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## **Capital Income Shares and Income Inequality in 16 EU Member Countries**

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# Capital Income Shares and Income Inequality in 16 EU Member Countries

Eva Schlenker and Kai D. Schmid\*

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## Abstract

In this paper, we estimate the effect of changes in capital income shares on inequality of gross household income. Using EU-SILC data covering 16 EU countries from 2005 to 2011 we find that the level of capital income shares is positively associated with the concentration of gross household income. Moreover, we show that the transmission of a shift in capital income shares into the personal distribution of income depends on the concentration of capital income in an economy. At the mean of the distribution of capital income a 1 percentage point increase of the capital share is associated with a 0.8 percentage point increase of the Gini coefficient of gross household income. Our findings imply that in many industrialized countries income inequality has by no means evolved independently from the observed structural shift in factor income towards a higher capital income share over the last decades.

*Keywords:* Factor Income Shares, Income Inequality, EU-SILC, Fixed Effects

*JEL-classifications:* D31, D33, E6, E25

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# 1 Introduction

Over the last decades capital income has gained in relevance vis-à-vis the distribution of economic resources in many industrialized countries. This is not only due to the steady accumulation and concentration of private wealth in developed economies since the Second World War (Piketty, 2014); it is also visible in the structural change in factor shares towards higher profit income reported in national accounts statistics. The latter point has been thoroughly documented by a large body of literature such as Arpaia et al. (2009), Ellis and Smith (2010), Giovannoni (2010) and ILO (2013). At the same time, income inequality among individuals or households in industrialized countries – either measured by Gini coefficients or top income shares of either net or gross household income – has increased. This phenomenon has been addressed for example by Atkinson et al. (2011), OECD (2008), OECD (2011) or Jenkins et al. (2013).

Against the backdrop of these two trends a small number of economists, such as e.g. Atkinson (2009) or Glyn (2009), have raised the question of whether an increasing weight of capital income that might correspond to a shift in the functional distribution of income affects the development of income inequality among individuals or households. Indeed, the association of changes in capital income shares and the development of the personal distribution of income is a very topical and politically relevant subject as it touches upon issues such as social justice and poverty.

In this paper we address the following questions: How are capital income shares distributed in the countries of the European Union? Do changing capital income shares play a role in the development of personal income inequality? If yes, what is the size of the effect of changing capital income shares upon income inequality?

To examine these issues we proceed in two steps: First, we explore the link between the distribution of capital income and the concentration of gross household income. Second, we estimate the explanatory power of capital income shares for the evolution of household income inequality. The starting point of our analysis is the conceptual framework suggested by Adler and Schmid (2013). In their descriptive study, the authors connect the distribution of capital income shares and the relationship between capital income shares with levels of individual market income. In this way, the authors illustrate a positive association between capital income shares and market income concentration. Our analysis provides broad cross-country evidence for this basic result. Moreover, we can extend their study by using the data from EU-SILC, the only longitudinal survey that offers rich data for all EU member states and Norway since 2004. The number of observed households outnumbers all other existing studies. Therefore, EU-SILC does not only enable us to replicate major parts of the descriptive analysis of Adler and Schmid (2013) for 16 EU member states but we also show that capital income shares do indeed drive the concentration of household income using a fixed ef-

fects panel data model. This allows us to control for several other factors determining income inequality such as changes in the employment level, the employment structure or demographic characteristics across countries and over time. We use this approach to measure the size of the effect of capital income shares given the underlying distribution of capital income within a country. Because we derive our macroeconomic indicators from household data we do not have to rely on the assumption that shifts in factor income shares transmit proportionally into the factor income distribution of households. Moreover, we are able to explicitly consider inequality of capital income when modeling the link between capital shares and income inequality.

Our descriptive analysis documents rising capital income shares along the upper half of the distribution of gross household income for all considered countries. Moreover, our findings reveal substantial differences in the concentration of capital income between countries, according to which variations in capital income shares transmit differently into the personal distribution of income. Hence, changing capital income shares clearly affect the evolution of income inequality over time. Depending on the level of capital income inequality a 1 percentage point increase in a country's average capital income share is associated with an increase of the Gini coefficient of gross household income between 0.5 and 1.2 percentage points. In particular, in Cyprus, Finland and the United Kingdom comparably high concentrations of capital income coincide with pronounced contributions of changes in capital income shares to changes in income inequality.

Our analysis contributes to the empirical literature on the relevance of variations in factor income shares for the personal distribution. On the one hand cross-country panel regressions, such as Daudey and García-Peñalosa (2007) or Checchi and García-Peñalosa (2010), provide evidence for the impact of factor income shares on the personal distribution. Daudey and García-Peñalosa (2007) identify the factor distribution of income as an essential determinant of the personal distribution of income. In their cross-country and panel estimations for 39 developed and developing countries between 1970 and 1994 the authors find that a larger labor share is associated with a lower Gini coefficient of personal incomes and that the top income quintile share is negatively affected by a rising labor share.<sup>1</sup> Checchi and García-Peñalosa (2010) show that variations in the factor distribution of income help explain changes in the personal distribution. The authors run panel regressions of the Gini index on labor shares, wage differentials and unemployment for 11 OECD countries from 1960 to 2000 and document a negative impact of the labor share on the Gini coefficient.<sup>2</sup>

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<sup>1</sup>For approximating personal income inequality the authors use Gini indices from the World Institute for Developments in Economic Research (WIDER) dataset. Data on labor shares in the manufacturing sector are from the United Nations Industrial Development Organization (UNIDO) database.

<sup>2</sup>Gini coefficients are either constructed in line with information from Brandolini (2003) or taken from the WIDER dataset. Labor shares are from the OECD Structural Analysis (STAN) database.

On the other hand factor decomposition methods applied to micro data, as e.g. Fräßdorf et al. (2011), García-Peñalosa and Orgiazzi (2013) or Rehm et al. (2014), illustrate the relevance of capital income for the evolution of income inequality. Fräßdorf et al. (2011) present a factor decomposition analysis for the UK, Germany and the US within the years between 1984 and 2004. The authors find an increasing role of capital income for changes in personal income inequality.<sup>3</sup> García-Peñalosa and Orgiazzi (2013) analyze factor components of inequality in a cross-country comparison covering Canada, Germany, Norway, Sweden, the UK and the US over the last three decades of the 20th century. They find that increases in inequality of capital income account for a substantial fraction of overall inequality changes.<sup>4</sup> Rehm et al. (2014) analyze the contribution of capital income vis-à-vis labor income to inequality of household market income in Germany from 1991-2010 and report strong evidence for a major impact of capital income in explaining the evolution of income inequality.

Besides our extension of Adler and Schmid (2013)'s descriptive analysis of the distribution of capital income shares among households, our findings contribute to this literature in a variety of ways: We provide new evidence for the link between changing factor income shares and the personal distribution of income based on EU-SILC data for 16 EU countries from 2005 to 2011. In contrast to earlier research, such as Daudey and García-Peñalosa (2007) or Checchi and García-Peñalosa (2010), we use household capital income shares calculated from micro data rather than factor income shares reported in national accounts. Hence, our results do not directly rely on the assumption that varying factor income shares transmit largely proportionally into the factor income structure of households.<sup>5</sup> Moreover, we not only illustrate the distribution of capital income shares within and across these countries, but we also consider country-specific levels of capital income inequality in our regressions. This allows for a more detailed analysis of the relationship between capital income shares, the concentration of capital income and personal income inequality. In addition, our results confirm and complement the findings of factor decomposition analyzes for household panel data, such as Fräßdorf et al. (2011), García-Peñalosa and Orgiazzi (2013) or Rehm et al. (2014) who document the high relevance of capital income for personal income inequality.

The remainder of this paper is structured as follows: Section 2 introduces the data and explains the calculation of basic variables. Section 3 outlines the theoretical underpinnings and the estimation approach of our empirical analysis. The results are documented in section 4 and section 5 concludes.

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<sup>3</sup>Their analysis is based on the British Household Panel Survey (BHPS) for the UK, the Socio-Economic Panel (SOEP) for West Germany and the Panel Study of Income Dynamics (PSID) for the US provided by the Cross-National Equivalent File (CNEF).

<sup>4</sup>The authors use data from the Luxembourg Income Study dataset.

<sup>5</sup>For a discussion of this issue see Behringer et al. (2014).

## 2 Data Set and Construction of Basic Variables

We use data from the European Study on Income and Living Conditions (EU-SILC). This household survey is designed to describe and to explain living conditions in Europe. The European survey mainly provides data on social inclusion, poverty and living standards.<sup>6</sup>

Since 2004 the panel study EU-SILC has replaced the former European Household Panel. EU-SILC is based on the multidimensional Laeken indicators. These indicators were introduced by the Council of the European Union to improve comparisons of the member states' progress in poverty reduction. Every year approximately 130,000 households in the current EU member states are interviewed for EU-SILC. Although the Statistical Office of the European Union (Eurostat) is responsible for providing EU-SILC data at the European level, the collection and preparation of the data is conducted by the individual countries' statistical offices. According to Hauser (2007) there exist concerns about the quality of the data from the first waves in 2004 and 2005 for Germany and other countries. Moreover, the list of countries participating in EU-SILC differs over the years for various reasons.<sup>7</sup> Despite its shortcomings, EU-SILC is the only longitudinal survey that offers comparable data for all EU member states with a large number of observations per country and year, and it includes detailed information on different types of household income. This data set is, therefore, the most adequate data set for the analysis of income inequality in the EU. For our analysis, we use data from the cross sectional files from the waves between 2005 until 2011.

We refer to the cross sectional data since longitudinal data of the EU-SILC for Germany is not available at all due to privacy regulations. We use cross sectional data to compute macroeconomic variables for each country and create a panel data set from these macroeconomic indicators. When interpreting the results it has to be kept in mind that the panel data set does not stem from longitudinal data at the household level. However, we do not consider this a critical issue for the quality of our empirical conclusions on a country level because we only interpret the aggregate effects. These effects are not influenced because the sample of EU-SILC is representative of each country's population.

The starting point for the construction of our data set is the household data available in cross sectional waves of EU-SILC. We use total household gross income as our reference point. This income comprises the sum of individual labor income components of all household members consisting of gross employee cash or near cash income and gross cash benefits from self-employment. Moreover, gross income includes individual

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<sup>6</sup>For details see [http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/eu\\_silc](http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/eu_silc).

<sup>7</sup>The first EU-SILC wave in 2003 has only been conducted as an experiment in six European countries. The sample size is too small to apply our econometric analysis to this data set. In 2004, for example, Germany, the Netherlands and the United Kingdom did not take part in EU-SILC because their deadline to introduce EU-SILC was extended to 2005.



public transfer payments for unemployed persons, individual old-age benefits as well as family related allowances on the household level. Finally, gross household income comprises the household's gross capital income, which is computed as the sum of income from rents of a property or land and interest, dividends, and profits from capital investments in unincorporated business. For plausibility reasons we limit our data set to households with nonnegative values in these categories and compute the share of capital income for each household. Furthermore, the employment status, the year of birth, and the education level attained of the head of household (defined as the first interviewee) are kept as variables. We use this household level data for the descriptive part of our analysis.

For the estimations of the size of the effect of capital income shares on inequality we change the level of aggregation and create a country-year panel data set by computing the mean share of capital income per country and year. Additionally, the Gini coefficient of total and capital income and the income share of the top decile group of total income are calculated per country and year. To control for the effects of the economic cycle on income inequality we consider an indicator for the unemployment rate per country and year in the data set. A household is defined as unemployed if the head of household has stated unemployment as the current economic status. The unemployment rate in our sample is taken to be the percentage of households with this statement from all households in the same country and the same year whose heads are neither in retirement nor disabled.

To not only control for the employment level we introduce an additional indicator for the employment structure which is taken as the percentage of part-time workers from all working people<sup>8</sup> per country and year. Finally, we compute the ratio of workers who either indicate at least lower tertiary education as highest ISCED level attained or at most primary education per country and year. This indicator incorporates the educational structure of the working population in a country.

Our final panel data consists of observations for 16 countries, namely Austria (AT), Belgium (BE), Cyprus (CY), Germany (DE), Denmark (DK), Spain (ES), Finland (FI), France (FR), Ireland (IE), Italy (IT), Luxembourg (LU), the Netherlands (NL), Norway (NO), Portugal (PT), Sweden (SE) and the United Kingdom (UK) and covers all seven years from 2005 to 2011. Due to limited data availability we miss some variables for different countries and years. Therefore, the final data set includes 103 observations. Basic summary statistics for all variables are reported in table 1 in the appendix. All further descriptive calculations and the panel estimations rely on this data set.

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<sup>8</sup>Working is defined as one of the following employment statuses: full-time worker (employee or self-employed), part-time worker or in compulsory military service.

### 3 Methodology

Our methodological approach comprises two steps: First, we examine the distribution of capital income shares across the distribution of gross household income within 16 EU member countries. This descriptive analysis is carried out on the household level. Second, we investigate whether varying capital income shares play a role for the evolution of income inequality over time. To this end we calculate capital income shares, several inequality measures and macroeconomic indicators on the country-year level and carry out panel estimations in order to identify the effect of varying capital income shares on inequality of gross household income.

As mentioned above, the conceptual background of the first part of our study has been suggested by Adler and Schmid (2013) who use household data from the German Socio-Economic Panel and carry out a descriptive analysis covering the years from 2002 to 2008. The authors examine the development of capital income shares, the distribution of capital income shares and the relationship between capital income shares and the level of individual market incomes. We extend their framework in two ways: First, while their analysis focuses on Germany, we cover 16 EU countries from 2005 to 2011 and provide broad cross country evidence for the link between capital income shares and household income inequality. Second, we extend their methodological approach by estimating the effect of capital income shares upon the concentration of household income in a panel regression setup. This not only allows us to consider a number of factors that affect income inequality, such as changes in the employment level or the employment structure, but also to control for country-specific concentration of capital income which we assume to be a central determinant of the link between capital shares and income inequality. Besides these extensions we differ from the approach of Adler and Schmid (2013) as we consider gross household income, whereas these authors use individual market income. In contrast to individual market income, gross household income contains transfer income and is calculated for the household as the unit of observation. There are two reasons for this approach: First, we want to address the effects with regard to the whole population, i.e. we do not only focus on the working population.<sup>9</sup> Second, our approach does not require to assign household income components to single individuals which might be a potential source of arbitrariness.

#### 3.1 Conceptual Links of the Transmission of Changing Capital Income Shares into the Distribution of Household Income

How changes in capital income shares are associated with the distribution of household income depends on the concentration of capital income as well as on the relationship

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<sup>9</sup>Solely taking into account market income implies that households that live on transfer payments such as retirees cannot be included in the analysis as their market income only consists of capital income and is therefore close to zero in most cases.

between the share of capital income and the level of household income. Figure 1 (upper panel) illustrates the first aspect via three hypothetical cases of capital income concentration (A, B, C). The boxes represent the income structure of households.

[ Figure 1: Types of the Functional Distribution of Income ]

Case A assumes an identical income structure across all households. Here, changes in the functional distribution of income do not alter the personal distribution of income. Case B contrasts two extreme types of income structure. Households are supposed to earn either labor and transfer income or solely capital income. Here, changes in the functional distribution of income lead to strong changes in the personal distribution of income. Finally, case C combines the rather extreme setups A and B. Here, we assume that households gain labor and transfer income but also income from asset flows. However, the respective shares differ across households.

Additionally, one has to take into account the relationship between the level of household income and the share of capital income. The lower panel of figure 1 therefore contrasts two possible cases (both special cases of C). A negative relationship between the level of household income and the respective share of capital income (case C1) implies a reduction of the income concentration resulting from a rising average capital income share. In contrast to this, in the case of a positive relationship (case C2), rising capital income shares are associated with an increase in the concentration of household income.

### 3.2 Estimation of the Effect of Capital Income

After visualizing the distribution of capital income shares among households we change the level of aggregation and focus on the association of capital shares and income inequality on the country level. Here, we are primarily interested in the size of the effect which changing capital income shares exhibit upon the evolution of income inequality over time.

We first provide some stylized illustrations of the development of income inequality and the average relationship between capital shares, unemployment and several inequality measures. Second, to estimate the size of the effect of capital income shares on inequality of gross household income we regress inequality measures on the average capital income share within each country. We apply panel estimation for our group of 16 countries covering the years 2005 to 2011. The basic regression equation reads:

$$\begin{aligned}
 INEQ_{it} = & \beta_1 + \beta_2 CIS_{it} + \beta_3 CIS_{it} \times GINICI_{it} + \\
 & \beta_4 CONTR_{it} + YD_t + \beta_5 TREND_{it} + u_i + \varepsilon_{it}.
 \end{aligned}
 \tag{1}$$

Here, *INEQ* denotes the measure of inequality in household gross income, *CIS* is the capital income share, *CONTR* is a vector of control variables and *YD* is a yearly time dummy variable. *TREND* is a country specific time trend.  $u$  denotes a country fixed effect and  $\varepsilon$  is a random error term. The subscript  $i$  corresponds to the country dimension of our panel and  $t$  is the corresponding time subscript.

To examine whether inequality of capital income in a country affects the size of the effect of capital income shares on income inequality we consider the interaction term  $CIS \times GINICI$ . Here, *GINICI* denotes the level of capital income inequality. To facilitate the interpretation of the estimated coefficients we demean the Gini coefficient of capital income by its sample mean. Hence,  $\beta_2$  expresses the effect of a 1 percentage point change in the capital share on the inequality measure of gross household income at the sample mean of the Gini coefficient of capital income. The coefficient  $\beta_3$  indicates how this effect varies across different levels of capital income inequality. According to our considerations in section 3.1 we expect  $\beta_3$  to show up with a positive sign indicating an increasing effect of capital shares along the concentration of capital income.

Within our set of control variables we seek to capture factors other than capital income shares that influence the concentration of household income. The most important aspects concern employment changes over the business cycle. Authors such as Hoover et al. (2009), Heathcote et al. (2010) or Krueger et al. (2010) provide evidence that fluctuations in macroeconomic activity affect the income distribution asymmetrically. Most important, during economic downturns the distribution of labor income changes as unemployment rises and hours worked disperse. This effect is most pronounced in the lower part of the income distribution as job lay offs are disproportionately distributed across the income distribution.<sup>10</sup> We try to catch these effects through two control variables: The unemployment rate and a measure for the percentage of atypical employment in the labor force.<sup>11</sup> The construction of these variables is explained in section 2. In addition, we consider the educational structure of the labor force. This is supposed to capture effects of skill-driven dispersion of labor income due to the rising percentage of academic job qualification and global factor competition, as argued by authors such as Katz and Autor (1999).

We use the Gini coefficient of gross household income as our basic inequality measure. Additionally, we compare these results with regressions that consider the Theil coefficient and the income share of the top ten percent of the income distribution as dependent variables.<sup>12</sup>

We estimate specification (1) for all of these inequality measures by Fixed Effects. The corresponding results for the Gini coefficient as the dependent variable are pre-

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<sup>10</sup>The cross-correlations presented in table 2 confirm these relationships.

<sup>11</sup>As described in section 2 we approximate atypical employment with part-time job occupation.

<sup>12</sup>For a discussion of the appropriateness of approximating developments in income concentration with changes in top income shares see for example Leigh (2007).

sented in table 3. The results for the Theil coefficient and the top decile income share are reported in tables 4 and 5.

Because we use gross household income for the construction of inequality measures used in our regressions our results may be affected by changes in the public transfer system. We are not able to control for such institutional changes any better than by the inclusion of country-specific time trends and year dummy variables that are supposed to capture distributional shocks on a global level. In order to gain some more confidence with regard to the robustness of our results we run a set of additional regressions on inequality measures constructed from market income rather than gross income. Household market income comprises the sum of individual labor earnings of all household members and household capital income. As market income does not include transfer payments, changes in its distribution should not be directly affected by policy changes in the transfer system. The results of these regressions are presented in tables 6 and 7.

## 4 Empirical Results

### 4.1 Capital Shares Across the Distribution Gross Household Income

In the following we examine to what extent the results for the 16 EU countries reflect the relationships of the conceptual framework presented in subsection 3.1. Therefore, we illustrate how these countries differ with respect to the distribution of capital income shares as well as the association of capital income shares and the level of gross household income across different income groups. To this end, figures 2 to 5 show the shares of capital income on gross household income sorted by capital income shares (left panels). Note that we report capital income shares on the vertical axis across quintiles of capital income shares on the horizontal axis. This representation corresponds to the upper row of panels presented in figure 1. The right panels in figures 2 to 5 illustrate levels of gross household income (left vertical axis) by income classes. These correspond to the lower panels (cases C1 and C2) in figure 1. In addition, on the right vertical axis, we report capital income shares by income deciles. The exposition is based on a pooled calculation for all available data covering 2005 to 2011.<sup>13</sup>

We see that the left panels in figures 2 to 5 resemble case C in figure 1. This illustration reveals that capital income shares are far from being distributed equally across households and is a first indication that changing capital income shares may affect the personal distribution of income. The most pronounced differences in capital shares among households are visible for Denmark, Finland and France. On the contrary, in Austria, Spain, Ireland and Portugal show a rather equal distribution of capital shares for the majority of their households.

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<sup>13</sup>Calculations for single years yield qualitatively identical results.

The right panels in figures 2 to 5 illustrate that capital income shares tend to increase with the level of gross household income in most countries. This implies that shocks to the factor distribution of household income particularly affect the upper part of the income distribution.<sup>14</sup> Hence, according to our conceptual considerations, this suggests a positive relationship between changes in capital income shares and changes in the concentration of gross household income. This result is even valid in case of a comparably flat distribution of capital income shares across the distribution of gross household income, as, e.g. in the case of Belgium, Cyprus or Germany. Given the low levels of gross household income in the lower income deciles the level of the capital share is of little relevance for the level of capital income and in particular for its share in total capital income of the whole population.

[ Figures 2 to 5: Distribution of Capital Shares and Income Structure on the Household Level, 2005-2011 ]

## 4.2 Capital Shares and Income Inequality

Next, we analyze the size of the effect which changing capital income shares exhibit upon the evolution of income inequality. As described in section 3.2 for this purpose we leave the household dimension of our data and switch to the country-year level. Figure 6 contrasts the development of the Gini coefficient and the top decile income share of gross household income with the average capital share and the unemployment rate for each country across the years 2005-2011.

[ Figure 6: Development of Capital Shares, Unemployment and Income Inequality, 2005-2011 ]

The Gini coefficient of gross household income and the top decile income share widely move in parallel. Based on these measures, we do not observe a clear upward or downward movement in income inequality in the period under consideration. Particularly, due to the start of the financial and economic crisis (indicated by the vertical line around the year 2008) the often debated trend increase in income inequality since the 1980s seems to have been moderated during the second half of the 2000s. This moderation is caused by rising unemployment and decreasing or stagnating capital shares in most countries from 2008 onwards.<sup>15</sup>

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<sup>14</sup>These findings are in line with the evidence provided by Adler and Schmid (2013) for the German economy.

<sup>15</sup>Exceptions to this general pattern are on the one hand Austria, Cyprus, France, Italy, Luxembourg, the Netherlands and Portugal. Here, according to our data the average capital income share did not fall during the crisis. On the other hand, for Germany, France and Norway we do not observe an increase in unemployment during this period.

While increasing unemployment c.p. tends to reduce the income shares of households in the lower part of the income distribution, and thus, tends to increase income inequality, decreasing capital shares negatively affect the upper part of the distribution inducing a reduction in inequality. Table 2 confirms these basic relationships through (unconditional) cross-correlations between several inequality indicators, unemployment and capital shares. While capital shares are positively associated with the level of the Theil coefficient and the income shares of households at the top of the income distribution, unemployment is positively related to the level of the Gini coefficient and shows a significant negative correlation vis-à-vis the income share of household below the median income.<sup>16</sup>

[ Table 2: Cross-correlations between Inequality Measures of Gross Household Income, Capital Shares and Unemployment Rates, 2005-2011 ]

Against the background of these descriptive and unconditional indications our panel regressions - motivated and explained in subsection 3.2 - allow to disentangle the effects of capital shares and unemployment changes on the income distribution. Table 3 reports the results for our fixed effects panel regressions of the Gini coefficient of gross household income on the average capital income share of all households. The sample comprises all countries for the years 2005-2011. Columns 1-4 contain the results for different sets of control variables.

[ Table 3: Estimation Results for the Gini Coefficient of Gross Income ]

The total marginal effect of the capital income share upon the concentration of gross household income results from the sum of the basic coefficient  $\beta_2$  and the coefficient for the interaction with each country's Gini-coefficient of capital income  $\beta_3$  multiplied with the respective level of capital income concentration. The corresponding formula reads

$$\frac{\partial INEQ}{\partial CIS} = \beta_2 + \beta_3 \times GINICI. \quad (2)$$

To facilitate the interpretation of the estimation results we center the Gini coefficient of capital income around its sample mean when constructing the interaction term stated in equation 1. Hence, the coefficients in the first row of table 3 correspond to the effect of the capital share at the sample mean of capital income inequality. According to the size of this effect a 1 percentage point increase in the capital share is associated with a 0.8 percentage point increase in the Gini coefficient of gross household inequality. Moreover, we see that deviations from the sample mean of the concentration of

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<sup>16</sup>These basic patterns also visible when contrasting inequality measures, capital shares and unemployment rates for each single country as presented in figure 7.

capital income significantly alter the size of the effect of the capital income share. This is in line with our theoretical considerations described in section 3 and is further illustrated in figure 8. Here, we depict the total marginal effect of capital income share upon inequality of gross household market income across different degrees of capital income concentration.<sup>17</sup> The horizontal axis covers the range of capital income inequality levels in the sample. The dotted vertical lines represent the first and third quartiles, the solid vertical line the median value of the concentration of capital income measured by its demeaned Gini coefficient. We see that the total marginal effect varies between about 0.5 at the first quartile of capital income inequality and 1.2 at the third quartile.

[ Figure 8: Marginal Effects of Capital Income Share for Different Degrees of Capital Income Inequality ]

The illustration also reveals that the effect of the capital income share is statistically significant only above the first quartile of capital income inequality. For our sample, given a 95 percent confidence interval, this threshold corresponds to a Gini coefficient of capital income of about 0.85 (see also figure 10). Above this value, a more pronounced concentration of capital income is associated with a stronger impact of capital income shares upon the distribution of gross household market income.

For the remaining covariates we find a significant and positive effect of unemployment on income inequality. This is in line with the reasoning that high unemployment rates tend to be a heavier burden for people at lower income levels and income inequality therefore increases in times of economic recession and high unemployment. This finding confirms the evidence provided by the above-cited studies (see section 3.2) and is consistent with our descriptive indications presented in table 2. The significant coefficients for the other terms of the polynomial show that the size of the effect declines for values close the median of the distribution of unemployment. The effect is larger for small and large levels of unemployment.

In contrast to the significant effect of unemployment we do not find empirical evidence for the influence of the employment structure: The coefficient of the ratio of part-time workers is not significant in columns 3 and 4. However, even though the estimated coefficient is not statistically significant and small in size, the sign is positive as expected since a higher percentage of workers in atypical jobs may be a potential driver of income inequality in a society, as posited by Grabka and Frick (2011) or Schmid and Stein (2013).<sup>18</sup> A further explanatory factor of the level of income

<sup>17</sup>The estimates correspond to the model in column 4 of table 3. However, the results are very similar across the different sets of covariates.

<sup>18</sup>While with regard to individual earnings this mechanism is straightforward, it is less clear on the basis of household income. This is because a rising proportion of part-time occupation in the labor force may rather reflect additional labor income than a substitution of full-time occupation within households.



inequality in an economy is the educational structure of the workforce as skill-biased technological change and global factor competition increase wage dispersion: However, as reported in column 4, though positive in sign our indicator for job qualification does not yield a statistically significant effect on the Gini coefficient of gross household income.

We additionally ran the four specifications presented in table 3 for the Theil coefficient and the income share of the richest ten percent of the population which serve as alternative measures of income inequality. These regressions yield very similar results and are reported in tables 4 and 5.

[ Table 4: Estimation Results for the Theil Coefficient of Gross Income ]

[ Table 5: Estimation Results for the Top Decile Income Share ]

### 4.3 Explanatory Power and Role of Capital Income Concentration

Next, we examine to what extent variations in capital income shares explain the level of income inequality given the differing degrees of capital income inequality across countries. To assess the actual impact of capital income shares upon the concentration of gross household income we compute the contribution of this regressor to the explanation of our measure of income inequality. The contribution of the capital income share is calculated by multiplying its average sample value with the estimated total marginal effect derived according to equation 2. Figure 9 contrasts these contributions of capital income shares based on our estimation specification summarized in column 4 of table 3 across all 16 countries.

[ Figure 9: Contribution of Capital Income Shares to the Concentration of Gross Household Income ]

We see that depending on the country the impact of capital income shares ranges from approximately 0.013 to 0.045 in terms of variations of the Gini coefficient of gross household income. The highest contributions are visible for Finland, Cyprus and the United Kingdom. In contrast, for Germany and the Netherlands the explanatory power of capital income shares is rather small. These differences are closely connected to the distribution of capital income within the respective economies. The higher the concentration of capital income, the stronger is the effect of developments in capital income shares on the concentration of gross household income. This relationship is illustrated in figure 10. Here, we scatter the above derived contributions of capital income shares against the Gini coefficient of capital income for each country.

[ Figure 10: Contribution of Capital Income Shares to Income Inequality Against Capital Income Concentration ]

While Finland, Cyprus and the United Kingdom are among the group of countries with the highest concentration of capital income, Germany and the Netherlands show comparably small values for the Gini coefficient of capital income.

#### 4.4 Potential Role of Public Transfer System

As mentioned above, using inequality measures derived from the gross household income in the panel regression analyses may involve the potential impact of policy changes in the public transfer system on the income distribution. Such impacts may not be controlled for sufficiently by including time trends and year dummy variables that work on the global level. Hence, to examine whether this might systematically drive our results, we run a set of additional regressions that use inequality measures constructed from market rather than gross income levels of households. The results of these regressions are summarized in tables 6 and 7.

[ Table 6: Robustness: Estimation Results for Gini Coefficient of Market Household Income ]

[ Table 7: Robustness: Estimation Results for Top Decile Share of Market Household Income ]

These regressions yield very similar results as our baseline specifications for gross household income. Note that due to the different levels of Gini coefficients, top decile shares and most importantly capital income shares between both income measures (see table 1), the size of the estimated effects for market income is not directly comparable to those of the regressions based on gross income. We take this finding as an indication for the fact that our baseline results are not systematically affected by country-specific changes in transfer policies.

## 5 Conclusion

In order to assess the relevance of changing capital income shares for the evolution of income inequality we use household data from EU-SILC and examine the distribution of capital income shares among households in 16 EU member countries within the years 2005-2011. In addition to a first descriptive analysis of the association of capital income shares and the distribution of gross income on the household level, we switch to the country-year perspective and estimate fixed effect panel data models to identify the size of the effect of the capital income share on gross household income inequality. Our descriptive analysis reveals that capital income shares increase along the upper half of the distribution of gross household income for all considered countries. Moreover, there are substantial differences in the concentration of capital income between countries,

according to which variations in capital income shares transmit differently into the personal distribution of income. When controlling for changes in unemployment, the employment structure, global macroeconomic shocks and country-specific inequality trends, we find that capital income shares and income inequality are positively related and that the size of the effect of the capital income share depends on the concentration of capital income. At the sample mean of the concentration of capital income a 1 percentage point increase in the capital income share is associated with a 0.8 percentage point increase in the Gini coefficient of gross household income. Depending on the level of capital income inequality this effect varies between 0.5 and 1.2 percentage points. In particular, in Cyprus, Finland and the United Kingdom comparably high concentrations of capital income coincide with pronounced contributions to changes in capital income shares and changes in income inequality.

Although a clear connection of aggregate movements in profit shares reported in national account statistics to changes in the income structure of households is subject to a number of limitations<sup>19</sup>, our study provides valuable insights into the role of the distribution of capital income for the development of income inequality across households. As both the development of capital income shares as well as the concentration of capital income constitute a stable link from the functional income distribution to income inequality across households, shifts in the functional distribution of income affect the personal income distribution. This link suggests a connection between two trends that many industrialized economies have been subject to during the last decades: Shifts within factor shares towards a higher percentage of capital income and the rise of top income shares, which reflects increasing income concentration across households.

Moreover, the inequality increases observed in some countries since the beginning of the financial and economic crisis do not fully reflect the income losses suffered by households in the lower part of the income distribution due to rising unemployment. This is because in the course of the economic downturn falling capital income shares negatively affected the upper income percentiles reducing inequality at this margin.

Further research could focus on two aspects: First, a more explicit consideration of the influence of the business cycle on both, the development of factor shares and the personal distribution of income. Such analysis requires a longer time span than EU-SILC offers and will therefore have to be based on country-specific household surveys as for example the German Socio-Economic Panel (SOEP) or the British Household Panel Survey (BHPS). Second, the distribution of household wealth underlying the concentration of capital income might be taken into account. In a cross-country perspective this might be approached by using the recently released Household and Consumer Finance (HFCS) data or on the basis of data from the Luxembourg Wealth Study (LWS). A better understanding of the mechanisms addressed in this paper crucially depends on the further collection and preparation of high quality household data in the future.

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<sup>19</sup>For a discussion of this issue see, for example Adler and Schmid (2013) and Ryan (1996).

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## Appendix - Tables

**Table 1:** Summary Statistics of Main Variables

Household Level								
	N	Mean	p25	p50	p75	Std.Dev.	Min	Max
Total Gross Income	819,548	47,760	21,047	37,597	61,689	53,935	0	1.71e+07
Total Market Income	817,993	35,948	1,825	25,716	53,001	55,035	0	1.71e+07
Gross Capital Income	819,604	2,218	0	95	829	30,234	0	1.69e+07
Capital Share (Gross)	817,816	0.035	0.000	0.002	0.019	0.100	0.000	1.000
Capital Share (Market)	720,789	0.223	0.000	0.007	0.145	0.391	0.000	1.000
Country Level								
	N	Mean	p25	p50	p75	Std.Dev.	Min	Max
<i>Gross Income</i>								
Gini Coefficient	103	0.381	0.354	0.379	0.400	0.037	0.319	0.463
Theil Coefficient	103	0.267	0.222	0.250	0.295	0.065	0.175	0.611
Top Decile Share	103	0.277	0.259	0.271	0.289	0.027	0.232	0.343
Capital Share	103	0.034	0.025	0.033	0.040	0.013	0.014	0.085
<i>Market Income</i>								
Gini Coefficient	103	0.555	0.512	0.554	0.583	0.053	0.463	0.688
Top Decile Share	103	0.346	0.323	0.338	0.365	0.040	0.285	0.447
Capital Share	103	0.213	0.162	0.205	0.264	0.075	0.067	0.356
<i>Capital Income</i>								
Gini Coefficient	103	0.887	0.853	0.893	0.928	0.049	0.730	0.965
<i>Labour Market</i>								
Unemployment Rate	110	0.062	0.039	0.059	0.082	0.030	0.013	0.145
Part-time Rate	110	0.113	0.063	0.096	0.138	0.065	0.019	0.324
Job Qualification	110	0.454	0.371	0.423	0.566	0.136	0.175	0.782

Note: This table reports summary statistics of the variables used within our regressions. The construction of these variables is described in section 2.

**Table 2:** Cross-correlations between Inequality Measures of Gross Household Income, Capital Shares and Unemployment Rates, 2005-2011

	Gini Coefficient	Theil Coefficient	Top Decile Income Share		
Gini Coefficient	1				
Theil Coefficient	0.856**	1			
Top Decile Share	0.957**	0.911**	1		
Top Vingtile Share	0.883**	0.953**	0.971**		
Bottom Half Share	-0.987**	0.797**	-0.902**		
Capital Share	0.008	0.157 <sup>+</sup>	0.051		
Unemployment Rate	0.275**	0.063	0.165*		
	Top Vingtile Income Share	Bottom Half Income Share	Capital Share	Unempl. Rate	
Gini Coefficient					
Theil Coefficient					
Top Decile Income Share					
Top Vingtile Income Share	1				
Bottom Half Income Share	-0.806**	1			
Capital Share	0.155 <sup>+</sup>	0.027	1		
Unemployment Rate	0.031	-0.317**	-0.044	1	

<sup>+</sup>  $p < 0.2$ , \*  $p < 0.1$ , \*\*  $p < 0.05$

**Table 3:** Estimation Results for the Gini Coefficient of Gross Income

	(1)	(2)	(3)	(4)
Capital Income (CI) Share	0.665*** (0.167)	0.825*** (0.168)	0.824*** (0.170)	0.790*** (0.167)
Std. Gini CI $\times$ CI Share	6.911*** (0.857)	8.277*** (0.939)	8.238*** (0.963)	7.817*** (0.967)
Unempl. Rate		2.380*** (0.746)	2.355*** (0.760)	2.008** (0.765)
Unempl. Rate <sup>2</sup>		-32.59*** (10.78)	-32.34*** (10.92)	-27.21** (11.01)
Unempl. Rate <sup>3</sup>		143.6*** (48.76)	142.7*** (49.31)	119.5** (49.72)
Part-time Rate			0.0113 (0.0506)	0.0110 (0.0495)
Job Qualification				0.0730* (0.0379)
Obs.	103	103	103	103
R <sup>2</sup>	0.701	0.747	0.747	0.762

Standard errors in parentheses  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Note: This table reports results from a fixed effects regression of the Gini coefficient of gross household income on the average capital income share of all households. The sample comprises all countries for the years 2005-2011. Columns 1-4 compare the results of specification for different sets of control variables. All four regressions include year dummies and a country specific time trend. The total effect of capital income shares is calculated according to the formula in equation 2. As the Gini coefficient of capital income in the interaction term has been averaged around the sample mean, the coefficients in the top row correspond to the total marginal effects at the sample mean of the Gini coefficient of capital income.



**Table 4:** Estimation Results for the Theil Coefficient of Gross Income

	(1)	(2)	(3)	(4)
Capital Income (CI) Share	3.114*** (0.681)	3.361*** (0.727)	3.359*** (0.723)	3.164*** (0.694)
Std. Gini CI $\times$ CI Share	33.53*** (3.502)	36.54*** (4.050)	35.57*** (4.099)	33.21*** (4.018)
Unempl. Rate		5.699* (46.50)	5.090 (46.50)	3.134 (45.76)
Unempl. Rate <sup>2</sup>		-86.58* (12.09)	-80.49* (12.22)	-51.62 (12.15)
Unempl. Rate <sup>3</sup>		399.9* (210.4)	377.6* (210.0)	247.1 (206.6)
Part-time Rate			0.276 (0.215)	0.275 (0.206)
Job Qualification				0.411** (0.158)
Obs.	103	103	103	103
R <sup>2</sup>	0.700	0.717	0.725	0.753

Standard errors in parentheses  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Note: This table reports results from a fixed effects regression of the Theil coefficient of gross household income on the average capital income share of all households. The sample comprises all countries for the years 2005-2011. Columns 1-4 compare the results of specification for different sets of control variables. All four regressions include year dummies and a country specific time trend. The total effect of capital income shares is calculated according to the formula in equation 2. As the Gini coefficient of capital income in the interaction term has been averaged around the sample mean, the coefficients in the top row correspond to the total marginal effects at the sample mean of the Gini coefficient of capital income.

**Table 5:** Estimation Results for the Top Decile Income Share

	(1)	(2)	(3)	(4)
Capital Income (CI) Share	0.883*** (0.183)	1.028*** (0.189)	1.028*** (0.190)	0.982*** (0.184)
Std. Gini CI $\times$ CI Share	8.305*** (0.943)	9.676*** (1.053)	9.553*** (1.077)	8.989*** (1.067)
Unempl. Rate		2.373*** (0.837)	2.296*** (0.850)	1.830** (0.844)
Unempl. Rate <sup>2</sup>		-33.18*** (12.09)	-32.41** (12.22)	-25.54** (12.15)
Unempl. Rate <sup>3</sup>		146.4*** (54.70)	143.5** (55.17)	112.5** (54.85)
Part-time Rate			0.0350 (0.0566)	0.0346 (0.0546)
Job Qualification				0.0978** (0.0418)
Obs.	103	103	103	103
R <sup>2</sup>	0.690	0.728	0.729	0.752

Standard errors in parentheses  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Note: This table reports results from a fixed effects regression of the top decile share on gross household income on the average capital income share of all households. The sample comprises all countries for the years 2005-2011. Columns 1-4 compare the results of specification for different sets of control variables. All four regressions include year dummies and a country specific time trend. The total effect of capital income shares is calculated according to the formula in equation 2. As the Gini coefficient of capital income in the interaction term has been averaged around the sample mean, the coefficients in the top row correspond to the total marginal effects at the sample mean of the Gini coefficient of capital income.

**Table 6:** Robustness: Estimation Results for the Gini Coefficient of Market Income

	(1)	(2)	(3)	(4)
Capital Income (CI) Share	0.146* (0.0783)	0.199*** (0.0736)	0.187** (0.0723)	0.184** (0.0730)
Std. Gini CI $\times$ CI Share	0.864*** (0.159)	1.150*** (0.163)	1.118*** (0.161)	1.096*** (0.167)
Unempl. Rate		3.061*** (0.783)	2.911*** (0.770)	2.805*** (0.799)
Unempl. Rate <sup>2</sup>		-43.33*** (11.36)	-42.19*** (11.13)	-40.60*** (11.58)
Unempl. Rate <sup>3</sup>		196.3*** (51.40)	192.5*** (50.32)	185.3*** (52.38)
Part-time Rate			0.102* (0.0529)	0.102* (0.0533)
Job Qualification				0.0223 (0.0414)
Obs.	103	103	103	103
R <sup>2</sup>	0.711	0.776	0.789	0.790

Standard errors in parentheses  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Note: This table reports results from a fixed effects regression of the Gini coefficient of household market income on the average capital income share of all households. The sample comprises all countries for the years 2005-2011. Columns 1-4 compare the results of specification for different sets of control variables. All four regressions include year dummies and a country specific time trend. The total effect of capital income shares is calculated according to the formula in equation 2. As the Gini coefficient of capital income in the interaction term has been averaged around the sample mean, the coefficients in the top row correspond to the total marginal effects at the sample mean of the Gini coefficient of capital income.

**Table 7:** Robustness: Estimation Results for the Top Decile Share of Market Income

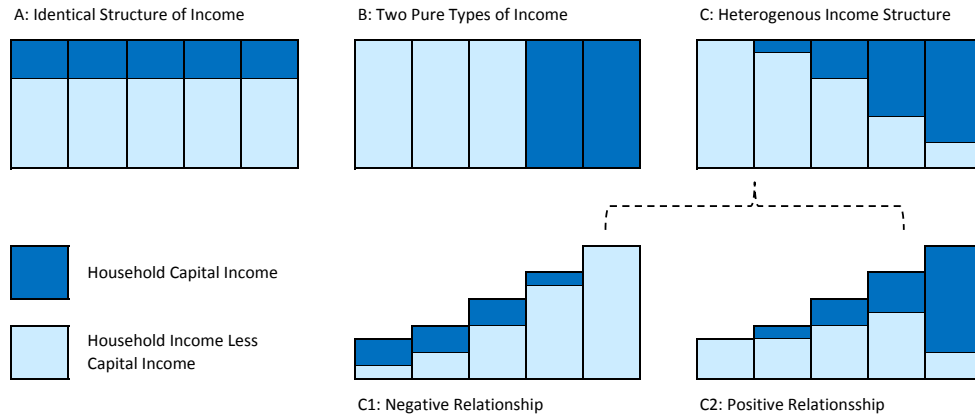
	(1)	(2)	(3)	(4)
Capital Income (CI) Share	0.287*** (0.0915)	0.341*** (0.0906)	0.330*** (0.0900)	0.317*** (0.0888)
Std. Gini CI × CI Share	1.477*** (0.186)	1.709*** (0.201)	1.678*** (0.200)	1.592*** (0.203)
Unempl. Rate		2.594*** (0.964)	2.446** (0.958)	2.031** (0.972)
Unempl. Rate <sup>2</sup>		-38.12*** (13.99)	-37.00*** (13.85)	-30.80** (14.09)
Unempl. Rate <sup>3</sup>		179.2*** (63.27)	175.5*** (62.63)	147.2** (63.75)
Part-time Rate			0.101 (0.0659)	0.0996 (0.0648)
Job Qualification				0.0872* (0.0504)
Obs.	103	103	103	103
R <sup>2</sup>	0.674	0.719	0.730	0.743

Standard errors in parentheses  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Note: This table reports results from a fixed effects regression of the top decile share on household market income on the average capital income share of all households. The sample comprises all countries for the years 2005-2011. Columns 1-4 compare the results of specification for different sets of control variables. All four regressions include year dummies and a country specific time trend. The total effect of capital income shares is calculated according to the formula in equation 2. As the Gini coefficient of capital income in the interaction term has been averaged around the sample mean, the coefficients in the top row correspond to the total marginal effects at the sample mean of the Gini coefficient of capital income.

## Appendix - Figures

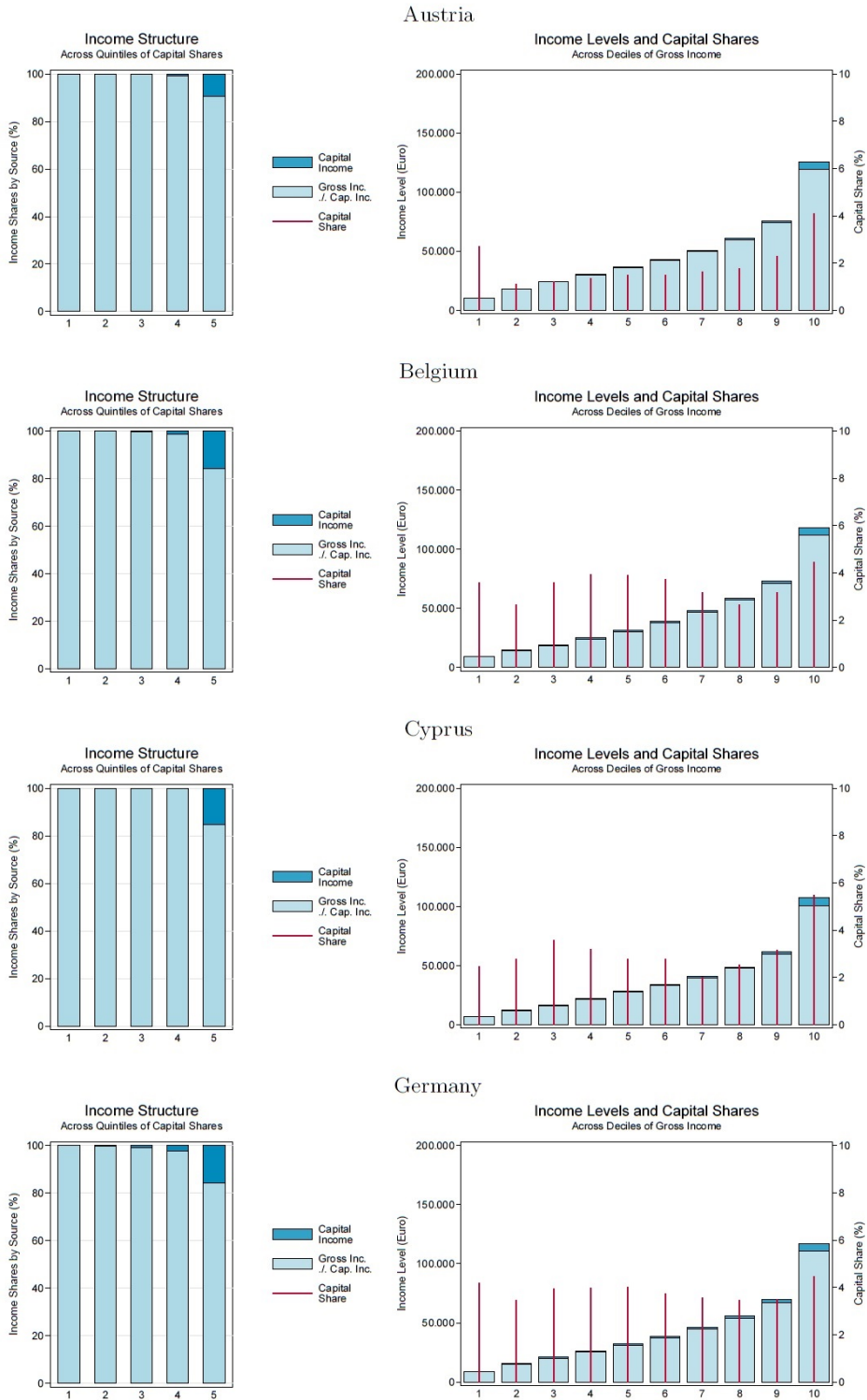
**Figure 1:** Types of the Factor Distribution of Income



Note: This figure shows that the transmission of changing capital income shares depends on the concentration of capital income (illustrated by three hypothetical cases of income concentration A, B, C) and on the relationship between the share of capital income and the level of household income (illustrated by two cases C1, C2). Within each panel each of the five boxes on the horizontal axis represents the income structure of a household. The five households within each of the five panels constitute the income structure of hypothetical populations. In contrast to the upper panels (A, B, C) that only focus on the structure of income, within the lower panels (C1, C2) the height of the boxes reflects different levels of household income.

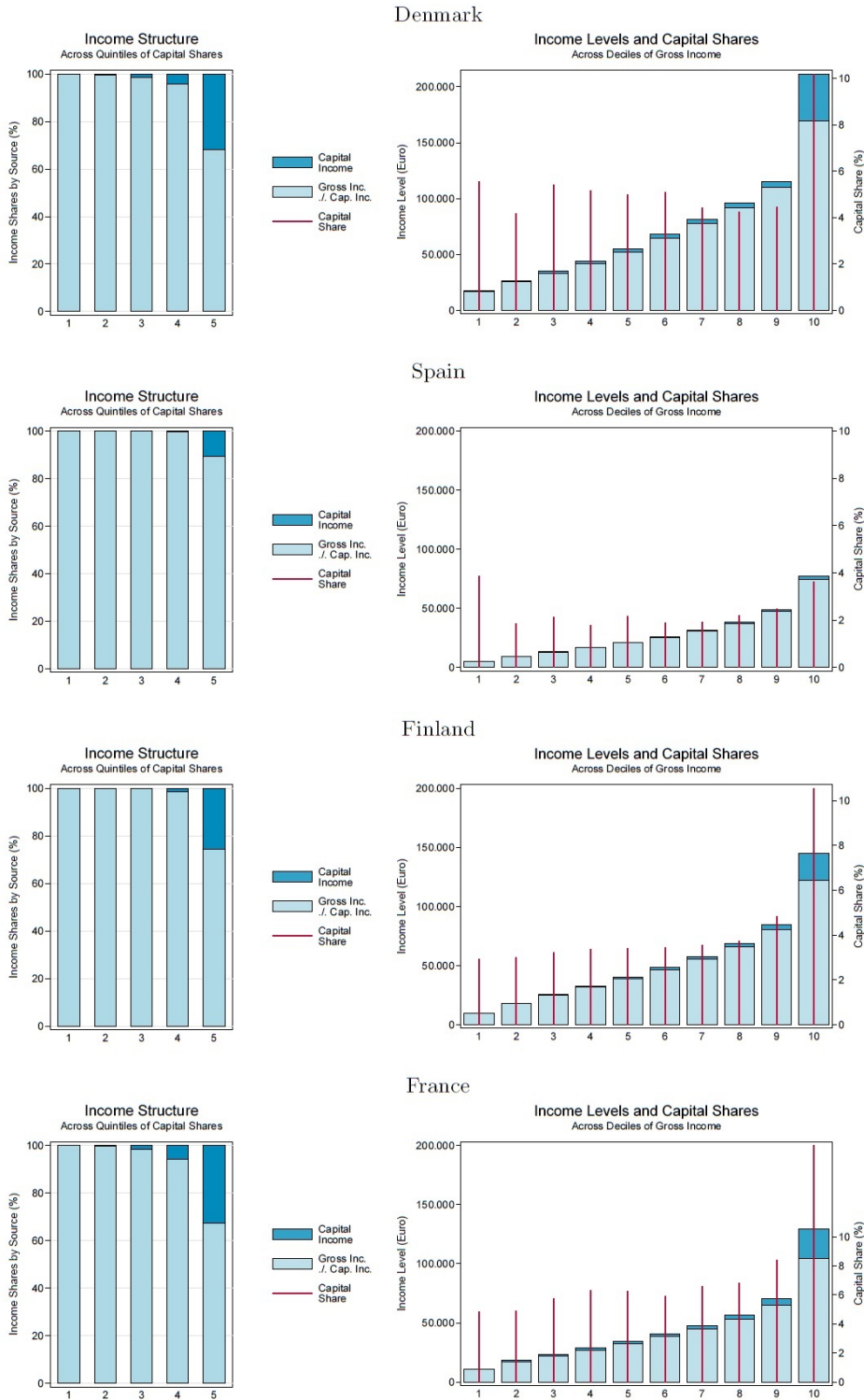
Source: Adler and Schmid (2013).

**Figure 2:** Distribution of Capital Shares and Income Structure on the Household Level, 2005-2011



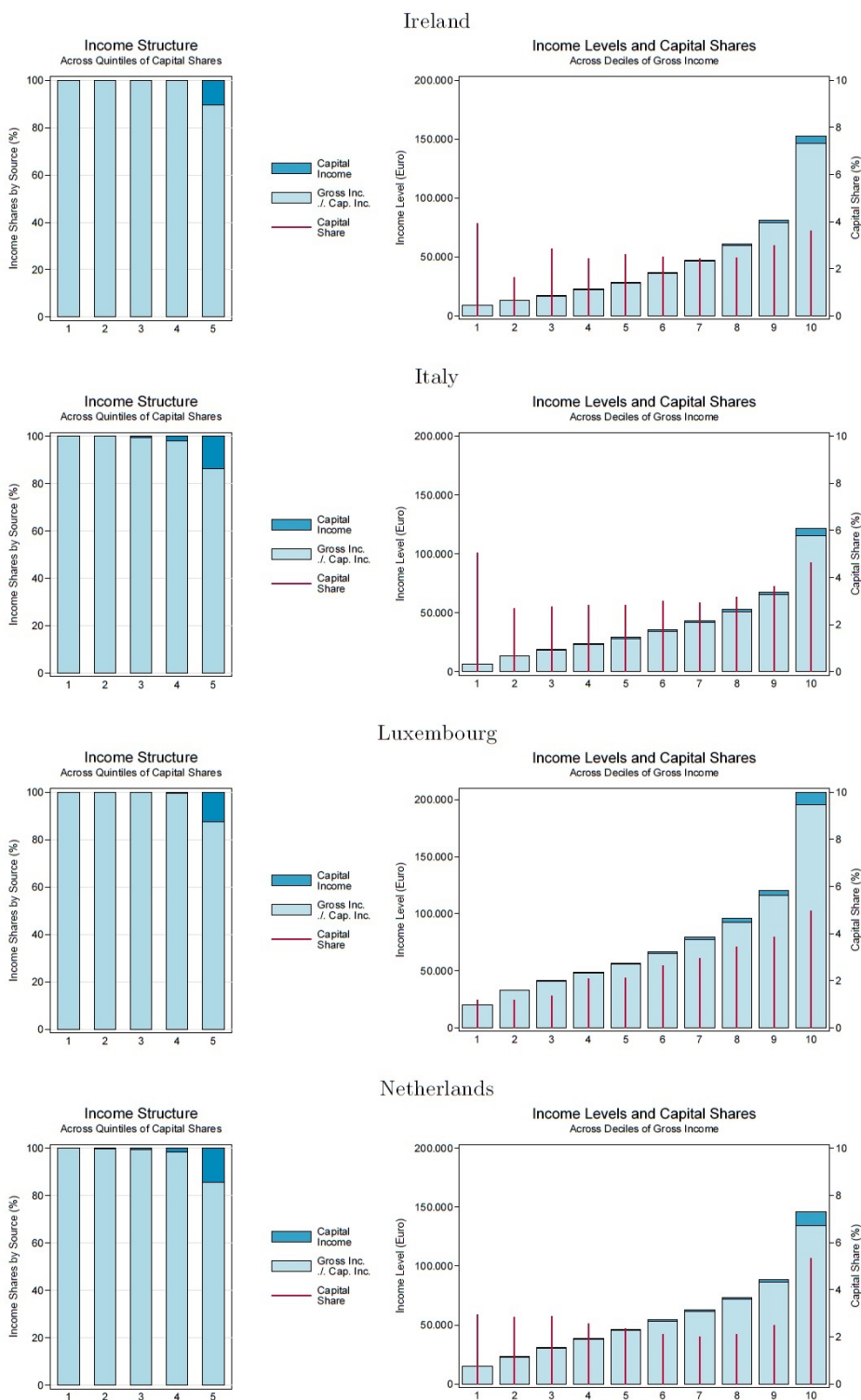
Note: The left panel shows capital income shares (vertical axis) across quintiles of capital shares (horizontal axis). The right panel illustrates income levels (left vertical axis) and capital income shares (right vertical axis) across deciles of total market income (horizontal axis).

**Figure 3:** Distribution of Capital Shares and Income Structure on the Household Level, 2005-2011



Note: The left panel shows capital income shares (vertical axis) across quintiles of capital shares (horizontal axis). The right panel illustrates income levels (left vertical axis) and capital income shares (right vertical axis) across deciles of total market income (horizontal axis).

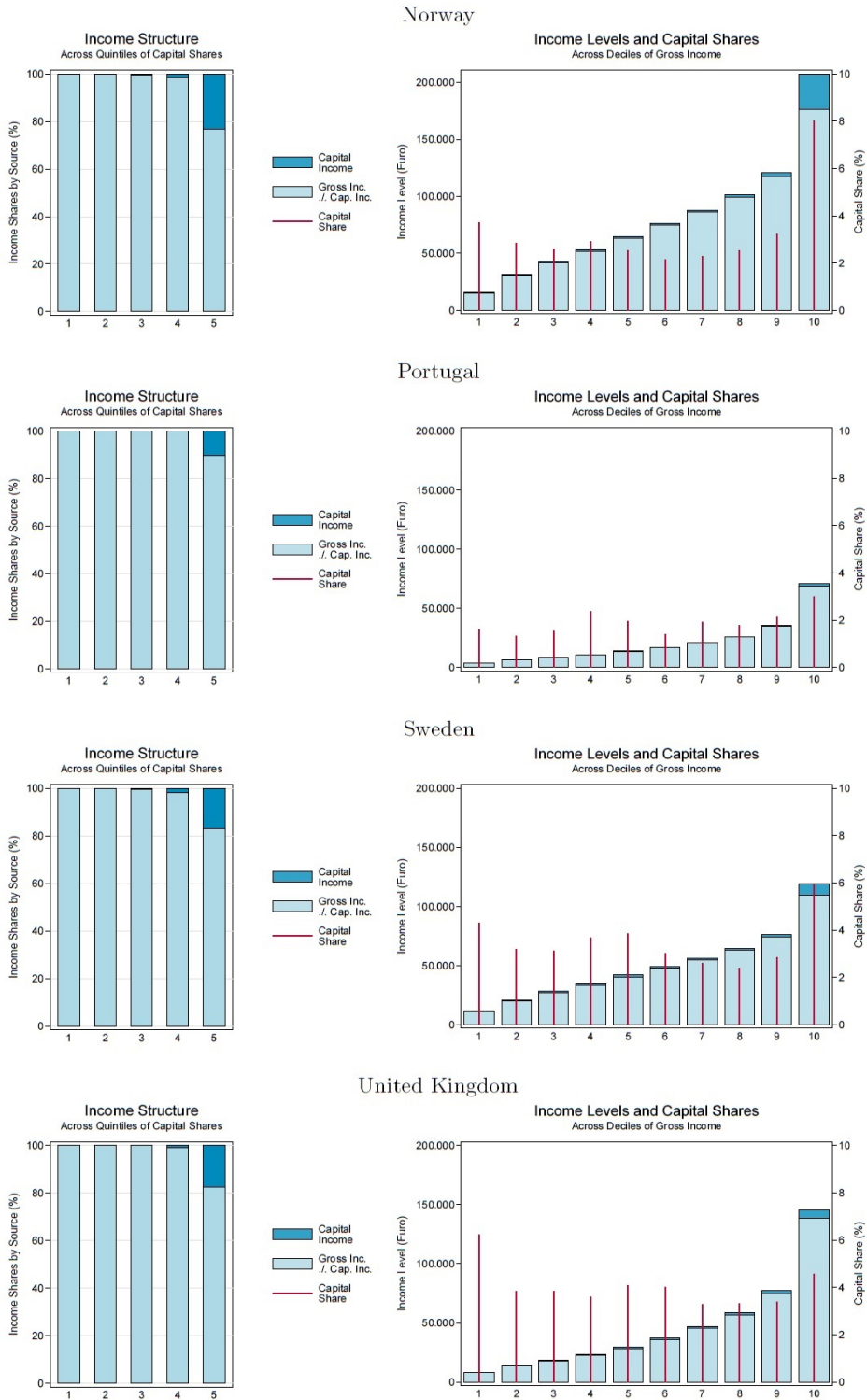
**Figure 4:** Distribution of Capital Shares and Income Structure on the Household Level, 2005-2011



Note: The left panel shows capital income shares (vertical axis) across quintiles of capital shares (horizontal axis). The right panel illustrates income levels (left vertical axis) and capital income shares (right vertical axis) across deciles of total market income (horizontal axis).

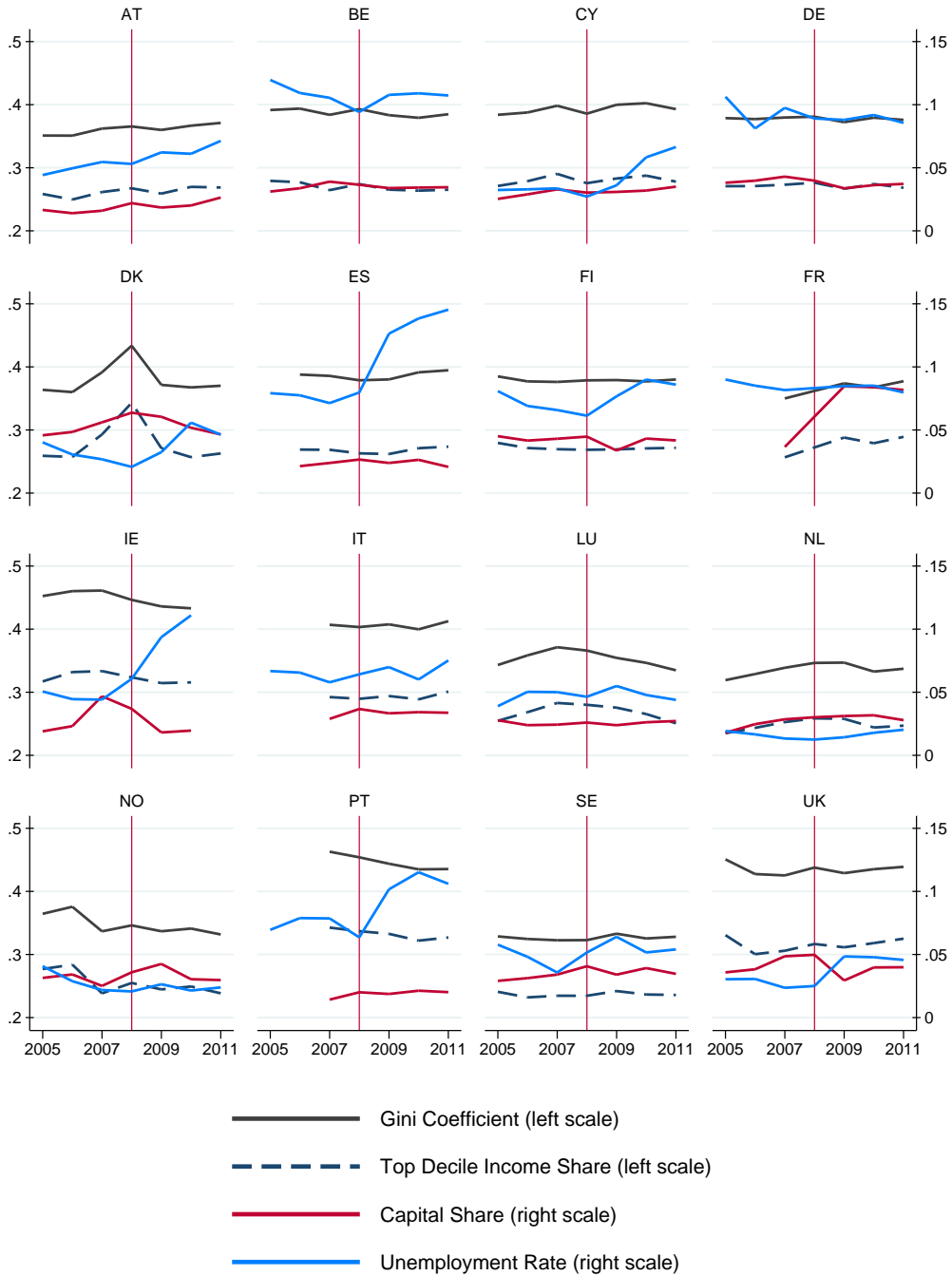


**Figure 5:** Distribution of Capital Shares and Income Structure on the Household Level, 2005-2011



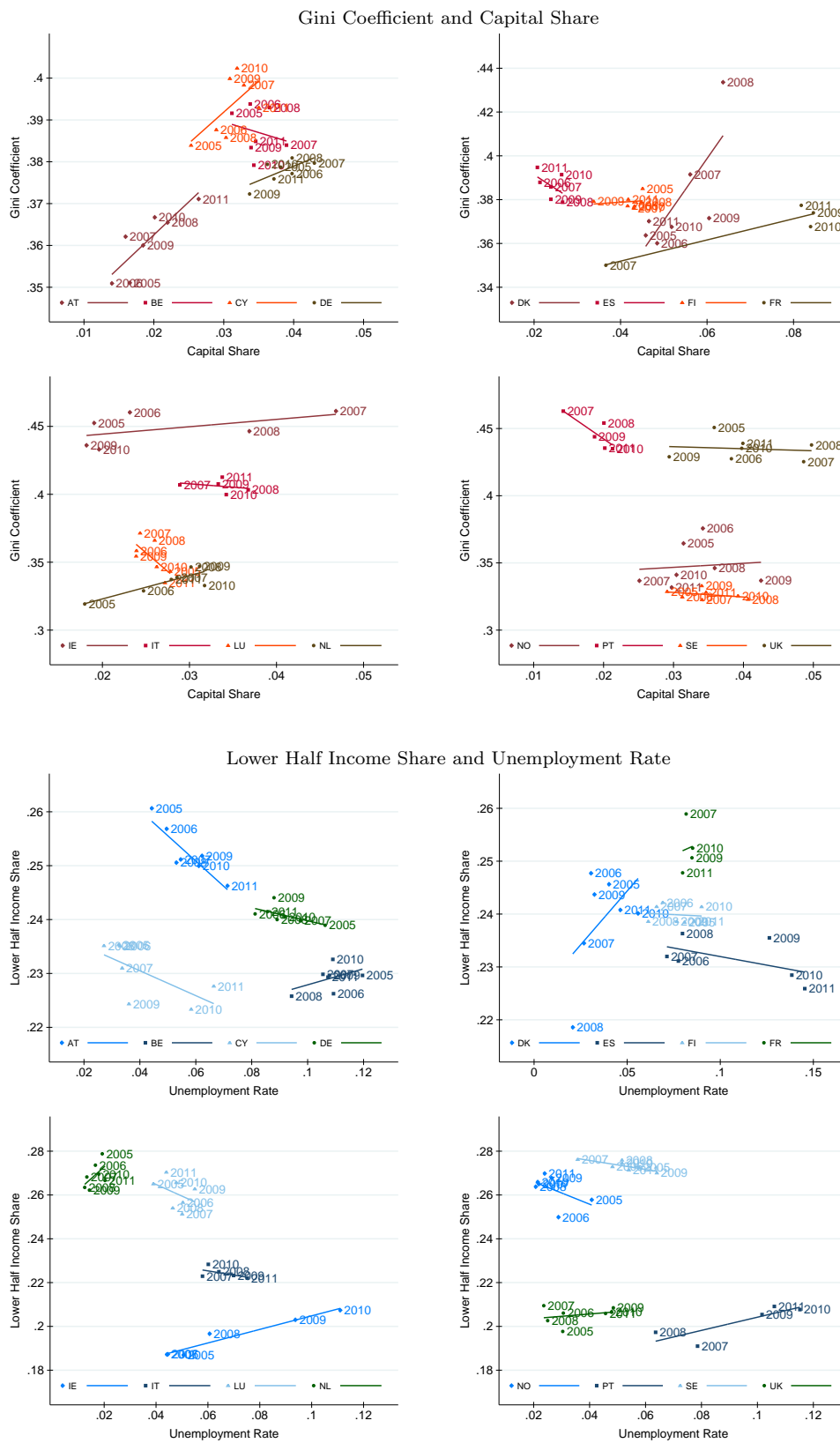
Note: The left panel shows capital income shares (vertical axis) across quintiles of capital shares (horizontal axis). The right panel illustrates income levels (left vertical axis) and capital income shares (right vertical axis) across deciles of total market income (horizontal axis).

**Figure 6:** Development of Capital Shares, Unemployment and Income Inequality, 2005-2011

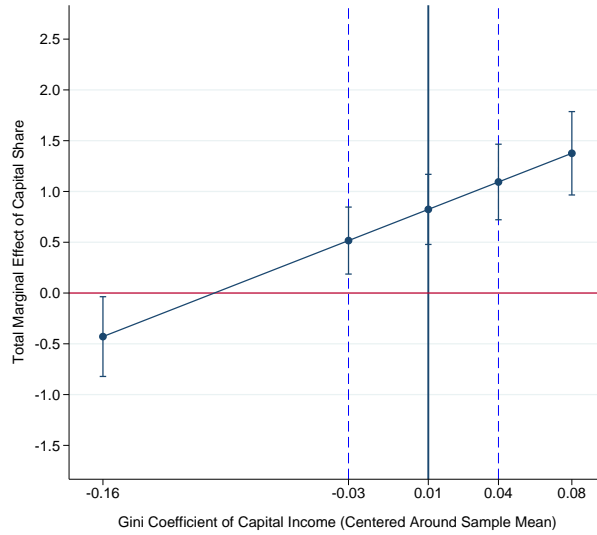


Note: This graph contrasts Gini-coefficients, top decile income shares, capital shares and unemployment rates across the 16 EU-member countries for the years 2005-2011 on the country level. Gini-coefficients and top decile shares refer to the left axis. Unemployment rates and capital shares refer to the rights axis. The red vertical line indicates the beginning of the financial and economic crisis.

**Figure 7: Stylized Association of Inequality Measures, Capital Shares and Unemployment, 2005-2011**

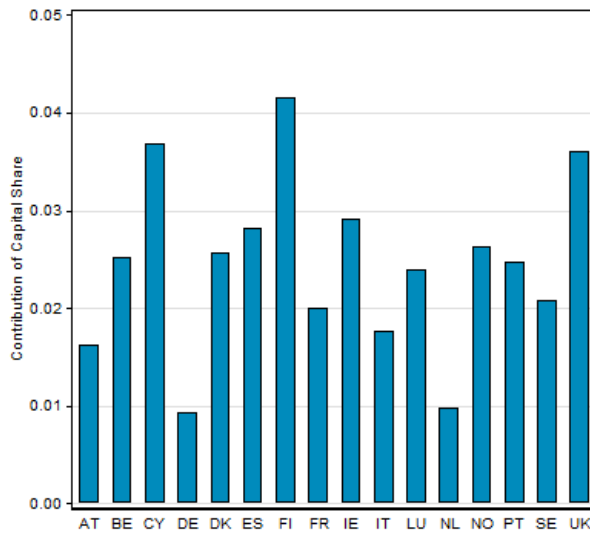


**Figure 8:** Total Marginal Effect of Capital Share Across Different Degrees of Capital Income Inequality



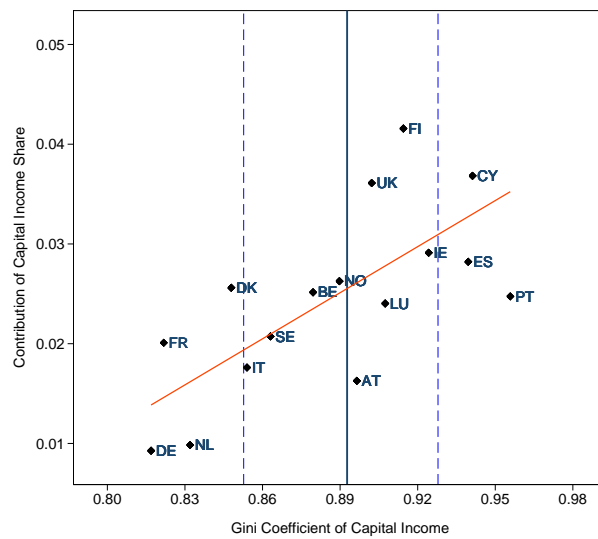
Note: This graph illustrates total marginal effect of the capital income share across different degrees of capital income concentration. Point estimates as well as confidence bands at the 5%-level of significance are reported. The total marginal effect of the capital income share is calculated according to the formula in equation 2. According to our panel regression model, the concentration of capital income is represented by the Gini-coefficient of capital income, which has been centered around the sample mean (horizontal axis). The vertical dotted lines represent the first and third quartiles of the concentration of capital income. The vertical solid line corresponds to the median value of the of the concentration of capital income.

**Figure 9:** Contribution of Capital Share to Inequality of Gross Household Income



Note: This graph illustrates the contribution of variations in the capital share to changes in the concentration of household gross income across countries. Calculations are based on the estimation results presented in table 3, column 4.

**Figure 10:** Contribution of Capital Share to Income Inequality Against Capital Income Concentration



Note: This graph illustrates the association of capital income concentration measured by the Gini-coefficient and the absolute contribution of the capital income share to gross income inequality for different countries. Calculations of the contributions are based on the estimation results presented in table 3, column 4. The simple linear regression line corresponds to a regression yielding a coefficient of 0.15 significant at the 1 percent level and an  $R^2$  of 49 percent. In analogy to figure 8 the vertical dotted lines represent the first and third quartiles of the concentration of capital income. The vertical solid line corresponds to the median value of the of the concentration of capital income.

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