with more favorable tax systems.[44] While assets are subject to Norwegian tax law in a transition period, the tax obligations typically disappear completely after five years (Norwegian Tax Autorities, 2022).[45]

6.1 Taxes Paid as a Fraction of Gross Income

Following official statistics, total assessed taxes include wealth and income taxes (paid to municipalities, counties and the state) and social insurance contributions. The distribution of the tax burden is generally referred to as taxes paid as a fraction of gross income, and gross income is measured by what appears in the personal income tax records, that is, market income (i.e., labor income, business income, and other capital income) plus public transfers. This means that profits not paid as dividends are *not* included in the official calculation of the average tax paid by shareholders.

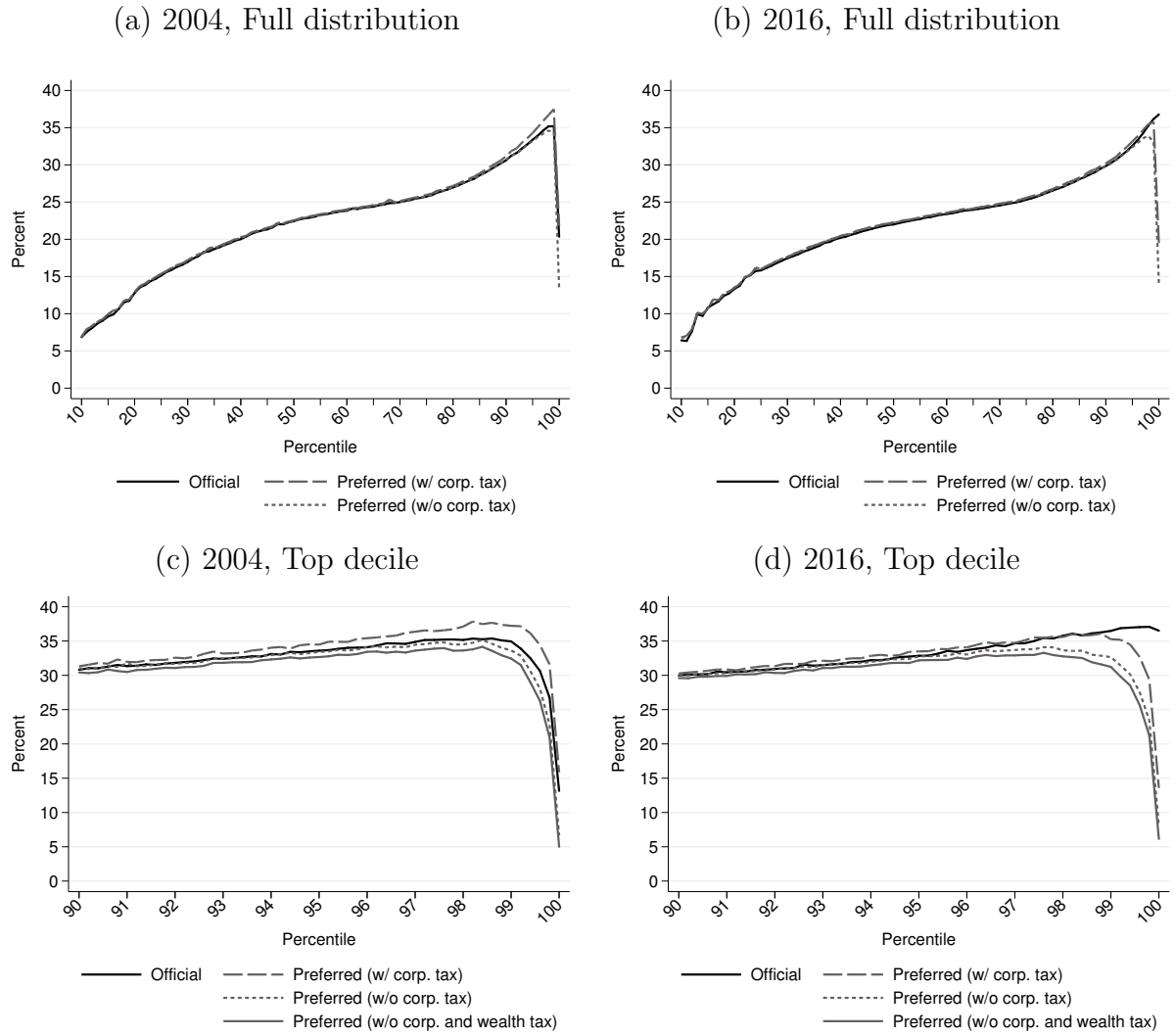
Figure 13 shows average tax rates by percentile in the distribution of gross income for two years over the period of analysis, 2004 and 2016, across the entire income distribution and for the top 10%.[46] All four panels report the estimates found with the measures of income and taxes used in official statistics and the estimates found with two other measures based on our preferred definition of gross income B^*. These two measures differ depending on the taxes we use in the computation. In the series labelled 'Preferred (w/o corp. tax)', we include the same taxes as in official statistics. Thus, B^* is the only source of differences between this measure and the official measures of income and taxes. In the 'Preferred (w/ corp. tax)' series, we add the personal owners' share of corporate taxes to the tax definition used in official statistics. In this case, we assume that the full incidence of corporate taxes falls on business owners, although there is evidence that a significant share of corporate

[44] For a general view of the tax avoidance issue in Norway, see Alstadsæter et al. (2022).

[45] After a rule change announced on 29 November 2022, for individuals emigrating after this date, there is no longer any general removal of tax obligations after five years (Norwegian Ministry of Finance, 2022).

[46] Measuring income and taxes over multiple years (before and after the 2006 reform) gives very similar results. These estimates are available upon request.

Figure 13: Taxes Paid as a Fraction of Gross Income, 2004 and 2016



Notes: The figure shows taxes paid as a fraction of gross income by percentile in the distribution of gross income, for 2004 and 2016 and for different measures of average tax rates. "Official" refers to average tax rates defined as in official statistics, i.e. as the sum of personal income and wealth taxes (paid to municipalities, counties, and the state) and social security contributions divided by gross income. The other measures are calculated with a denominator consisting of gross income including our preferred measure of business income and different types of taxes in the numerator. "Preferred (w/o corp. tax)" includes the same taxes as in official statistics; "Preferred (w/ corp. tax)" includes the same taxes as in official statistics plus personal owners' share of corporate taxes; and "Preferred (w/o corp. and wealth tax)" includes the same taxes as in official statistics except the wealth tax. When calculating the average tax rates, individuals are divided into 100 (panels (a) and (b)) and 50 (panels (c) and (d)) equally sized groups, and taxes paid are summed over all individuals in each group and then divided by the sum of gross income within the group.

taxes is paid by wage earners in the form of lower wages (Gruber, 2010; Fuest et al., 2018).[47] Finally, panels (c) and (d) also show the 'Preferred (w/o corp. tax and wealth tax)' series, which includes the same taxes as in the official statistics except the wealth tax.

Starting with the entire distribution in 2004 (panel (a)), we notice that the average tax rate increases from about 7% at the 10th percentile all the way up to 35% at the 99th percentile. The increase is steep up to the 40th percentile, becomes almost linear with the rank in the gross income distribution between the 40th and the 70th percentile, and accelerates in the top three deciles. However, it drops to an average of 22% for the top income percentile and to 14% for the top 0.1%. This regressivity at the very top of the income distribution emerges both when using the official measure and our preferred measure of business income.[48] In 2004, in fact, business income according to our preferred definition was not substantially different from the official measure. This is because before the introduction of the 2006 dividend tax, most profits were paid as dividends to personal owners, while just a small fraction was retained within companies.[49]

Zooming in on the top 10% of the distribution of gross income allows us to emphasize the importance of the different forms of taxes at the very top (panel (c)). The series at the bottom of the panel refers to the case where wealth and corporate taxes are excluded. Adding the wealth tax changes little, with the average tax rates obtained with our preferred measure of business income and that obtained from official statistics being very similar. Adding the personal owners' share of corporate taxes brings our measure of the average tax rate in 2004 to 37% at the 99th percentile, about 2 percentage points higher than the official measure, which does not include corporate taxes. But for the top 0.1%, both measures deliver virtually identical tax rates of about 14–15%.

The two right panels of Figure 13 suggest a radically different story for 2016, ten years after the introduction of the tax on dividends paid to personal owners. The patterns observed across measures are almost identical to those found for 2004 up to the 90th percentile. From the 90th to the 99th percentile, all measures deliver average tax rates that are more similar to each other than in 2004. But the substantive difference emerges

[47] Kopczuk and Zwick (2020) and Splinter (2020) provide a useful discussion of this assumption and its implications in the US context.

[48] Using only official measures of income and taxes, the evidence that average effective tax rates are regressive in the top 1% of the income distribution in Norway is confirmed by Mathisen (2024).

[49] The fact that the average tax rate, i.e. taxes paid as a fraction of gross income, is *lower* than the corporate tax rate at the very top of the distribution may have a simple explanation. In our measure, we include both taxable and non-taxable income, before any tax deductions, which means that the denominator can be quite different from the tax base, that is, taxable income net of deductions. This applies to both personal and corporate income. Factors that may reduce the tax base for the corporate income tax include (i) carry forward of losses from previous years, which means that firms that incurred losses in year $t-1$ can have high profits but no (or low) tax liabilities in year t; (ii) special deductions (e.g., for costs related to R&D); (iii) depreciation and amortization; (iv) tax exemptions, which mean that some financial income sources (such as dividends and capital gains) are not taxed at the corporate level; and (v) financial income from abroad, for which we do not include the taxes paid to other countries.

at the top 1%. The 2016 estimates suggest that the tax system is essentially progressive even at the top 1% according to the official measure. Using our preferred definition of business income, however, leads to the opposite conclusion. The evidence in panel (d) confirms the 2004 results, with declining tax rates at the very top of the distribution of gross income. These results document that the implementation of the 2006 dividend tax reform had only minor effects on the distribution of the tax burden and, importantly, they weaken the informational value of official statistics. Rethinking capital taxation to achieve progressivity across the whole income distribution as argued by Piketty et al. (2023) and Bach et al. (2023), therefore, requires a redefinition of income measurement, which should include business income as it is earned by companies and not when it is cashed in by owners.

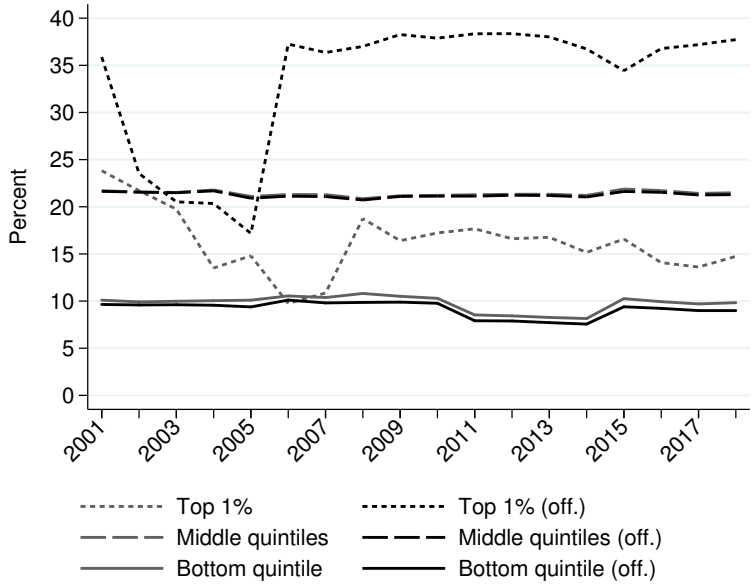
To give an idea of the magnitude of the estimates found at the top 1%, we provide the following example. In line with the design of the tax system in Norway, taxpayers are expected to pay taxes on the basis of economic ability. This means that the average tax of the top 1% could be conservatively set at 38% rather than 22%, both before and after the 2006 reform, reflecting a simple linear extrapolation over the top decile of the official and 'Preferred (w/ corp. tax)' series reported in Figure 13. Assuming no behavioral changes, the increase of 16 percentage points (from 22 to 38%) would have led to a staggering increase in tax revenues of about NOK 30 billion ($3.5 billion) and NOK 55 billion ($6.5 billion) in 2004 and 2018, respectively, representing 1.3% and 1.5% of the country's GDP in those two years.[50]

Another way of documenting the fundamental differences in average tax rates generated by our preferred measure of income as opposed to that from official statistics is displayed in Figure 14. This shows the average tax rate for the richest 1%, the bottom quintile, and the three middle quintiles (20–80th percentiles) between 2001 and 2018. Each of these tax rates are estimated separately using the official income measure and our preferred measure of gross income, which differ just by the measure of business income.

According to the official measure, the average tax rate for the top 1% ranges from 17% in 2005 to 38% in 2012. These estimates reveal that, as expected, the tax rate is low when dividends are tax-free and high when the dividend tax is in place. This, however, is an artifact of the incomplete measurement of gross income in official statistics, which excludes business income that is not paid to personal owners from the tax base. When this income is included, the picture changes radically. According to our preferred income measure, the

[50]This evidence suggests that income redistribution from the very top of the distribution may be a relatively blunt instrument, even in Norway. Furthermore, as documented in Sections 4 and 5, predistribution (i.e., all forms of government interventions that drive gross market income concentration and inequality, including policies that ensure that low-income groups benefit from relatively good-paying jobs) may play only a small role when we see them in the context of our comprehensive measure of business income. See the discussions in Blanchet et al. (2022), Yagan (2023), and Bozio et al. (2024).

Figure 14: Taxes Paid as a Fraction of Gross Income, 2001–2018



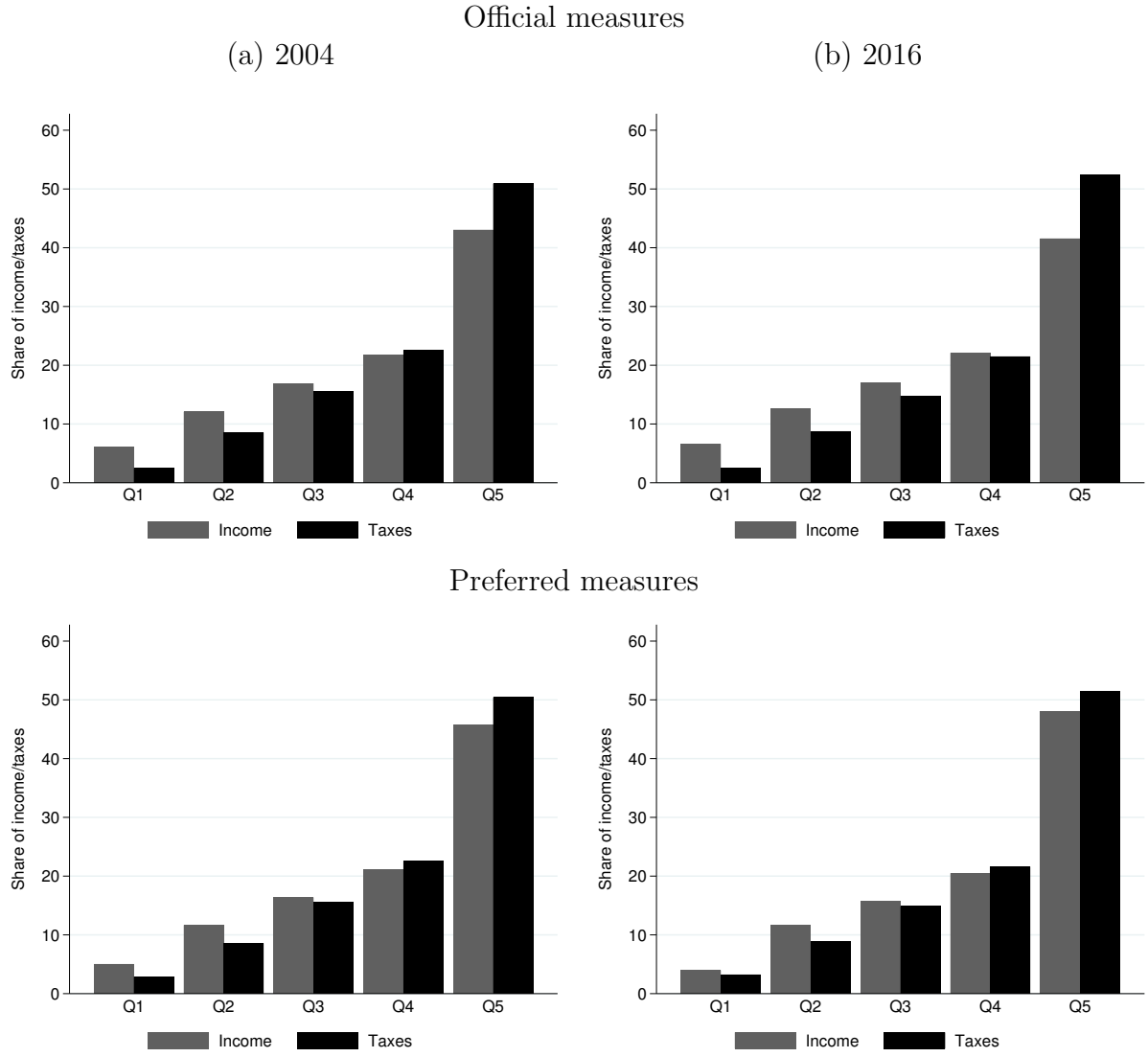
Notes: The figure shows taxes paid as a fraction of gross income by percentile in the distribution of gross income, for the top 1%, the three middle quintiles, and the bottom quintile. The black lines refer to average tax rates defined as in official statistics, i.e. as the sum of personal income and wealth taxes (paid to municipalities, counties, and the state) and social security contributions divided by gross income. The grey lines refer to average tax rates calculated with a denominator consisting of gross income including our preferred measure of business income and the same taxes as in official statistics in the numerator. When calculating the average tax rates, taxes paid are summed over all individuals in each group and then divided by the sum of gross income within the group.

average tax rate levied on the richest 1% is 10% in 2006 (comparable to the rate for the lowest quintile in that year) and about 15–17% since then, approximately 5 percentage points less than the tax rate paid by the three middle quintiles.[51]

6.2 Shares of Total Gross Income and Total Taxes Paid

Our final exercise is to estimate total gross income shares for specific fractiles of the income distribution and compare them to the shares of taxes paid by the same fractiles.

Figure 15: Shares of Gross Income and Taxes by Quintile, 2004 and 2016

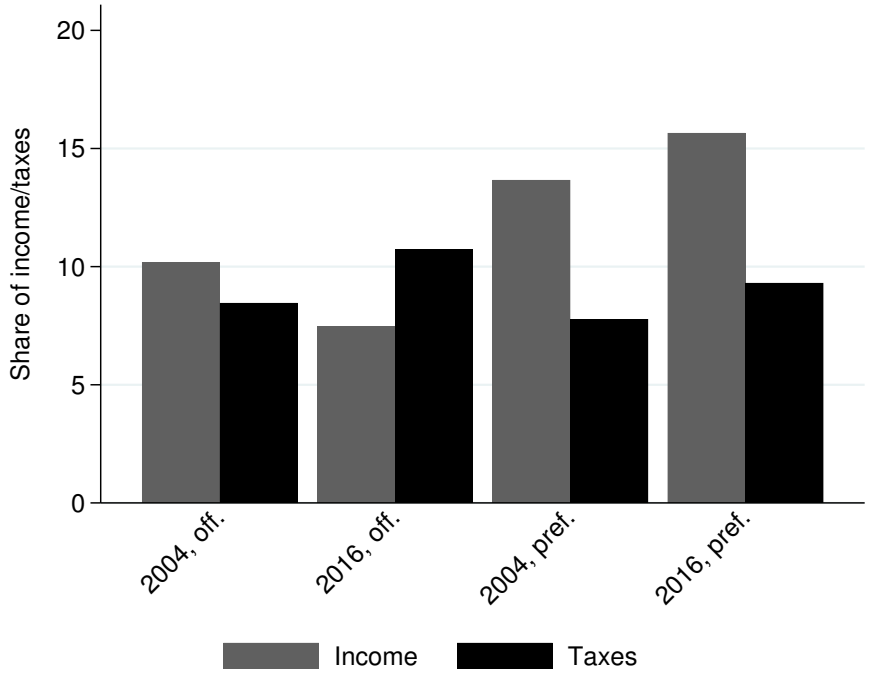


Notes: The figure shows shares of total gross income and total taxes paid for each of the five quintiles in the distribution of gross income, for 2004 and 2016.

[51] Figure A10 in Appendix A.7 documents that accounting for corporate taxes (i.e., the personal owners' share of corporate taxes) does not affect the estimated average tax rate for individuals in the 90–99th percentiles. It does, however, increase the average tax rate for the richest 1%, bringing it in line with the average rate paid by the three middle quintiles.

Figure 15 shows the results of this analysis by quintile of the gross income distribution for 2004 and 2016. The official measure reveals that individuals in the top quintile received about 40% of total gross income in 2004 and paid approximately 50% of total taxes. From 2004 to 2016, we observe a slight reduction in the top quintile's income share and a slight increase in their share of taxes paid. With our preferred measure of business income, we find a marginally larger top income share and a comparable share of total taxes paid by the top quintile. Overall, therefore, the two measures deliver the same qualitative evidence at this level of aggregation.

Figure 16: Shares of Gross Income and Taxes for the Top 1%, 2004 and 2016



Notes: This figure shows shares of total gross income and total taxes paid for the top 1% in the distribution of gross income, for 2004 and 2016. The bars marked with "off." refer to gross income and taxes defined as in official statistics, while the bars marked with "pref." refer to gross income including our preferred measure of business income.

In Figure 16, we focus on the top 1% of the distribution of gross income. Official statistics suggest that in 2004, the share of gross income accruing to the top 1% was about 10%, 2 percentage points more than their share of total taxes paid. By 2016, their share of income was less than 8%, while the share of taxes paid had grown to 11%. When we use our preferred measure of business income, which captures both realized and unrealized components, we uncover a totally different picture. In both years, the share of income was considerably larger (13% in 2004 and 16% in 2016), whereas the share of taxes paid was markedly smaller (7.5% in 2004 and 9% in 2016). This evidence reiterates the substantial difference in what we can infer from official income statistics as opposed to our more comprehensive measure of business income. Not only does this difference affect the

estimates of concentration of market income but also those of taxes paid at the very top of the income distribution, both before and after the dividend tax reform.

7 Conclusion

This paper presents estimates of income concentration and overall income inequality for Norway using a new comprehensive measure of income that identifies business income as it accrues, rather than only when it is paid out as dividends to business owners, and thus includes changes in accumulated retained earnings. The high quality information contained in the Norwegian registers allows us to account for multiple layers of ownership, which is vital as retained earnings are likely to be hidden behind indirect ownership and a large fraction of the total income of individuals at the very top of the distribution can be in the form of unrealized business income.

We emphasize four substantive results. First, our new income measure shows a two-fold increase in the share of market income attributable to the top 1% and a five- and six-fold increase for the top 0.1 and the top 0.01%, respectively, after the introduction of the dividend tax reform in 2006. Put differently, the top 1% income share averages around 18% of total market income while the estimated share found with the official income measure is about 9%. The corresponding figures for the top 0.1% are 11% (our preferred measure) and 2.3% (official measure). Indirect ownership of private firms accounts for about half of the difference between the income concentration estimates found with the official income measure and those found with our preferred measure.

Second, compared to the official income measure, our new accrual approach measure of business income yields Gini estimates for the distribution of after-tax equivalent income that are approximately 40% larger after 2006. This represents a considerable increase, which gives a sharply different picture of the evolution of inequality and underlines the importance of unrealized business income. For the first time, we also compare estimates based on accurate measures of individual business income with the estimates we would obtain if we had to invoke similar assumptions to those used by studies that combine individual tax returns with aggregate data from national accounts to impute individual business income. We show that commonly used imputation strategies lead to downward biased estimates of both income concentration measures and Gini coefficients, highlighting the importance of the assumptions introduced when accurate measures of individual business income are unavailable.

Third, we find that our new measure of income identifies pronounced tax regressivity at the very top of the income distribution (among the richest 1%) over the entire sample period. For instance, while the fraction of gross income paid in taxes by individuals at the 99th percentile was about 37% in 2016, the corresponding fraction paid by individuals in

the top 0.1% was approximately 18%. This feature is not detected by the official measure of income and it is only evident from disaggregated analyses at the very top of the distribution.

Fourth, the evidence on the distribution of the tax burden is similar regardless of whether we use our preferred measure or the official income standard in the pre-2006 dividend tax reform period. Once again, this emphasizes the importance of timing effects in dividend payments and the prevalence of indirect ownership (through holding companies) among top income earners, which allows for deferral of dividends and capital gains at the personal level. Unlike the official measure, our measure of business income accounts for all retained earnings and becomes much less sensitive to changes in tax incentives. This ultimately reiterates the importance of systematic, high quality data collection for official statistics and research purposes, setting more ambitious international standards than those recommended by the Canberra Group guidelines.

Several areas for future research are desirable. One is to assess the extent to which our new income measure changes our understanding of inheritance and, more generally, of the intergenerational transmission of wealth. This links back to the recent results found by Fagereng et al. (2021) and Black et al. (2024). Another is to leverage our findings to inform different options for reforming the taxation of top incomes, which could be relevant in all economies where distributed dividends are taxed and capitalists have incentives to keep large sums of profits in the shape of untaxed retained earnings. This research line stems from our regressivity results and builds on the discussions by Saez (2017), Saez and Zucman (2019), Kopczuk and Zwick (2020), Smith et al. (2023), and Delestre et al. (2024). A third area is to gain more insights into the role played by primary assets, such as human capital, among owners of closely held firms in skill intensive industries, which seem to be key for the evolution of top income inequality in the United States, as suggested by Piketty et al. (2018) and Smith et al. (2019). Finally, it has been argued that other advanced economies have introduced tax rules that incentivize the practice of retaining income within firms (e.g., Kopczuk and Zwick, 2020; Alstadsæter et al., 2023). It would then be valuable to know more about the importance of accumulated retained earnings relative to distributed dividends and pass-through organizations in other countries for which we cannot allocate profits to shareholders in all firms, including those that are not publicly traded, although current data availability is likely to make this exercise challenging.

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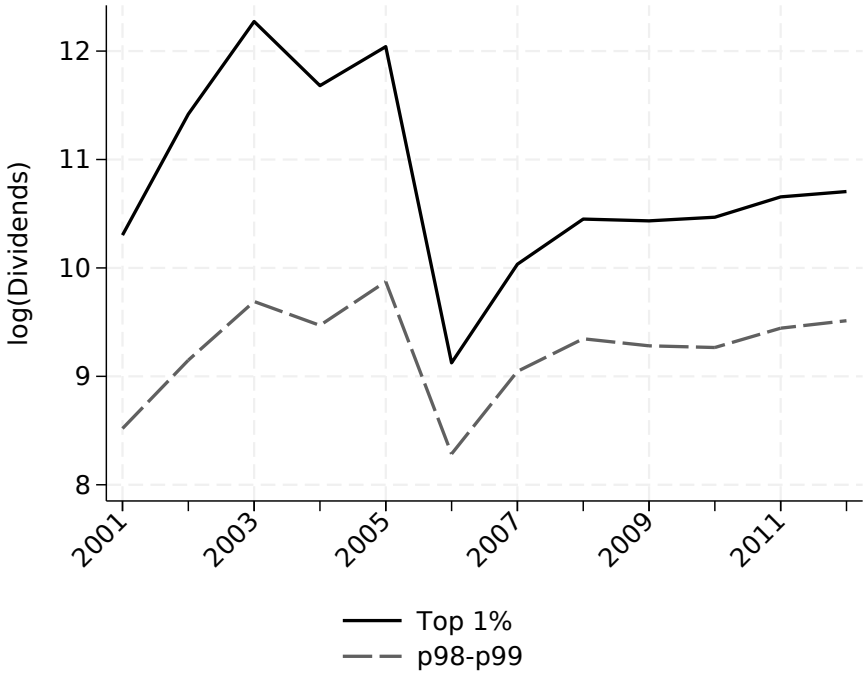
A Online Appendix

A.1 Dividends Received by Personal Owners

Figure A1: Dividends Received by Individuals in the Top Percentile and in the P98-P99 Fractile, Official Income 2001–2012



Notes: The figure shows average dividends (in logs) received by personal shareholders in the top 1% and the P98-P99 fractile of the distribution of market income (using the official measure of business income). Both series are based on a sample of individuals in the top 2% of the distribution of official income in 2003 and followed up to 2012.

As mentioned in subsection 3.1, we provide further evidence that individuals in the top 1% of the income distribution — who receive the largest share of total dividends paid to personal shareholders in our data as shown in Figures 2 and A1 — significantly changed dividends levels as a result of the 2006 dividend tax reform. The reform increased the tax on dividends to personal shareholders from 0 to 28%, while keeping dividends to corporate shareholders untaxed. Our additional evidence comes from estimating the following simple difference-in-differences (DiD) model:

$$\log(\text{Dividends})_{ijt} = \alpha + \gamma \mathcal{T}_{ij} + \delta \text{post}_{ijt} + \beta(\mathcal{T}_{ij} \times \text{post}_{ijt}) + \lambda_t + \varepsilon_{ijt}, \tag{A1}$$

where 'Dividends' represents the amount of dividends (in million NOK) received by personal owner i at time (year) t, j indicates treatment status, which can be either $\{\mathcal{T}$ or $\mathcal{C}\}$, where $\mathcal{T}$ denotes treated individuals, i.e., individuals in the top 1% of the total market income distribution in 2003 (i.e., the year prior to the announcement of the 2006 reform),

Table A1: Difference-in-Differences Estimates of Dividends Levels and Recipience, 2001–2012

	Post-reform period defined starting from:	
	2006	2004
A. Dividends levels (log)		
β	–1.099	–0.827
	(0.020)	(0.023)
N	363,686	363,686
B. Dividends recipience (=1 if yes)		
β	–0.109	–0.089
	(0.002)	(0.003)
N	693,012	693,012

Notes: Obtained from the estimation of equation (A1). Standard errors in parentheses. All estimates are statistically significant at the 0.001 level of significance.

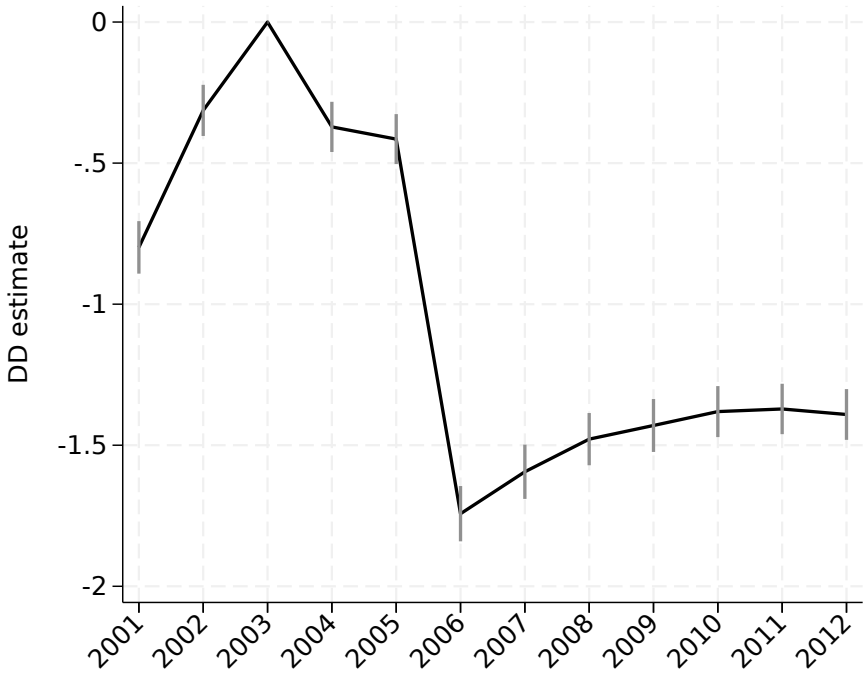
and $\mathcal{C}$ defines the control group which comprises individuals who were in the P98–P99 fractile of the same distribution in 2003. λ_t denotes year fixed effects, and ε_{ijt} is the error term. Our parameter of interest is β.

The β estimates, reported in panel A of Table A1, confirm that individuals in the top percentile of the income distribution reduced the amount of dividends received by 1.1 log points over the full post-reform period. The reduction is substantial, at about 0.83 log points, even if we account for the reform announcement, which occurred in 2004.

Figure A2 upholds this evidence further by showing the temporal evolution of the DiD estimates, normalizing the impact in 2003 at 0. The reduction in dividends received by individuals in the top percentile is largest in 2006, when the reform was enacted, at about 1.75 log points. It remained substantial in the following years and was around 1.4 log points seven years after the implementation of the reform.

Panel B of Table A1 also reports the estimates on the extensive margin, i.e., dividends recipience. Individual owners experienced an 11% reduction in recipience as a result of the reform (9% if we use 2004 as the start of the post-reform period, accounting for possible announcement effects). Figure A3 reiterates the same result and upholds for recipience the same evidence found for levels. Even if owners in the upper percentile of the total market income distribution received more dvidends in the years following the 2006 reform, the gap relative to individuals in the P98-P99 percentile remained significantly negative up to the end of the period, suggesting that individuals had strong disincentives to receive large amounts of dividends after the introduction of the dividend tax reform. We find similar results even if we do not restrict the analysis to the sample of individuals with positive

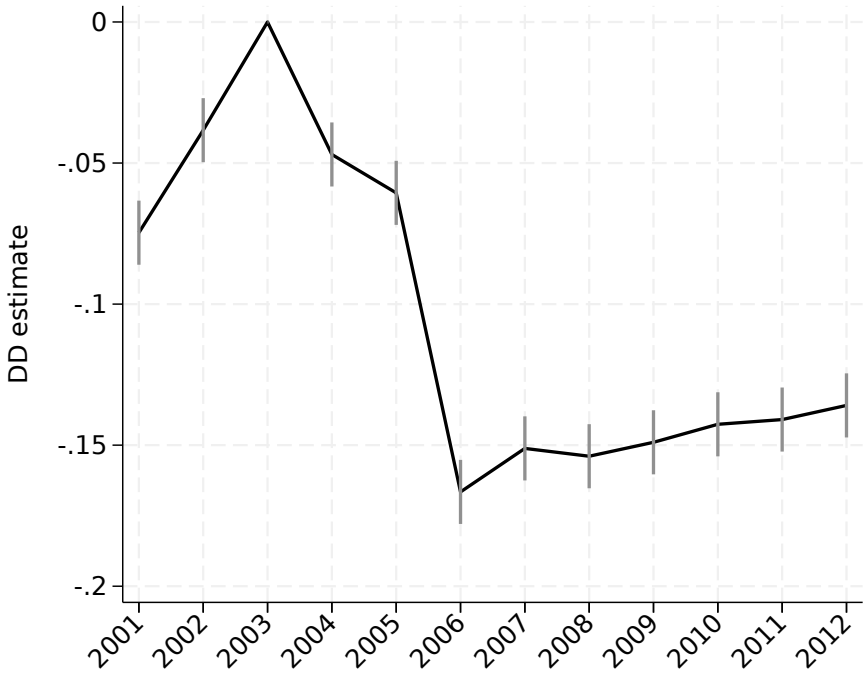
Figure A2: Difference-in-Differences Estimates of Dividends Levels Over Time, 2001–2012



Notes: The figure displays the temporal evolution of the difference-in-differences estimates from (A1), normalizing the impact in 2003 to 0. The vertical lines show the 95% confidence intervals.

business income.

Figure A3: Difference-in-Differences Estimates of Dividends Recipience Over Time, 2001–2012



Notes: The figure displays the temporal evolution of the difference-in-differences estimates from equation (A1), normalizing the impact in 2003 to 0. The vertical lines show the 95% confidence intervals.

A.2 Measuring Business Income Using Proposed vs Distributed Dividends

To illustrate this issue, we rely on the concept of retained earnings. The accumulated stock of retained earnings in year t can be approximated by

$$R_{jt} \approx R_{jt-1} + \Pi_{jt} - D_{jt}, \tag{A2}$$

where R_{jt} and Π_{jt} denote firm j's retained earnings and profits in year t, respectively, while D_{jt} refers to firm j's proposed (or ordinary) dividends in the same year. Assuming that (A2) holds with an equality, which is the case for the majority of firms in our sample prior to 2014, the change in retained earnings equals current profits net of dividends, i.e.:

$$\Delta R_{jt} = \Pi_{jt} - D_{jt}. \tag{A3}$$

From expression (A3), then, the firm's profits Π_{jt}, which corresponds to the income that would have been passed through to the personal owners in a pass-through regime, can be decomposed into two components: changes in retained earnings and proposed dividends.

For now, we abstract from the distinction between proposed and distributed dividends and assume that each firm's dividends are distributed to personal and corporate shareholders according to their ownership shares s_{ijt} and r_{kjt}:

$$D_{jt} = \sum_i s_{ijt} D_{jt} + \sum_k r_{kjt} D_{jt}.$$

Assuming further that each firm's profits, Π_{jt}, consist of own economic profits, $\widetilde{\Pi}_{jt}$, plus dividends received from other firms,

$$\Pi_{jt} = \widetilde{\Pi}_{jt} + \sum_k r_{jkt} D_{kt},$$

one can show that the sum of changes in retained earnings and dividends to personal shareholders equals the total economic profits of the corporate sector:

$$\begin{aligned}
\sum_j \Delta R_{jt} &= \sum_j \Pi_{jt} - \sum_j D_{jt} \\
&= \sum_j \left(\widetilde{\Pi}_{jt} + \sum_k r_{jkt} D_{kt} \right) - \sum_j \left(\sum_i s_{ijt} D_{jt} + \sum_k r_{kjt} D_{jt} \right) \\
&= \sum_j \widetilde{\Pi}_{jt} - \sum_j \sum_i s_{ijt} D_{jt}.
\end{aligned}$$

This motivates the measure of business income implemented by Alstadsæter et al.

(2023), where individual i's business income is equal to his shares of the changes in retained earnings plus dividends received from directly held firms:

$$B_{it}^{RE} = \sum_j s_{ijt} \left(\Delta R_{jt} + D_{jt} \right) + \sum_j \sum_k s_{ijt} r_{jkt} \Delta R_{kt}. \tag{A4}$$

Our measure B_i^* deviates from B_i^{RE} in two ways. The first is related to the difference between proposed (or ordinary) dividends D_{jt} and distributed dividends d_{jt}. Proposed dividends for accounting year t are decided by the general assembly when the books are closed for year t, in Norway typically this is in May/June in year $t+1$, and are payable in year $t+1$. Hence, proposed dividends is the concept that belongs in equations (A2) and (A3), and we have that $d_{jt} = D_{jt-1}$ (when we abstract from extraordinary dividends).

When implementing the measure of business income described by equation (A4), Alstadsæter et al. (2023) use year t distributed dividends d_{jt} instead of year t *proposed* dividends D_{jt}. This results in a measure of business income that differs from the individual owner's share of the total net income generated in the corporate sector when proposed dividends are not constant across subsequent years, i.e., when $D_{jt} \neq D_{jt-1}$. This can be shown by replacing D_{jt} by d_{jt} in equation (A4):[1]

$$\begin{aligned}
B_{it}^{d} &= \sum_j s_{ijt} \left(\Delta R_{jt} + d_{jt} \right) + \sum_j \sum_k s_{ijt} r_{jkt} \Delta R_{kt} \\
&= \sum_j s_{ijt} \left(\Pi_{jt} - D_{jt} + d_{jt} \right) + \sum_j \sum_k s_{ijt} r_{jkt} \left(\widetilde{\Pi}_{kt} - D_{kt} \right) \\
&= \sum_j s_{ijt} \left(\widetilde{\Pi}_{jt} + \sum_k r_{jkt} d_{kt} - D_{jt} + d_{jt} \right) + \sum_j \sum_k s_{ijt} r_{jkt} \left(\widetilde{\Pi}_{kt} - D_{kt} \right) \\
&= \sum_j s_{ijt} \left(\widetilde{\Pi}_{jt} + \sum_k r_{jkt} \widetilde{\Pi}_{kt} \right) + \sum_j s_{ijt} \left(D_{jt-1} - D_{jt} \right) + \sum_j \sum_k s_{ijt} r_{jkt} \left(D_{kt-1} - D_{kt} \right)
\end{aligned} \tag{A5}$$

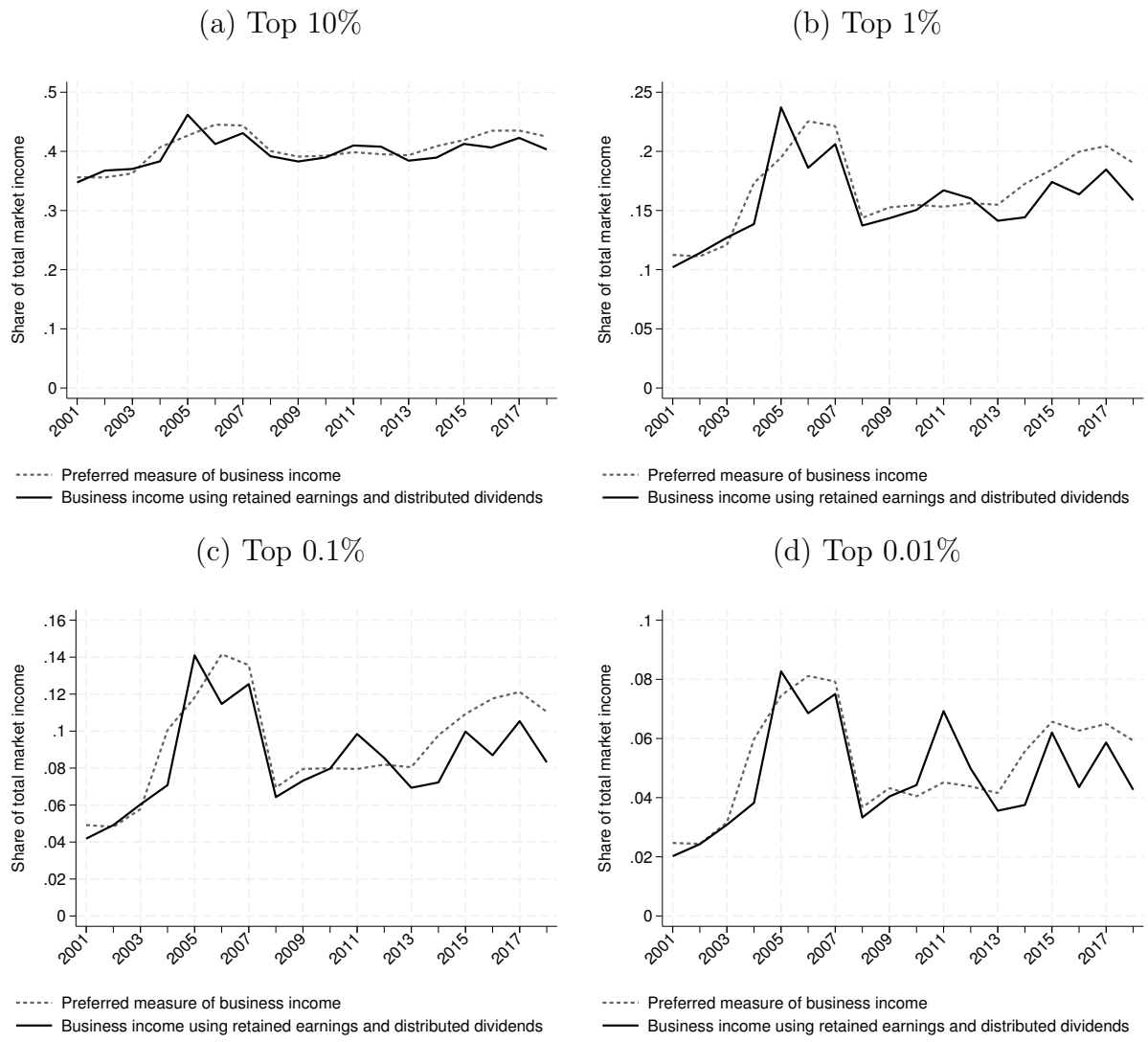
The second way our measure B_i^* deviates from B_i^{RE} is related to changes in the Limited Liability Companies Act ("Aksjeloven") that were implemented in 2014 and resulted in more flexible regulations for the distribution of dividends. These changes weakened the link between year t after-tax profits, proposed dividends, and changes in retained earnings, which implies that the approximation in (A2) is worse from 2014 onwards than for the years before. We therefore decided to use after-tax profits rather than changes in retained earnings to allocate business income to personal owners, as described in equation (2). To

[1] To get from the first to the second equality in expression (A5), we insert for ΔR_{jt} from equation (A3). The third equality uses that the after-tax profits of directly held firms consists of the net income from their own economic activity plus dividends received from other firms, while we assume for simplicity that indirectly held firms do not receive dividends from other firms, so that their after-tax profits consists only of the net income from their own economic activity; $\Pi_{kt} = \widetilde{\Pi}_{kt}$. To get from the third to the fourth equality, we insert for $d_{jt} = D_{jt-1}$ and rearrange.

avoid double counting of profits from indirectly held firms, we subtract the personal owners' shares of indirectly held firms' year $t-1$ proposed dividends:

$$\begin{aligned} B_{it}^{*} &= \sum_{j} s_{ijt}\Pi_{jt} + \sum_{j}\sum_{k} s_{ijt}r_{jkt}\Pi_{kt} - \sum_{j}\sum_{k} s_{ijt}r_{jkt}D_{kt-1} \\ &= \sum_{j} s_{ijt}\left(\widetilde{\Pi}_{jt} + \sum_{k} r_{jkt}D_{kt-1}\right) + \sum_{j}\sum_{k} s_{ijt}r_{jkt}\widetilde{\Pi}_{kt} - \sum_{j}\sum_{k} s_{ijt}r_{jkt}D_{kt-1} \\ &= \sum_{j} s_{ijt}\left(\widetilde{\Pi}_{jt} + \sum_{k} r_{jkt}\widetilde{\Pi}_{kt}\right). \end{aligned}$$

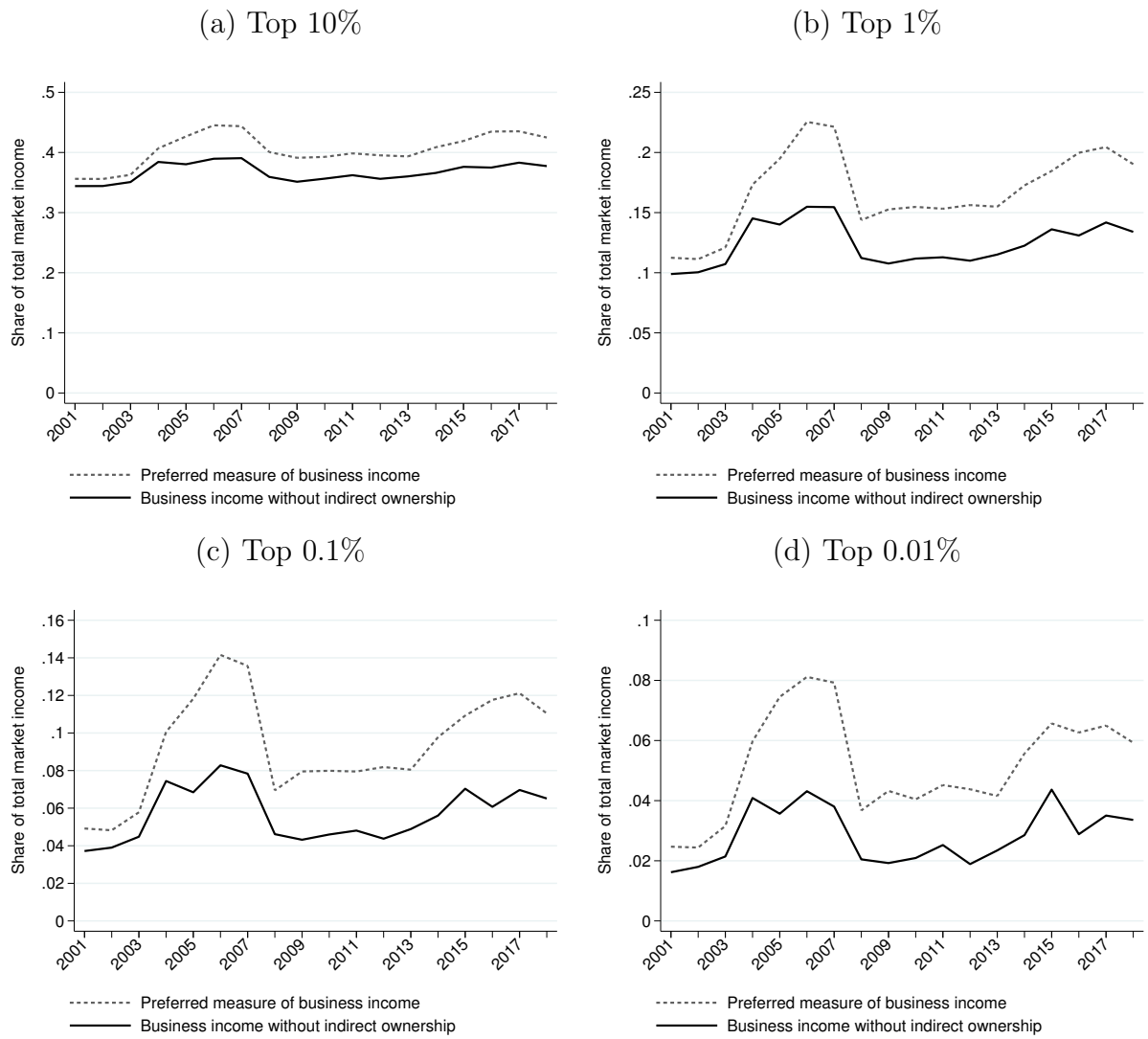
Figure A4: Shares of Total Market Income Accruing to the Top 10, 1, 0.1, and 0.01%, using Retained Earnings and Distributed Dividends versus After-Tax Profits and Proposed Dividends (our preferred measure), 2001–2018



Notes: The figure shows the shares of total market income accruing to individuals in the top 10%, 1%, 0.1%, and 0.01%, using our preferred measure of business income and a measure that allocates business income to personal owners based on changes in retained earnings and distributed dividends.

A.3 Disregarding Indirect Ownership

Figure A5: Shares of Total Market Income Accruing to the Top 10, 1, 0.1, and 0.01%, Using Direct versus Total Ownership Shares, 2001–2018



Notes: The figure shows the shares of total market income accruing to individuals in the top 10%, 1%, 0.1%, and 0.01%, using our preferred measure of business income and a measure that allocates business income to personal owners based on direct ownership only.

A.4 Conditional Copulas and Local Spearman Coefficients

Let X_i be a random variable with cumulative distribution function F_i, $i = 1, 2$, and let $\tilde{C}(s|v)$ be the conditional survival copula defined by

$$\tilde{C}(s|v) = \Pr\left(X_1 \geq F_1^{-1}(1-s)|X_2 \geq F_2^{-1}(1-v)\right) = \frac{\tilde{C}(s,v)}{v}, \tag{A6}$$

where $\tilde{C}(s,v)$ is the survival copula associated with the bivariate survival function of (X_1, X_2).

Assume that X_1 and X_2 are independent random variables. Then we get that

$$\tilde{C}(s|v) = \frac{sv}{v} = s, \tag{A7}$$

which means that $\tilde{C}(s|v)$ exhibits positive association between X_1 and X_2 for the proportion of the population located at the top $100v$ per cent of F_2 for various top percentages of F_1 when $\tilde{C}(s,v) > s$.

By noting that

$$\tilde{C}(s|v) \leq \begin{cases} \dfrac{s}{v}, & s \leq v \\ 1, & s \geq v, \end{cases} \tag{A8}$$

we get by straightforward calculations that

$$\max\left[\int_{u_1}^{u_2}\left(\tilde{C}(s|v) - s\right)\mathrm{d}s\right] = \begin{cases} \dfrac{u_2}{2}(2-u_2) - \dfrac{u_1}{2}(2-u_1), & s \geq u_1 \geq v \\ \dfrac{1-v}{2v}\left(u_2^2 - u_1^2\right), & s \leq u_2 \leq v, \end{cases} \tag{A9}$$

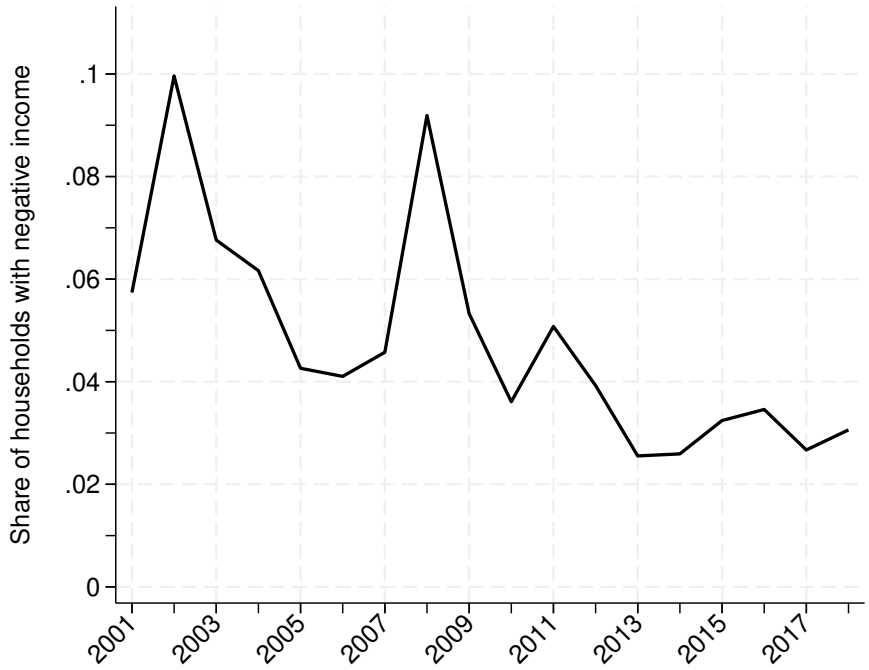
which means that

$$\rho(u_1, u_2|v) = \begin{cases} \dfrac{2}{u_2(2-u_2) - u_1(2-u_1)}\displaystyle\int_{u_1}^{u_2}\left(\tilde{C}(s|v) - s\right)\mathrm{d}s, & s \geq u_1 \geq v \\ \dfrac{2v}{(1-v)\left(u_2^2 - u_1^2\right)}\displaystyle\int_{u_1}^{u_2}\left(\tilde{C}(s|v) - s\right)\mathrm{d}s, & s \leq u_2 \leq v \end{cases} \tag{A10}$$

can be interpreted as a segment-specific local Spearman coefficient with range $[0, 1]$, when $\tilde{C}(s|v)$ exhibits positive association.

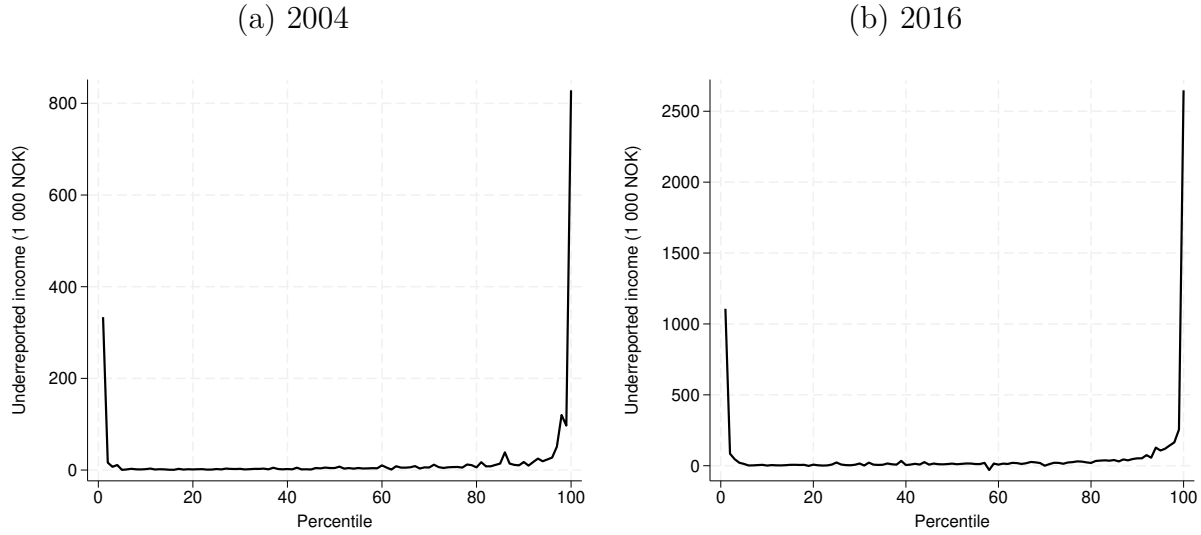
A.5 Imputing Business Incomes by Simple Rules

Figure A6: Share of Households with Negative Business Income, 2001–2018



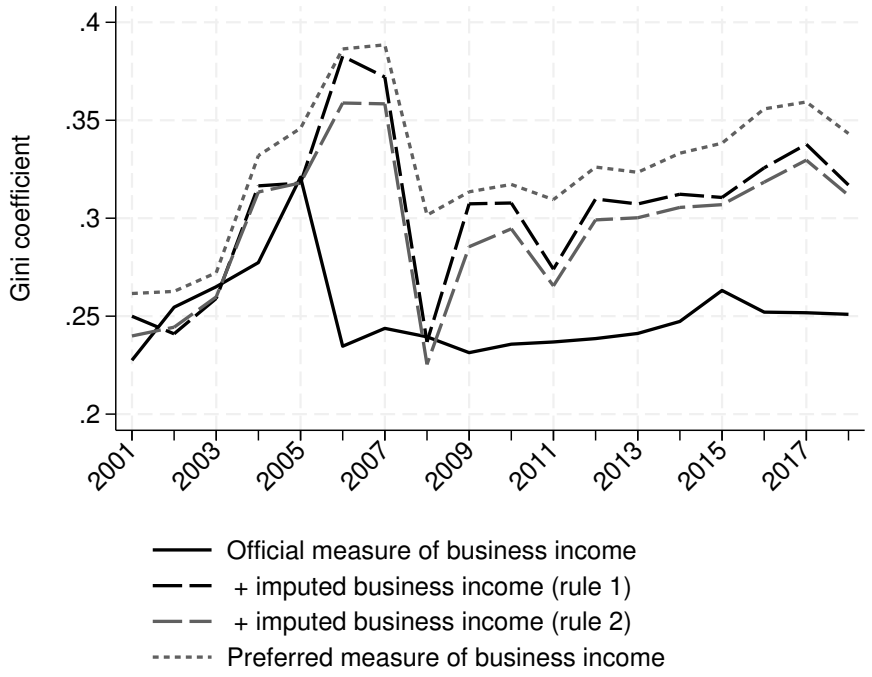
Note: The figure shows the share of households with negative values of the *official* measure of business income.

Figure A7: Underreported Income by Percentile in the Distribution of Disposable Income, 2004 and 2016



Notes: The figure shows average underreported income by percentile in the distribution of the official measure of disposable income.

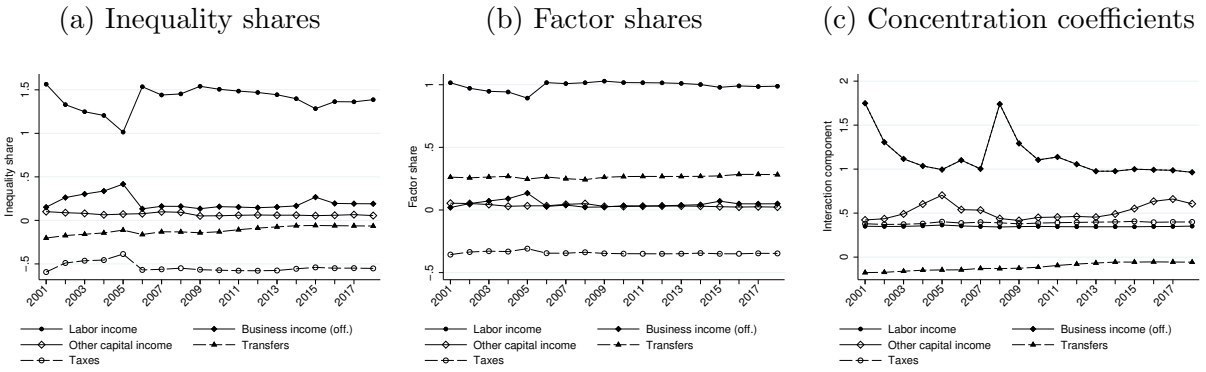
Figure A8: Estimated Gini Coefficients Using Imputed Business Income, 2001–2018



Notes: The figure shows estimated Gini coefficients for household disposable income, using four different measures of business income: the official measure, the official measure plus underreported business income, using two different allocation rules, and our preferred measure. With allocation rule 1, underreported business income is allocated proportionally to the official measure of business income. With allocation rule 2, underreported business income is allocated only to individuals with positive values of official business income (proportionally to their share of total positive official business income).

A.6 Decomposition of the Gini Coefficient for the Official Measure of Income

Figure A9: Decomposition of the Gini Coefficient: Inequality Shares, Factor Shares, and Concentration Coefficients, 2001–2018



Notes: This figure shows inequality shares, factor shares, and interaction components for each of the five broad components of the official measure of household disposable income. The inequality share of component c is defined as $\tau_c = \left(\frac{\mu_c}{\mu}\right)\frac{\gamma_c}{G}$, where μ_c/μ denotes the income (or factor) share of component c, G denotes the Gini coefficient for disposable income, and γ_c denotes the concentration coefficient, which can be interpreted as the conditional Gini coefficient of component c given the rank order in disposable income. See notation in the text.

A.7 Corporate Taxes

Figure A10: Taxes Paid as a Fraction of Gross Income, With and Without Corporate Taxes, 2001–2018

Notes: This figure shows taxes paid as a fraction of gross income by percentile in the distribution of gross income, for the top 1% and for individuals between the 90th and the 99th percentiles. The grey lines refer to average tax rates calculated with a denominator consisting of gross income including our preferred measure of business income and with the same taxes as in official statistics, i.e. the sum of personal income and wealth taxes (paid to municipalities, counties, and the state) and social security contributions, in the numerator. The black lines refer to average tax rates calculated with the same taxes as in official statistics plus personal owners' share of corporate taxes. When calculating the average tax rates, taxes paid are summed over all individuals in each group and then divided by the sum of gross income within the group.