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Still the lands of equality? On the heterogeneity of individual factor income shares in the Nordics

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Still the lands of equality? On the heterogeneity of individual factor income shares in the Nordics*

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Abstract

As far as standard measures of income inequality are concerned, 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 highlight the structural change taking place in all the Nordic countries since the early 1990s, with rising inequality in composition of individual incomes due mostly to a shift in capital incomes towards the top of the distribution. We link this result to changes in taxation of factor incomes, by highlighting the role played by the introduction of Dual Income Taxation reforms in the 1990s throughout the Nordic countries. Our estimates of the degree of income composition inequality allow a descriptive analysis of the role of functional distribution as a determinant of personal income inequality in the Nordics. We show that for Denmark in the period 2009 – 2013, Finland 1990 – 2007, and Norway 1991 – 2005, rising capital shares of income contributed to changes in personal income inequality, whilst for Sweden the evidence leads to disregard the capital share as a determinant of income inequality.

JEL Classification: D33, D63, E25.

Keywords: Functional distribution, personal income distribution, income composition inequality, Nordic countries.

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1 Introduction

The link between the functional and the personal distribution of income has returned to be a field of interest for economists in the last years. The debate was initiated by the prediction made in Piketty and Zucman (2014) and Piketty (2014), for which 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 and enriches this important debate, by analyzing empirically 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 the personal distribution of income varies substantially across time and 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 the personal income distribution, by providing evidence on this relationship for the Nordic countries in the last decades. We build on the view from Bengtsson and Waldenström (2018) showing that the relationship between the functional and the personal income distribution is more thoroughly understood by allowing its shape to vary across time and countries. Methodologically, we exploit a recent inequality dimension introduced by Ranaldi (2020), labeled as *income composition inequality*.

How does the concept of income composition inequality innovate on the debate about the relationship between the functional and the personal distribution? The prediction of rising inequality in response to rising capital shares of Piketty (2014) and Piketty and Zucman (2014) lies 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 it is the case for labour income, which Piketty (2014), Piketty and Zucman (2014) and more recently Chancel (2019) show to be indeed the case for most advanced economies since the 1980s. Second, receivers 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 brought about by Ranaldi (2020) is to reduce these two conditions to a single one. Hence, we can study the shape of the relationship between the functional and personal income distribution through estimating 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) index. Ranaldi (2020) shows that a positive *and* high level of the ICI index would, alone, suffice to support the prediction of rising inequality due to rising capital shares 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 pre-tax market income distribution, namely the Nordic countries (see Aaberge et al. (2018a), Barth et al. (2015) for an overview of the stylized facts describing these countries).

Does a low level of pre-tax market income inequality (both in terms of the aggregate and the income factor Ginis) prevent a rising capital share of income from increasing the level of inequality? Does low pre-tax market income inequality also imply low inequality in income composition? Is there a form of Nordic *exceptionalism* (Fochesato and Bowles, 2015) as well with respect to the relationship between the functional distribution and income inequality?

The starting point is the empirical evidence showing the *microeconomic* side of the story, namely the increase in personal income inequality in the Nordic countries since the early 1990s,

[1] For an application of this methodology to the case of Italian economy in the last decades, see Iacono and Ranaldi (2020).

as documented in Aaberge et al. (2018a). In other words, income inequality will act as the dependent variable in our conceptual framework, in line with Bengtsson and Waldenström (2018). The countries under analysis are: Denmark, Finland, Norway and Sweden[2]. The level of personal income inequality in the Nordic countries is plotted by means of the Gini coefficients. Figure 1 conveys this evidence.

[*Figure 1 approximately here*]

Let us focus on the countries and periods for which income inequality increased most significantly. We observe that the Gini coefficient for Norway went from 0.251 to 0.384 in the years 1989 – 2005. For Sweden, the year 1990 marks the lowest Gini, 0.27, increasing from then onward up to 0.31 in 2005. For Finland, the lowest Gini is in 1993 with 0.31 points, climbing all the way to 0.368 in 2011. For Denmark, the Gini is stable around 0.32 up to 2009, followed by a jump to the level of 0.37 in 2013.

All in all, regardless of country differences (which will be further analyzed in the core of the paper), in the post-1990 era the Nordic economies have been subject to prolonged periods of increase in the level of personal income inequality.

As regards the *macroeconomic* side of the story, on the right-hand side of the equation, the main determinant under scrutiny is the net capital share of income in the Nordic countries for the same years, similarly to the model specifications proposed by Bengtsson and Waldenström (2018). Figure 2 conveys this evidence.

[*Figure 2 approximately here*]

Figure 2 shows that the Nordic economies differ more from each other as regards the capital share dynamics of the last decades, than they do with respect to personal income inequality. In brief, whilst the capital share of income is shown to increase for Norway (yellow) and Finland (red) from approximately the beginning 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 the Gini coefficients (Figure 1) can be explained by the evidence of Figure 2? Have the Nordic economies moved towards being societies in which the composition of individual income across the distribution is more or less equal?

The main contribution of this work is to provide robust evidence of the structural change in income composition taking place in the Nordic countries since the early 1990s. For all the countries under analysis, we estimate rising inequality in composition of individual incomes, mostly due to a shift in capital incomes towards the top of the income distribution. A higher share of rich having their incomes to a great extent composed by capital income implies as well a higher fraction of the poor mostly relying on labour income, and can be interpreted as a gradual move towards *classical capitalism*[3] for the Nordic countries in the last decades.

We analyze to which extent the evidence of increasing inequality in income composition hinges on changes in taxation of factor incomes. We highlight that the introduction of Dual Income Taxation reforms in the early 1990s in the Nordics, lowering the degree of progressivity in capital income taxation, lies behind the shift in capital incomes towards the top of the distribution that contributes to the main result of the paper. In other words, not only is a lower progressivity in taxation one of the most important direct determinants of inequality, as generally found in empirical studies (Jaumotte and Osorio Buitron, 2020, Rubolino and Waldenström, 2017, Roine et al., 2009), but it is also an indirect one, by strengthening the transmission channel from the functional to the personal distribution of income. Moreover, we document

[2]Iceland has been excluded due to limited data availability.

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

that the degree of income composition inequality is especially suited to analyze the effects from changes in (factor income) taxation schemes.

We investigate in a descriptive manner whether changes in the functional distribution are among the determinants of personal income inequality in the Nordic economies in the last decades. 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, showing that rising capital shares might have contributed to increasing inequality. In Denmark, this applies to the period from 2009 to 2013 under 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 is provided in Table 9. Finally, by utilizing our estimates of the degree of income composition inequality, we show that the richness of information provided by this dimension is not properly grasped by relying on more traditional cross-country exercises.

The structure of the paper is as follows. Section 2 presents the data and the methodology. Section 3 constitutes the core of the paper showing the main results. Section 4 discusses the role of taxation, it introduces a comparison of our approach to cross-country evidence, it shows a simulation exercise and robustness checks, whilst Section 5 concludes the paper.

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 labour income and capital income. Labour 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 of the 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 the Gini coefficients in 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, unit of analysis are individual adults (equal-split series). These data were employed in Figure 1.

The series for the capital share of income (value added net of capital depreciation minus compensation of employees) are obtained from the Bengtsson-Waldenström Historical Capital Shares Database (Bengtsson and Waldenström, 2018). 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. As regards income of the self-employed, Bengtsson and Waldenström (2018) utilize the proportional method, treating 65 – 70% of the income of the self-employed as labour income, with the residual being treated as capital income. These data were employed in Figure 2.

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 market factor income, rather

than net disposable income, allows us to measure the pre-tax concentration of factor incomes 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[4] 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) [5].

As regards the unit of analysis, we employ household-level data adjusted by the LIS (2020) database sample weight (*hpopwgt*). Then we multiply the LIS (2020) household weights by the number of household members (given by the variable *nhhmem* in the LIS (2020) data variable list).

2.3 Income Composition Inequality

Ranaldi (2020) introduces and defines the properties of a novel inequality dimension, termed as *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 splitting total income Y in two income sources, e.g. total income given by capital π and labor w (although this applies to any other pair of sources), as such $(w + \pi)/Y = Y/Y = 1$.

Individual's income share is given by $y_i = Y_i/Y$, and it can also 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 of individual i. Individuals are indexed by their (total) income ranking.

Income composition inequality is maximal whenever individuals at the bottom and top end of the income distribution separately own the two income sources, thereby making the composition of income *unequal* across the income ranking. This can happen either in a state of the world in which the poorest earn mostly labour income and the richest earn mostly capital income, or in the opposite case in which labour income goes to the top and capital income goes towards the bottom of the distribution.

On the contrary, income composition inequality is minimal whenever all individuals have the same share of factor incomes in their individual income. Notice that a minimal degree of income composition inequality does not imply low personal income inequality.

Ranaldi (2020) proposes a statistic to measure the degree of income composition inequality. As explained in Ranaldi (2020), the income composition inequality (ICI, hereafter) index is constructed by means of the concentration curves for each income source. A concentration curve (similarly to concentration curves introduced by Kakwani (1977a), Kakwani (1977b)) is

[4] As regards 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, 1995; for Norway 1979, 1986, 1991, 1995; for Sweden 1975, 1981, 1987, 1992.

[5] Glyn (2011) attributes the yearly average wage income $\bar{W}_{wa}$ to represent 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.

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.

Figure 3 plots the concentration curves for both income sources, in a theoretical setting with 10 individuals and equal sources of income in the economy ($\pi = w = \frac{1}{2}$). If the area below the concentration curve for income source z is higher than the area for the other income source, then we can claim that z is concentrated more towards the bottom of the income distribution, whilst the other source is owned relatively more among the richest incomes. The sum of the two concentration curves at each given point in time gives back the Lorenz curve for total income.

[*Figure 3 approximately here*]

The next step in Ranaldi (2020) is to introduce the zero and maximum concentration curves, mirroring respectively the situation of *minimal* income composition inequality (the zero concentration curve implies that each individual owns the same share of both income sources along the income distribution) and *maximal* income composition inequality (with income sources owned respectively at the top and at the bottom of the income distribution).

Ranaldi (2020) then constructs the ICI index similarly to the way the Gini coefficient is built, by taking the area given by the difference between the concentration curve for a given income source and the zero-concentration curve, however suitably normalized.[6]

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 (2020). Hence, we can define the ICI index (labeled as ICI_z) as follows:

$$ICI_z = \frac{\mathscr{A}}{\mathscr{B}}. \tag{4}$$

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 $ICI_z = 0$.

On the contrary, a state of the world with maximal income composition inequality can imply either $ICI_z = -1$ or $ICI_z = 1$, depending on which end of the income distribution has higher shares of income source z in their incomes.

In order to highlight the role played by the areas below the concentration curves, a few algebraic steps show that the ICI index can also be expressed as follows[7]:

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

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. 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 for capital will be in that year lower than the area below the concentration curve for labor. This implies that the difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ turns positive, meaning a positive degree of income composition inequality. On the contrary, 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.

[6] Similarly to the Gini coefficient negative values represent an issue for the estimation of the index. For this reason in the following sections we will set negative values equal to 0.

[7] Ranaldi (2020) shows that that $\mathscr{A} = \pi(\tilde{\mu}_y - \tilde{\mu}_\pi)$, where $\tilde{\mu}_y$ is the area below the Lorenz curve. The area below the Lorenz curve $\tilde{\mu}_y$ can be decomposed into the sum of the two areas below the concentration curves for capital and labor: $\tilde{\mu}_y = \pi\tilde{\mu}_\pi + w\tilde{\mu}_w$, which in turn gives $\mathscr{A} = \pi w\,(\tilde{\mu}_w - \tilde{\mu}_\pi)$.

It has to be pointed out that the ICI index differs from a decomposition of the Gini coefficient into the marginal contributions of the dispersion of capital income and labour income taken individually, as in Atkinson (2009).

2.4 The transmission mechanism

Let us attempt to explain why the link (or transmission mechanism) between the functional and personal income distribution is better understood through the lenses of 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 ICI being close to 1, we have a state of the world in which the richest individuals own relatively more capital income as part of their incomes than 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 a higher level of personal income inequality.

The opposite happens when ICI is close to -1, indicating that the poorest part of the population have higher shares of their income composed by capital income with respect to the richest (less common in advanced economies). 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 implies a *strong* transmission mechanism between the functional and the personal income distribution. This is precisely the nexus pinned down in Piketty (2014), for which the increase in capital shares of income is expected to increase personal income inequality.

On the contrary, the transmission mechanism from the functional to the personal income distribution is *weak* under a *low* degree of income composition inequality. A low degree of income composition inequality is measured by an absolute level of the ICI index close to 0. In this case, a sudden shift in the functional income distribution is not expected to have an impact on the level of personal income inequality.

The above reasoning can be formalized following Ranaldi (2020). Deriving the Gini coefficient $\mathscr{G}$, with respect to changes in the capital share of income (assume $z = \pi$), we obtain the elasticity:

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

Equation 6 identifies the connection between the ICI index and the elasticity of Gini to changes in the capital income share[8]. Recall that the right-hand side of equation 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, equation 5 tells us that the ICI index will be positive as well, indicating that an increase in the capital share will imply higher income inequality.

This can be seen through equation 6, since the difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ determines both the sign and the magnitude of the elasticity 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.[9]

[8] In the methodological literature, other Lorenz curve decomposition techniques than that of Ranaldi (2020) permit to estimate elasticities similar to the one in equation 6, as for instance Shorrocks (1982) and Rao (1969). In our view, Ranaldi (2020) highlights more clearly the role of income composition inequality in estimating succinctly (with a single summary statistics) the strength of the transmission mechanism between the functional and personal distribution of income.

[9] Recall that, given that we are considering total capital incomes, the ICI index identifies an average effect of changes of the capital share of income on income inequality. If one wants to take into account effects given by heterogeneous sources of capital income, one would have to disaggregate total capital income in sub-components and build an index on these.

2.5 Political economy implications

Milanovic (2017) defines different economic systems, each with a different transmission mechanism from capital shares to personal income inequality. In *classical capitalism*, ownership of factor incomes (capital and labor) is totally separated, creating two social groups that are non-overlapping by their income level. In terms of the methodology used in this paper, classical capitalism corresponds precisely to a state in which income composition inequality is maximal. The ICI index will therefore be equal to 1 (or −1), with ownership of capital incomes concentrated at the top (bottom) of the income distribution and labour incomes at the bottom (top). Recall that in the state of the world with $ICI = 1$ a rising share of capital income gets to a large extent transmitted into higher personal income inequality, as shown by equation 6.

On the contrary, Milanovic (2017) describes *new capitalism* as the typology of economic systems under which all individuals receive income from *both* capital and labour. If all individuals have the same proportions of capital and labor income, then a rising capital share of income does not necessarily imply a higher level of personal income inequality (although heterogeneous returns on types of capital incomes can still result in a higher level of personal income inequality). In terms of equations 5 and 6, this corresponds to a situation in which the difference $(\tilde{\mu}_w - \tilde{\mu}_\pi)$ tends to 0, resulting in a low level of the ICI index and reducing the strength of the transmission mechanism. As also stressed by Milanovic (2019) this does not necessarily refer to a more egalitarian system. In fact, in such an economy capital income rich individuals also correspond to labour income rich individuals.

The above definitions offer a way of interpreting the results from the estimation of the ICI index for the Nordic countries that will be presented in the next sections. Are the Nordic economies moving towards the classical or new capitalism types? In other words, do the Nordic countries resemble a multiple sources of income type of economy? How heterogeneous are the Nordic economies in this respect?

3 Main results

This section presents the main results of the paper: each of the four countries is analyzed within a stand-alone subsection. This approach is based on results from Bengtsson and Waldenström (2018), showing that the link between the functional and the personal distribution of income varies substantially across time and countries, being contingent on different institutional contexts and production technologies. A summary of the results from this section is provided in Table 9.

3.1 Denmark

Although Denmark ranks among the countries with lowest income inequality in the world (Alvaredo et al., 2018, Chancel, 2019), 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 a tendency of rising inequality at the very top of the income distribution in recent years, up to 2010. According to the authors, in 2010 the share of income going to the top 1% reaches 6.4%, at its highest level over the past three decades.

Søgaard (2018) seeks to explain these changes in top income shares, pointing to (**i**) the role of taxation, jointly with (**ii**) the role of capital income. On the one hand, reductions in top marginal tax rates prospected in the Danish Tax Reform Act of 1993 (Lange et al., 1999) and implemented from 1994 onward, lowered progressivity of taxation of capital incomes (Rubolino and Waldenström, 2017). 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 (2017) identify a causal effect from policy changes in taxation, for the case of Denmark.

On the other hand, Søgaard (2018) points out 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 lowered interest rates) and towards higher dividends (due to lower capital income taxation). Although Søgaard (2018) offers most correlation evidence, the plausible hypothesis is that this increased fraction of dividends in the net capital income received by households in Denmark lies behind the increase in top income shares documented in the literature.

In addition, Søgaard (2018) states that the increase in net capital incomes for the household sector in Denmark in the last decades, has been mostly due to a reduction in negative capital incomes (due again to lowered interest rates leading to lower interest expenditure), rather then an increase in positive capital incomes. In our LIS (2020) data for the Nordic countries, we employ directly net capital incomes, hence we do not capture this dynamics.

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 income distribution. The whole income distribution is split 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.

[*Table 1 approximately here*]

From Table 1 and looking at the overall 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% has radically increased 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 grasped by looking at the aggregate statistics on the functional and personal distribution of income. On aggregate, the capital share of income has slightly increased from 17% in 1987 to 22% in 1995, followed by a mild decrease in the following years. The Gini coefficient from WID.World (2020) has been rather stable around 0.33 up to 2007, with a jump in the last years to a level of 0.37 in 2013[10]. Before commenting on these dynamics, let us focus in Table 2 on the other source of factor income, namely labour incomes.

[*Table 2 approximately here*]

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 in 2016 a fraction of labour incomes 4% higher than in 1987.

Figure 4 summarizes the evidence above by plotting the factor income incidence curve for Denmark, capturing the percentage change in capital and labor income across the total income rank in between 1987 and 2016.

[*Figure 4 approximately here*]

[10]The gap in the series for 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 both series appear to be rather similar. Notice that, although we exclude pensions in our baseline definition of income, the inclusion of pensions does not alter any of our results.

All in all, Tables 1-2 and Figure 4 indicate that the top of the income distribution has increased its share of capital incomes, with incomes of the very rich becoming more capital-intensive, whilst the opposite has happened at the bottom of the distribution. This development has been mainly driven by the shift in the concentration of capital incomes towards the top.

As explained in Equation 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 estimating the ICI index itself, it is instructive to give a look at the series of these areas, as in Figure 5.

[*Figure 5 approximately here*]

First, focus on the blue series of the area of the concentration curve for capital, $\tilde{\mu}_\pi$. A drop in the area below the concentration curve for capital, as a result of capital incomes shifting towards the top (this area is large/small when capital incomes accrue towards the bottom/top of the income distribution), takes place all the way 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 between $0.17 - 0.19$.

Our informed guess, based on the evidence from both Tables 1-2 and Figure 5 is that it is indeed the structural change observed in the concentration of capital incomes that is going to contribute mostly to the variation in the series of the ICI index for Denmark. We can now proceed with the estimation of the ICI index, in Figure 6.

[*Figure 6 approximately here*]

The ICI index departs from very low values in the late 1980s and early 1990s (in 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 is historically low, and capital incomes have not yet started to accrue to top incomes as they will do in the subsequent years.

In the early 1990s, the Danish tax reform (Lange et al., 1999) lowered top marginal tax rates on capital incomes, and, in response to that, capital incomes shifted rapidly towards 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 5). 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 (in between 0.4 and 0.55), with the exceptions of the period $2013 - 2016$. To state clearly the main result from this section on Denmark: the evidence from the ICI index series is unambiguous, in the sense that a substantial increase in the inequality in income composition has taken 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 analysing the evolution of the net capital share, our estimates for the ICI index and the Gini coefficient in Figure 7.

[*Figure 7 approximately here*]

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

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 increases its relevance for the determination of the personal income distribution in these years.

The period in between 2009 and 2013 shows an increasing capital share (from 13% to around 19%), positive and rather high values of the ICI index (in between 0.4 and 0.55), and sustained increase for the Gini coefficient. Due to the relatively high values of the ICI index, we claim that the functional distribution may qualify as one of the drivers of the jump in personal income inequality in Denmark since 2009.

Summing up, the working hypothesis that the functional distribution of income has been the main driver behind changes in the income distribution, is to a large extent 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, the decreasing trend has been reverted. Both in terms of top shares of income and of the overall income distribution summarized by the Gini coefficient, income inequality in Finland has been increasing since the 1990s.

In particular, Jäntti et al. (2010) document a surge in the share of income accruing at the top 1% since the mid-1990s. According to the authors, this dynamics is mostly due to a change in the composition of incomes, corresponding to an increase in the fraction of capital income accruing at the top of the income distribution. They report that in 2004 as much as 63% of the incomes of the top 1% are composed of capital income, a major change with respect to earlier years. A key determinant of this development is the 1993's Dual Income Tax (DIT) reform, that turned taxation on capital income in Finland from progressive to proportional. The decline in the degree of progressivity of capital income taxation is central to explain the increase in top income shares. Overall, André et al. (2018) show that in the period 1981 – 2014 the share of income accruing to the top 1% increased in Finland by 3.2% [11].

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 in between 1987 and 2016. As for Denmark, the income distribution is divided into four groups, the bottom 50%, the middle class 50 – 90%, and the top 10% further divided into the bottom half and the top half of the decile.

[*Table 3 approximately here*]

Table 3 shows that capital incomes accrue steadily more towards the top 5% of the income distribution up to the year of the financial crisis (2007), with the bottom 95% loosing a fraction of 19% of total capital incomes comparing 2007 with 1987. On aggregate, the capital share of income rises from 14% up to 29% in the years of the crisis, before it drops to 19% in 2013. Summing up, a shift in the concentration of capital incomes at the very top (5%) of the income distribution has taken place up to 2007. Let us see in Table 4 the dynamics of the concentration of the other factor income, namely labour.

[*Table 4 approximately here*]

Table 4 shows that labor incomes accrue steadily more towards 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.

[11] André et al. (2018) also show how in Finland there has been a strong correlation between changes in dividends as a share of total household income and changes in the top income share.

Figure 8 summarizes the evidence above by plotting the factor income incidence curve for Finland, capturing the percentage change in capital and labor income across the total income rank in between 1987 and 2016.

[*Figure 8 approximately here*]

All in all, Tables 3-4 and Figure 8 show that the very top of the income distribution has increased substantially its share of capital incomes up to the year of the financial crisis, in addition to a slight increase in its share of labour incomes. Hence, looking in terms of income composition, incomes of the very rich became more capital-intensive, whilst the opposite has happened at the bottom of the distribution. The post-crisis years 2010 – 2016 present instead levels of concentration similar to the pre-crisis years.

As for Denmark in the previous section, before we proceed to estimate the ICI index itself, it is instructive to give a look at the series of the areas below the concentration curves for labor and capital, as in Figure 9.

[*Figure 9 approximately here*]

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 towards the top in the period 1991 – 2004. Since then, the (blue) series for $\tilde{\mu}_\pi$ slightly regains some magnitude up to 2016. The (red) series for the area below the concentration curve for labor decreases as well, 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 Figures 8-9, it is clear that it is indeed the structural change observed in the concentration of capital incomes that is going to contribute mostly to the variation in the series of the ICI index for Finland. We can now proceed with the estimation of the ICI index for Finland in the period 1987 – 2016, in Figure 10.

[*Figure 10 approximately here*]

Figure 10 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 since 1995 up to the years after the financial crisis of 2007 – 2010. The ICI index witnesses a surge, reaching up to around 0.6 points, in 2000 and 2004. In those years, highly positive values of the ICI index indicate that capital incomes are now concentrated more towards the top of the income distribution relatively to labour incomes, with high-income earners deriving the majority of their income from capital, and low-income earners deriving a large share of its income from labour.

Summing up, our estimates of the degree of income composition inequality in Finland seem to go in line with the evidence of Jäntti et al. (2010) on the surge of the top 1% share of income. Jäntti et al. (2010) pointed out to 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 estimates confirm that there has been a shift in the composition of incomes across the distribution, especially from 1995 to 2007 and due to capital incomes moving from lower deciles of the income distribution to the very top. In this respect, the results for Finland are in line with what observed for Denmark.

In Figure 11 we compare graphically the evolution of the net capital share of income, the ICI index and the Gini coefficient calculated on market income in the period 1980 – 2016.

[*Figure 11 approximately here*]

It is visible from Figure 11 how Finland witnessed a significant increase in the capital share of income between the early 1990s and 2007. This coincides also with progressively higher values of the ICI index, which indicate, *ceteris paribus*, a strengthening of the transmission mechanism between the functional and personal distribution of income. In the same period the Gini coefficient shows as well an increase from around 0.31 to around 0.35. Although the ICI index starts from low values in the early 1990s, the evolution of the ICI index in this period points to a relevant role of the functional distribution of income for the determination of personal income inequality.

In the final period from 2008 onward, our estimates provide less straightforward insights. From 2008 to 2013, there is a decreasing trend in the capital share of income, in parallel to a rather flat series for the Gini coefficient. If one were able to isolate the effect of the decrease in the capital share on the Gini, given the relatively high levels of ICI, we would have guessed a decrease in the Gini coefficient. Therefore, in this period it is plausible that other factors than the functional distribution of income have played a role in compensating the effect given by the capital share. In conclusion, the hypothesis implying that the surge in the capital share of income has been the main driver of increased inequality in Finland, seems to apply mostly for the central period of our analysis, from the early 1990s and up to the years of the financial crisis.

3.3 Norway

One of the main contributions about the evolution of income inequality in Norway is Aaberge and Atkinson (2010), focusing on top incomes. Through the use of tax data, they document that top income shares in Norway started to increase from the late 1980s and early 1990s. The sharp rise for income shares accruing to the richest households is recorded during the 1990s, in response to the introduction of the Dual Income Tax (DIT) system in 1992. In particular, Aaberge and Atkinson (2010) show that rising top income shares are driven by an increase in dividends and capital gains. The dual income tax reform of 1992 (Alstadsaeter, 2007, Sørensen, 1994, Thoresen, 2004) implied that the tax rate on capital incomes became proportional, while the one on labour incomes stayed progressive. As a result of this decrease in progressivity (Thoresen, 2004), capital incomes became more unevenly distributed in the 1990s and this contributed to increased income inequality.

Strong behavioural responses to tax reforms are also found in later years for the Norwegian case. In fact, a temporary tax on dividends in 2001 resulted in a peak of dividends in 2000, and a subsequent fall in 2001. A few years later, the implementation of a permanent dividend tax in 2006 (publicly announced in 2005) determined a sharp increase in dividends in 2005 and, as a consequence, a temporary rise in capital incomes and top income shares in that year. On the contrary, from 2006 onward, the tax exemption on dividends for companies (i.e., the exemption is granted only if the receiver of the dividends is a company and not a taxable individual) determined paradoxically a lower concentration of capital incomes at the very top (this applies also to our analysis, given that LIS (2020) data are limited to the household sector and do not include retained profits for companies). In fact, as pointed out by Alstadsæter et al. (2017), by attributing business income to personal owners, independently from whether it is realized or not, drastically increases top income shares after the dividend tax reform in 2005.

Aaberge et al. (2017) extend the analysis in Aaberge and Atkinson (2010) showing how after the sharp increase in top income shares in 2005 due to the upcoming tax dividend reform, these have afterwards stabilized at the levels of the late 1990s[12]. They also present the evolution of the pre-tax Gini coefficient, which increased in between 1989 and 2013. More precisely, after a significant increase between the late 1980s and 2000, the Gini witnessed turbulence around the years of the previously mentioned tax reforms and a slight increase thereafter.

[12]The latest available observation in the series provided in Aaberge et al. (2017) refers to the year 2011.

A third dimension of inequality which is investigated in the literature on Norway, and which is highly relevant for our analysis, is the association between labour and capital incomes at the top of the distribution (the wage-capital composition of top incomes). As shown by Aaberge et al. (2018b) and for what concerns the top half of the income distribution, the association between capital and labor incomes in Norway grew between 1995 and 2005. However, narrowing on the top 1% of capital income earners this association has instead declined in the period 1995 – 2005.

In order to have a more comprehensive view on the evolution of inequality in income composition across the distribution, we turn to the evolution of both capital and labour 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 approximately here*]

Table 5 documents the concentration of capital income shares by income group in between 1979 – 2013. We can observe overall significant changes in the shares for all groups (except the 90 – 95 one) in the income distribution. From 1979 to 1991, we observe a shift in concentration of capital incomes from the top 10% towards the bottom 90% (the share of capital income going to the top 10% decreased to 49% starting from a value of 62% in 1979).

All the way from 1991 to 2004 we observe a striking shift in the concentration of capital incomes, potentially in response to the tax reform of 1992. In this period, the top 5% increased its share by 37 percentage points, in response to the reduced progressivity in the taxation of capital incomes. The process of amplification of the share of capital incomes going to the top 5% jointly with the reduction of the shares going to the bottom 90% continues until 2004. As mentioned above, these were also years of tax reforms that resulted in an increase in dividends in both 2000 and 2004, right before an introduction of a tax on dividends first in a temporary fashion in 2001, then in a permanent one in 2006.

From 2004 to 2013, the shares of capital incomes accruing to the bottom 90% gain back some percentage points, whilst the top 5% appears to be slightly loosing in the aftermath of the financial crisis. However, the richest 5% still hold in these years far higher shares of capital incomes with respect to the end of the 1980s, while the lower and middle classes hold a lower share with respect to those 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 (SSB, 2020). For each year from 1993 to 2015, Figure 12 plots the average of the capital incomes accruing respectively to the top 5%, 10% and to the 50-90th income percentiles (rank variable is total income).

[*Figure 12 approximately here*]

Figure 12 substantially confirms the evidence of Table 5 with respect to different aspects. First, we can see that in the years post-DIT reform, capital incomes for the top income percentiles increased, especially for the top 5%. Second, it is clearly visible that years 2000 and 2005 were years in which anticipations of upcoming dividend tax reforms determined higher capital incomes for the top 5%.

Looking at the aggregate statistics on the functional and personal income inequality summarized as well in Table 5, the capital share of income increases monotonously from 19% in 1986 to 34% in 2007, before it reduces slightly in the last years. In other words, in addition to a structural shift in the shares of capital incomes accruing to the different income groups, we observe as well an overall increase of the share of total income going to capital up to 2007. As regards the Gini coefficient, both series in Table 5 show a sustained increase, mostly in the years subsequent to the tax reform of 1992.

[*Table 6 approximately here*]

Similarly to the other Nordic countries, in Norway we witness as well relatively more stable shares of labour income. Table 6 shows changes in the shares of labour income that are of smaller magnitude with respect to the turbulent ones for capital incomes. Nevertheless, it can be pointed out that the share of labour income accruing to the bottom 50% has decreased from 24% in 1979 to 17% in 2013, while the share of labour income going to the top 50% increased from 77% in 1979 to 83% in 2013. This shows that the bottom of the distribution is losing ground also with respect to labour incomes.

Figure 13 summarizes the evidence above by plotting the factor income incidence curve for Norway, capturing the percentage change in capital and labor income across the total income rank in between 1979 and 2013.

[*Figure 13 approximately here*]

Let us start to convey the evidence of Tables 5-6 and Figure 13 into the building blocks of the ICI index, namely the series of the areas below the concentration curves for capital (blue) and labor (red), whose difference at each point in time uniquely determines the sign and magnitude of the ICI index, as explained in Equation 5. Figure 14 shows the series of the areas below the concentration curves for both factor incomes, in Norway in the period 1979 – 2013.

[*Figure 14 approximately here*]

Similarly to the cases of Denmark and Finland, it is the (blue) series of the area below the concentration for capital that shows the highest variation in Figure 14, dropping substantially from the early 1990s to 2004. However, differently from the cases of Denmark and Finland, the series of $\tilde{\mu}_w$ drops as well significantly, confirming the evidence from Table 6 that labor incomes shifted as well towards the top of the income distribution. All in all, Figure 14 documents that all the way from 1979 to 2013, the difference between $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ is positive[13].

We focus now on our main contribution in this sub-section: the series of the ICI index for Norway in Figure 15. In the initial years 1979 – 1986 – 1991, the ICI index decreases from around 0.4 to around 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 the upper parts.

The monotonic tendency towards higher levels for the ICI index in Norway starts from 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 towards the top (shown in Table 5 and Figure 14) after the DIT reform of 1992. The ICI index reaches a rather high value in 2004, slightly above 0.7[14]. In the years 2007 – 2013, the ICI index drops again to lower values, similarly to the values of the late 1990s.

[*Figure 15 approximately here*]

Summing up, we estimate for Norway a clear tendency towards a higher degree of income composition inequality all the way from 1991 to 2004, potentially due to the tax reform of 1992 that introduced proportional taxation of capital incomes. This implies that throughout

[13] Recall that a positive (negative) difference between the two series in a given year implies that the sign of the ICI index is positive (negative), signalling a positive (negative) degree of income composition inequality and meaning that capital incomes accrue relatively more to the top of the income distribution than labor incomes do, hence the individual incomes of the rich becomes more capital-intensive.

[14] 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 taxation of dividends of 2005 explains as well the high value of the ICI index in this year.

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 14 show instead levels of concentration of capital incomes closer to those of the late 1990s in Norway. This is reflected in the lower values of the ICI index in these years, in between 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 16 the evolution of the capital share of income, the ICI index and the Gini coefficient for income.

We divide the descriptive analysis in three sub-periods. In the first sub-period 1979 – 1991, the ICI index displays a low and falling degree of income composition inequality, whilst 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 that the functional distribution of income is at this stage a main driver of the series of the Gini in Figure 16. The most relevant and interesting sub-period is in between 1991 and 2005. This period is characterized by a clearly increasing capital share of income (from 24% in 1991 to around 36% in 2005), significant positive levels of the ICI index (especially in the years from 1995 to 2004) and increasing Gini (from around 0.25 in 1991 to around 0.38 in 2005). In our view, it is reasonable to believe that the increase in the capital share in these years has indeed determined part of the increase in income inequality.

The final sub-period, between 2005 and 2013, witnessed instead a decreasing capital share and a stable or decreasing Gini (excluding 2005 that is affected by the dividend tax reform). The transmission mechanism between the functional and personal distribution seems to be weaker in these years (with respect to the values of the ICI index in 2000 and 2004).

[*Figure 16 approximately here*]

In conclusion, for Norway, the hypothesis that changes in the capital share of income constitute a driver behind the increased personal income inequality, seems to yield uniquely for the central sub-period of our analysis (from the early 1990s and up to 2005, similarly 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 allow us to claim that the functional distribution has indeed been actively driving the increase in the Gini coefficient.

3.4 Sweden

Domeij and Flodén (2010) document inequality trends as regards labour incomes in the period 1978 – 2004 in Sweden, looking at both pre-tax and disposable earnings. The main message is that a clear increase in the dispersion of pre-tax earnings took place in the early 1990s in Sweden, a result that weakens when focusing on inequality of disposable earnings instead. The authors explain this development through the gradual reformation of the centralized wage-setting system in the Swedish economy from the 1980s, reducing the coverage of collective agreements and increasing the use of industry-wide bargaining.

Analyzing the long-run dynamics of the labor share in Sweden from the 1900 to the 2000, Bengtsson (2014) shows that the share of labor income started to drop since the early 1980s. Hence, not only inequality in pre-tax earnings rose as shown in Domeij and Flodén (2010), but also the share of total income accruing to labor was reduced since the 1980s, mostly to the advantage of capital earners and more in general top income earners.

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 a decisive role for inequality estimates is played by the portion of capital incomes given by capital gains. When capital gains are included in the definition of capital income, the top 10% income share

increases substantially since the 1990s. Excluding capital gains leads instead to an increase in the share of income going to the top 10% 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 gradually decreasing the marginal tax rate on capital (relative to taxation of labour 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 partially explained as well by asset price increases on the post-1980 deregulated financial markets. On the other hand this implies that, in the period before the 1990s, concentration of capital incomes at the top of the income distribution is largely underestimated in the available income data. We will come back to this point further below.

To sum up, the above overview of the literature on inequality trends in Sweden conveys several important lessons. Since the 1980s, the distribution of pre-tax labor incomes worsened due to institutional changes in bargaining structures, as documented in Domeij and Flodén (2010). This happened in parallel to an aggregate reduction of the share of income accruing to labor, as shown in Bengtsson (2014). Roine and Waldenström (2008) and Roine and Waldenström (2012) point out that one of the drivers of increased inequality can be found in capital incomes accruing to top income earners, with capital gains playing a crucial role. All in all, the above evidence points in the direction of higher capital share of income, higher concentration of capital incomes at the very top, and resulting higher Gini coefficient for Sweden, starting from the 1980s.

As we have done for the previous countries, let us analyze how the approach of inequality of income composition brings novel insights to this literature. Table 7 presents the concentration of capital income across the (total) income distribution for Sweden in between 1975 and 2005[15].

[*Table 7 approximately here*]

As regards 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 year, the clearest trend is that of an enormous shift of capital incomes from the bottom 50% to the top 5%, in between 1981 and 2000. The bottom 90% looses a fraction close to 50% of capital incomes in the period 1981 – 2005, whilst the opposite happens to the top 10%. These numbers are in line with the trends shown in the above mentioned literature on concentration of capital incomes in Sweden (Roine and Waldenström, 2008, 2012).

On aggregate, the capital share of income rose from 11% to 18% in the period 1981 – 2000, before it dropped back to the levels of the 1980s. As regards the Gini coefficients, both series from WID.World (2020) and LIS (2020) show a monotonic increase throughout the period, with much of it happening in between 1981 – 1995 for both measures. Before we proceed, let us see the dynamics of the concentration of labour incomes in Table 8.

[*Table 8 approximately here*]

Although with smaller magnitudes that it was the case for capital incomes, Table 8 presents a trend with labour incomes shifting from the bottom 50% to the top 50% throughout the period of analysis.

Figure 17 summarizes the evidence above by plotting the factor income incidence curve for Sweden, capturing the percentage change in capital and labor income across the total income rank in between 1975 and 2005.

[15]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.

[*Figure 17 approximately here*]

Summing up, from Tables 7-8 and Figure 17 it can be pointed out that the very top of the income distribution has dramatically increased its share of capital incomes, additionally to a mild increase in its share of labour incomes as well. Looking from the angles of income composition, this implies that incomes of the very rich became more capital-intensive, whilst the opposite has happened at the bottom of the distribution. Most of this shift in concentration took place in the two decades from the 1981 to 2000.

[*Figure 18 approximately here*]

Figure 18 plots the series of the areas below the concentration curves for capital (blue) and labor (red). Similarly to the cases of Denmark, Finland and Norway, it is the (blue) series of the area below the concentration for capital that presents the dynamics with higher variation in Figure 18, decreasing steadily from the early 1980s to 2000. The series of $\tilde{\mu}_w$ drops as well (up to 1995), confirming the evidence from Table 8 and Figure 17 that labor incomes shifted as well towards the top of the income distribution.

Crucially, Figure 18 entails a negative difference between $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ all the way up to (however excluding) 1995, implying that the lower deciles of the total income distribution are characterized by an income that is relatively more capital income intensive with respect to the upper deciles of the distribution. It is only in the final years 1995 – 2005 that this difference turns positive, due to the higher share of capital incomes in the incomes of the rich in these years. Recall that this switch in the sign of the difference between the two series in Figure 18 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 try to synthesize these dynamics into one single summary statistics, the ICI index for Sweden in the period 1975 – 2005. Figure 19 shows the results.

[*Figure 19 approximately here*]

The evidence shown in Figure 19 is somewhat striking. Differently from 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 4 observations available from 1975 to 1992, with a value around -0.2 for the years 1981, 1987, 1992. This situation appears to change gradually from 1995 onward, showing a rapid increase of the ICI index from around 0 in 1995, up 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 18.

Focusing on the trend, the result coming out from Figure 19 is that of an increasing inequality in income composition in Sweden all the way from 1981 to 2000. This result goes hand in hand with the evidence from Roine and Waldenström (2008, 2012), showing that capital incomes became gradually more and more concentrated at the top of the income distribution. As explained above, Roine and Waldenström (2008, 2012) point to the fact that only from the 1990s onward have Swedish capital owners started to realize larger fractions of their investments. Therefore, up to 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 show in the income of individuals ranked at the top of the income distribution.

In order to analyze more in detail the contribution behind the evidence of Figure 19, let us jointly observe in Figure 20 the series of the capital share of income, the ICI index and the Gini coefficient (WID.World, 2020).

[*Figure 20 approximately here*]

Let us divide the entire period 1975 – 2005 into two different sub-periods. First, from 1975 to 1995, the series of the capital share increases significantly, with a jump from below 8% in 1977 up to around 18% in 1995. The ICI index shows negative values throughout the sub-period 1975 – 1992, before it turns slightly positive in 2005. Hence, we would expect a rather limited effect (and, if any, a negative one) from the functional distribution of income on the Gini coefficient in those years. The evidence of stable Gini coefficient around 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 the 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 dropping in 2000 back to 12%. In these years, the ICI index jumps from around 0 in 1995 to 0.5 in 2000 (due to the shift in income composition given by capital incomes accruing towards the top of the income distribution). This implies that the degree of income composition inequality is initially low but then increases to higher values is 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 (which is increasing since the early 1990s) is the period 2000 – 2005. In those years, however, volatility in both capital share and the Gini coefficient lead us to exclude that the functional distribution has had a very significant effect on the level of personal income inequality. All in all, similarly to Denmark (and differently from Finland and Norway), our results indicate that the functional income distribution cannot be indicated among the determinants of increasing income inequality in Sweden.

4 Discussion

The analysis laid out in section 3 shows how movements in capital incomes, increasingly going to the top of the distribution, are behind the evolution in income composition inequality and its increase in all the Nordic economies. The main results are summarized in Table 9, in which the sub-periods for which rising capital shares contribute to rising income inequality are highlighted in gray. A related aspect that emerges in the country sections is the tight relation of the ICI index to changes in taxation regimes. In section 4.1 we will investigate in more detail the role of taxation, and in particular the introduction of Dual Income Taxation, in possibly increasing the strength in the transmission channel from the functional to the personal income distribution. Thereafter, in section 4.2, we will discuss differences and complementarities between the approach taken in this paper and a cross-country econometric analysis. In section 4.3 a simulation exercise shows the importance of taking into account the heterogeneity of individual factor income shares when predicting future scenarios of inequality. Finally, robustness checks are presented in section 4.4.

[*Table 9 approximately here*]

4.1 Dual Income Tax reforms and progressivity

From the core of the paper, it emerges that the Dual Income Tax (DIT) reforms of the early 1990s in the Nordic countries 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. This subsection aims therefore at investigating closer the role of taxation reforms for 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 taxpayer's income from all sources), towards 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 labour and transfer incomes (labeled as *personal*[16] or earned income) is chosen as the proportional (flat) tax on capital incomes (encompassing all types of capital incomes). In other words, capital incomes get 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, as compared to the *before-tax* income distribution (Thoresen, 2004). However, claims on the causal distributional effects of the DIT systems miss out an important behavioural aspect regarding capital gains (as highlighted by Roine and Waldenström (2012) for Sweden), triggered by taxation reforms. Before the reforms, substantial shares of the income of shareholders were retained profits in the firms, hence capital gains were not realized and the corresponding capital incomes were not showing up at the top of the distribution. DIT reforms lowered marginal tax rates on capital incomes (broadening as well the tax base by eliminating tax favours to 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 towards the top of the distribution.

[*Table 12 approximately here*]

Re-adapting from Sørensen (1994), Table 12 presents the DIT reforms and the resulting marginal tax rates on personal and capital incomes in the Nordic countries. Table 12 clearly shows that the progressivity of 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.

Sørensen (1994) mentions that critics of the DIT reforms focused on vertical equity concerns (since capital incomes are usually not equally distributed across the distribution), whilst proponents of the reforms highlighted the enlarged broad base (lower nominal tax rates do not affect the effective tax rates if the tax base is broadened by the reform) and the enhanced overall economic efficiency of the system.

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 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 towards 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 implies a stronger relationship between the functional and personal distribution of income, we expect in the aftermath of the DIT reforms to observe a stronger elasticity of the personal income distribution to changes in capital share of income.

[*Figure 22 approximately here*]

Figure 22 plots, for each of the four countries under analysis, the series of the elasticities of Equation 6, obtained by employing the series of the $\tilde{\mu}_\pi$ and $\tilde{\mu}_w$. The vertical reference line is the year in which the DIT reform has been introduced.

The descriptive evidence of Figure 22 highlights that the DIT reforms are a valid candidate to explain the rising degree of income composition inequality in the Nordics in the last decades[17]. Lowering progressivity in taxation of capital incomes, DIT reforms led to a shift in capital incomes towards the top of the distribution that resulted in higher inequality in income

[16] 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.

[17] In order to conduct a proper econometric analysis of this relationship, we would need substantially more observations of the elasticity of Equation 6 and of the ICI index.

composition. This implies that taxation might not only directly affect the income distribution, with lower progressivity increasing inequality (Jaumotte and Osorio Buitron, 2020, Rubolino and Waldenström, 2017, Roine et al., 2009)[18], but also indirectly, strengthening the detrimental effects of rising capital shares. This evidence also highlights that the degree of income composition inequality can be considered as a good measure to study effects of changes in (factor income) taxation schemes.

4.2 Cross-country evidence

In this sub-section, we shift the focus to cross-country analysis. In our view, a comparison between the country case-studies of the core of the paper and the cross-country evidence leads to a clearer understanding of the role played by the concept of income composition inequality.

To be clear, 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) (with dependent variable being the top income shares). Rather, the baseline cross-country evidence of this section will help to interpret the country-specific results provided in the subsections 3.1-3.4. First, Table 10 provides some summary statistics.

[*Table 10 approximately here*]

Let us introduce the baseline linear specification. Dependent variable is the Gini coefficient (WID.World, 2020) for country $i = 1, .., 4$ 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 $i = 1, .., 4$ 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.

$$Gini_{it} = \mu_i + t + \beta_0 + \beta_1 CS_{it} + X_{it}\delta + \varepsilon_{it} \tag{7}$$

Table 11 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 11 indicates, if anything, that the transmission mechanism measured by the ICI index has been weak on average for the countries analyzed. In Bengtsson and Waldenström (2018), using annual observations for the period 1980-present, authors find as well non significant 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).

[*Table 11 approximately here*]

Apart from standard endogeneity caveats that can be raised regarding the model specification in Equation 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 Equation 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 with country and year fixed-effects limits a deeper understanding of the underlying forces.

Second and most importantly, the shape of the relationship between the functional and the personal distribution grasped in Equation 7 through the coefficient β_1, is only one side of the

[18] See also Roine and Waldenström (2015) for a review of previous studies.

full story. The elasticity 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 in absolute value). 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 variation in 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 positive and close to one). A high value of the β_1 indicates again 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 variation in the Gini coefficient.

These two cases demonstrate that a thorough approach to understanding the relationship between the functional and the personal distribution needs to rely on time dependent and country specific estimates of the strength of the transmission mechanism between the two distributions. Only such estimates allow to disentangle in which country and for which period the capital share can or can not be included among the determinants of personal income inequality.

To convey graphically the argument above, Figure 21 plots the β_1 coefficient from Table 11 together with our estimation of the elasticities in Equation 6 by employing the series of the $\tilde{\mu}_\pi$ and $\tilde{\mu}_w$ for each country and at each point in time. In line with results presented in the country sections, notice how the elasticity of the Gini coefficient to changes in the aggregate capital share of income has been increasing since the 1990s. Figure 21 shows as well that the β_1 coefficient underestimates this elasticity for the majority of countries and years in our analysis.

[*Figure 21 approximately here*]

4.3 A simulation exercise

In this section 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.[19]

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

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

the United States, leaving aside Sweden due to lack of recent observations. We employ 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 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 elasticity of the Gini coefficient with respect to changes in capital income shares, estimated on LIS microdata through Equation 6. In particular, for each country we consider the average of the estimates of the elasticity in the period 1994 – 2016. Starting from empirical values of our variables of interest and from the country-specific average elasticities, 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:

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

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 equation 10:

$$CS_{i,t} = \frac{r_i K_{i,t}}{GDP_{i,t}}. \tag{10}$$

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 elasticity of the Gini coefficient to the change in the capital share of income, $\frac{\partial \mathcal{G}}{\partial \pi_i} = \epsilon_i$, as in equation 11:

$$Gini_{i,t} = Gini_{i,t-1} + \epsilon_i(CS_{i,t} - CS_{i,t-1}). \tag{11}$$

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.

[*Table 13 approximately here*]

In this hypothetical scenario, assuming no other factor is affecting income inequality and hypothesizing constancy over time of r_i, g_i and of the elasticity 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 slightly decrease. These simulated paths depend both on the difference between r_i and g_i[20], in line with Piketty (2014), and on the elasticity of the Gini coefficient with respect to changes in the capital share.

In the final three simulations in Table 13, we assume that the elasticity is equal to the β_1 coefficient found in the regression exercise in Section 4.2 and simulate the same forecasted

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

path. Assuming this common elasticity would underestimate the resulting inequality in all of the Nordic countries considered here, confirming our statement that having country specific elasticities, 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 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.

4.4 Robustness: the inclusion of transfer income

We perform a robustness check, namely the inclusion of transfer income into the core definition of income given in Equations 1 and 2. More specifically, we include public pensions (both contributory and not), private pensions, other public social benefits and private transfers (cash transfers) as labour income in Equation 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 implies as well that elderly end up in their correct position in the income distribution, instead of being considered poorer than they effectively are.

Since transfer income affects more the bottom part of the income distribution (especially public social benefits), our guess is that the new income definition entails a more labour-intensive (capital-intensive) income for the poor (rich) relatively to the baseline definition of income. Other things being equal, a higher concentration of labour income towards 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 23. 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 around $0.1 - 0.2$ points). This evidence confirms the hypothesis that the polarization in income composition between top earners with capital-intensive incomes and bottom earners with more labour-intensive incomes turns stronger when transfer income is taken into account. Moreover, the trends in the index closely follow the ones for the baseline definition of income in all the Nordic countries, such that our conclusions are robust to the inclusion of transfer income.

[*Figure 23 approximately here*]

5 Concluding remarks

In this research, we provide novel estimates on the degree of income composition inequality in the Nordic countries in the last 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 the 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 composition of individual incomes, mostly derived from a shift in capital incomes towards the top of the income distribution. This result indicates that the Nordic countries have been moving in the last decades towards the *classical capitalism* ideal-type of economic system, as defined by Milanovic (2017). We provide as well a discussion of the potential causes behind this dynamics, pointing to 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 towards the top of the distribution that led to rising inequality in income composition. We also show that the structural change in income composition is not properly grasped by focusing on cross-country evidence.

Second, we employ 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 the last decades. To sum up, 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, results show that a high degree of income composition inequality in the period from the 1990s up to around 2005 implies that changes in the capital share have indeed contributed to increasing personal income inequality. For Denmark the same applies, however 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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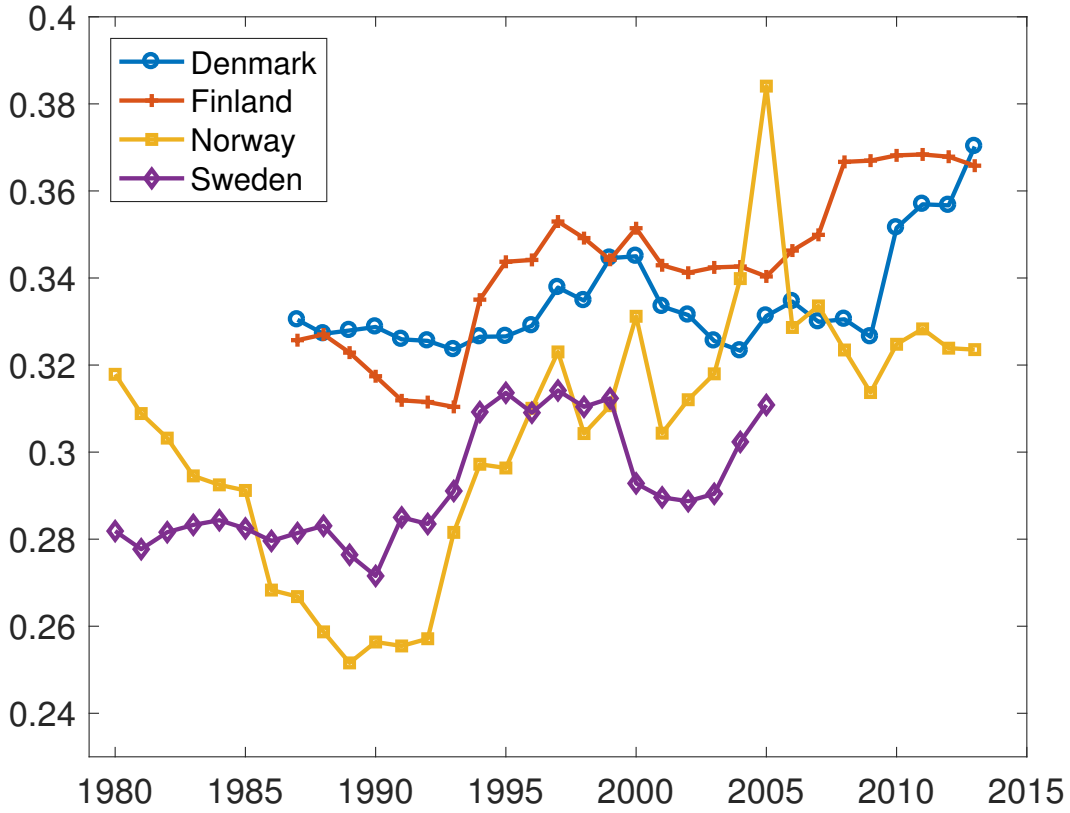
List of Figures

1 Personal income inequality in the Nordics 30
2 Capital Share of Income in the Nordics 31
3 Concentration Curves for Income Source 32
4 Factor income incidence curve, Denmark 1987 – 2016 34
5 Evolution of the areas of factor concentration curves for Denmark 35
6 Income Composition Inequality index in Denmark, 1987-2016. 36
7 Capital share, ICI index and Gini: Denmark, 1987-2016. 37
8 Factor income incidence curve, Finland 1987 – 2016 39
9 Evolution of the areas of factor concentration curves for Finland 40
10 Income Composition Inequality index in Finland, 1987 – 2016 41
11 Capital share, ICI index and Gini: Finland, 1987 – 2016 42
12 Average capital incomes for different total income percentiles 44
13 Factor income incidence curve, Norway 1979 – 2013 45
14 Evolution of the areas of factor concentration curves for Norway 46
15 Income Composition Inequality index in Norway, 1979-2013. 47
16 Capital share, ICI index and Gini: Norway, 1979-2013. 48
17 Factor income incidence curve, Sweden 1975 – 2005 50
18 Evolution of the areas of factor concentration curves for Sweden 51
19 Income Composition Inequality index in Sweden, 1975-2005. 52
20 Capital share, ICI index and Gini in Sweden, 1975-2005. 53
21 Comparison between pooled elasticities and regression coefficient 56
22 Elasticities and Dual Income Taxation 58
23 ICI index in the Nordics, including transfer income 60

List of Tables

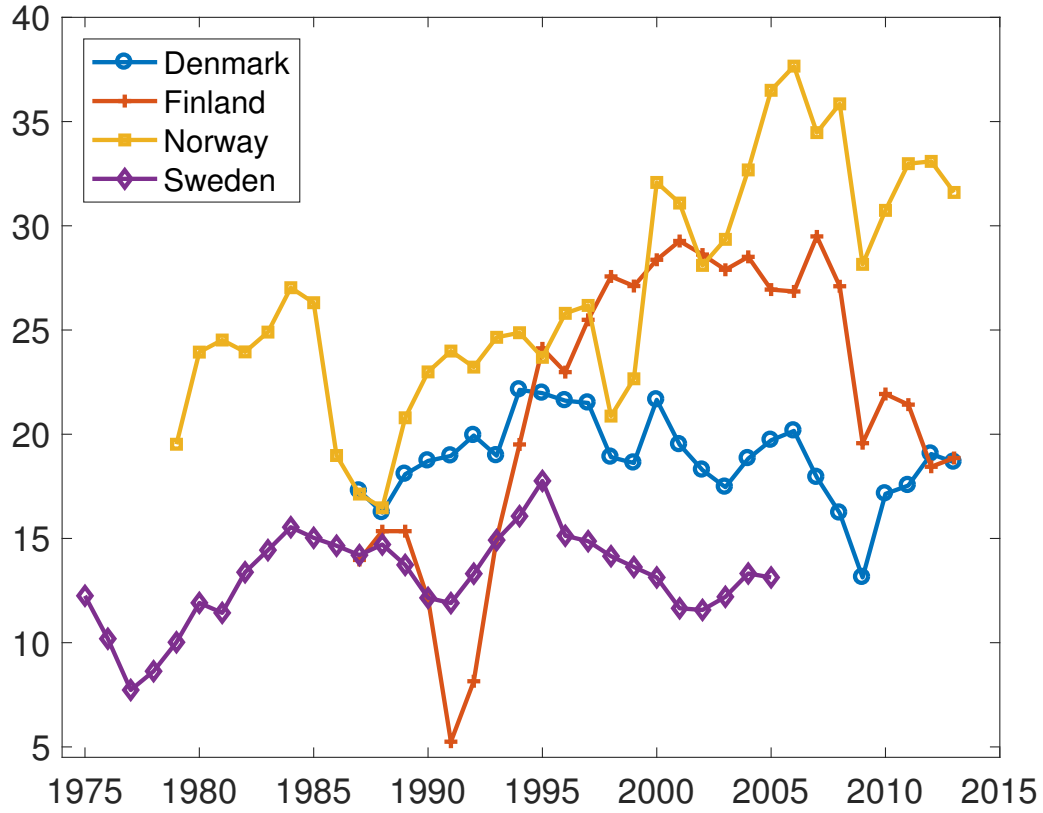
1 Capital income shares by income group, Denmark 1987 – 2016 33
2 Labour income shares by income group, Denmark 1987 – 2016 33
3 Capital income shares by income group, Finland 1987 – 2016 38
4 Labour income shares by income group, Finland 1987 – 2016 38
5 Capital income shares by income group, Norway 1979 – 2013 43
6 Labour income shares by income group, Norway 1979 – 2013 43
7 Capital income shares by income group, Sweden 1975 – 2005 49
8 Labour income shares by income group, Sweden 1975 – 2005 49
9 Summary of results by country 54
10 Summary statistics 55
11 Capital Share and Income Inequality in the Nordics 55
12 Marginal income tax rates in the Nordics, before/after DIT reforms 57
13 Simulation results 59

Figure 1: Personal income inequality in the Nordics



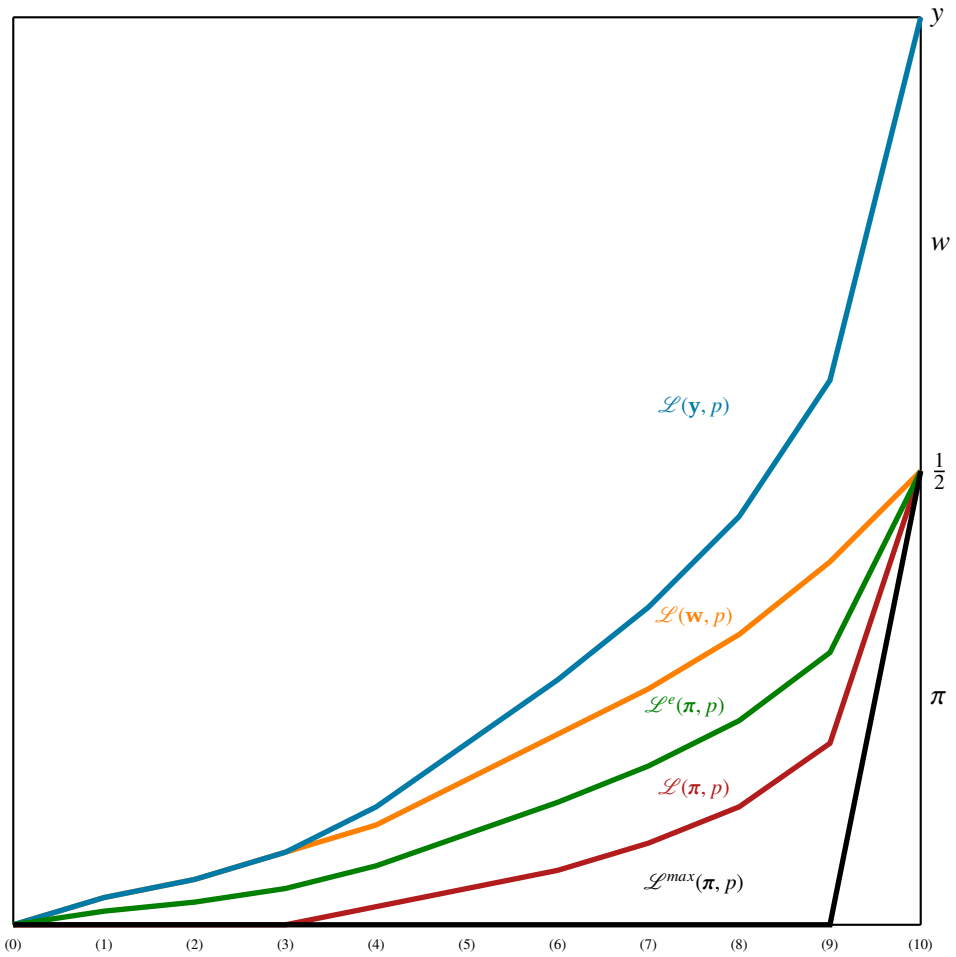
Note: This Figure shows yearly time series for the Gini coefficient (1980 – 2013, pre-tax national income, total population, unit=individuals, age=adults, equal-split series) for Denmark (blue), Finland (red), Norway (yellow), Sweden (purple). The Gini coefficient for Norway went from 0.251 to 0.384 in the years 1989 – 2005. For Sweden, the year 1990 marks the lowest Gini, 0.27, increasing from then onward up to 0.31 in 2005. For Finland, the lowest Gini is in 1993 with 0.31 points, climbing all the way to 0.368 in 2011. For Denmark, the Gini is stable around 0.32 up to 2009, followed by a jump to the level of 0.37 in 2013. Source: World Inequality Database WID.World (2020).

Figure 2: Capital Share of Income in the Nordics



Note: This Figure shows capital share of income (1975 – 2013, defined as: value added net of capital depreciation minus compensation of employees over national income) for Denmark (blue), Finland (red), Norway (yellow), Sweden (purple). In brief, the capital share of income is shown to increase for Norway (yellow) and Finland (red) from approximately the beginning of the 1990s to 2005, with a subsequent drop. The series for Denmark (blue) and Sweden (purple) appear instead to be rather stable throughout the period. Data were retrieved from the Bengtsson-Waldenström (BW) Historical Capital Shares Database in Bengtsson and Waldenström (2018), Version 2.0, March 2017.

Figure 3: Concentration Curves for Income Source



Note: This Figure shows a graphical representation of the concentration curve for capital $\mathscr{L}(\boldsymbol{\pi}, p)$, the concentration curve for labor $\mathscr{L}(\mathbf{w}, p)$, the Lorenz curve for income $\mathscr{L}(\mathbf{y}, p)$, the zero-concentration curve $\mathscr{L}^e(\boldsymbol{\pi}, p)$, and the maximum-concentration curve $\mathscr{L}^{max}(\boldsymbol{\pi}, p)$ with 10 individuals and equal sources of income in the economy ($\pi = w = \frac{1}{2}$). For each population decile p the Lorenz curve for income $\mathscr{L}(\mathbf{y}, p)$ equals the sum of the concentration curve for capital $\mathscr{L}(\boldsymbol{\pi}, p)$ and the concentration curve for labor $\mathscr{L}(\mathbf{w}, p)$.

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

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%	na.
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: Labour income shares by income group, Denmark 1987 – 2016

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%	na.
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

Figure 4: Factor income incidence curve, Denmark 1987 – 2016

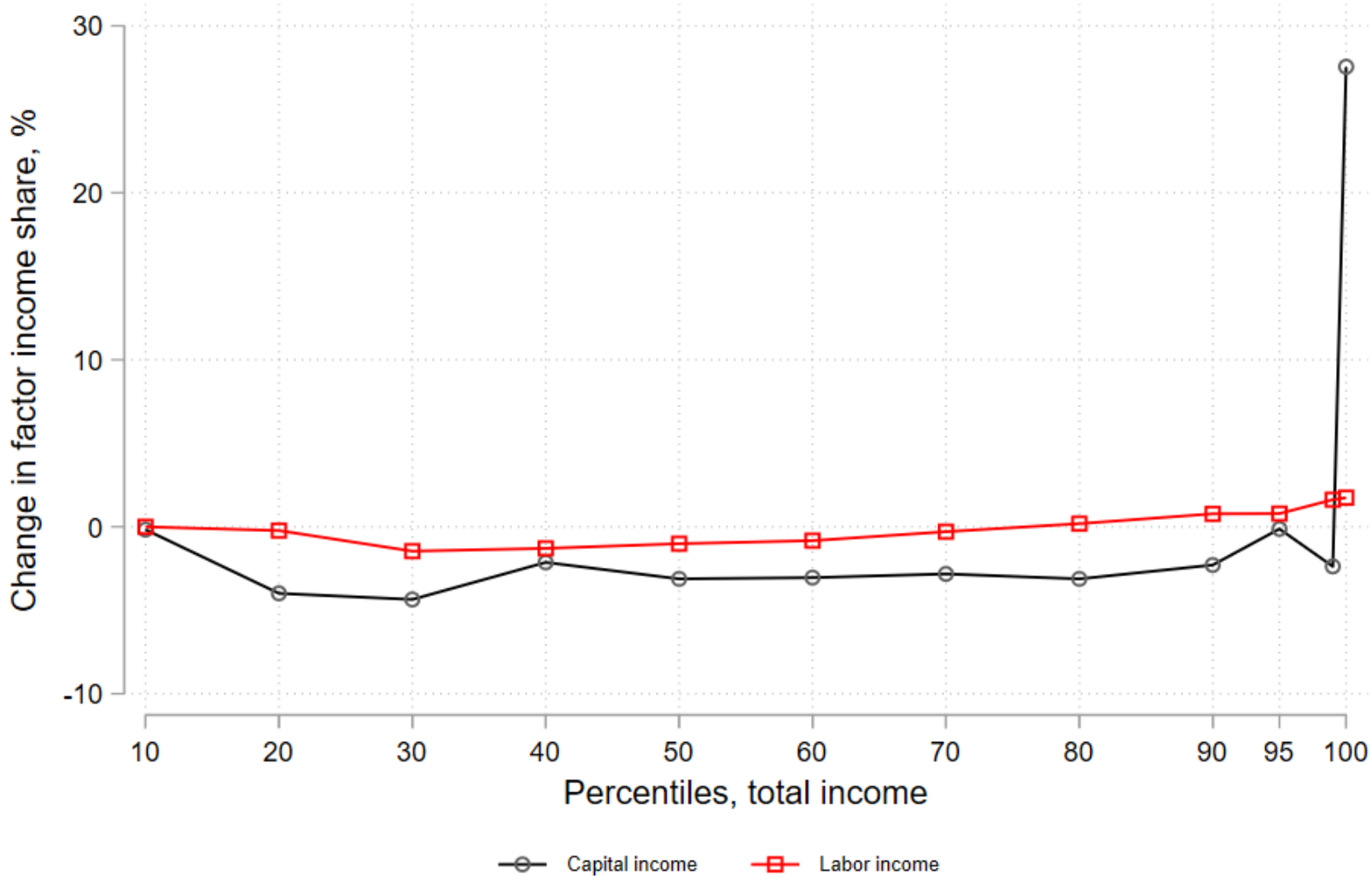
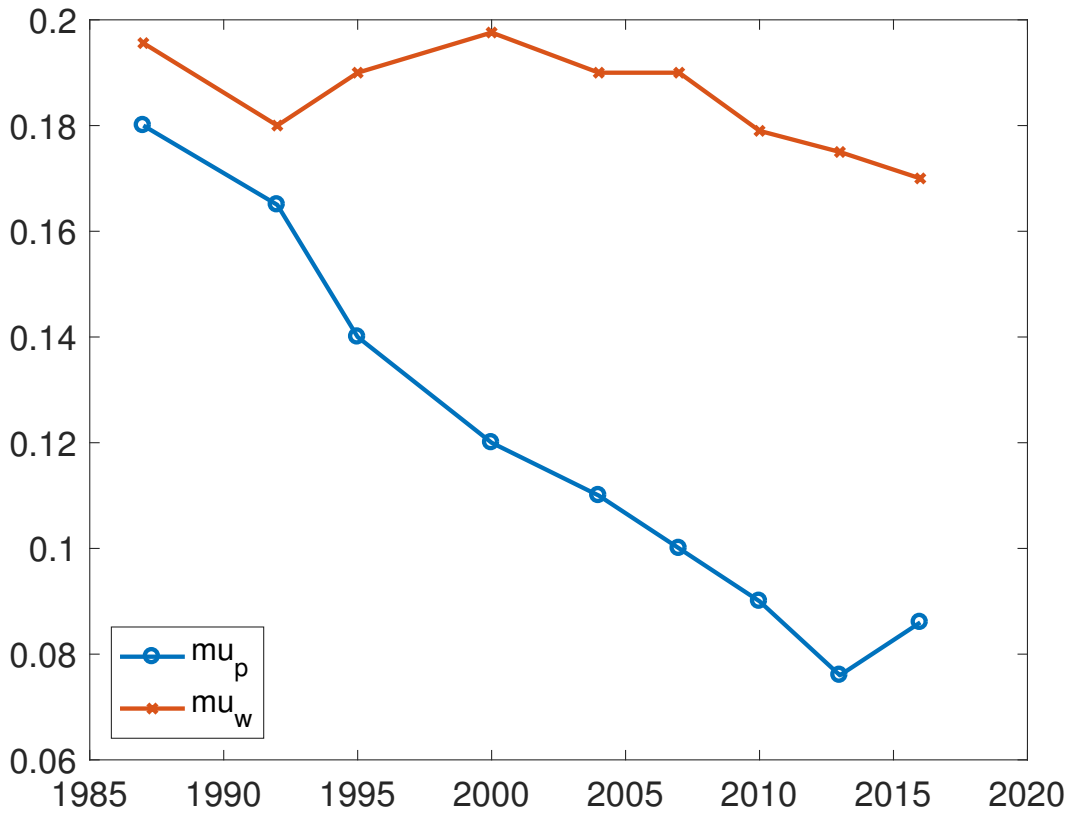
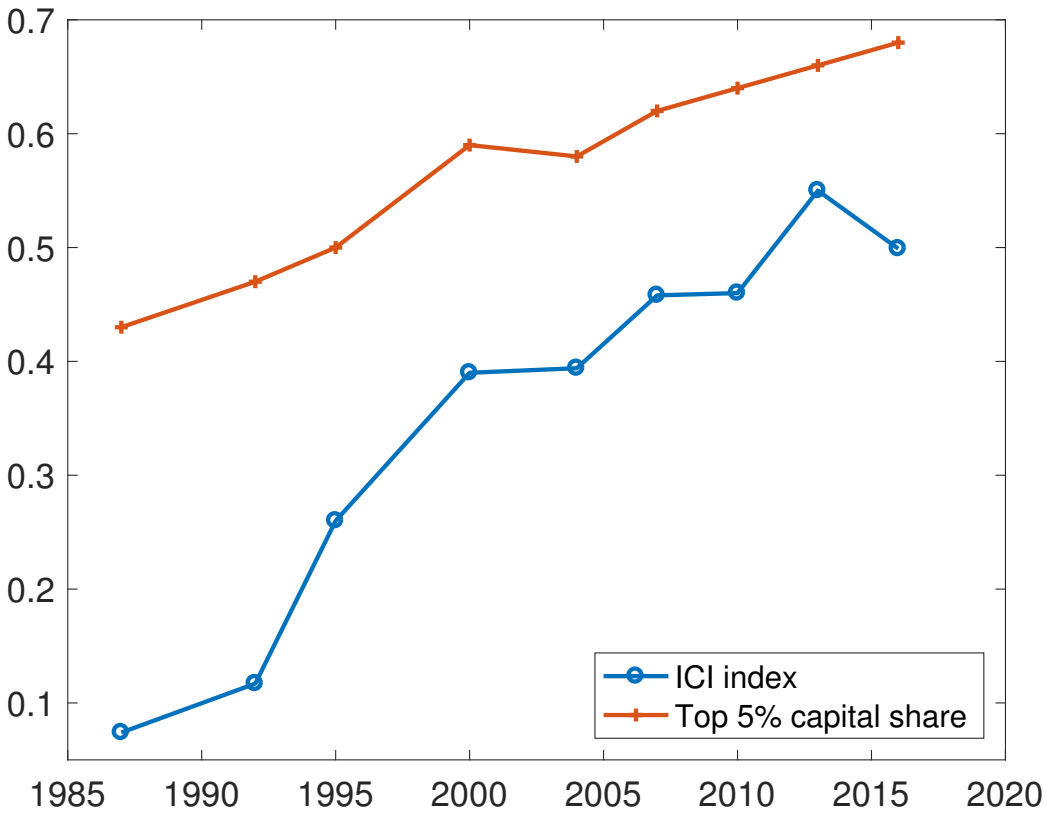


Figure 5: Evolution of the areas of factor concentration curves for Denmark



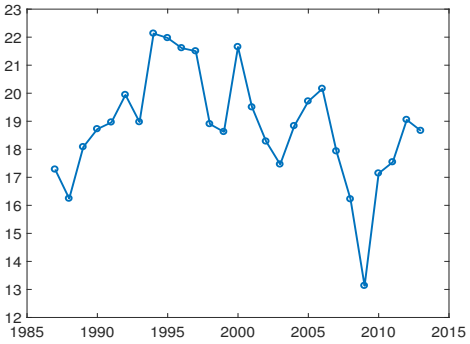
Note: $\tilde{\mu}_{\pi}$ is the area under the concentration curve for capital (blue series), $\tilde{\mu}_{w}$ is the area under the concentration curve for labour (red series). A drop in the area below the concentration curve for capital, as a result of capital incomes shifting towards the top (this area is large/small when capital incomes accrue towards the bottom/top of the income distribution), takes place all the way from 1987 (0.18) to 2013 (0.07). On the other hand, the (red) series for the area below the concentration curve for labor is stable throughout the period in between 0.17 – 0.19.

Figure 6: Income Composition Inequality index in Denmark, 1987-2016.

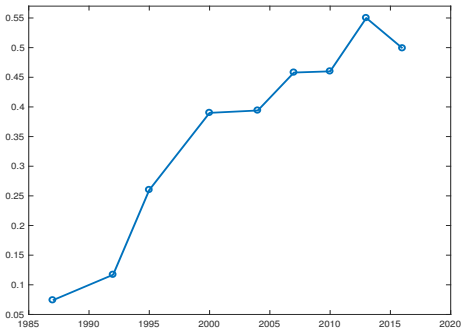


Note: This Figure plots the series of the ICI index for Denmark, using micro data on gross income from the Luxembourg Income Study Database (Luxembourg Income Study (LIS) Database , 2020) for the following years: 1987, 1992, 1995, 2000, 2004, 2007, 2010, 2013, 2016. The ICI index departs from very low values in the late 1980s and early 1990s (in 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. In the early 1990s, the Danish tax reform (Lange et al., 1999) lowered top marginal tax rates on capital incomes, and in response to that capital incomes shifted rapidly towards 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 Table 1, and from Figure 5). From 2000 up to 2013, the ICI index continues to grow (in between 0.4 and 0.55), with the exceptions of the period 2013 – 2016.

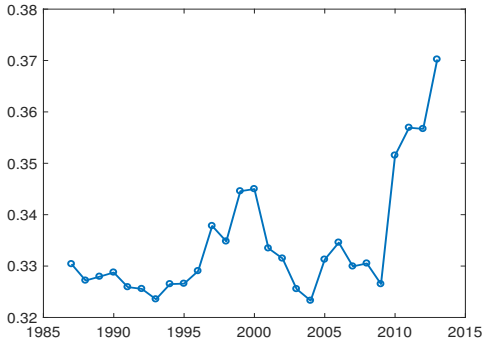
Figure 7: Capital share, ICI index and Gini: Denmark, 1987-2016.



Capital share of income



Income Composition Inequality



Gini

Note: The left-hand side graph plots the series of the capital share of income (value added net of capital depreciation minus compensation of employees), 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 plots once again the series of the ICI index for Denmark in the period 1987 – 2016, as shown in figure 6. 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).

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

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%	n.a.
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: Labour income shares by income group, Finland 1987 – 2016

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%	n.a.
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

Figure 8: Factor income incidence curve, Finland 1987 – 2016

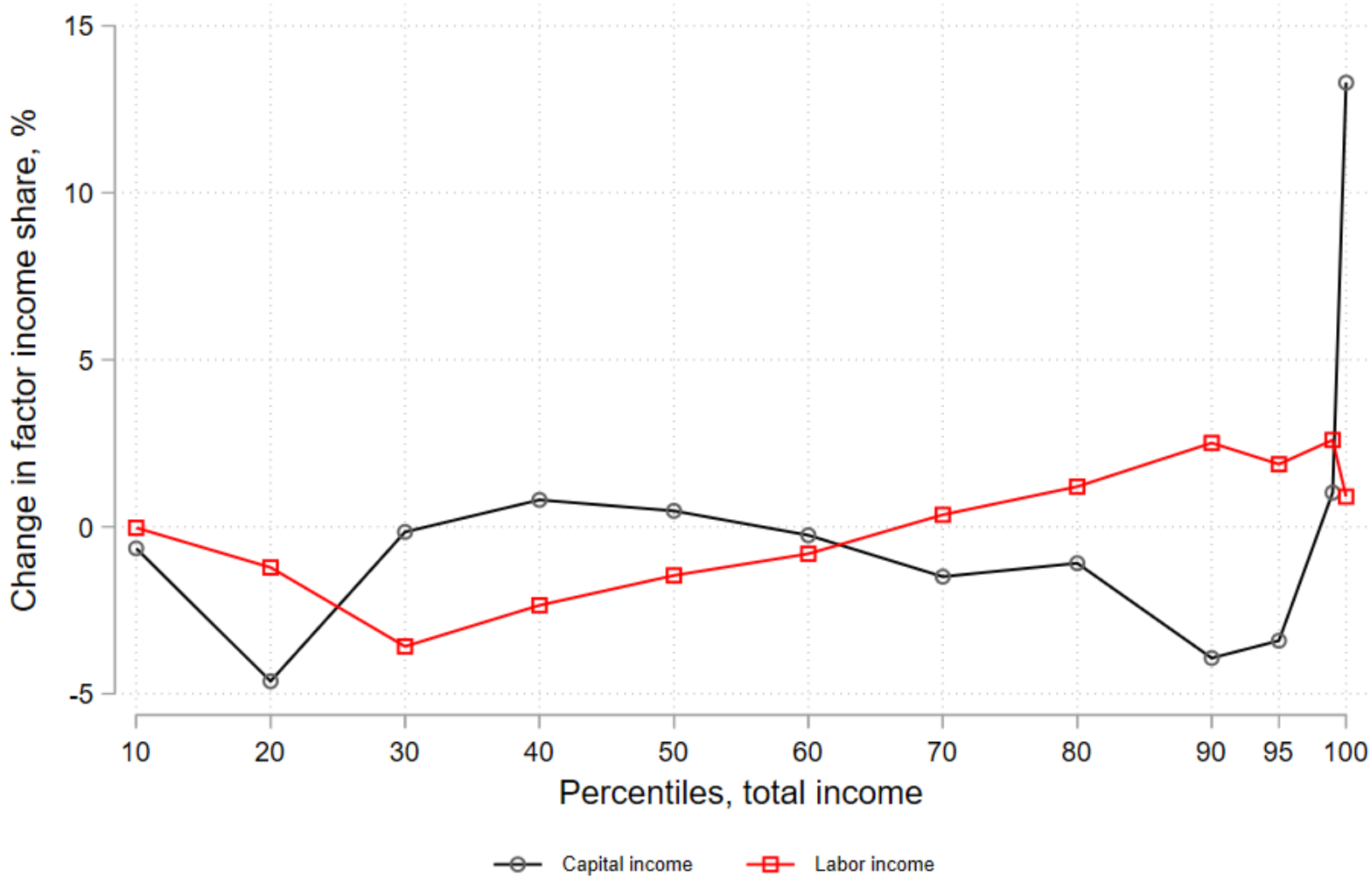
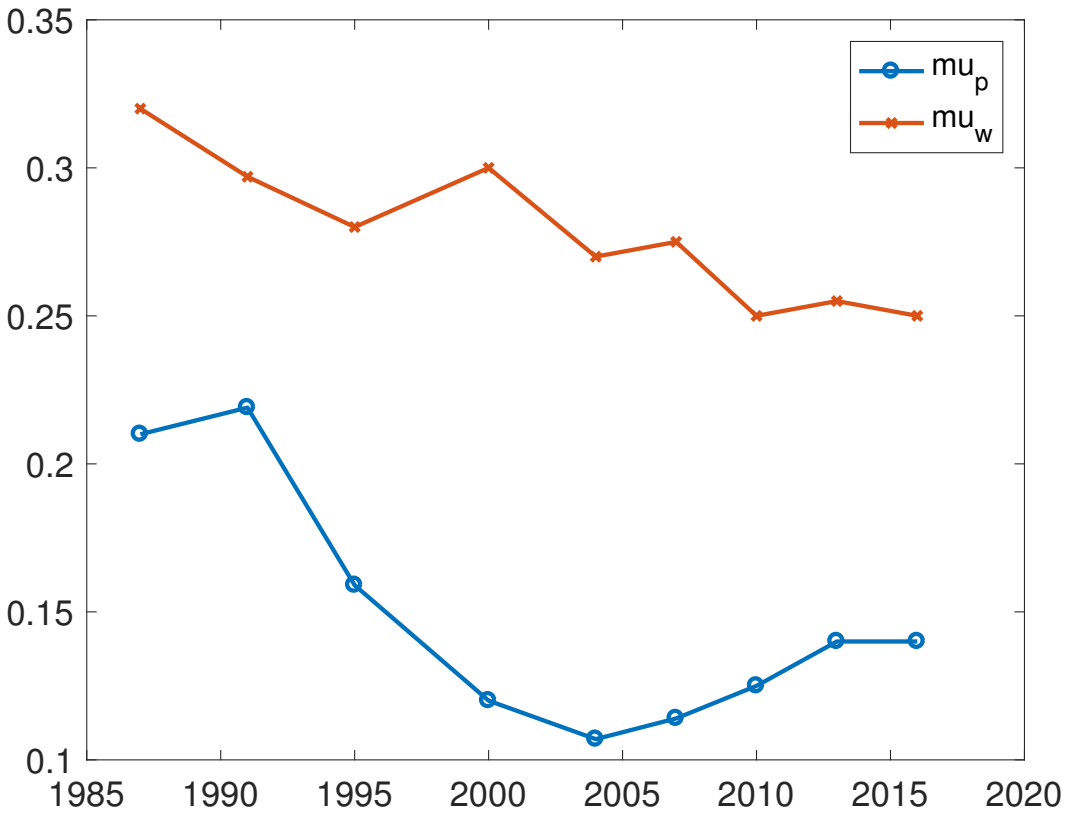
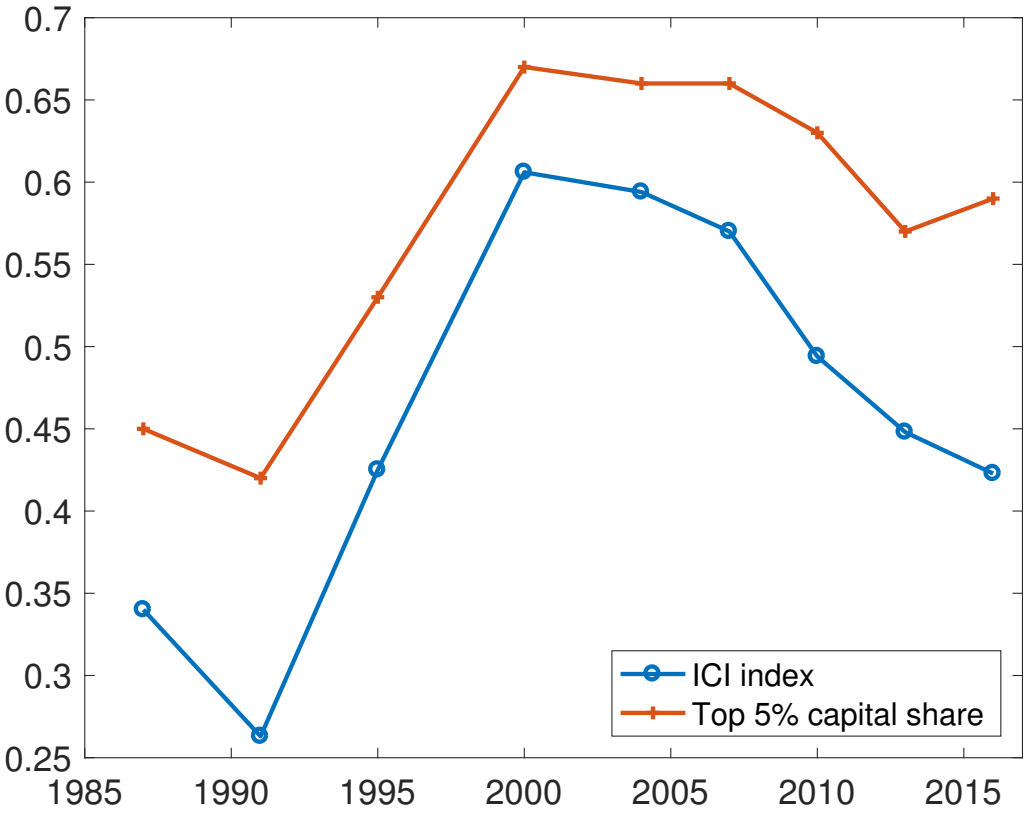


Figure 9: Evolution of the areas of factor concentration curves for Finland



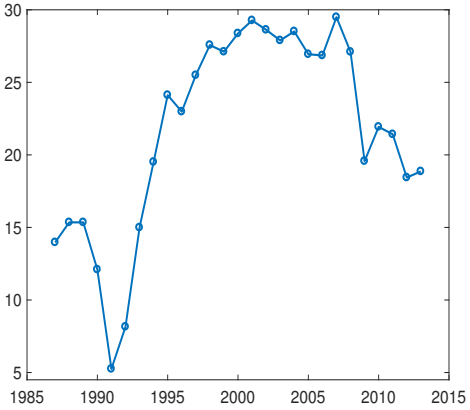
Note: $\tilde{\mu}_\pi$ (blue) is the area of the concentration curve for capital, $\tilde{\mu}_w$ (red) is the area of the concentration curve for labour. We observe a clear decrease in the series of the area below the concentration curve for capital, as a result of capital incomes shifting towards the top in the period 1991 – 2004. Since then, the (blue) series for $\tilde{\mu}_\pi$ slightly regains some magnitude up to 2016. On the contrary, the (red) series for the area below the concentration curve for labor stays within 0.25 – 0.35 throughout the period. In other words, this Figure shows that it is indeed the structural change observed in the concentration of capital incomes that is going to contribute mostly to the variation in the series of the ICI index for Finland.

Figure 10: Income Composition Inequality index in Finland, 1987 – 2016

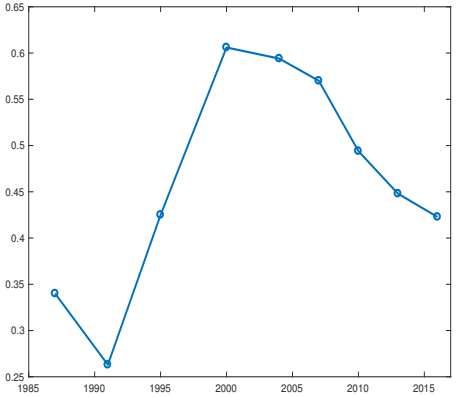


Note: This figure plots the ICI index estimates for Finland, using micro data on factor income from LIS (2020) for the following years: 1987, 1991, 1995, 2000, 2004, 2007, 2010, 2013, 2016. Figure 10 shows that in the late 1980s and early 1990s the ICI index for Finland was rather low, indicating a low degree of income composition inequality. This picture radically changes since 1995 up to the years after the financial crisis of 2007 – 2010. The ICI index witnesses a surge, reaching up to around 0.6 points, in 2000 and 2004. In those years, highly positive values of the ICI index indicate that capital incomes are now concentrated more towards the top of the income distribution relatively to labour incomes, with high-income earners deriving the majority of their income from capital, and low-income earners deriving a large share of its income from labour.

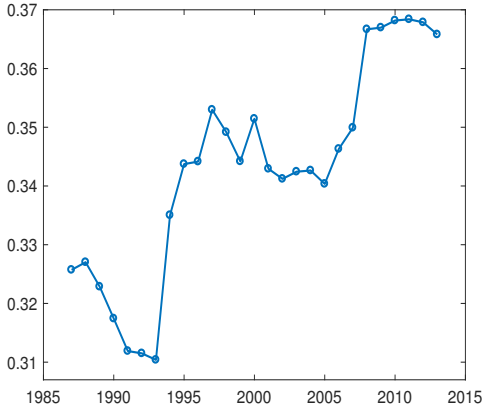
Figure 11: Capital share, ICI index and Gini: Finland, 1987 – 2016



Capital share of income



Income Composition Inequality



Gini

Note: The left-hand side graph plots the series of the capital share of income (value added net of capital depreciation minus compensation of employees), 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 plots once again the series of the ICI index for Finland in 1987 – 2016, as shown in Figure 10. The graph on the right-hand side plots the Gini coefficient for Finland from 1987 to 2013, obtained from the WID.World (2020).

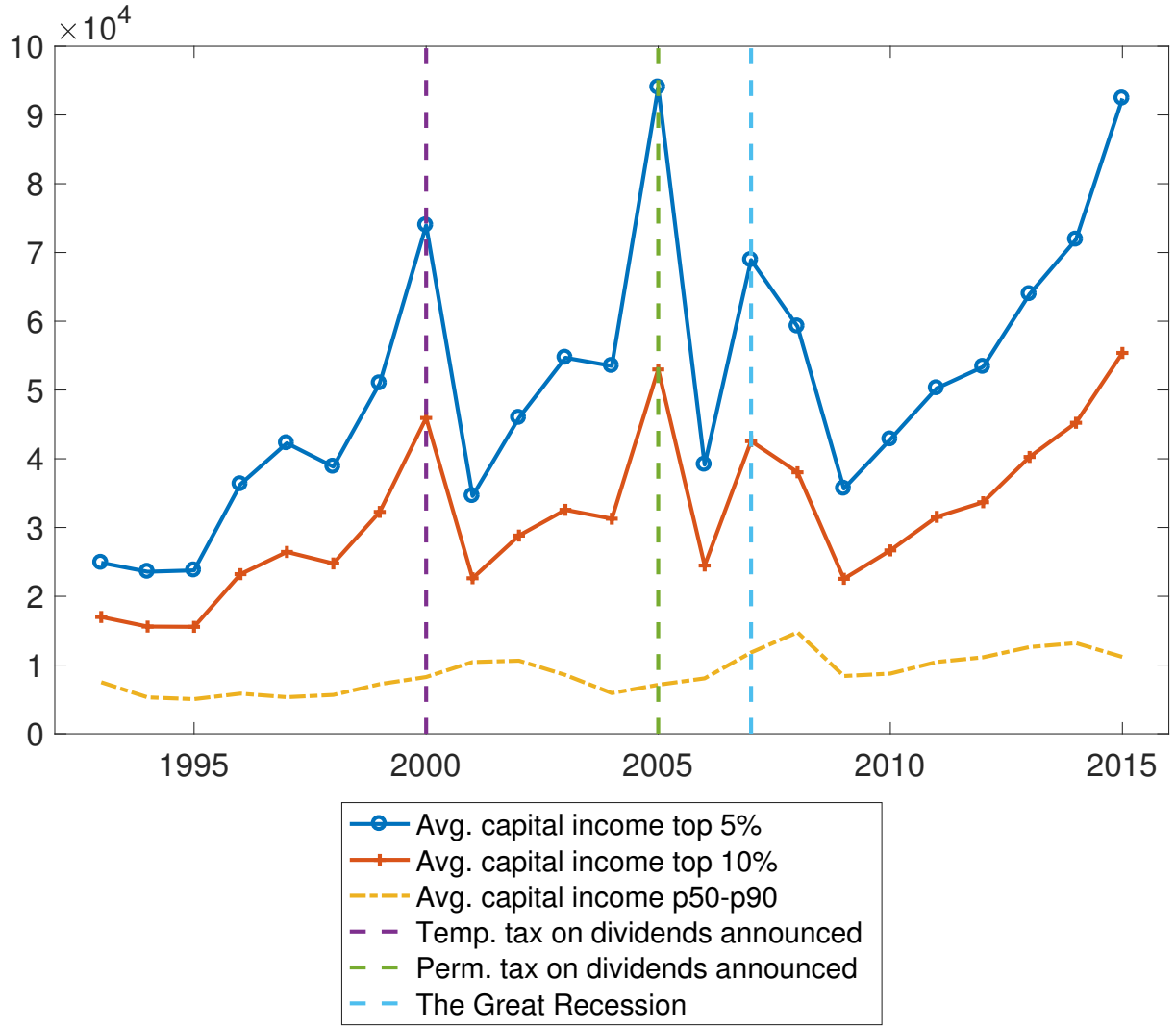
Table 5: Capital income shares by income group, Norway 1979 – 2013

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

Table 6: Labour income shares by income group, Norway 1979 – 2013

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

Figure 12: Average capital incomes for different total income percentiles



Note: This Figure utilizes register data on income retrieved from Statistics Norway, SSB (2020). Population is ranked according to total income, including capital and labour. We compute the average capital incomes (including capital gains) received by different total income percentiles.

Figure 13: Factor income incidence curve, Norway 1979 – 2013

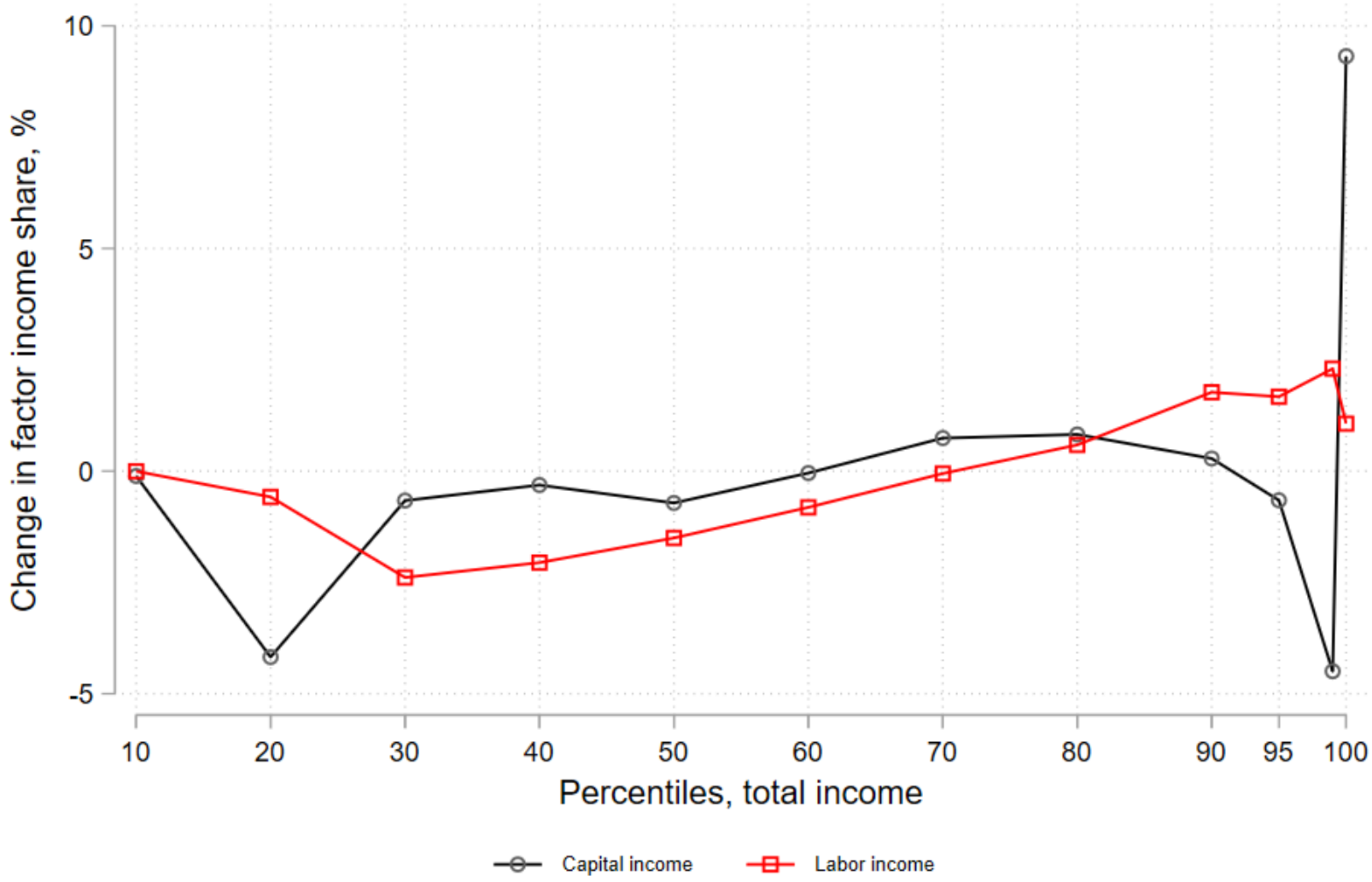
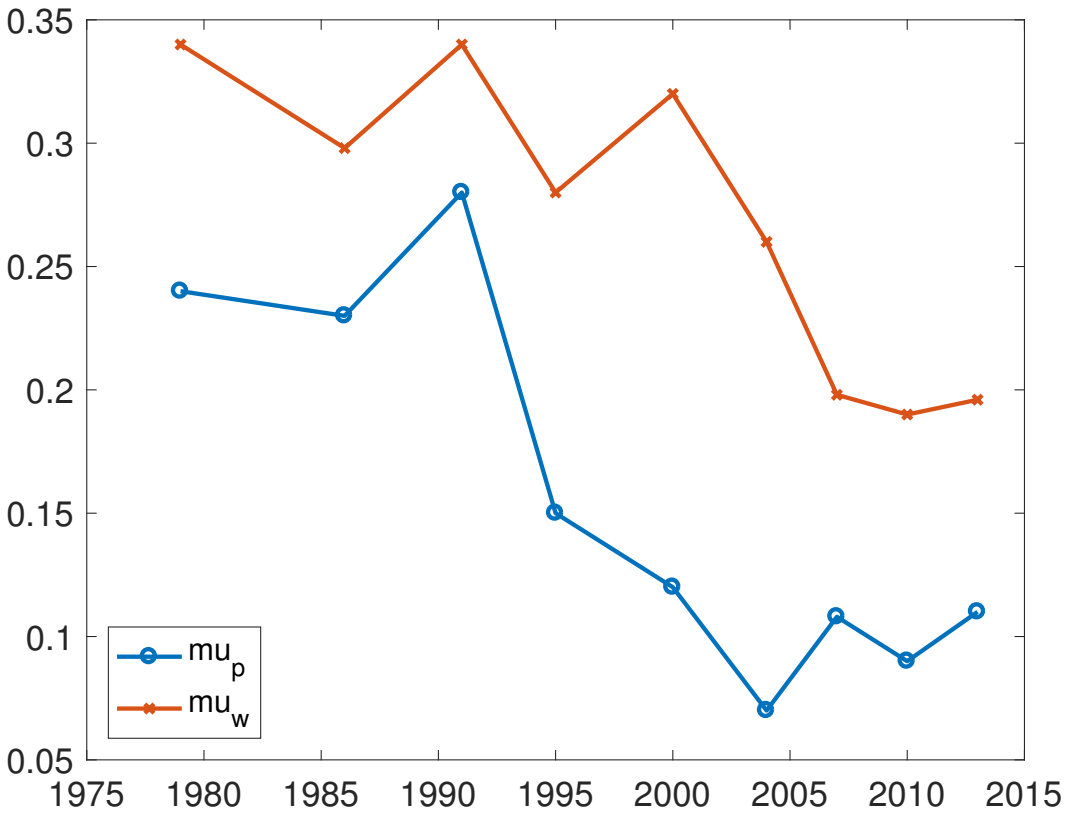
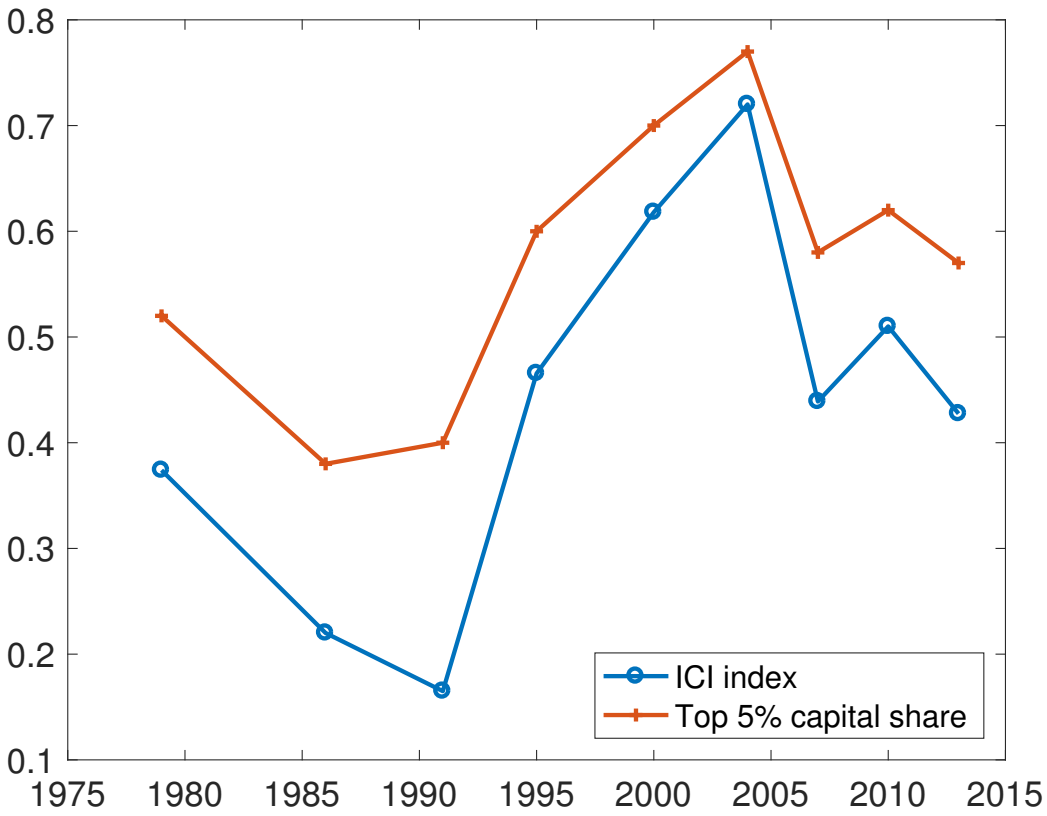


Figure 14: Evolution of the areas of factor concentration curves for Norway



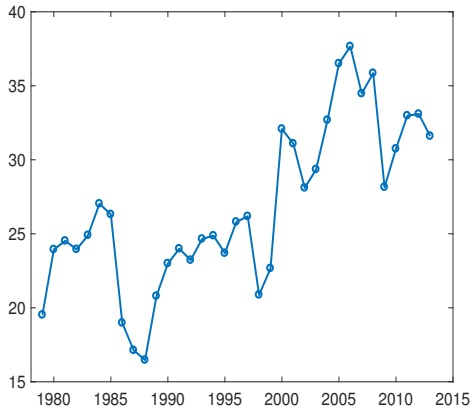
Note: $\tilde{\mu}_\pi$ is the area of the concentration curve for capital (blue), $\tilde{\mu}_w$ is the area of the concentration curve for labour (red). It is the (blue) series of the area below the concentration for capital that shows the highest variation in Figure 14, dropping substantially from the early 1990s to 2004. The series of $\tilde{\mu}_w$ drops as well significantly, confirming the evidence from Table 6 that labor incomes shifted as well towards the top of the income distribution. All in all, Figure 14 documents that all the way from 1979 to 2013, the difference between $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ is positive.

Figure 15: Income Composition Inequality index in Norway, 1979-2013.

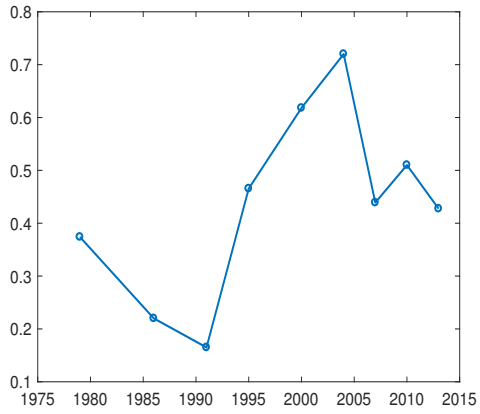


Note: Authors' computation based on LIS (2020) data. This Figure shows the yearly ICI index for Norway, using the following LIS waves: 1979, 1986, 1991, 1995, 2000, 2004, 2007, 2010, 2013. We estimate a clear tendency towards a higher degree of income composition inequality all the way from 1991 to 2004, 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), Figure 14 show instead levels of concentration of capital incomes closer to those of the late 1990s in Norway. This is reflected in the lower values of the ICI index in these years, in between 0.4 – 0.5.

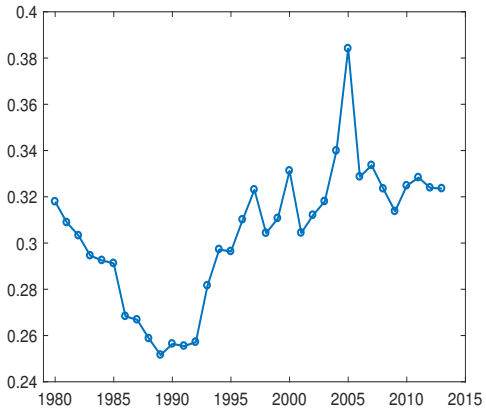
Figure 16: Capital share, ICI index and Gini: Norway, 1979-2013.



Capital share of income



Income Composition Inequality



Gini

Note: The left-hand side graph plots the series of the capital share of income (value added net of capital depreciation minus compensation of employees), in the period 1979 – 2013. This series is obtained from the Bengtsson-Waldenström (BW) Historical Capital Shares Database in Bengtsson and Waldenström (2018). The graph in the middle plots once again the series of the ICI index for Norway in 1979 – 2013, as shown in Figure 15. The graph on the right-hand side plots the Gini coefficient for Norway from 1980 to 2013, source: World Inequality Database (WID.World, 2020).

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

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)	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

Table 8: Labour income shares by income group, Sweden 1975 – 2005

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 17: Factor income incidence curve, Sweden 1975 – 2005

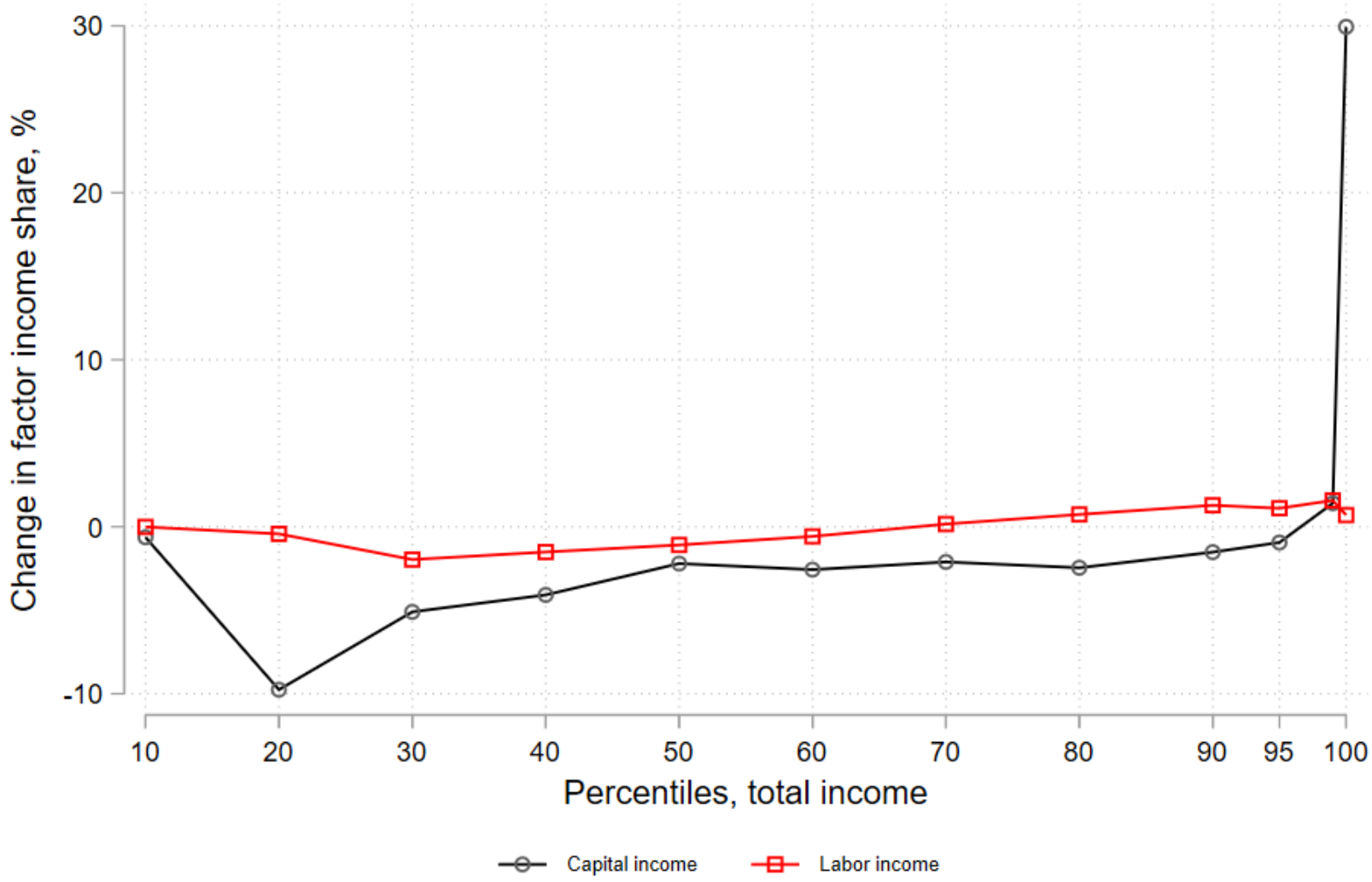
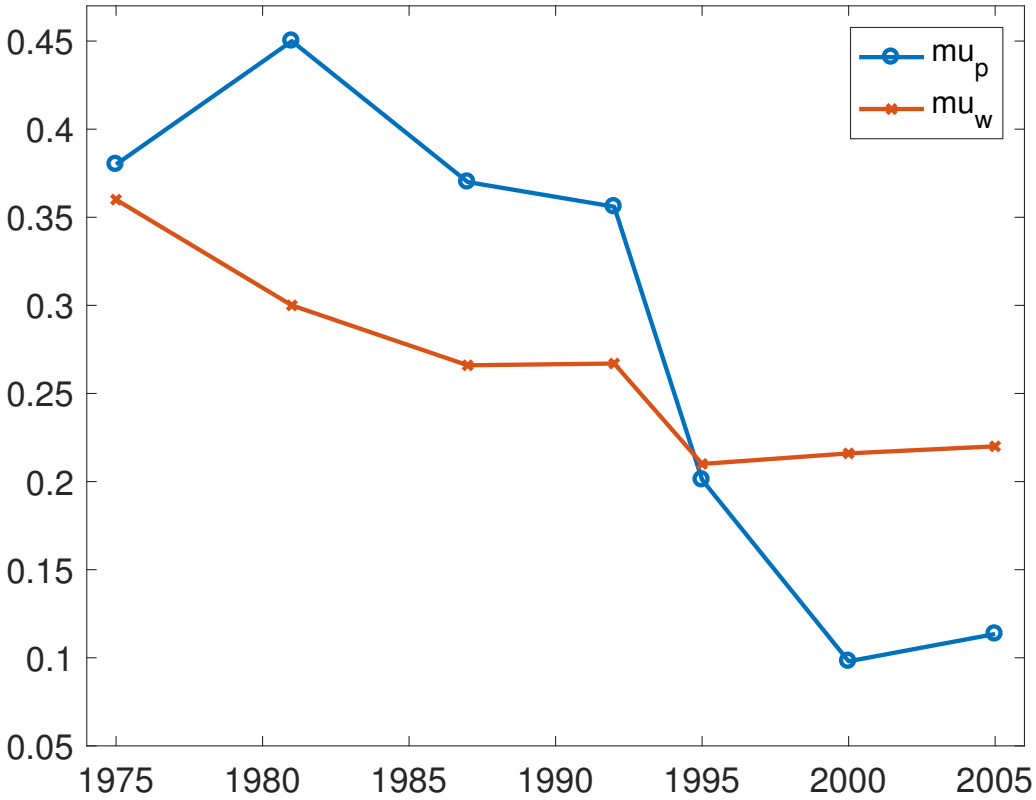
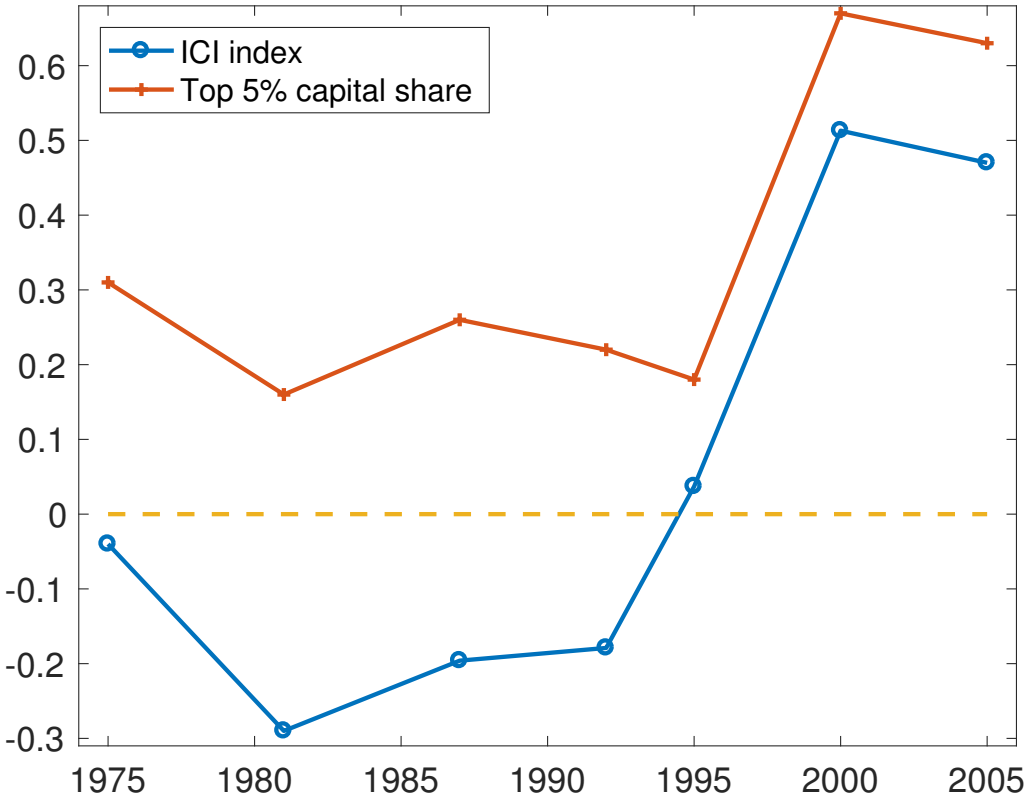


Figure 18: Evolution of the areas of factor concentration curves for Sweden



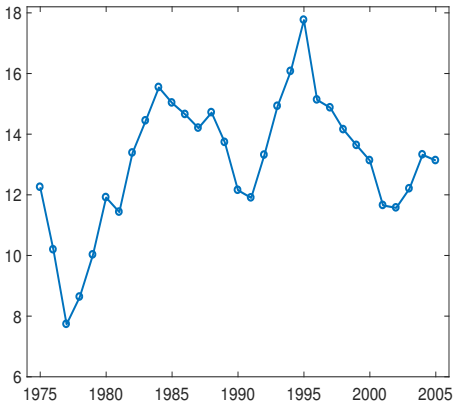
Note: $\tilde{\mu}_\pi$ is the area of the concentration curve for capital (blue), $\tilde{\mu}_w$ is the area of the concentration curve for labour (red). This Figure shows that the (blue) series of the area below the concentration for capital presents the dynamics with higher variation, decreasing steadily from the early 1980s to 2000. The series of $\tilde{\mu}_w$ drops as well (up to 1995), confirming the evidence from Table 8 that labor incomes shifted towards the top of the income distribution. Crucially, Figure 18 entails a negative difference between $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ all the way up to (however excluding) 1995, implying that the lower deciles of the total income distribution are characterized by an income that is relatively more capital income intensive with respect to the upper deciles of the distribution. It is only in the final years 1995 – 2005 that this difference turns positive, due to the higher share of capital incomes in the incomes of the rich in these years. Recall that this switch in the sign of the difference between the two series uniquely determines the sign of the ICI index.

Figure 19: Income Composition Inequality index in Sweden, 1975-2005.

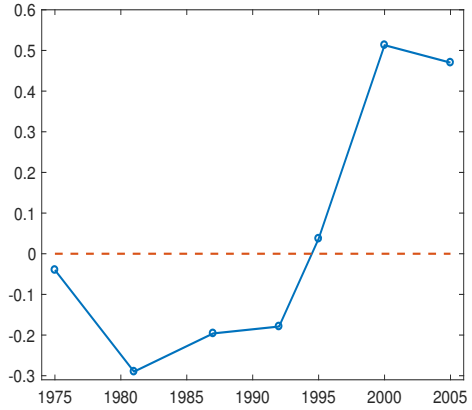


Note: Authors' computation based on LIS (2020) data. The figure shows the yearly ICI index for Sweden, estimated using the following LIS waves: 1975, 1981, 1987, 1992, 1995, 2000, 2005. The ICI index for Sweden is below zero from 1975 to 1992, with a value around −0.2 for the years 1981, 1987, 1992. This situation appears to change gradually from 1995 onward, showing a rapid increase of the ICI index from around 0 in 1995, up to approximately 0.5 in 2000 – 2005, reflecting the gradual increase in capital incomes accruing to the upper deciles of the income distribution. Focusing on the trend, the result coming out from Figure 19 is that of an increasing inequality in income composition in Sweden all the way from 1981 to 2000.

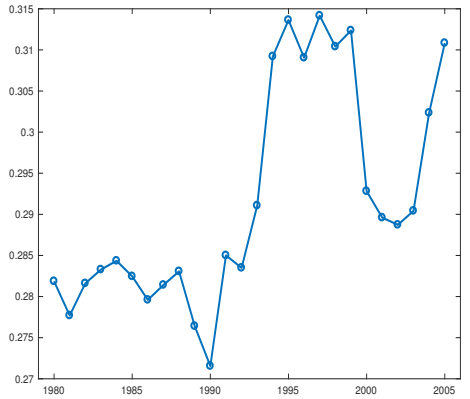
Figure 20: Capital share, ICI index and Gini in Sweden, 1975-2005.



Capital share of income (BW)



Income Composition Inequality



Gini (WID.World)

Note: The left-hand side graph plots the series of the capital share of income (value added net of capital depreciation minus compensation of employees), 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 plots once again the series of the ICI index for Sweden in 1975 – 2005, as shown in Figure 19. The graph on the right-hand side plots the Gini coefficient for Sweden from 1980 to 2005, source: World Inequality Database (WID.World, 2020).

Table 9: Summary of results by country

Income Composition Inequality						
Country	Period	Variation (weak/strong) or sign (high/low)				
		Cap. share (variation)	mu_p (variation)	mu_w (variation)	ICI index (sign)	Gini (variation)
Denmark	1987 – 2016	+ (weak)	- (strong)	- (weak)	+	+ (strong)
	1987 – 1995	+ (strong)	- (strong)	- (weak)	+ (low)	- (weak)
	1995 – 2009	- (strong)	- (strong)	- (weak)	+ (low)	+ (weak)
	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	+ (weak)	- (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)

Table 10: Summary statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Gini of total income (WID.World)	114	0.318	0.0288	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

Note: 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), Version 2.0, March 2017. 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 12. 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.

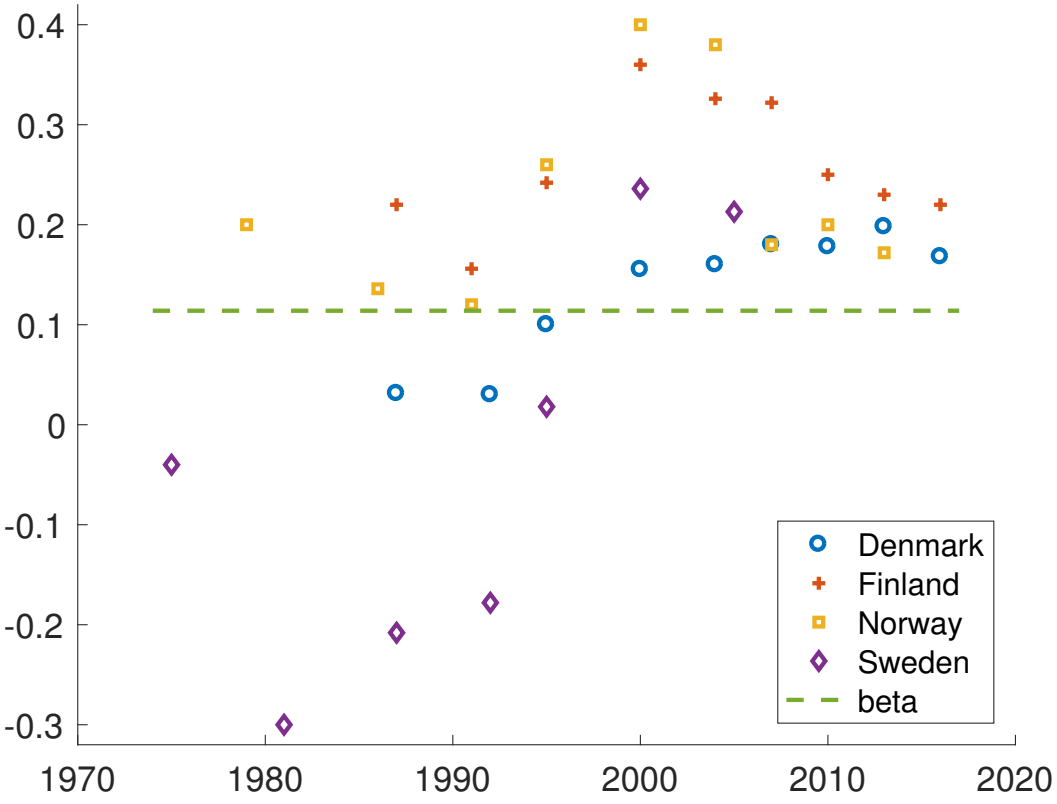
Table 11: Capital Share and Income Inequality in the Nordics

	(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. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Column [1] reports estimates of β_1 without controls and fixed effects, which are introduced step-wise in columns [2,3,4].

Figure 21: Comparison between pooled elasticities and regression coefficient



Note: The horizontal green line is the β_1 from column 4 of Table 11, representing the average of the estimated elasticity of the Gini coefficient to the functional income distribution. The coloured dots represent instead the elasticity in Equation 6 and estimated by using LIS (2020) data for each country/year.

Table 12: Marginal income tax rates in the Nordics, before/after DIT reforms

Country	(1) Tax rates personal income[21]	(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

Note: This table is re-arranged from Table 1 (page 59) in Sørensen (1994). Sørensen (1994) includes as well the corporate income tax rates before and after the interoduction of the DIT system, which have been however excluded from the table above since they lie outside the scope of this paper.

Figure 22: Elasticities and Dual Income Taxation

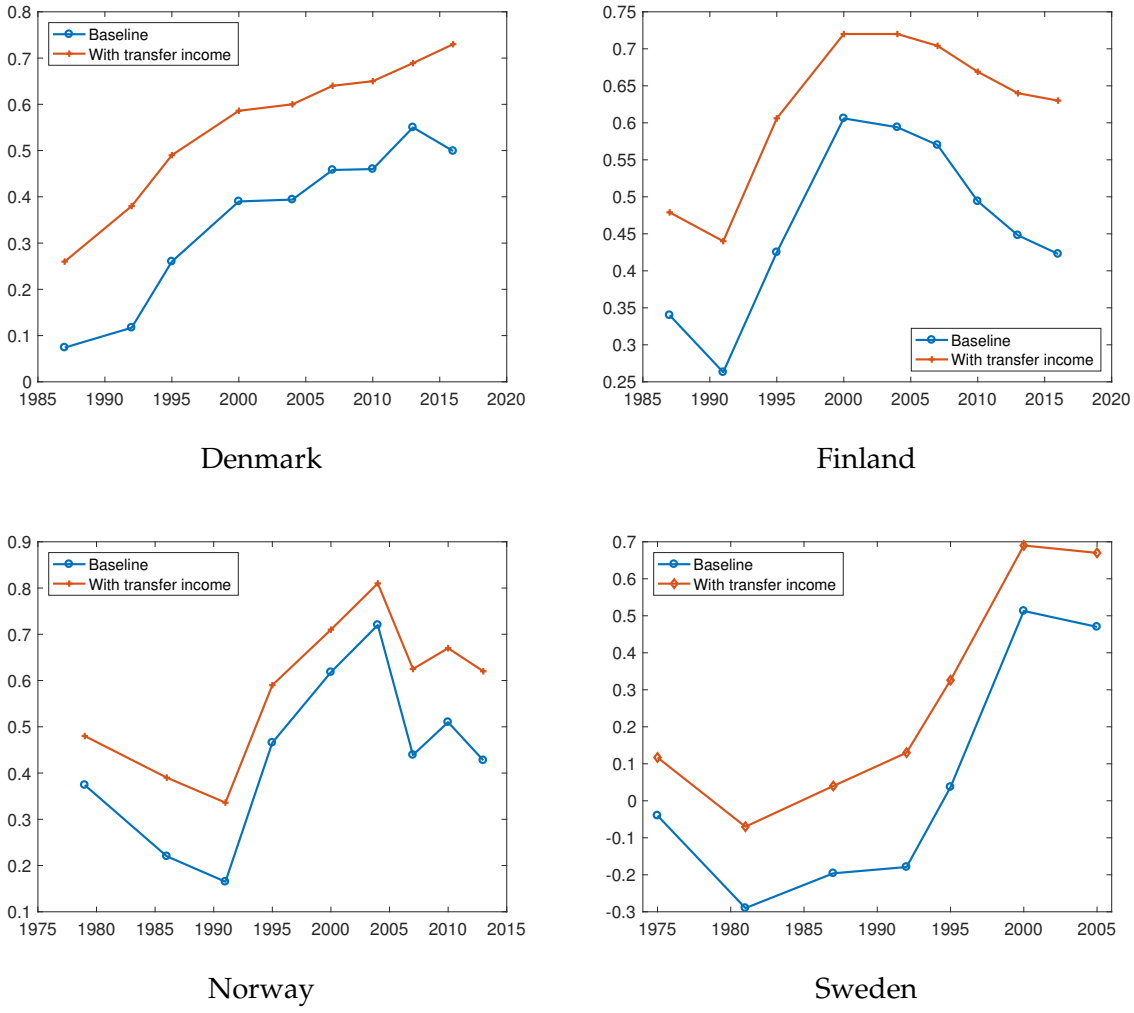
Note: For each of the four countries under analysis, we plot here the series of the elasticities of Equation 6, obtained by employing the series of the $\tilde{\mu}_{\pi}$ and $\tilde{\mu}_{w}$. the vertical reference line signals the introduction of the DIT system: 1993 for Denmark and Finland, 1992 for Norway, 1991 for Sweden.

Table 13: Simulation results

Country	ϵ_i	$r_i - g_i$	Gini growth (%)
Norway	0.2276	0.1100	33
Denmark	0.1334	0.0873	0.64
Finland	0.2584	0.1277	62
United States	0.1400	0.0700	-2.5
Norway	$\beta_1 = 0.114$	0.1100	16
Denmark	$\beta_1 = 0.114$	0.0873	0.55
Finland	$\beta_1 = 0.114$	0.1277	27

Note: in this example $T = 30$. r, g and elasticity 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 4.2 and is equal to 0.114.

Figure 23: ICI index in the Nordics, including transfer income



Note: 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.