Research Article

Roberto Iacono* and Elisa Palagi

Still the Lands of Equality? Heterogeneity of Income Composition in the Nordics, 1975–2016

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Abstract: According to standard measures of income inequality, the Nordic countries rank among the most equal economies in the world. This paper studies whether and how this picture changes when the focus is on inequality of income *composition*, meaning the heterogeneity in individuals' factor income shares. We show that, for all countries, a shift in capital incomes toward the top since the early 1990s causes rising heterogeneity in individuals' factor income shares. To explain this result, we highlight the role of dual taxation systems. For Denmark in 2009–2013, Finland (1990–2007), and Norway (1991–2005), rising capital shares contributed to changes in personal income inequality, while for Sweden our results lead to disregard the capital share as a determinant of increasing income inequality.

Keywords: income composition inequality, dual income taxation, Nordic countries

JEL Classification: D3, D31, D33

1 Introduction

The link between the functional and personal distributions of income has again become a field of interest in recent years. The debate was initiated by Piketty and

***Corresponding author**: **Roberto Iacono**, Faculty of Social and Educational Sciences, Norwegian University of Science and Technology (NTNU), Campus Tunga, NO-7491, Trondheim, Norway, E-mail: roberto.iacono@ntnu.no. https://orcid.org/0000-0002-7538-8244
Elisa Palagi, Sant'Anna School of Advanced Studies, Institute of Economics and EMbeDS, Pisa, Italy, E-mail: elisa.palagi@santannapisa.it

Zucman (2014) and Piketty (2014), predicting that higher capital shares of income in advanced economies (and, correspondingly, falling labor shares, Karabarbounis and Neiman (2014)) would inevitably lead to higher personal income inequality in the decades to come. The study by Bengtsson and Waldenström (2018) broadens the debate by empirically analyzing the relationship between factor shares and income inequality (proxied by top income shares) in the longer run. One of their take-away messages is that the link between the functional and personal distribution of income varies substantially over time and across countries, being contingent on different institutional contexts and production technologies.

In this research, we intend to contribute to the debate on the link between the functional and personal income distributions, by providing evidence on this relationship for the Nordic countries in recent decades. Ranaldi and Milanovic (2021) find that the evidence from the Nordic countries constitutes a puzzle: While the Nordics are still the lands of equality with respect to the more conventional Gini coefficient, they exhibit high inequality in income *composition*. This implies (a) that ownership of factor income is highly polarized across the total income distribution, with the bottom receiving mostly labor income and the top mostly capital income; and (b) that rising capital share might lead to sustained increases in personal income inequality in the years to come. By focusing on a longer time span and country-specific details, we show that income composition inequality has *not* always been high in the Nordics, and that current high levels of heterogeneity in factor income shares in Ranaldi and Milanovic (2021) are associated to recent taxation reforms.

Methodologically, we adopt a recent inequality dimension introduced by Ranaldi (2021), labeled income *composition* inequality. How is this new dimension useful? The prediction of rising inequality in response to rising capital shares made by Piketty (2014) and Piketty and Zucman (2014) rests on a set of necessary conditions regarding the transmission mechanism from the functional to the personal income distribution. First, capital incomes ought to be concentrated in fewer hands than in the case of labor income. Second, recipients of capital income ought to be, to a large extent, also the richest in the income distribution. These two necessary (and sufficient) conditions are analytically pinned down in Milanovic (2017). The methodological innovation in Ranaldi (2021) is to reduce these two conditions to the estimation of a single, aggregate, summary statistic. The degree of inequality in income composition, i.e., the heterogeneity in individuals' income factor shares, is measured by the Income Composition Inequality (ICI, hereafter) index.

Ranaldi (2021) shows that a positive *and* high level of the ICI index would, alone, suffice to support the prediction of increasing inequality due to rising

capital shares made by Piketty (2014) and Piketty and Zucman (2014).[1] Rather than focusing on a large set of countries as in Bengtsson and Waldenström (2018), we study the countries that rank as the most egalitarian with respect to the pre-tax market income distribution, namely, the Nordic countries.[2] Does a low level of pre-tax market income inequality prevent a rising capital share of income from increasing the level of inequality?

Our starting point is the empirical evidence identifying the increase in personal income inequality in the Nordic countries since the early 1990s, as documented in Aaberge et al. (2018a). In other words, income inequality will act as the dependent variable in our conceptual framework. The countries under analysis are Denmark, Finland, Norway and Sweden. The level of personal income inequality (Gini coefficient) in the Nordic countries is plotted in Figure 1.

Let us focus on the countries and periods in which income inequality increased most significantly. We observe that the Gini coefficient for Norway

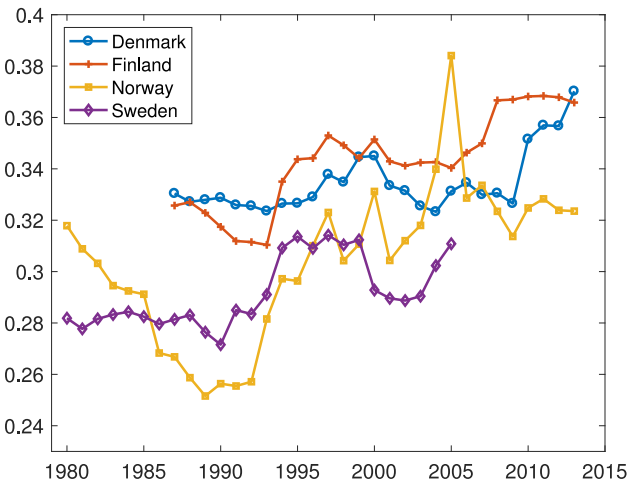

Figure 1: Personal income inequality in the Nordics.
This figure shows yearly time series for the Gini coefficient (1980–2013, pre-tax national income, total population, unit = individuals, age = adults, equal-split series) for Denmark (blue), Finland (red), Norway (yellow), and Sweden (purple).
Source: World Inequality Database WID.World (2020).

1 For an application of this methodology to the case of the Italian economy in recent decades, see Iacono and Ranaldi (2022).

2 See Fochesato and Bowles (2015) for a historical overview of *Nordic exceptionalism* in terms of the degree of egalitarianism or Aaberge, et al. (2018a); Barth, Moene, and Willumsen (2015); Iacono (2018) for an overview of the stylized facts describing the Nordic economies.

increased from 0.251 to 0.384 in the period 1989–2005. For Sweden, the year 1990 marks the lowest Gini, 0.27, which then increases up to 0.31 in 2005. In Finland, the lowest Gini is in 1993 at 0.31 points, climbing all the way to 0.368 in 2011. In Denmark, the Gini is stable at approximately 0.32 up to 2009, followed by a jump to a level of 0.37 in 2013. Overall, regardless of country differences, in the post-1990 era, the Nordic economies have been subject to prolonged periods of increases in the level of personal income inequality.

The main determinant of personal income inequality under scrutiny in this study is the net capital share of income in the Nordic countries for these years, similar to the model specifications proposed by Bengtsson and Waldenström (2018).[3] Figure 2 shows that the Nordic economies differ more from one another in recent decades with respect to capital share dynamics than with respect to personal income inequality. In brief, while the capital share of income is shown to increase for Norway (yellow) and Finland (red) from approximately the beginning

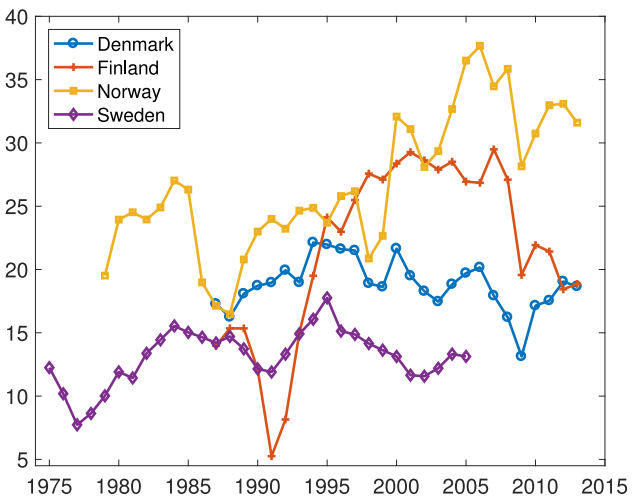

Figure 2: Capital share of income in the Nordics.
This figure shows the capital share of income (1975–2013, defined as value added net of capital depreciation minus employee compensation over national income) for Denmark (blue), Finland (red), Norway (yellow), and Sweden (purple). Data were retrieved from the Bengtsson–Waldenström (BW) Historical Capital Shares Database in Bengtsson and Waldenström (2018), Version 2.0, March 2017.

3 More traditional analyses as regards the determinants of increases in income inequality have focused on standard decomposition exercises, see for the UK Brewer and Wren-Lewis (2016), for Fiorio (2011) for Italy and Albarran, Carrasco, and Martinez-Granado (2009) for Spain.

of the 1990s to 2005, the series for Denmark (blue) and Sweden (purple) appear to be rather stable throughout the period. How much of the variation in the series of Gini coefficients (Figure 1) can be explained by the evidence in Figure 2?

The main contribution of this work is to provide evidence of the structural change in income composition taking place in Nordic countries since the early 1990s. For all the countries under analysis, we identify rising inequality in the composition of individual incomes, mostly due to a shift in capital incomes toward the top of the income distribution. A higher share of the wealthy having their incomes primarily composed of capital income also implies a higher fraction of the poor mostly relying on labor income and can be interpreted as a gradual move toward *classical capitalism*[4] in the Nordic countries in recent decades.

Furthermore, we analyze the extent to which the evidence of increasing inequality in income composition hinges on changes in the taxation of factor income. We highlight that the introduction of dual income taxation reforms in the early 1990s in the Nordics, which reduced the degree of progressivity in capital income taxation, lies behind the shift in capital incomes toward the top of the distribution and, hence, the strengthening of the responsiveness of the Gini coefficient to changes in the aggregate capital share.

Finally, we show that, for Sweden, changes in the capital share of income did not have a key impact on the level of personal income inequality. For Denmark, Finland, and Norway, the evidence is more mixed, indicating that rising capital shares might have contributed to increasing inequality. In Denmark, this applies to the period from 2009 to 2013, during which income composition inequality is high, indicating that the jump in the capital share of income in these years contributed to the rapid increase in income inequality. For Finland and Norway, this especially applies to the period from the early 1990s up to the outbreak of the financial crisis. A summary of these results will be provided in Table 9.

The structure of the paper is as follows. Section 2 presents the data and the methodology. Section 3 constitutes the core of the paper, reporting the main results for each country taken individually. Section 4 discusses the role of taxation and includes robustness checks, while Section 5 concludes the paper.

4 Milanovic (2017) defines classical capitalism as the ideal type of capitalist economy constituted primarily of poor laborers and wealthy capitalists, as opposed to new capitalism under which the wealthy not only earn capital income but also a conspicuous amount of labor income.

2 Data and Methodology

2.1 Data Sources

The micro data on income employed in this research are retrieved from the Luxembourg Income Study Database, LIS (2020). Cross-nationally harmonized LIS data allow a meaningful cross-country comparison of the estimates of income composition inequality. The LIS (2020) database divides current income (pre-tax market income) into factor and transfer income. In turn, factor income comprises labor income and capital income. Labor income is composed of wage income and self-employment income (including farm income). Capital income includes interest and dividends and rental income. Transfer income includes public and private pensions, public social benefits and private transfers. Capital gains received are available in the LIS (2020) data as extraordinary income sources. For all four countries under analysis, the source of the data included in the LIS (2020) database is register data from the national statistical institutes, with relatively high population coverage.

The series of Gini coefficients for the Nordic countries are, to ensure comparability, all retrieved from the World Inequality Database, WID.World (2020). The Gini coefficients are computed from pre-tax national income, and the unit of analysis is individual adults (equal-split series). These data are employed in Figure 1.

The series for the capital share of income (value added net of capital depreciation minus employee compensation) are obtained from the Bengtsson–Waldenström Historical Capital Shares Database (Bengtsson and Waldenström 2018). The capital share is computed as the sum of capital incomes (interest, profits, dividends, realized capital gains) divided by value added calculated at factor cost, net of capital depreciation. Regarding the income of the self-employed, Bengtsson and Waldenström (2018) utilize the proportional method, treating 65–70% of the income of the self-employed as labor income, with the residual being treated as capital income. These data are employed in Figure 2.[5]

2.2 Baseline Income Definition

In the core of the paper, we adopt a single baseline definition of income, based on the LIS (2020) factor income, hence excluding transfer income. The use of

5 The choice of utilizing external data sources for personal and functional income inequality is motivated by their wider coverage in terms of years.

market factor income, rather than net disposable income, allows us to measure the pre-tax concentration of factor income across the income distribution. We define capital income (Π) as the sum of property income (Π_{pr}), comprising rental income, interest, dividends and capital gains[6] and the capital component of net self-employment income (Π_{se}). Formally, we write:

$$\Pi = \Pi_{pr} + \Pi_{se}. \tag{1}$$

Labor income (W) includes wage income (W_{wa}) and the labor component of net self-employment income (W_{se}). Formally, we write:

$$W = W_{wa} + W_{se}. \tag{2}$$

The capital and labor components of net self-employment income are imputed following Glyn (2011).[7] The unit of analysis is the individual: to this end, we use household-level data adjusted by the LIS (2020) database sample weight (*hpopwgt*), and multiplied by the number of household members, given by the variable *nhhmem* in the LIS (2020) data variable list.

2.3 Income Composition Inequality

Ranaldi (2021) introduces and defines the properties of a novel inequality dimension: *income composition inequality*. Income composition inequality focuses on the heterogeneity in individuals' factor income shares across the income distribution. The concept of inequality of income composition can be explained by first dividing total income Y into two income sources, e.g., total income given by capital π and labor w (although this applies to any other pair of sources), such that $(w + \pi)/Y = Y/Y = 1$. Individual i's income share is given by $y_i = Y_i/Y$, and it can be written in terms of the share of the two factor incomes she receives:

$$y_i = \alpha_i \pi + \beta_i w, \tag{3}$$

where α_i and β_i are the relative shares of capital and labor for individual i. Individuals are indexed by their (total) income ranking. Ranaldi (2021) proposes a statistic

6 Regarding capital gains, their exclusion from the main definition of income does not modify the general trends in a significant manner for any of the countries under analysis. In the LIS (2020) database, capital gains are missing for Denmark in 1987, 1992, and 1995; for Norway in 1979, 1986, 1991, and 1995; and for Sweden in 1975, 1981, 1987, and 1992.

7 Glyn (2011) regards the yearly average wage income $\bar{W}_{wa}$ as representing the upper threshold for the labor component of self-employment income. If i's net self-employment income Y_{se} is greater than $\bar{W}_{wa}$, then $\Pi_{se} = Y_{se} - \bar{W}_{wa}$ becomes the capital component of net self-employment income.

to measure the degree of income composition inequality. The income composition inequality (ICI, hereafter) index is constructed by means of the concentration curves for each income source.[8]

The two other building blocks of the index are the zero and maximum concentration curves, reflecting the situation of *minimal* income composition inequality (implying that each individual owns the same share of both income sources along the income distribution) and *maximal* income composition inequality (with income sources separately owned at the top and at the bottom of the income distribution). Ranaldi (2021) then constructs the ICI index by taking the area given by the difference between the concentration curve for a given income source scaled down to the factor share and the zero concentration curve.[9] In more formal terms, define the area between the zero concentration curve and the concentration curve for source z (with $z = \pi, w$) by $\mathscr{A}$ and the area between the zero concentration curve and the maximum concentration curve by $\mathscr{B}$, as in Ranaldi (2021). Hence, we can define the ICI index (labeled as ICI_z) as follows:

$$\text{ICI}_z = \frac{\mathscr{A}}{\mathscr{B}}. \tag{4}$$

The ICI index can assume any level in the range $[-1, 1]$. When income composition inequality is minimal, the area between the concentration curve for source z and the zero concentration curve tends to zero, implying $\text{ICI}_z = 0$. In contrast, a state of the world with maximal income composition inequality can imply either $\text{ICI}_z = -1$ or $\text{ICI}_z = 1$, depending on which end of the income distribution owns income source z. A useful formulation of the index presented in Ranaldi (2021), highlighting the role of the areas below the concentration curves, is the following:

$$\text{ICI}_z = \frac{\pi w (\tilde{\mu}_w - \tilde{\mu}_\pi)}{\mathscr{B}}, \tag{5}$$

where π and w are the capital and labor shares of income, respectively, and $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ are the areas under the labor and capital concentration curves, respectively, this time summing to one (with no scaling down adjustment). For example, if $z = \pi$ and for a given year capital incomes are owned relatively more at the *top* of the distribution than labor incomes are, the area below the concentration curve

8 Note that in Ranaldi (2021), the index is labeled as Income-Factor Concentration (IFC) Index, measuring the degree of Income Composition Inequality. For simplicity, we just refer to the ICI index. Note also that a concentration curve (similar to concentration curves introduced by Kakwani 1977a, 1977b) is the cumulative distribution of a specific income factor up to the level of the factor share (less than 1), with individuals indexed, however, by their total income rank.

9 Similar to the Gini coefficient, negative values pose an issue for the estimation of the index. For this reason, in the following sections, we will set negative values equal to 0.

for capital will be in that year lower than the area below the concentration curve for labor. This implies that the difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ becomes positive, meaning a positive degree of income composition inequality. In contrast, if capital incomes are owned relatively more at the bottom of the distribution, the area below the concentration curve for capital will be in that year higher than the area below the concentration curve for labor. This would then imply a negative difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ and a negative sign of the index of income composition inequality in Equation (5).[10]

2.3.1 The Transmission Mechanism

Let us explain why the transmission mechanism between the functional and personal income distributions is better understood through the degree of income composition inequality. Whenever the degree of income composition inequality is high, the ICI index will display a level close to −1 or 1. In the case of an ICI index value close to 1, we have a state of the world in which the wealthiest individuals own relatively more capital income as part of their income than individuals at the bottom of the distribution. This means that a sudden increase in the capital share of income would imply a substantial increase in the income owned by the top of the income distribution, thereby resulting in higher personal income inequality. The opposite happens when the ICI index is close to −1, indicating that the poorest part of the population has higher shares of their income composed of capital income with respect to the wealthiest. In the latter case, a sudden increase in the capital share of income would imply a substantial *reduction* in the income owned by the top of the income distribution, thereby resulting in a *lower* level of personal income inequality.

In other words, a high degree of income composition inequality is associated with a *strong* transmission mechanism between the functional and the personal income distribution. In contrast, the transmission mechanism from the functional to the personal income distribution is *weak* under a *low* degree of income composition inequality. The above reasoning can be formalized following Ranaldi (2021). Deriving the Gini coefficient $\mathscr{G}$, with respect to changes in the capital share

10 Note that the ICI index differs from a decomposition of the Gini coefficient into the marginal contributions of the dispersion of capital income and labor income taken individually, as in Atkinson (2009). In fact, this work does not attempt to quantify the relative contributions of the two income sources to total factor income inequality. Instead, it studies the heterogeneity in income composition in the Nordics and what this implies for the relation between the functional and personal income distributions.

of income (assume $z = \pi$), we obtain:

$$\frac{\partial \mathscr{G}}{\partial \pi} = 2(\tilde{\mu}_w - \tilde{\mu}_\pi). \tag{6}$$

Equation (6) identifies the connection between the ICI index and the derivative of the Gini index with respect to changes in the capital income share. We will refer to this derivative as the *degree of responsiveness* of the Gini index to increases in the aggregate capital income share.[11] Recall that the right-hand side of Eq. (5) finds the difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ to be decisive for the sign of the ICI index. Hence, when $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ is positive, Eq. (5) tells us that the ICI index will also be positive, indicating that an increase in the capital share will imply higher income inequality. This can be seen through Eq. (6), since the difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ determines both the sign and the magnitude of the degree of responsiveness of the Gini to changes in the functional income distribution. In other words, the sign and the value of the ICI index unambiguously constitute the bridge between the functional and the personal income distribution.[12]

3 Main Results

This section presents the main results of the paper: each of the four countries is analyzed within a standalone subsection. A summary of the results from this section is provided in Table 9.

3.1 Denmark

Denmark ranks among the countries with the lowest income inequality in the world (Alvaredo et al. 2018; Chancel 2021). However, recent empirical evidence has shown a tendency of widening disparities. Atkinson and Søgaard (2016) study the long-run evolution of top taxable income shares in Denmark, and find

11 In the methodological literature, Lorenz curve decomposition techniques other than that of Ranaldi (2021) permit us to estimate derivatives similar to that in Eq. (6), such as Shorrocks (1982) and Rao (1969). In our view, Ranaldi (2021) highlights more clearly the role of income composition inequality in succinctly estimating (with single summary statistics) the strength of the transmission mechanism between the functional and personal distributions of income.

12 Recall that because we are considering total capital incomes, the ICI index identifies an average effect of changes in the capital share of income on income inequality. If one wished to account for effects generated by heterogeneous sources of capital income, one would have to disaggregate total capital income into subcomponents and build an index on these.

a tendency of rising inequality at the very top of the income distribution in recent years, up to 2010. Søgaard (2018) seeks to explain these changes in top income shares, identifying (i) the role of taxation in conjunction with (ii) the role of capital income. On the one hand, reductions in top marginal tax rates proposed in the Danish Tax Reform Act of 1993 (Lange, Pedersen, and Sørensen 1999) and implemented from 1994 onward lowered the progressivity of taxation of capital incomes (Rubolino and Waldenström 2020). Lower progressivity of capital income taxation might have led to higher concentration of capital incomes at the top of the distribution and hence higher income inequality. However, neither Søgaard (2018) nor Rubolino and Waldenström (2020) identify a causal effect from policy changes in taxation in the case of Denmark. On the other hand, Søgaard (2018) notes that the role of different types of capital income (a composition effect) has been decisive for the dynamics of the top 1%. He documents a shift away from interest income (due to reduced interest rates) and toward higher dividends (due to lower capital income taxation). Although Søgaard (2018) offers mostly correlation evidence, the plausible hypothesis is that this increased fraction of dividends in the net capital income received by households in Denmark is responsible for the increase in top income shares documented in the literature.

To shed light on the heterogeneity of income composition throughout the income distribution, let us start to analyze the concentration of factor incomes in Denmark over the period 1987–2016. Table 1 shows the concentration of capital income across the total income distribution.[13] The income distribution is divided into four main groups, the bottom 50%, the middle class 50–90%, and the top 10%, which is further divided into the bottom half and the top half of the decile.[14]

From Table 1 and considering the full period 1987–2016, we can infer that the bottom 90% of the income distribution in Denmark lost a substantial fraction of capital income, dropping from a total share of 49% in 1987 to 25% in 2016. In parallel, the fraction of capital incomes accruing to the top 10% increased radically by 24%. In other words, a dramatic shift in the concentration of capital incomes at the top of the income distribution has taken place throughout the period. This change in factor income concentration and composition of individual incomes is not captured by the aggregate statistics on the functional and personal distribution of income. On aggregate, the capital share of income increased slightly from 17% in 1987 to 22% in 1995, followed by a mild decrease in the following years. The Gini coefficient from WID.World (2020) was fairly stable at approximately 0.33 up

13 Recall that in this framework, total income is the sum of labor and capital income.

14 As a complementary evidence for the evolution of capital and labor incomes across the total factor income distribution, in Appendix C we present growth incidence curves for each of the four countries under analysis.

Table 1: Capital income shares by total income group, Denmark 1987–2016.

Total income group	1987	1992	1995	2000	2004	2007	2010	2013	2016
0–50%	21%	19%	15%	13%	12%	11%	10%	9%	8%
50–90%	28%	26%	26%	20%	22%	19%	18%	18%	17%
90–95%	8%	7%	9%	8%	8%	8%	8%	8%	7%
95–100%	43%	47%	50%	59%	58%	62%	64%	66%	68%
Capital share (BW)	17%	20%	22%	21%	19%	18%	17%	19%	20%
Gini pre-tax national income (WID)	0.33	0.32	0.32	0.34	0.32	0.33	0.35	0.37	na.
Gini total factor income (LIS)	0.44	0.47	0.47	0.46	0.47	0.47	0.50	0.51	0.51

Table 2: Labor income shares by total income group, Denmark 1987–2016.

Total income group	1987	1992	1995	2000	2004	2007	2010	2013	2016
0–50%	18%	15%	16%	17%	16%	17%	15%	14%	14%
50–90%	58%	60%	59%	58%	58%	58%	58%	58%	58%
90–95%	11%	11%	11%	11%	11%	11%	11%	11%	11%
95–100%	13%	14%	14%	14%	15%	14%	16%	16%	17%
Capital share (BW)	17%	20%	22%	21%	19%	18%	17%	19%	20%
Gini pre-tax national income (WID)	0.33	0.32	0.32	0.34	0.32	0.33	0.35	0.37	na.
Gini total factor income (LIS)	0.44	0.47	0.47	0.46	0.47	0.47	0.50	0.51	0.51

to 2007 but exhibits a jump in more recent years to a level of 0.37 in 2013.[15] See Appendix D for a discussion on entropy measures. Before commenting on these dynamics, let us focus in Table 2 on the other source of factor income, namely, labor incomes.

Table 2 tells a different story, with labor incomes being relatively more stable across the income distribution throughout the period of analysis. The only notable change is the decrease in the share of labor incomes accruing to the bottom 50% of the distribution, from 18% in 1987 to 14% in 2016. In parallel, the top 5% received a 4% higher share of labor incomes in 2016 than in 1987. Overall, Tables 1 and 2

15 The gap between the series of the WID.World (2020) and LIS (2020) Gini coefficients is due to the exclusion of pensions in our baseline definition of income. However, the trends for the two series appear to be rather similar. Note that, although we exclude pensions in our baseline definition of income, the inclusion of pensions does not alter any of our results.

indicate that the top of the income distribution has increased its share of capital incomes, with the incomes of the very wealthy becoming more capital intensive, while the opposite is the case at the bottom of the distribution. This development was mainly driven by the shift in the concentration of capital incomes toward the top. As explained in Eq. (5), the difference between the areas under the concentration curves for labor and capital ($\tilde{\mu}_w - \tilde{\mu}_\pi$) uniquely determines the sign of the ICI index. Hence, before we proceed to estimate the ICI index itself, it is instructive to examine the series of these areas, as shown in Figure 3.

First, focus on the blue series of the area of the concentration curve for capital, $\tilde{\mu}_\pi$. A decrease in the area below the concentration curve for capital, as a result of capital incomes shifting toward the top (this area is large/small when capital incomes accrue toward the bottom/top of the income distribution), is observed consistently from 1987 to 2013. On the other hand, the (red) series for the area below the concentration curve for labor is stable throughout the period in the range 0.17–0.19. We can now proceed with the estimation of the ICI index in Figure 4.

The ICI index departs from very low values in the late 1980s and early 1990s (between 0.05 and 0.15). The low values of the ICI index in these years indicate a low degree of income composition inequality across the income distribution. Recall that in these years, income inequality in Denmark was historically low, and capital incomes had not yet started to accrue to top incomes as they will in subsequent years.

In the early 1990s, the Danish tax reform (Lange, Pedersen, and Sørensen 1999) lowered top marginal tax rates on capital incomes, and in response,

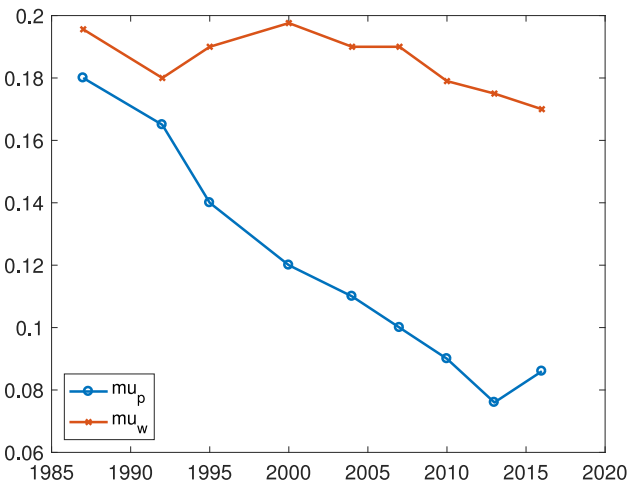

Figure 3: Evolution of the areas of factor concentration curves for Denmark. $\tilde{\mu}_\pi$ is the area under the concentration curve for capital (blue series), and $\tilde{\mu}_w$ is the area under the concentration curve for labor (red series).

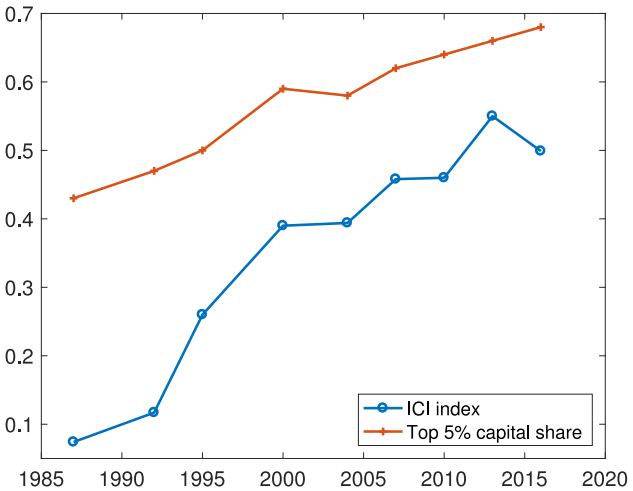

Figure 4: Income composition inequality index in Denmark, 1987–2016.
This figure plots the series of the ICI index for Denmark using micro data on gross income from the Luxembourg Income Study Database (Luxembourg Income Study (LIS) Database, 2020) for the following years: 1987, 1992, 1995, 2000, 2004, 2007, 2010, 2013, and 2016. Capital shares going to the top 5% of the total income distribution are also reported.

capital incomes shifted rapidly toward the top of the income distribution. This development is clearly visible in the period 1992–2000 during which the ICI index increases substantially (in line with the evidence from Atkinson and Søgaard (2016), Aaberge, et al. (2018a), Table 1 and Figure 3). Interestingly, this jump in the concentration of capital incomes is not reflected in the evolution of the Gini index for total income, which only slightly increases between 1992 and 2000.

From 2000 up to 2013, the ICI index continues to grow (between 0.4 and 0.55), with the exception of period 2013–2016. To summarize the main result for Denmark, the evidence from the ICI index series is unambiguous in the sense that a substantial increase in the inequality in income composition took place in the country throughout the period, mostly due to changes observed in the concentration of capital incomes.

Finally, we attempt to shed light on the relation between the aggregate capital share of income and the personal distribution of income by jointly analyzing the evolution of the net capital share, our estimates for the ICI index and the Gini coefficient in Figure 5.

We start with the period from 1987 to 1995, a range of years with an increasing capital share. The ICI index shows low values, indicating a weak transmission mechanism, and consistently, the Gini coefficient appears to be quite stable.

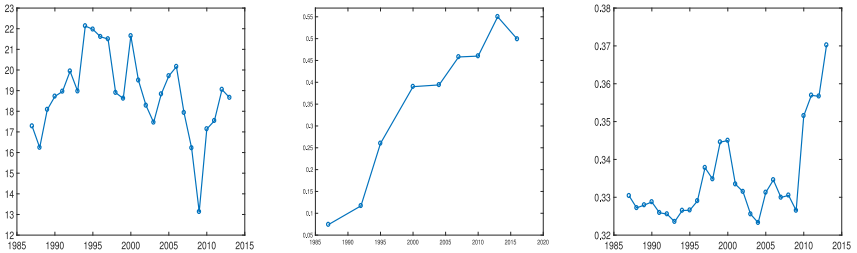

Figure 5: Capital share, ICI index and Gini: Denmark, 1987–2016.
The left-hand side graph plots the series of the capital share of income (value added net of capital depreciation minus employee compensation) in the period 1987–2013. This series is obtained from the Bengtsson–Waldenström Historical Capital Shares Database in Bengtsson and Waldenström (2018). The graph in the middle again plots the series of the ICI index for Denmark for the period 1987–2016, as shown in Figure 4. The graph on the right-hand side plots the Gini coefficient for Denmark from 1987 to 2013 using data from the World Inequality Database WID.World (2020).

The subsequent period, from 1995 to 2009, is characterized by a volatile capital share and an equally volatile (but rather stationary) Gini coefficient. The absolute values for the ICI index are now higher in magnitude (0.25–0.4), suggesting that the functional distribution becomes more relevant for the determination of the personal income distribution. The period between 2009 and 2013 shows an increasing capital share (from 13% to approximately 19%), positive and rather high values of the ICI index (between 0.4 and 0.55), and sustained increases for the Gini coefficient. Due to the relatively high values of the ICI index, which are associated with higher responsiveness of the income Gini coefficient to the capital share, we claim that the functional distribution qualifies as one of the drivers of the jump in personal income inequality in Denmark since 2009. In summary, the working hypothesis that the functional distribution of income has been the main driver of changes in income distribution is largely rejected, with the exception of the period from 2009 to 2013.

3.2 Finland

The literature on the evolution of income inequality in Finland (Eriksson and Jäntti 1997; Jäntti et al. 2010) shows that after a period of overall inequality reduction from the 1960s up to the 1990s, this decreasing trend has reversed. Both in terms of the top shares of income and of the overall income distribution summarized by the Gini coefficient, inequality in Finland has been increasing since the 1990s. In particular, Jäntti et al. (2010) document a surge in the share of

income accruing to the top 1% since the mid-1990s. According to the authors, these dynamics are mostly due to a change in the composition of incomes, corresponding to an increase in the fraction of capital income going to the top of the income distribution. A key determinant of this development is the 1993 dual income tax (DIT) reform, which shifted taxation on capital income in Finland from progressive to proportional.

As done for Denmark, let us start by focusing on factor income trends in Finland. Table 3 presents the concentration of capital income across the income distribution for Finland between 1987 and 2016. As before, the income distribution is divided into four groups, the bottom 50%, the middle class 50–90%, and the top 10%, which is further divided into the bottom half and the top half of the decile.

Table 3 shows that capital incomes go steadily more toward the top 5% of the income distribution up to the year of the financial crisis (2007), with the bottom 95% losing a fraction of 19% of total capital incomes when comparing 2007 with 1987. On aggregate, the capital share of income rises from 14 to 29% in the years of the crisis, before it declines to 19% in 2013. In summary, a shift in the concentration of capital incomes at the very top (5%) of the income distribution took place up to 2007. We present in Table 4 the dynamics of the concentration of the other factor income, namely, labor.

Table 4 shows that labor incomes accrue steadily more toward the top 50% of the income distribution. The share accruing to the bottom 50% of the distribution decreases from 21% in 1987 to 13% in 2016; hence, a fraction of 8% of capital incomes shifted to the top half of the distribution.

Overall, Tables 3 and 4 show that the very top of the income distribution substantially increased its share of capital incomes up to the year of the financial

Table 3: Capital income shares by total income group, Finland 1987–2016.

Total income group	1987	1991	1995	2000	2004	2007	2010	2013	2016
0–50%	16%	16%	11%	6%	7%	7%	9%	9%	11%
50–90%	27%	30%	25%	18%	18%	19%	20%	24%	20%
90–95%	13%	12%	12%	8%	9%	8%	8%	10%	10%
95–100%	45%	42%	53%	67%	66%	66%	63%	57%	59%
Capital share (BW)	14%	5%	24%	28%	28%	29%	22%	19%	20%
Gini pre-tax national income (WID)	0.32	0.31	0.34	0.35	0.34	0.35	0.36	0.36	n.a.
Gini total factor income (LIS)	0.41	0.42	0.49	0.50	0.51	0.51	0.51	0.51	0.53

Table 4: Labor income shares by total income group, Finland 1987–2016.

Total income group	1987	1991	1995	2000	2004	2007	2010	2013	2016
0–50%	21%	20%	15%	16%	16%	16%	14%	13%	13%
50–90%	55%	56%	58%	58%	58%	58%	58%	58%	58%
90–95%	10%	10%	12%	11%	11%	12%	12%	12%	12%
95–100%	14%	14%	15%	15%	15%	15%	15%	16%	17%
Capital share (BW)	14%	5%	24%	28%	28%	29%	22%	19%	20%
Gini pre-tax national income (WID)	0.32	0.31	0.34	0.35	0.34	0.35	0.36	0.36	n.a.
Gini total factor income (LIS)	0.41	0.42	0.49	0.50	0.51	0.51	0.51	0.51	0.53

crisis, in addition to a slight increase in its share of labor incomes. Hence, in terms of income composition, the incomes of the very wealthy became more capital intensive, while the opposite occurred at the bottom of the distribution. The post-crisis period 2010–2016 instead presents levels of concentration similar to those of the pre-crisis period. As for Denmark in the previous section, before we proceed to estimate the ICI index itself, we present the series of the areas below the concentration curves for labor and capital, as shown in Figure 6.

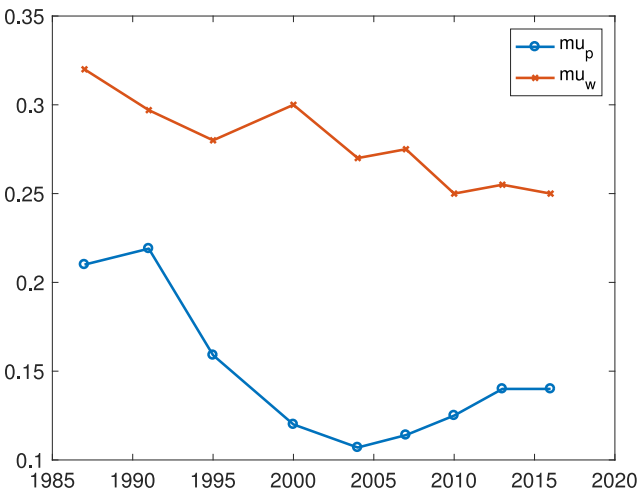

Figure 6: Evolution of the areas of factor concentration curves for Finland. $\tilde{\mu}_{\pi}$ (blue) is the area of the concentration curve for capital, and $\tilde{\mu}_{w}$ (red) is the area of the concentration curve for labor.

First, focus on the (blue) series of the area of the concentration curve for capital, $\tilde{\mu}_{\pi}$. We observe a clear decrease in the series of the area below the concentration curve for capital as a result of capital incomes shifting toward the top over the period 1991–2004. Thereafter, the (blue) series for $\tilde{\mu}_{\pi}$ slightly regains magnitude up to 2016. The (red) series for the area below the concentration curve for also labor decreases; however, it remains within the range 0.25–0.35 throughout the period. In other words, based on the evidence from Tables 3, 4 and Figure 6, it is clear that it is indeed the structural change observed in the concentration of capital incomes that is primarily responsible for the variation in the series of the ICI index for Finland. We can now proceed with the estimation of the ICI index for Finland for the period 1987–2016 in Figure 7.

Figure 7 shows that in the late 1980s and early 1990s, the ICI index for Finland was rather low, indicating a low degree of income composition inequality. Low values of the ICI index (regardless of the sign) imply that the composition of incomes is quite homogeneous across the income distribution. This also implies that the concentration of factor incomes across the income distribution is rather similar for both factor incomes. This picture radically changes from 1995 up to the years after the financial crisis of 2007–2010. The ICI index exhibits a surge, reaching approximately 0.6 points in 2000 and 2004. In those years, the highly positive values of the ICI index indicate that capital incomes are now concentrated more toward the top of the income distribution relative to labor incomes, with high-income earners deriving the majority of their income from capital and low-income earners deriving a large share of their income from labor. In summary, our estimates of the degree of income composition inequality in Finland accord

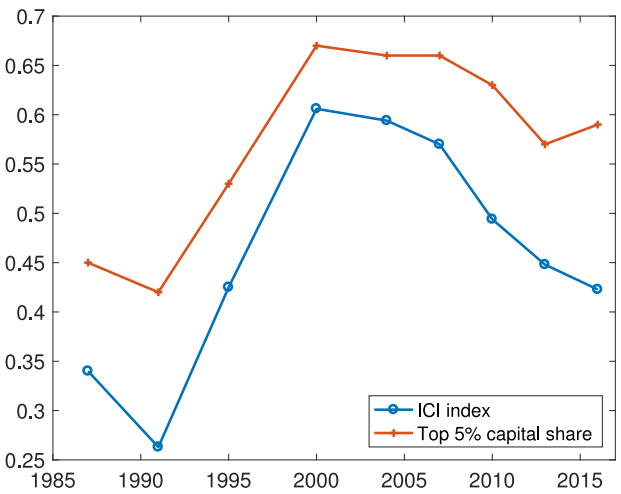

Figure 7: Income composition inequality Index in Finland, 1987–2016. This figure plots the ICI index estimates for Finland using micro data on factor income from LIS (2020) for the following years: 1987, 1991, 1995, 2000, 2004, 2007, 2010, 2013, and 2016. Capital shares going to the top 5% of the total income distribution are also reported.

with the evidence of Jäntti et al. (2010) on the surge in the share of income going to the top 1%. Jäntti et al. (2010) identified the surge in capital incomes for the top 1% as the cause of increased concentration of incomes at the very top of the distribution. Our ICI index estimates confirm that there has been a shift in the composition of incomes across the distribution, especially from 1995 to 2007, due to capital incomes moving from lower deciles of the income distribution to the very top.

In Figure 8, we compare the evolution of the net capital share of income, the ICI index and the Gini coefficient calculated on market income for the period 1980–2016. Figure 8 shows that Finland witnessed a significant increase in the capital share of income between the early 1990s and 2007. This coincides with progressively higher values of the ICI index, which indicate, *ceteris paribus*, a strengthening of the transmission mechanism between the functional and personal distributions of income. In the same period, the Gini coefficient also shows an increase from approximately 0.31 to approximately 0.35.[16] Although the ICI index starts from low values in the early 1990s, the evolution of the ICI index in this period indicates a relevant role of the functional distribution of income in the determination of personal income inequality. In the final period from 2008 to 2013, it is plausible that factors other than the functional distribution of income played a role in the dynamics of the Gini coefficient. In conclusion, the hypothesis implying that the surge in the capital share of income has been an important driver of increased inequality in Finland seems to apply mostly for the

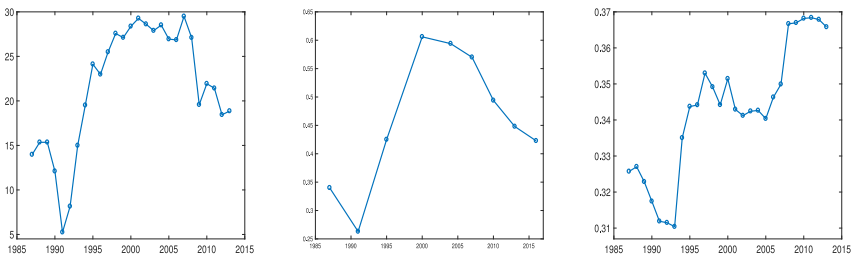

Figure 8: Capital share, ICI index and Gini: Finland, 1987–2016.
The left-hand side graph plots the capital share of income in the period 1987–2013, obtained from Bengtsson and Waldenström (2018). The graph in the middle plots the ICI index for Finland for the period 1987–2016. The graph on the right-hand side plots the Gini coefficient for Finland from 1987 to 2013, obtained from the WID.World (2020).

16 See Appendix D for a discussion on entropy measures.

central period of our analysis, from the early 1990s up to the years of the financial crisis.

3.3 Norway

Aaberge and Atkinson (2010) use tax data to document that top income shares in Norway started to increase in the late 1980s and early 1990s. The sharp rise in income shares accruing to the wealthiest households is recorded during the 1990s, in response to the introduction of the dual income tax (DIT) system in 1992. The dual income tax reform of 1992 (Alstadsaeter 2007; Sørensen 1994; Thoresen 2004) shifted the tax rate on capital incomes to be proportional, while that on labor incomes remained progressive. As a result of this decrease in progressivity (Thoresen 2004), capital incomes became more unevenly distributed in the 1990s, which contributed to increased income inequality. Aaberge, Atkinson, and Modalsli (2020) extend the analysis in Aaberge and Atkinson (2010), demonstrating that after the sharp increase in top income shares in 2005 due to the upcoming tax dividend reform, they subsequently stabilized at the levels of the late 1990s.[17] They also present the evolution of the pre-tax Gini coefficient, which increased between 1989 and 2013. Specifically, after a significant increase between the late 1980s and 2000, the Gini exhibited turbulent behavior around the years of the previously mentioned tax reforms and a slight increase thereafter. A third dimension of inequality, which is investigated in the literature on Norway and is highly relevant for our analysis, is the association between labor and capital incomes at the top of the distribution (the wage-capital composition of top incomes). As shown by Aaberge, Atkinson, and Königs (2018) for the top half of the income distribution, the association between capital and labor incomes in Norway grew between 1995 and 2005. However, when we focus more narrowly on the top 1% of capital income earners, this association declined in the period 1995–2005. To obtain a more comprehensive view on the evolution of inequality in income composition across the distribution, we turn to the evolution of both capital and labor income shares for different groups. As done for previous countries, we focus on the bottom 50%, the middle 50–90%, the 90–95 percentiles and the top 5%.

Table 5 documents the concentration of capital income shares by income group over the period 1979–2013. We observe significant overall changes in the shares for all groups (except the 90–95 group) in the income distribution. From 1979 to 1991, we observe a shift in the concentration of capital incomes from the top 10% toward the bottom 90% (the share of capital income going to the top 10%

17 The latest available observation in the series provided in Aaberge, Atkinson, and Modalsli (2020) refers to the year 2011.

Table 5: Capital income shares by total income group, Norway 1979–2013.

Total income group	1979	1986	1991	1995	2000	2004	2007	2010	2013
0–50%	16%	21%	22%	13%	8%	5%	11%	8%	10%
50–90%	21%	30%	28%	20%	14%	12%	22%	21%	23%
90–95%	10%	11%	9%	7%	7%	7%	10%	9%	10%
95–100%	52%	38%	40%	60%	70%	77%	58%	62%	57%
Capital share (BW)	19%	19%	24%	23%	32%	32%	34%	30%	31%
Gini pre-tax national income (WID)	n.a.	0.26	0.25	0.29	0.33	0.34	0.33	0.32	0.32
Gini total factor income (LIS)	0.38	0.38	0.42	0.45	0.47	0.49	0.47	0.48	0.48

decreased to 49% from a value of 62% in 1979). From 1991 to 2004, we observe a striking shift in the concentration of capital incomes. In this period, the top 5% increased its share by 37 percentage points, potentially in response to the reduced progressivity of the taxation of capital incomes. The process of amplification of the share of capital incomes going to the top 5% in conjunction with the reduction of the shares going to the bottom 90% continued until 2004. From 2004 to 2013, the shares of capital incomes accruing to the bottom 90% regained some percentage points, while the top 5% appears to have lost slightly in the aftermath of the financial crisis. However, in these years, the wealthiest 5% still held far higher shares of capital incomes relative to the end of the 1980s, while the lower and middle classes held a lower share during these years.

In addition to the weighted data sample of capital incomes from LIS (2020) plotted in Table 5, for Norway, we also have access to register data on capital incomes for the whole population from Statistics Norway (Statistics Norway 2020). For each year from 1993 to 2015, Figure 9 plots the average of the capital incomes accruing to the top 5%, 10% and to the 50–90th income percentiles (rank variable is total income). Figure 9 substantially confirms the evidence in Table 5. First, in the years post-DIT reform, capital incomes for the top income percentiles increased, especially for the top 5%. Second, it is clear that 2000 and 2005 were years in which anticipations of upcoming dividend tax reforms determined higher capital incomes for the top 5%. Regarding the aggregate statistics on the functional and personal income inequality also summarized in Table 5, the capital share of income increases monotonically from 19% in 1986 to 34% in 2007, before it declines slightly in the last years considered. In other words, in addition to a structural shift in the shares of capital incomes accruing to the different income groups, we also observe an overall increase in the share of total income going to capital up to 2007. Regarding the Gini coefficient, both series in Table 5 show a

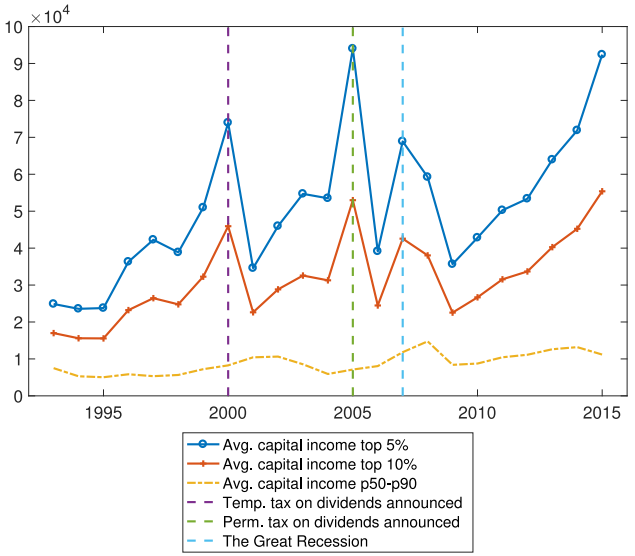

Figure 9: Average capital incomes for different total income percentiles.
This figure plots register data on income retrieved from Statistics Norway, Statistics Norway (2020). Population is ranked according to total income, including capital and labor. We compute the average capital incomes (including capital gains) received by each total income percentile.

sustained increase, mostly in the years subsequent to the tax reform of 1992. See Appendix D for a discussion on entropy measures.

Similar to the other Nordic countries, in Norway, we witness relatively more stable shares of labor income. Table 6 shows changes in the shares of labor income that are of smaller magnitude with respect to the turbulent shares observed for capital incomes. Nevertheless, the share of labor income accruing to the bottom 50% decreased from 24% in 1979 to 17% in 2013, while the share of labor income going to the top 50% increased from 77% in 1979 to 83% in 2013. This shows that the bottom of the distribution is also losing ground with respect to labor incomes.

Table 6: Labor income shares by total income group, Norway 1979–2013.

Total income group	1979	1986	1991	1995	2000	2004	2007	2010	2013
0–50%	24%	23%	20%	18%	19%	18%	18%	17%	17%
50–90%	55%	55%	56%	58%	57%	58%	57%	57%	57%
90–95%	10%	10%	10%	11%	11%	11%	11%	11%	11%
95–100%	12%	12%	13%	13%	13%	13%	15%	15%	15%
Capital share (BW)	19%	19%	24%	23%	32%	32%	34%	30%	31%
Gini pre-tax national income (WID)	n.a.	0.26	0.25	0.29	0.33	0.34	0.33	0.32	0.32
Gini total factor income (LIS)	0.38	0.38	0.42	0.45	0.47	0.49	0.47	0.48	0.48

Let us turn to use the evidence in Tables 5 and 6 as building blocks of the ICI index, namely, the series of the areas below the concentration curves for capital (blue) and labor (red), the difference of which at each point in time uniquely determines the sign and magnitude of the ICI index, as explained in Eq. (5). Figure 10 shows the series of the areas below the concentration curves for both factor incomes in Norway in the period 1979–2013.

Similar to the cases of Denmark and Finland, the (blue) series of the area below the concentration for capital shows the highest variation in Figure 10, declining substantially from the early 1990s to 2004. However, in contrast to the cases of Denmark and Finland, the series of $\tilde{\mu}_w$ also declines significantly, confirming the evidence from Table 6 that labor incomes also shifted toward the top of the income distribution. Overall, Figure 10 documents that from 1979 to 2013, the difference between $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ is positive.

We now focus on our main contribution: the series of the ICI index for Norway in Figure 11. In the initial years 1979–1986–1991, the ICI index decreases from approximately 0.4 to approximately 0.2. This implies that the composition of incomes in the late 1970s and 1980s for the lower parts of the distribution of income gradually becomes more similar to that of the upper parts. The monotonic tendency toward higher levels for the ICI index in Norway starts in the 1990s, with a clear jump in the period 1991–1995. In our view, this tendency can be attributed to the shift in the concentration of capital incomes toward the top (as shown in

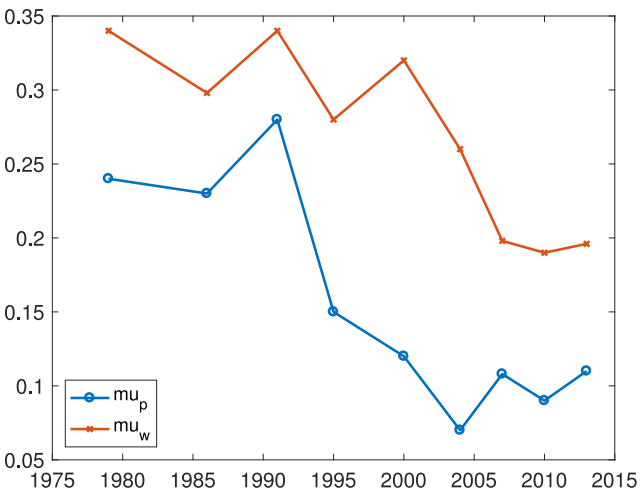

Figure 10: Evolution of the areas of factor concentration curves for Norway. $\tilde{\mu}_\pi$ is the area of the concentration curve for capital (blue), and $\tilde{\mu}_w$ is the area of the concentration curve for labor (red).

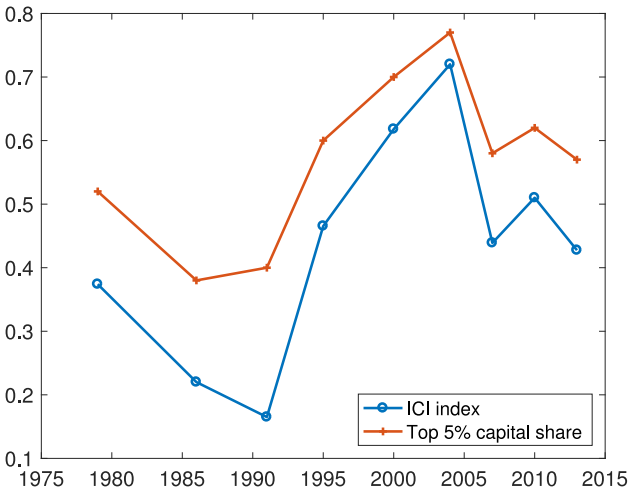

Figure 11: Income composition inequality index in Norway, 1979–2013.
Authors' computation based on LIS (2020) data. This figure shows the yearly ICI index for Norway using the following LIS waves: 1979, 1986, 1991, 1995, 2000, 2004, 2007, 2010, and 2013. Capital shares going to the top 5% of the total income distribution are also reported.

Table 5 and Figure 10) after the DIT reform of 1992. The ICI index reaches a rather high value in 2004, slightly above 0.7.[18] In the period 2007–2013, the ICI index again decreased to lower values similar to those of the late 1990s.

In summary, we estimate for Norway a clear tendency toward a higher degree of income composition inequality throughout the period from 1991 to 2004, potentially due to the tax reform of 1992 that introduced proportional taxation of capital incomes. This implies that throughout the 1990s, the incomes of the upper part of the income distribution became increasingly capital intensive with respect to the incomes of the poor. In the aftermath of the financial crisis (post-2007), Table 5 and Figure 10 show instead levels of concentration of capital incomes in Norway closer to those of the late 1990s. This is reflected in the lower values of the ICI index in these years, in the range 0.4–0.5. Finally, to detect whether there is a direct relationship between changes in the functional distribution of income and changes in personal inequality, we jointly investigate in Figure 12 the evolution of the capital share of income, the ICI index and the Gini coefficient for income. We divide the analysis into three subperiods. In the first subperiod 1979–1991,

18 As mentioned in this section in relation to Table 5, the high value of capital incomes accruing to the top 5% in 2004 in anticipation of the upcoming reform on the taxation of dividends in 2005 also explains the high value of the ICI index in this year.

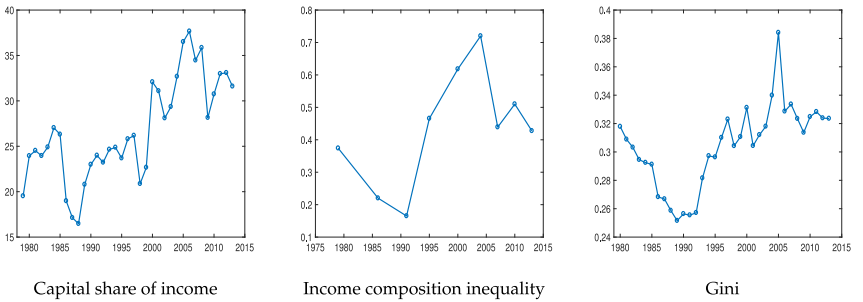

Figure 12: Capital share, ICI index and Gini: Norway, 1979–2013.
The left-hand side graph plots the series of the capital share of income for the period 1979–2013 derived from the Bengtsson–Waldenström (BW) Historical Capital Shares Database in Bengtsson and Waldenström (2018). The graph in the middle plots the series of the ICI index for Norway for the period 1979–2013. The graph on the right-hand side plots the Gini coefficient for Norway from 1980 to 2013, source: World nequality Database (WID.World 2020).

the ICI index displays a low and falling degree of income composition inequality, while the capital share of income appears to be rather volatile. In these years, personal income inequality is clearly decreasing. In other words, the estimation of the ICI index for these years leads us to exclude the functional distribution of income being a main driver of the series of the Gini in Figure 12. The most interesting subperiod is between 1991 and 2005. This period is characterized by a clearly increasing capital share of income (from 24% in 1991 to approximately 36% in 2005), significant positive levels of the ICI index (especially in the years from 1995 to 2004) and increasing Gini (from approximately 0.25 in 1991 to approximately 0.38 in 2005). In our view, the increase in the capital share in these years is partially responsible for the increase in income inequality. The final subperiod, between 2005 and 2013, instead witnessed a decreasing capital share and a stable or decreasing Gini (excluding 2005, which was affected by the dividend tax reform). The transmission mechanism between the functional and personal distributions seems to be weaker in these years (with respect to the values of the ICI index in 2000 and 2004).

In conclusion, for Norway, the hypothesis that changes in the capital share of income constitute a driver of increased personal income inequality seems to hold uniquely for the central subperiod of our analysis (from the early 1990s to 2005, similar to what observed for Finland). In these years, and especially from 1995 to 2005, due to capital incomes shifting dramatically from lower deciles of the income distribution to the very top, the high levels of the ICI index, which are associated with a high partial derivative of the Gini coefficient with respect to changes in the capital share, allow us to claim that the functional distribution has indeed been actively driving the increase in personal income inequality.

3.4 Sweden

Domeij and Flodén (2010) document inequality trends in Sweden using labor incomes for the period 1978–2004 and examine both pre-tax and disposable earnings. The main message is that a clear increase in the dispersion of pre-tax earnings occurred in Sweden in the early 1990s, a result that weakens when instead focusing on the inequality of disposable earnings. The authors explain this development through the gradual reformation of the centralized wage-setting system in the Swedish economy from the 1980s, which reduced the coverage of collective bargaining agreements and increased the use of industry-wide bargaining. García-Peñalosa and Orgiazzi (2013) as well claims that the increase in income inequality that started in 1980s was mainly due to greater earnings dispersion. Analyzing the long-run dynamics of the labor share in Sweden from the 1900s to the 2000s, Bengtsson (2014) shows that the share of labor income began to decline in the early 1980s. Hence, not only did inequality in pre-tax earnings rise, as shown in Domeij and Flodén (2010) but the share of total income accruing to labor also decreased since the 1980s, mostly to the advantage of capital earners in particular and to top income earners in general.

Focusing on the long-run concentration of top incomes in the Swedish economy from 1903 to 2004, Roine and Waldenström (2008) and Roine and Waldenström (2012) show that the portion of capital incomes generated by capital gains plays a decisive role in inequality estimates. When capital gains are included in the definition of capital income, the top 10% income share has increased substantially since the 1990s. Excluding capital gains instead leads to an increase in the share of income going to the top 10% that is more in line with other countries in continental Europe. As shown in Roine and Waldenström (2008) and Roine and Waldenström (2012), since the 1990s, a series of tax reforms that gradually decreased the marginal tax rate on capital (relative to the taxation of labor incomes) created incentives for capital earners to realize larger shares of their investments. In turn, increased capital gains boosted capital incomes at the top of the distribution. The magnitude of this jump is also partially explained by asset price increases in post-1980 deregulated financial markets. On the other hand, this implies that in the period before the 1990s, the concentration of capital incomes at the top of the income distribution in the available income data is largely underestimated. We will return to this point further below.

Overall, the above evidence points in the direction of a higher capital share of income, greater concentration of capital incomes at the very top, and, in turn, a higher Gini coefficient for Sweden starting in the 1980s.

As we have done for the countries considered previously, let us analyze how the approach of considering the inequality of income composition brings novel

Table 7: Capital income shares by total income group, Sweden 1975–2005.

Total income group	1975	1981	1987	1992	1995	2000	2005
0–50%	32%	43%	36%	31%	10%	9%	10%
50–90%	28%	34%	30%	38%	60%	17%	20%
90–95%	9%	7%	8%	9%	12%	8%	8%
95–100%	31%	16%	26%	22%	18%	67%	63%
Capital share (BW)	12%	11%	14%	13%	18%	13%	13%
Gini pre-tax national income (WID)	na.	0.27	0.28	0.28	0.31	0.29	0.31
Gini total income (LIS)	0.42	0.43	0.46	0.49	0.53	0.53	0.51

insights to this literature. Table 7 presents the concentration of capital income across the (total) income distribution for Sweden in between 1975 and 2005.[19]

Regarding capital incomes, the overall picture shows high volatility in the fraction of capital incomes accruing to most of the income groups. Excluding the initial and final years, the clearest trend is of an enormous shift of capital incomes from the bottom 50% to the top 5% between 1981 and 2000. The bottom 90% loses a fraction close to 50% of capital incomes in the period 1981–2005, while the opposite is the case for the top 10%. On aggregate, the capital share of income rose from 11 to 18% in the period 1981–1995 before it declined back to the levels of the 1980s. Regarding the Gini coefficients, both series from WID.World (2020) and LIS (2020) show a monotonic increase throughout the period, with much of it occurring in the period 1981–1995 for both measures. See Appendix D for a discussion on entropy measures. Before we proceed, we describe the dynamics of the concentration of labor incomes in Table 8.

Although with smaller magnitudes than in the case of capital incomes, Table 8 presents a trend of labor incomes shifting from the bottom 50% to the top 50% throughout the period of analysis. In summary, Tables 7 and 8 indicate that the very top of the income distribution has dramatically increased its share of capital incomes, in addition to the mild increase in its share of labor incomes. From the perspective of income composition, this implies that the incomes of the very wealthy became more capital intensive, while the opposite is the case at the bottom of the distribution. Most of this shift in concentration occurred in the two decades from 1981 to 2000.

19 The period of analysis for Sweden is from 1975 to 2005, since LIS (2020) micro data are not available after 2005 due to a domestic law on confidentiality.

Table 8: Labor income shares by total income group, Sweden 1975–2005.

Total income group	1975	1981	1987	1992	1995	2000	2005
0–50%	20%	17%	16%	13%	12%	15%	15%
50–90%	55%	57%	58%	59%	58%	57%	57%
90–95%	10%	11%	11%	12%	12%	11%	12%
95–100%	15%	15%	15%	16%	18%	17%	17%
Capital share (BW)	12%	11%	14%	13%	18%	13%	13%
Gini pre-tax national income (WID)	n.a.	0.27	0.28	0.28	0.31	0.29	0.31
Gini total income (LIS)	0.42	0.43	0.46	0.49	0.53	0.53	0.51

Figure 13 plots the series of the areas below the concentration curves for capital (blue) and labor (red). Similar to the cases of Denmark, Finland and Norway, the (blue) series of the area below the concentration for capital presents dynamics with higher variation in Figure 13, decreasing steadily from the early 1980s to 2000. The series of $\tilde{\mu}_w$ also decreases (up to 1995), confirming the evidence in Table 8 that labor incomes also shifted toward the top of the income distribution. Crucially, Figure 13 entails a negative difference between $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ until (but excluding) 1995, implying that the lower deciles of the total income distribution are characterized by incomes that are relatively more capital income intensive than the upper deciles of the distribution. It is only in the final years 1995–2005 that this difference becomes positive due to the higher share of capital incomes

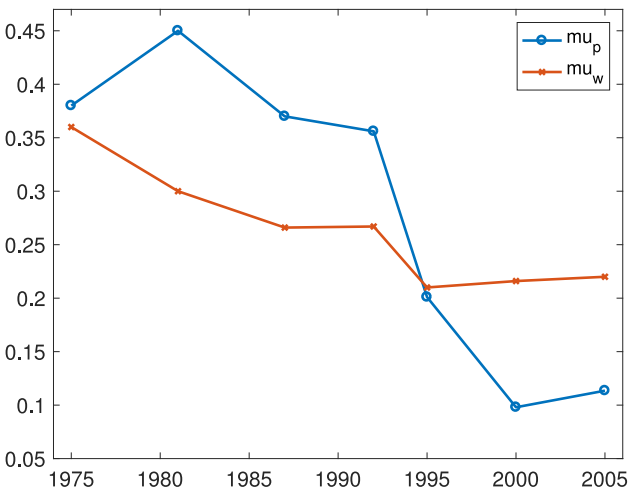

Figure 13: Evolution of the areas of factor concentration curves for Sweden.
$\tilde{\mu}_\pi$ is the area of the concentration curve for capital (blue), and $\tilde{\mu}_w$ is the area of the concentration curve for labor (red).

in the incomes of the wealthy in these years. Recall that this switch in the sign of the difference between the two series in Figure 13 uniquely determines the sign of the ICI index and will therefore be evident in the series of the index for Sweden.

In the following, we attempt to synthesize these dynamics into one a summary statistic, the ICI index for Sweden in the period 1975–2005. Figure 14 shows the results. The evidence shown in Figure 14 is somewhat striking. In contrast to the other Nordic economies previously analyzed in this paper, a significant fraction of the available series for the ICI index for Sweden is of negative sign. The ICI index for Sweden is below zero for the four observations available from 1975 to 1992, with a value of approximately −0.2 for the years 1981, 1987, and 1992. This situation appears to change gradually from 1995 onward, showing a rapid increase in the ICI index from approximately 0 in 1995 to approximately 0.5 in 2000–2005, reflecting the gradual increase in capital incomes accruing to the upper deciles of the income distribution shown in Table 7 and Figure 13. Focusing on the trend, the result emerging from Figure 14 is of increasing inequality in the income composition in Sweden throughout the period from 1981 to 2000. This result accords with the evidence obtained by Roine and Waldenström (2008, 2012) showing that capital incomes gradually became increasingly concentrated at the top of the income distribution. As explained above, Roine and Waldenström (2008, 2012) highlight the fact that only from the 1990s onward have Swedish capital owners

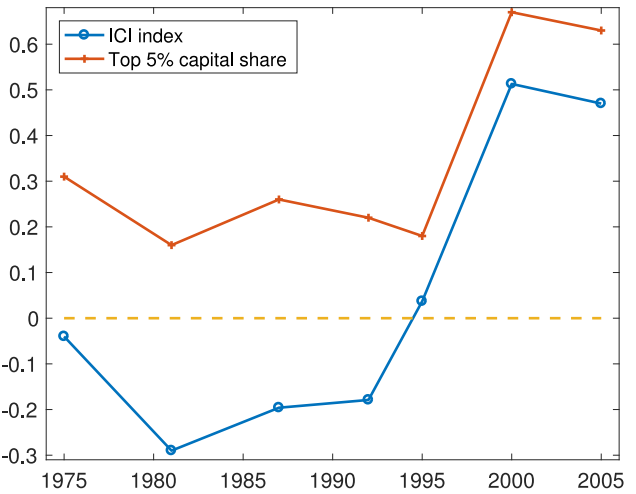

Figure 14: Income composition inequality index in Sweden, 1975–2005.
Authors' computation based on LIS (2020) data. The figure shows the yearly ICI index for Sweden estimated using the following LIS waves: 1975, 1981, 1987, 1992, 1995, 2000, and 2005. Capital shares going to the top 5% of the total income distribution are also reported.

started to realize larger fractions of their investments. Therefore, until the 1990s, the available data on capital incomes largely underestimate the concentration of capital incomes at the top of the income distribution. Before the 1990s, high marginal tax rates on capital and various loopholes in tax legislation are the reasons why capital incomes do not fully appear in the incomes of individuals ranked at the top of the income distribution. To analyze in greater detail the contribution behind the evidence in Figure 14, let us jointly observe in Figure 15 the series of the capital share of income, the ICI index and the Gini coefficient (WID.World 2020).

Let us divide the period 1975–2005 into two different subperiods. First, from 1975 to 1995, the series of the capital share increases significantly, with a jump from below 8% in 1977 up to approximately 18% in 1995. The ICI index shows negative values throughout the subperiod 1975–1992 before it becomes slightly positive in 2005. Hence, we would expect a rather limited (and, if any, negative) effect from the functional distribution of income on the Gini coefficient in those years. The evidence of a stable Gini coefficient of approximately 0.27–0.28 throughout the 1980s partially confirms a story of limited response of the level of personal income inequality to changes in factor shares of income. Second, the period from 1995 to 2005 witnesses again a rather volatile series of the capital share of income, jumping to 18% in the first half of the 1990s and subsequently declining in 2000 back to 12%. In these years, the ICI index jumps from approximately 0 in 1995 to 0.5

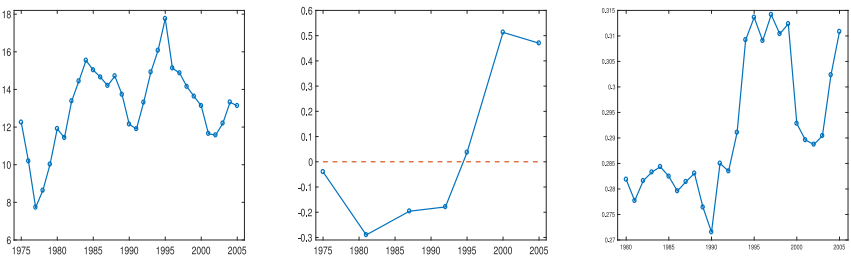

Figure 15: Capital share, ICI index and Gini in Sweden, 1975–2005.
The left-hand side graph plots the series of the capital share of income (value added net of capital depreciation minus employee compensation) in the period 1975–2005. This series is obtained from the Bengtsson–Waldenström (BW) Historical Capital Shares Database in Bengtsson and Waldenström (2018). The graph in the middle again plots the series of the ICI index for Sweden in the period 1975–2005, as shown in Figure 14. The graph on the right-hand side plots the Gini coefficient for Sweden from 1980 to 2005, source: World Inequality Database (WID.World 2020).

in 2000. This implies that the degree of income composition inequality is initially low but then increases to higher values in the years 2000–2005. Hence, the only period for which the dynamics of the capital share of income can be considered among the key determinants of the Gini coefficient is the period 2000–2005. In those years, however, volatility in both the capital share and the Gini coefficient lead us to exclude the possibility that the functional distribution has had a very significant effect on the level of personal income inequality. Overall, in contrast to the other Nordic countries, our results indicate that the functional income distribution cannot be identified as one of the determinants of increasing income inequality in Sweden.

4 Discussion

The four country-level analyses in Section 3 show how movements in capital incomes, which increasingly go to the top of the total factor income distribution, are responsible for the increase in income composition inequality in all the Nordic economies. The evidence of increased capital income shares at the top of the income distribution starting in the early 1990s is in line with findings in the literature (Aaberge and Atkinson 2010; Jäntti et al. 2010; Roine and Waldenström 2012; Søgaard 2018). However, the relation between the latter result and the increase in income composition inequality across the income distribution is a novel contribution. Furthermore, this case study has clearly shown how low income inequality may be accompanied by substantial heterogeneity in the composition of income. In Milanovic (2017)'s terminology, these findings would mean that the Nordics are moving toward a *classical capitalism* type of society, as ownership of factor incomes (capital and labor) is increasingly separated, creating two social groups that are non-overlapping in their income levels.

These main results are summarized in Table 9, in which the subperiods for which rising capital shares actually contributed to rising income inequality are highlighted (in gray). In each subperiod in which we observe a strong increase in the capital income share in conjunction with high income composition inequality, we also observe a strong increase in the Gini coefficient. The shaded subperiods are those characterized by relatively high responsiveness of the Gini coefficient to increases in the capital share of income. It emerges from our results that the use of the income composition inequality framework allows us to appreciate time-varying and country-specific relations in greater detail, as we also claim in Appendix A. Furthermore, the increase in income composition inequality and, relatedly, the stronger sensitivity of personal income inequality to changes in the capital share might represent a challenge to the Nordic egalitarian model in the

Table 9: Summary of results by country.

		Income composition inequality				
Country	**Period**	**Variation (weak/strong) or sign (high/low)**				
		Cap. share	mu_p	mu_w	**ICI index**	**Gini**
Denmark	1987–2016	+ (Weak)	− (Strong)	− (Weak)	+	+ (Strong)
	1987–1995	+ (Strong)	− (Strong)	− (Weak)	+ (Low)	− (Weak)
	1995–2009	− (Strong)	− (Strong)	− (Weak)	+ (Low)	=
	2009–2013	+ (Strong)	− (Weak)	− (Weak)	+ (High)	+ (Strong)
Finland	1987–2016	+ (Weak)	− (Strong)	− (Weak)	+	+ (Strong)
	1990–2007	+ (Strong)	− (Strong)	− (Weak)	+ (High)	+ (Strong)
	2008–2013	− (Weak)	+ (Weak)	− (Weak)	+ (High)	+ (Weak)
Norway	1979–2013	+ (Strong)	− (Strong)	− (Weak)	+	+ (Weak)
	1979–1991	+ (Weak)	+ (Weak)	+ (Weak)	+ (Low)	− (Strong)
	1991–2005	+ (Strong)	− (Strong)	− (Strong)	+ (High)	+ (Strong)
	2005–2013	− (Weak)	+ (Weak)	− (Weak)	+ (High)	− (Weak)
Sweden	1975–2005	+ (Weak)	− (Strong)	− (Weak)	−/+	+ (Strong)
	1975–1995	+ (Strong)	− (Strong)	− (Weak)	− (Low)	+ (Strong)
	1995–2005	− (Weak)	− (Strong)	+ (Weak)	+ (High)	− (Weak)

mu_p is the area below the concentration curve for capital income; mu_w is the area below the concentration curve for labor income. Heuristically, we define a high income composition inequality index as being above 0.4.

future, as the thought experiment in Appendix B illustrates. A related aspect that emerged in the country sections is the tight relation of the ICI index to changes in taxation regimes. Hence, in Subsection 4.1, we will investigate in greater detail the role of taxation and, in particular, the introduction of dual income taxation. Finally, robustness checks are presented in Subsection 4.2.

4.1 Dual Income Tax Reforms and Progressivity

From the core of the paper, it emerges that the dual income tax (DIT) reforms in the Nordic countries in the early 1990s contributed to important shifts in the concentration of capital incomes across the income distribution and hence to rapid changes in the degree of income composition inequality. The aim of this subsection is therefore to investigate the role of taxation reforms in the dynamics of income composition inequality.

Sørensen (1994) describes in detail how the Nordic countries moved in the early 1990s away from the principles of global income taxation (GIT) (where global refers to the sum of a taxpayer's income from all sources) toward a system

of dual income taxation (DIT) in which taxation on capital and labor income is differentiated. The characteristic of the DIT system is that the lowest marginal tax rate for labor and transfer incomes (labeled *personal*[20] or earned income) is chosen as the proportional (flat) tax on capital incomes (encompassing all types of capital incomes). In other words, capital incomes are taxed at a flat rate considerably lower than the effective rate on personal incomes from labor and transfers. Overall, DIT reforms imply a lower progressivity of the tax system, potentially increasing the dispersion of *after-tax* incomes across the distribution, compared to the *before-tax* income distribution (Thoresen 2004).

However, claims on the causal distributional effects of the DIT systems ignore an important behavioral aspect regarding capital gains (as highlighted by Roine and Waldenström (2012) for Sweden) triggered by taxation reforms. Before the reforms, substantial shares of the incomes of shareholders were retained profits in firms; hence, capital gains were not realized, and the corresponding capital incomes did not appear at the top of the distribution. The DIT reforms lowered marginal tax rates on capital incomes (also broadening the tax base by eliminating tax favors for specific types of capital investments), triggering an extensive distribution of dividends and capital gains that contributed to the shift in the concentration of capital incomes toward the top of the distribution.

Readapted from Sørensen (1994), Table 10 presents the DIT reforms and the resulting marginal tax rates on personal and capital incomes in the Nordic countries. Table 10 clearly shows that the progressivity of the taxation of capital incomes has decreased in the Nordic countries as a consequence of the DIT reforms, especially with respect to taxation of labor incomes.

In this work, rather than being interested in disentangling the causal distributional effects of the DIT reforms (as done, for instance, in Thoresen (2004) for Norway), we are interested in how taxation policy changes may alter the degree of income composition inequality. Based on the evidence from the core sections of this paper, our informed guess is that the introduction of the DIT reforms led to a jump in the concentration of capital incomes toward the top, implying a lower area of the concentration curve for capital incomes and correspondingly higher values of the ICI index. Since a higher value of the ICI index is associated with a stronger relationship between the functional and personal distributions of income, we expect in the aftermath of the DIT reforms to observe a stronger responsiveness of the personal income distribution to changes in capital share of income.

20 Personal income refers to personal income from sources other than capital, in accordance with the terminology used in Sørensen (1994) and in the Nordic tax law.

Table 10: Marginal income tax rates in the Nordics, before/after DIT reforms.

Country	(1) Tax rates personal income[a]	(2) Tax rates capital income
Denmark		
Before 1993–1994 reform	50–68	50–56
After 1993–1994 reform	38–58	38–44
Finland		
Before 1993 reform	25–57	25–57
After 1993 reform	25–57	25
Norway		
Before 1992 reform	26.5–50	26.5–40.5
After 1992 reform	28–41.7	28
Sweden		
Before 1991 reform	36–72	36–72
After 1991 reform	31–51	30

[a]This table is rearranged from Table 1 (page 59) in Sørensen (1994). Sørensen (1994) also includes the corporate income tax rates before and after the introduction of the DIT system, which have been excluded from the table above since they lie beyond the scope of this paper.

Figure 16 plots, for each of the four countries under analysis, the series of the partial derivative of Eq. (6) obtained by substituting the series of the areas below the single-factor concentration curves, $\tilde{\mu}_{\pi}$ and $\tilde{\mu}_{w}$. The vertical reference line is the year when the DIT reform was introduced. The descriptive evidence in Figure 16 highlights that the DIT reforms are a valid candidate to explain the rising degree of income composition inequality in the Nordics in recent decades.[21] By reducing progressivity in the taxation of capital incomes, the DIT reforms led to a shift in capital incomes toward the top of the distribution that resulted in higher inequality in income composition. This implies that taxation might not only affect the income distribution directly, with lower progressivity increasing inequality (Jaumotte and Osorio Buitron 2020; Roine, Vlachos, and Waldenström 2009; Rubolino and Waldenström 2020),[22] but also indirectly, strengthening the detrimental effects of rising capital shares.

21 To conduct a proper econometric analysis of this relationship, we would need substantially more observations of the degree of responsiveness of Eq. (6) and of the ICI index.

22 See also Roine and Waldenström (2015) for a review of previous studies.

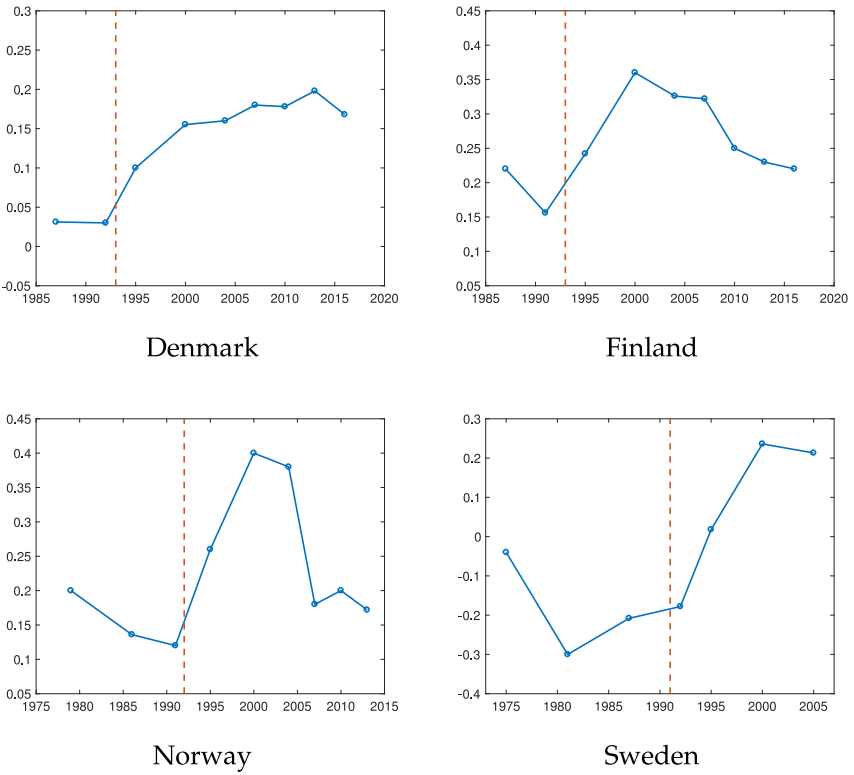

Figure 16: Gini responsiveness and dual income taxation.
For each of the four countries under analysis, we plot here the series of the partial derivative of Eq. (6) obtained by substituting the series of $\tilde{\mu}_{\pi}$ and $\tilde{\mu}_{w}$. The vertical reference line signals the introduction of the DIT system: 1993 for Denmark and Finland, 1992 for Norway, and 1991 for Sweden.

4.2 Robustness: The Inclusion of Transfer Income

We perform a robustness check by including transfers in the core definition of income given in Eqs. (1) and (2). Specifically, we include public pensions (both contributory and not), private pensions, other public social benefits and private transfers (cash transfers) as labor income in Eq. (2). This allows us to check whether our main results are robust when including components that may be considered as deferred income. In particular, including public contributory pensions also implies that elderly people are placed in the correct position in the income distribution instead of being considered poorer than they effectively are. Since transfer income affects more of the bottom part of the income distribution

(especially public social benefits), our guess is that the new income definition entails a more labor-intensive (capital-intensive) income for the poor (wealthy) relative to the baseline definition of income. Other things being equal, a higher concentration of labor income toward the bottom of the distribution increases the area under the concentration curve for labor, shifting the ICI index upwards. The results are presented in Figure 17.

As expected, we find higher values for the ICI index for all the Nordic countries and throughout the period of analysis (the magnitude of the increase is approximately 0.1–0.2 points). This evidence confirms the hypothesis that the polarization in income composition between top earners with capital-intensive incomes and bottom earners with more labor-intensive incomes becomes stronger

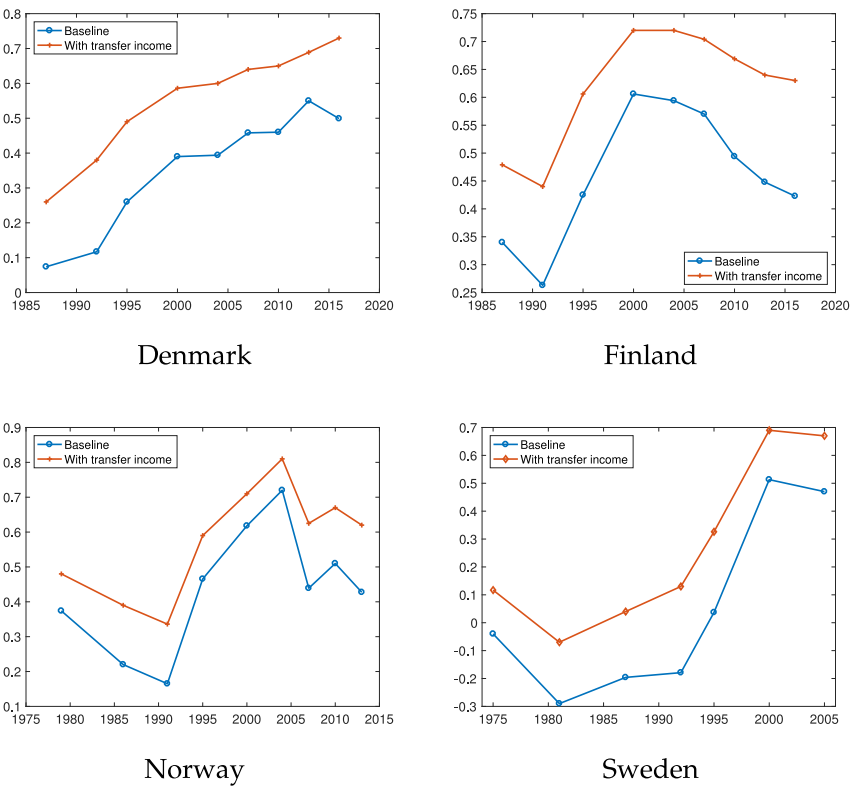

Figure 17: ICI index in the Nordics, including transfer income.
Authors' computation based on LIS (2020) data. The figure shows the yearly ICI index for Denmark, Finland, Norway and Sweden estimated using all available LIS (2020) waves, with and without transfer income.

when transfer income is taken into account. Moreover, the trends in the index closely follow those for the baseline definition of income in all Nordic countries, such that our conclusions are robust to the inclusion of transfer income.

5 Concluding Remarks

In this research, we provide novel estimates on the degree of income composition inequality in Nordic countries in recent decades. In our view, the set of contributions of the paper can be summarized into two main strains.

First, this paper provides novel evidence of the structural change in income composition taking place in Nordic countries since the early 1990s. This finding is robust to country heterogeneity in trends and levels of the capital shares of income. We document rising inequality in the composition of individual incomes, mostly derived from a shift in capital incomes toward the top of the income distribution. We also provide a discussion of the potential determinants of these dynamics, identifying the reforms of capital income taxation that took place in the early 1990s (dual income taxation reforms) in the Nordic countries. We highlight that the lower progressivity of capital income taxation introduced by the DIT reforms lies behind the shift in capital incomes toward the top of the distribution that led to rising inequality in income composition and strengthens the responsiveness of personal income inequality to changes in the aggregate capital share.

Second, we use the estimates of the degree of income composition inequality to understand whether changes in the capital share of income can be considered among the determinants of the level of personal income inequality in the Nordic economies in recent decades. In summary, our descriptive analysis shows that for Sweden, rising capital shares of income did not have a significant impact on the level of personal income inequality. For Finland and Norway, the results show that a high degree of income composition inequality in the period from the 1990s up to approximately 2005 implies that changes in the capital share indeed contributed to increasing personal income inequality. For Denmark, the same applies but only for the period from 2009 to 2013.

We argue that if the trends of increased heterogeneity among individual factor shares uncovered in this work persist and if these are coupled with more significant increases in the aggregate capital share, the transmission from the functional to the personal distribution of income might represent an important factor potentially increasing personal income inequality in the Nordic economies in the future.

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Appendix

A Cross-Country Evidence

In this section of the Appendix, we shift the focus to cross-country analysis. We do not provide a fully-fledged econometric analysis of the long-run relationship between the capital share of income and income inequality in the Nordic countries, as already done in Bengtsson and Waldenström (2018). Rather, the following cross-country evidence will help to interpret the country-specific results provided in subsections 3.1–3.4. First, Table 11 provides some summary statistics.

Table 11: Summary statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
Gini of total income (WID.World)	114	0.318	0.028 8	0.252	0.384
Capital share of income	128	19.78	7.002	5.250	37.66
Top marginal tax rate (capital, %)	134	42.29	16.87	25	72
GDP per capita (current USD)	131	34,978	20,294	4,697	102,913
Market capitalization (% of GDP)	98	48.04	42.27	2.676	258.4
Government expenditure (% of GDP)	131	23.04	2.612	17.90	27.93

Capital share of income (1975–2013) for Denmark, Finland, Norway, Sweden were retrieved from the Bengtsson–Waldenström (BW) Historical Capital Shares Database in Bengtsson and Waldenström (2018). Time series for the Gini coefficient (WID.World) (1980–2013) for Denmark, Finland, Norway, Sweden, were retrieved from: World Inequality Database WID.World (2020). Top marginal tax rates on capital incomes are taken from Table 10. GDP per capita, current USD; market capitalization of listed domestic companies, as a % of GDP; general government final consumption expenditure, as a % of GDP, are retrieved from the World Development Indicators of the World Bank.

Let us introduce the baseline linear specification. Dependent variable is the Gini coefficient (WID.World 2020) for country $i = 1, \dots, 4$ and time t; μ_i comprises country fixed effects; t captures time fixed effects; CS_{it} is the capital share in value added for country $i = 1, \dots, 4$ and time t; X_{it} is a matrix of control variables (top marginal tax rate on capital incomes; GDP per capita, current USD; market capitalization of listed domestic companies, as a % of GDP; general government final consumption expenditure, as a % of GDP), and finally ε_{it} is the random error term.

$$\text{Gini}_{it} = \mu_i + t + \beta_0 + \beta_1 CS_{it} + X_{it}\delta + \varepsilon_{it}. \tag{7}$$

Table 12 presents the results of the baseline GLS specification, with fixed effects and controls introduced step-wise. The non-significant estimate in column (4) of Table 12 indicates, if anything, that the transmission mechanism measured by the ICI index has been weak on average for the countries analyzed.[23]

Apart from standard endogeneity caveats that can be raised regarding the model specification in Eq. (7), we intend to raise a fundamental issue here. Estimating the shape of the relationship between the functional and the personal distribution of income, as done in Eq. (7) through the GLS coefficient β_1, is in our view a sub-optimal approach for two main reasons. First of all, the relationship we aim to estimate between functional and personal income inequality is inherently non-constant and country-specific, as shown in the core sections of this paper. Hence, approaching it from a cross-country perspective limits a deeper understanding of the underlying forces. Second and most importantly, the shape

Table 12: Capital share and income inequality in the Nordics.

	(1) Gini(WID)	(2) Gini(WID)	(3) Gini(WID)	(4) Gini(WID)
Capital share of income	0.265***	0.158*	0.179	0.114
	(0.100)	(0.091)	(0.146)	(0.088)
Controls	No	No	Yes	Yes
Year F.E.	No	Yes	No	Yes
Country F.E.	No	Yes	No	Yes
Observations	114	114	93	93

Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Column [1] reports estimates of β_1 without controls and fixed effects, which are introduced step-wise in columns [2, 3, 4].

23 In Bengtsson and Waldenström (2018), using annual observations for the period 1980-present, authors find as well nonsignificant estimates for the elasticity of top income shares to capital share of income for the Nordic economies (see Bengtsson and Waldenström (2018), Table 2, Page 727).

of the relationship between the functional and the personal distribution grasped in Eq. (7) through the coefficient β_1, is only one side of the story. The degree of responsiveness of the Gini coefficient to changes in capital share of income is *crucially* hinging on the strength of the transmission mechanism – the degree of income composition inequality. This point is illustrated by the two hypothetical cases below:

1. *(High β_1, low ICI index in absolute value)*. In this case, the degree of income composition inequality is low (i.e., the ICI index close to zero). A high value of the β_1 indicates that changes in the Gini coefficient strongly correlate with changes in the capital share of income. However, the low degree of income composition inequality allows us to disregard the functional distribution as a key determinant of the Gini coefficient.
2. *(High β_1, high ICI index in absolute value)*. The degree of income composition inequality is high (e.g., ICI index is close to one). A high value of the β_1 indicates that changes in the Gini coefficient strongly correlate with changes in the capital share of income. This time, the high degree of income composition inequality highlights the functional distribution as a key determinant of the Gini coefficient.

To convey graphically the argument above, Figure 18 plots the β_1 coefficient from Table 12 jointly with the derivatives in Eq. (6) by employing the series of the $\tilde{\mu}_\pi$

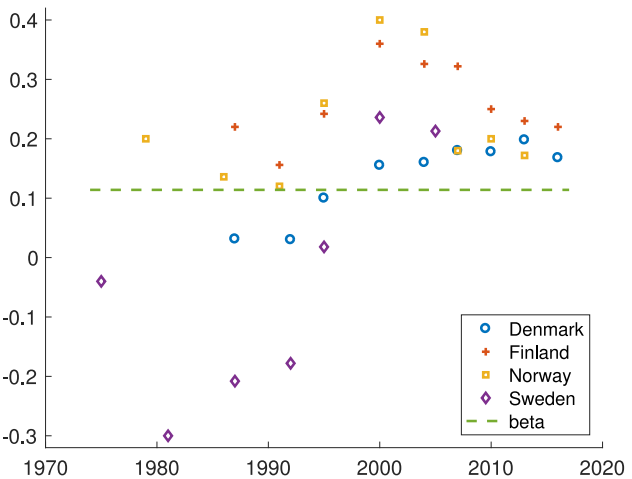

Figure 18: Comparison between pooled derivatives and regression coefficient.
The horizontal green line is the β_1 from column 4 of Table 12, representing the average of the estimated elasticity of the Gini coefficient to the functional income distribution. The colored dots represent instead the elasticity in Eq. (6) and estimated by using LIS (2020) data for each country/year.

and $\tilde{\mu}_w$ for each country. In line with main results, notice how the degree of responsiveness of the Gini coefficient to changes in the aggregate capital share of income has been increasing since the 1990s. Figure 18 shows as well that the β_1 coefficient underestimates this responsiveness for most countries and years.

B A Simulation Exercise

In this section of the Appendix we introduce a simple simulation exercise, aimed at showing the relevance of the approach of income composition inequality for understanding the evolution of personal income inequality. To this end, we introduce a benchmark country in order to provide context to our thought experiment, namely the United States. The Nordic countries and the US are at the two extremes of the OECD countries for what concerns income inequality. How does that modify when we shift the focus to income composition inequality? A similar approach, although with focus on relative income mobility, was followed by Björklund and Jantti (1997).

For comparability reasons, we utilize the LIS (2020) data for the estimation of the ICI index for the US. For the last wave available, year 2016, the ICI index turns out to be equal to 0.26. It follows that, whereas the Nordic countries stand out in the comparison with the US as being relatively more egalitarian in terms of income inequality, this needs not be the case for what concerns inequality in income composition. In fact, the degree of income composition inequality is higher for Denmark, Finland and Norway in the latest years, being respectively equal to 0.50, 0.42 and 0.43.[24]

A lower income composition inequality in the US means that, paradoxically, a rising capital share of income might represent a larger threat for the dynamics of income inequality in the Nordic countries, compared with the US, all else held constant. This represents a further reason for which it might be relevant from a policy point of view to follow the development of income composition inequality in the Nordic countries.

In order to make our point clearer, we construct a deterministic forecasted path for the Gini coefficient conditional on initial values calibrated on data for the Nordic countries and for the United States, leaving aside Sweden due to lack of recent observations. We use data on average rates of return on capital from the database in Jordà et al. (2019). From the same database we compute growth rates for GDP in the different countries. Moreover, as in the previous sections, we consider net capital shares from Bengtsson and Waldenström (2018) and

24 The latest available observation is 2013 for Norway and 2016 for Denmark and Finland. For Sweden we do not have observations for these years.

Gini coefficients on market incomes from WID.World (2020). For rates of return on capital, GDP growth rates and net capital shares, we average the available observations from 1994, year from which we observe a structural change in the series for the ICI index in the Nordic countries, to the most recent observations. For what concerns the initial value of the Gini coefficient (our variable of interest), we start from country specific empirical values for the latest observation available.

An important building block of our simulation exercise is given by the responsiveness of the Gini coefficient with respect to changes in capital income shares, estimated on LIS microdata through Eq. (6). In particular, for each country we consider the average of the estimates of the degree of responsiveness in the period 1994–2016. Starting from the empirical values of our variables of interest and from the country-specific average responsiveness rates, we simulate a simple system that evolves according to the following laws of motion.

For each country, GDP grows at a constant rate of growth g_i, namely the empirical average calculated for the years 1994–2015, such that the evolution of GDP reads:

$$\mathrm{GDP}_{i,t} = (1 + g_i)\mathrm{GDP}_{i,t-1}. \tag{8}$$

Capital in this system evolves as follows:

$$K_{i,t} = (1 + r_i)K_{i,t-1}, \tag{9}$$

with r_i assumed to be fixed over time, heterogeneous across countries, and equal to the empirical average rate of return on capital. Based on this information, at each time step we compute the capital share of income, as described in Eq. (10):

$$\mathrm{CS}_{i,t} = \frac{r_i K_{i,t}}{\mathrm{GDP}_{i,t}}. \tag{10}$$

For the purpose of this thought experiment, the Gini coefficient of income is assumed to depend (i) on past Gini coefficients and (ii) on the degree of responsiveness of the Gini coefficient to the change in the capital share of income, $\frac{\partial \mathcal{G}_i}{\partial \pi_i} = \epsilon_i$, as in Eq. (11):

$$\mathrm{Gini}_{i,t} = \mathrm{Gini}_{i,t-1} + \epsilon_i(\mathrm{CS}_{i,t} - \mathrm{CS}_{i,t-1}). \tag{11}$$

We simulate the above system of equations for $T = 30$ years, and show the resulting percentage growth in the Gini coefficient for each of the countries considered. We present the simulation results in Table 13.

In this hypothetical scenario, assuming no other factor is affecting income inequality and hypothesizing the constancy over time of r_i, g_i and of the degree of responsiveness ϵ_i, we find that inequality in Norway grows by 33%. Inequality in Denmark would only slightly increase (0.64%), while inequality in Finland would witness a major increase (62%). For United States inequality would instead

Table 13: Simulation results.

Country	ϵ_i	$r_i - g_i$	Gini growth (%)
Norway	0.227 6	0.110 0	33
Denmark	0.133 4	0.087 3	0.64
Finland	0.258 4	0.127 7	62
United States	0.140 0	0.070 0	−2.5
Norway	$\beta_1 = 0.114$	0.110 0	16
Denmark	$\beta_1 = 0.114$	0.087 3	0.55
Finland	$\beta_1 = 0.114$	0.127 7	27

In this example $T = 30$. r, g and responsiveness are assumed to be fixed in time and equal to the empirical average observation from the year 1994 (after introduction of DIT) to the year 2013 for each country. β is the coefficient estimated in Section A and is equal to 0.114.

slightly decrease. These simulated paths depend both on the difference between r_i and g_i,[25] in line with Piketty (2014), and on the responsiveness of the Gini coefficient with respect to changes in the capital share.

In the final three simulations in Table 13, we assume that the responsiveness is equal to the β_1 coefficient found in the regression exercise in Section A and simulate the same forecasted path. Assuming this common degree of responsiveness would underestimate the resulting inequality in all Nordic countries considered here, confirming our statement that having country specific degrees of responsiveness, as those estimated through the income composition inequality approach, is more informative.

We do not claim that this simulation exercise can be used for forecasting future inequality levels in the Nordic countries, since, in reality, there are numerous confounding factors that affect the evolution of personal income inequality. Furthermore, we are not taking into account multiple sources of endogeneity in the evolution of the different variables. However, we believe that this stylized exercise with alternative scenarios helps to show how the degree of income composition inequality is a key statistic that should be taken into consideration for policy aimed at reducing personal income inequality.

C Growth Incidence Curves

As a complementary evidence for the evolution in capital and labor incomes across the total factor income distribution in LIS data we present growth incidence

25 In this simple thought experiment we are considering a saving rate s equal to 1.

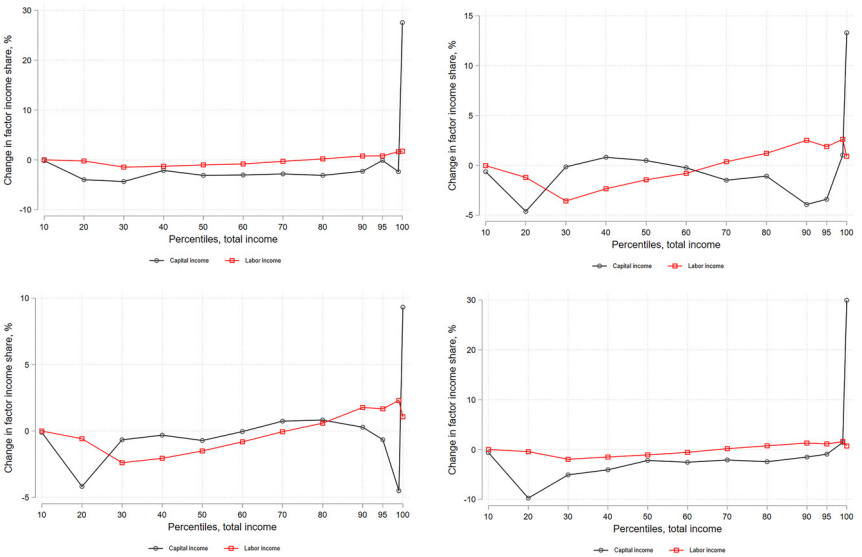

Figure 19: Factor income incidence curves.
These figures plot country-by-country the change (%) in the factor income shares, for each decile of the total income distribution.

curves for each of the four countries under analysis. Figure 19 plots the factor income incidence curve for Denmark, Finland, Norway and Sweden respectively, capturing the percentage change in capital and labor income across the total income rank in between the first period available (1979–1987) and the last one (2005–2016).

In line with the analysis in the main text, it is visible how the very top experienced surges in their capital incomes, while the rest of the distribution witnessed relatively minor changes in their labor and capital incomes in percentage terms.

D Decomposing Inequality: Varying Weights Across Income Groups

In this section, we add brief evidence on generalized entropy measures, to complement the analysis in the main text of the paper, which relies mostly on the Gini as the only aggregate measure of inequality. Table 14 presents, for each country and for each year, several entropy measures, attributing heterogeneous weights to different income groups. Assigning a higher weight to the bottom of the total income distribution results in large changes in the corresponding entropy

Table 14: Generalized entropy measures.

Country	Year	GE(−1)	GE(0)	GE(1)	GE(2)
Denmark	1992	937.920 94	1.133 58	0.394 43	0.404 06
	1995	165 000	1.184 42	0.396 20	0.561 24
	2000	213 000	1.124 40	0.388 67	0.570 77
	2004	169 000	1.069 41	0.395 04	1.466 35
	2007	170 000	1.172 20	0.429 61	0.714 50
	2010	268 000	1.197 75	0.457 47	1.128 53
	2013	235 000	1.198 56	0.477 94	2.167 37
	2016	172 000	1.057 47	0.512 55	9.779 62
Finland	1987	37.539 11	0.618 48	0.282 14	0.278 21
	1991	26.140 33	0.587 95	0.285 86	0.282 28
	1995	28.134 90	0.673 44	0.341 00	0.382 58
	2000	42.676 95	0.705 07	0.424 08	1.150 51
	2004	94.159 84	0.912 96	0.452 66	0.960 30
	2007	137.448 32	0.968 49	0.475 84	1.176 14
	2010	180.167 77	1.063 38	0.455 90	0.660 50
	2013	228.362 79	1.132 37	0.459 64	0.725 23
	2016	228.776 54	1.164 23	0.469 57	0.621 82
Norway	1979	3.043 39	0.358 64	0.209 92	0.291 37
	1986	6.610 21	0.382 78	0.213 78	0.201 32
	1991	29.579 00	0.587 36	0.297 44	0.301 06
	1995	370.571 72	0.890 46	0.372 09	0.432 01
	2000	623.339 20	0.938 74	0.448 73	0.833 79
	2004	172 000	1.158 42	0.543 68	2.366 86
	2007	944.949 99	0.950 97	0.431 40	0.900 56
	2010	139 000	1.050 47	0.455 23	1.048 17
	2013	169 000	1.025 53	0.427 12	0.628 33
Sweden	1975	6.164 99	0.470 23	0.264 00	0.271 64
	1981	6.421 81	0.543 02	0.296 50	0.280 82
	1987	11.070 54	0.680 04	0.355 94	0.370 74
	1992	30.117 60	0.800 90	0.392 00	0.381 81
	1995	151.054 16	0.559 97	0.299 60	0.302 07
	2000	162.150 71	0.901 34	0.576 69	2.433 31
	2005	458.892 99	0.900 35	0.472 76	5.530 80

The table shows different general entropy measures of inequality, GE(a). The higher the a, the more sensitive becomes GE(a) to differences at the top of the income distribution. Vice versa, the lower (and negative) the a, the more sensitive becomes GE(a) to income differences at the bottom of the distribution. GE(1) corresponds to the Theil index.

measure, GE(−1), with overall increasing trends in all countries. This implies that reductions in income shares at the bottom are a key contributor to variations in inequality measures in the period. An overall increasing trend is confirmed also

when considering the other entropy measures, with GE(1) (Theil index) and GE(2) assigning higher weights to upper parts of the distribution. The only exception is GE(0) for Denmark, which exhibits an overall flat trend.

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