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Income composition inequality : the missing dimension for distributional analysis

Marco Ranaldi

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ÉCOLE D'ÉCONOMIE DE PARIS & UNIVERSITÉ PARIS 1
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THÈSE

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Marco RANALDI

Income Composition Inequality

The Missing Dimension for Distributional Analysis

Directeur de thèse

Bruno AMABLE

Composition du Jury

Andrea BRANDOLINI - Bank of Italy
Elvire GUILLAUD - Paris 1 Panthéon-Sorbonne
Branko MILANOVIĆ - City University of New York
Muriel ROGER - Paris 1 Panthéon-Sorbonne
Francesco SARACENO - OFCE, Science-Po Paris
Engelbert STOCKHAMMER - Kings College London

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A Fabio e ai miei genitori

Summary

This thesis consists of four chapters on income distribution. All chapters are inter-related, and cohesively they serve the sole purpose of discussing the concept of *income composition inequality*. This concept is thoroughly explored from a conceptual, mathematical, as well as political economy perspective. Chapter 1 introduces this dissertation and its main findings. Chapter 2 presents the concept of *income composition inequality*, together with a summary statistics for its technical assessment. This chapter shows that income composition inequality links the functional and personal distribution of income. Chapter 3 analyzes the determinants of income inequality variation in light of the novel inequality dimension previously introduced. The methodology reveals a negative relationship between changes in income composition inequality and changes in income inequality. Chapter 4, co-written with Roberto Iacono, studies the evolution of income composition inequality in Italy between 1989 and 2016. By applying the method illustrated in Chapter 2, this Chapter shows that the strength of this link has steadily decreased in Italy over the period considered. Furthermore, it conceptualizes a simple rule of thumb for policy makers seeking to reduce income inequality in the long run. Chapter 5 proposes a method to jointly analyze the distributions of capital and labor and of saving and consumption across the population. Hinging on the novel concept of income composition inequality and on its technical assessment through the summary statistics proposed in Chapter 2, this Chapter classifies economic systems by bringing together these two distributions in a two-dimensional box. Economic systems can be classified as *Kaldorian Systems* or as *Representative Agent Systems* depending on their position in the box. The Chapter illustrates this method via an empirical application to the European context, in which two major clusters of economic systems - *Mediterranean* and *Northern European* - emerge. This Chapter shows how the classification proposed can be useful in understanding a country's long-run performance in terms of capital accumulation, inequality and growth. Finally, Chapter 6 concludes this dissertation and lays the ground for future research on the matter.

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Chapter 0

Introduction (*Français*)

Une des plus importantes découvertes du livre « Capitale au XXI^e siècle » de Thomas Piketty ([Piketty, 2014](#)) est l'augmentation de la part du capital dans le revenu de nombreux pays développés au cours des dernières décennies (voir aussi [Piketty, 2015](#)). La part du capital dans le revenu correspond à la partie du revenu total attribué au capital. Sa dynamique est influencée par plusieurs phénomènes macroéconomiques, tels que le progrès technique, la mondialisation, la financiarisation, le pouvoir de négociation et de marché des entreprises, entre autres (voir [Stockhammer et al. 2018](#)). Des résultats similaires sont également obtenus par [Stockhammer \(2013\)](#), qui montre que la part du travail dans le revenu a diminué au cours des 25 dernières années dans les pays de l'OCDE. L'augmentation de la part du capital dans le revenu est généralement considérée comme l'une des causes qui ont amené à l'augmentation des inégalités de revenus personnels. [Piketty \(2014\)](#) soutient que la croissance de la part du capital dans le revenu conduit inévitablement à de plus grandes inégalités entre individus, parce que les inégalités de revenu du capital ont tendance à être généralement supérieure à celles du travail.

D'un point de vue économétrique, Bengtsson et [Waldenström \(2018\)](#) montrent l'existence d'une forte relation positive entre la répartition fonctionnelle et personnelle du revenu, qui s'est renforcée au cours du siècle dernier. Au contraire, [Francese et Mulas-Granados \(2015\)](#), basé sur une analyse couvrant 93 pays entre 1970 et 2013, ont constaté que la répartition du revenu entre le travail et le capital n'a pas été un facteur majeur pour expliquer l'évolution des inégalités de revenus. [Milanovic \(2017\)](#) suggère que « le lien [entre les distributions fonctionnel et personnelle] n'est pas aussi simple et sans ambiguïté qu'il y paraît ». En effet, comprendre la relation entre la distribution fonctionnelle et la distribution personnelle du revenu est au cœur des études sur la répartition du revenu. Selon [Soci et Alacevich \(2017\)](#), Atkinson et Freedman considèrent cette relation comme « la principale lacune de la théorie économique moderne ». Tout au long de cette thèse, je soutiendrai que, afin d'examiner précisément le lien entre la distribution fonctionnelle et la distribution personnelle du revenu, nous devons introduire le concept d'inégalité de composition du revenu. Les différents chapitres qui composent cette thèse explorent le concept d'inégalité de composition du revenu d'un point de vue conceptuel, mathématique et économique. En outre, ce concept est employé pour proposer une nouvelle classification des systèmes économiques. Dans la suite de cette introduction, je discuterai plus en détail le concept d'inégalité de composition du revenu et je présenterai la contribution principale de chaque chapitre.

Si nous supposons que le revenu peut être décomposé en deux facteurs, tels que le capital et le revenu du travail, alors les inégalités de la composition du revenu expriment la mesure dans laquelle la composition du revenu est inégalement répartie au sein d'un groupe de personnes. Les inégalités dans la composition du revenu sont maximales

lorsque les individus situés au sommet et à la base de la répartition du revenu gagnent séparément deux types de revenus différents, et minimales lorsque la composition entre revenu du capital et revenu du travail est similaire pour les individus situés au sommet et à la base de la répartition du revenu.

La raison pour laquelle les inégalités de composition du revenu lient la distribution fonctionnelle et la distribution personnelle du revenu est simple : si les riches concentrent l'ensemble des revenus provenant du capital dans l'économie, alors une augmentation de la part des revenus du capital augmente le revenu des riches. Pour cette raison, il est facile de montrer que dans un contexte de fortes inégalités de composition du revenu, la distribution fonctionnelle du revenu peut être considérée comme une mesure des inégalités de revenus. De plus, l'inégalité de la composition de revenu nous informe sur le degré de capitalisme d'un système social ou d'une économie, tel que défini par [Milanovic \(2017\)](#). En particulier, dans un contexte où les inégalités de composition de revenus sont élevées, une société peut être considérée comme un cas de capitalisme classique, dans laquelle les riches concentrent le revenu du capital et les pauvres celui du travail. Ce type de capitalisme est proche d'une société caractérisée par les classes sociales dans leur configuration traditionnelle. Au contraire, dans un contexte de faibles inégalités de composition de revenus, une société peut être considérée comme un nouveau capitalisme, dans laquelle riches et pauvres détiennent une composition du capital et du revenu du travail similaire. Un nouveau capitalisme peut aussi être considéré comme une société dans laquelle les individus détiennent des revenus mixtes. Une telle interprétation du concept d'inégalité de composition du revenu permet une analyse multidisciplinaire sur l'évolution des systèmes sociaux ou des économies, et donne une idée approximative des utilisations multiples et

de la nature flexible du concept d'inégalité proposé dans cette thèse.

Bien que nous utilisions le capital et le revenu de travail comme sources de revenu dans cette thèse, il est important de souligner que l'étude de l'inégalité de la composition du revenu peut être appliquée à l'analyse de la répartition jointe de toute paire de composantes de revenu (ou de richesse), telles que le revenu net et les impôts, l'épargne et la consommation, et les actifs financiers et non financiers, entre autres.

Pour mesurer le degré d'inégalité de composition du revenu dans une population d'individus, dans le chapitre 2 je construis un indicateur spécifique. Cette indicateur est construit à partir de courbes de concentration de la source de revenu. De manière similaire aux courbes de concentration proposées par Kakwani (1977a, 1977b) et aux courbes de pseudo-Lorenz proposées par Fei et al. (1978), la courbe de concentration de la source de revenu est la distribution cumulative de la source de revenu dans la population, les individus étant indexés par leur classement de revenu total. À la différence de la courbe de concentration de Kakwani (et de la courbe de pseudo-Lorenz de Fei et al.), cette courbe ne cumule pas la source à 1, mais au niveau total de la part de facteur. Cette caractéristique des courbes en question nous permet d'illustrer graphiquement si une source de revenu est principalement concentrée au sommet ou à la base de la répartition du revenu total. De plus, cela nous permet de visualiser la relation entre la distribution de la source de revenu dans la population et le niveau global de la part de facteur correspondant. Pour construire un indicateur d'inégalité de composition du revenu, nous combinons trois courbes de concentration: la courbe de concentration, la courbe de concentration minimale et la courbe de concentration maximale. La première courbe décrit la distribution réelle de la source de revenu, tandis que la seconde courbe représente la condition d'absence d'inégalités dans

la composition du revenu. Dans cette condition, tous les individus ont la même composition de capital et de revenu du travail. Visuellement, lorsque la courbe de concentration réelle se situe au-dessus de la courbe de concentration minimale, la source de revenu se concentre à la base de la distribution des revenus. Au contraire, lorsque la courbe de concentration se situe en dessous de la courbe de concentration minimale, la source de revenu se concentre en haut de la distribution des revenus.

Fait intéressant, bien que, dans le contexte des inégalités de revenu, la ligne égalitaire soit la même pour tous les ensembles de population (c'est-à-dire la bissectrice), dans le contexte des inégalités dans la composition du revenu, la courbe de concentration minimale est spécifique à chaque ensemble de population. En d'autres termes, deux groupes de population différents sont caractérisés par deux courbes de concentration minimales.

Enfin, la troisième courbe sert de référence pour l'inégalité maximale dans la composition du revenu: les riches et les pauvres gagnent séparément le capital et le revenu du travail. La figure 1.1 illustre ces trois courbes pour l'Italie en 1989. Si on note A la zone située entre la courbe de concentration minimale et la courbe de concentration réelle, et B la zone située entre la courbe de concentration minimale et la courbe de concentration maximale, alors cet indicateur est défini comme le rapport entre ces deux surfaces. Nous appelons cet indicateur income-factor concentration index (IFC ci-après). L'indice IFC est compris entre 1 et -1 . Il est égal à 1 lorsque les riches gagnent le revenu du capital et les pauvres le revenu du travail. Il est égal à -1 lorsque les riches gagnent le revenu du travail et les pauvres gagnent le revenu du capital. Enfin, il est égal à 0 lorsque les deux sources de revenu sont également distribuées compte tenu du niveau total des parts de facteur et du niveau total d'inégalité de revenus.

Concentration Curves - Italy 1989

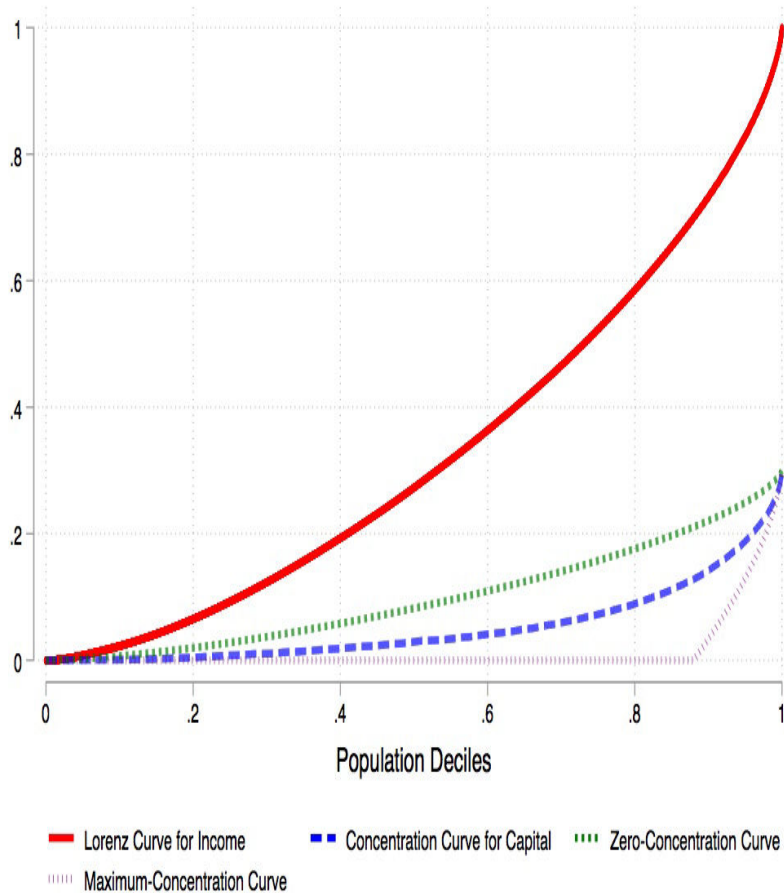


Figure 1: La courbe de concentration du capital (ligne bleue), la courbe de concentration minimale (ligne verte), la courbe de Lorenz pour le revenu (ligne rouge) et la courbe de concentration maximale (ligne violette) pour l'Italie en 1989 sont présentées à l'aide des données du sondage (SHIW) du 1989 réalisé par la Banque d'Italie.

Dans le chapitre 2 je montre mathématiquement que l'indice IFC peut être considéré comme une élasticité de l'inégalité des revenus personnels à fluctuations de la répartition du revenu fonctionnel. Ainsi, le signe de cet indicateur détermine si une augmentation de la part du capital dans le revenu entraînera une augmentation ou une diminution de l'inégalité des revenus entre les individus. Ce résultat correspond à celui présenté par Milanovic dans un article récent (Milanovic, 2017), dans lequel l'auteur affirme que, dans un contexte d'augmentation de la part du revenu du capital, le niveau d'inégalité des revenus

ne croît que sous deux conditions : (i) un niveau élevé d'inégalité dans les revenus du capital et (ii) une association forte et positive entre les riches en termes de capital et les personnes riches en général. Le signe de l'indice IFC exprime donc ces deux conditions. Au chapitre 3 j'étudie la relation entre les variations de des inégalités de composition du revenu et les variations des inégalités de revenus. À partir de la décomposition du coefficient de Gini de Lerman-Yitzhaki (LY) (Lerman et Yitzacki, 1985) et d'un résultat du chapitre 2, je montre que : (i) l'indice IFC émerge de manière simple de la décomposition standard de LY et (ii) les variations de la composition des revenus sont négativement corrélées avec les variations de l'inégalité des revenus, à la fois d'un point de vue empirique et théorique. Plus précisément, au chapitre 3 je montre que les variations d'inégalité des revenus peuvent être divisées en trois mouvements : les mouvements de la distribution de revenu fonctionnel (FID), le mouvement de l'indice IFC (IFC) et le mouvement de l'inégalité d'un facteur de revenu (IFI).

La relation négative entre l'évolution des inégalités de revenus et l'évolution de la composition des revenus est probablement due à la nature des politiques de redistribution, qui ont principalement redistribuées les revenus de travail plutôt que les revenus du capital. Ce dernier résultat souligne le caractère contradictoire de ces politiques, qui réduisent d'une part les inégalités de revenus à court terme et, d'autre part, accroissent les inégalités de revenus à long terme par le biais d'une augmentation des inégalités de composition du revenu dans un contexte d'augmentation de la part des revenus du capital.

Au chapitre 4, Roberto Iacono et moi étudions l'évolution de l'inégalité de la composition du revenu en Italie entre 1989 et 2016. Nous montrons que l'inégalité de la composition des revenus a régulièrement diminué en Italie au cours de la période considérée (voir

Italy 1989 - 2016

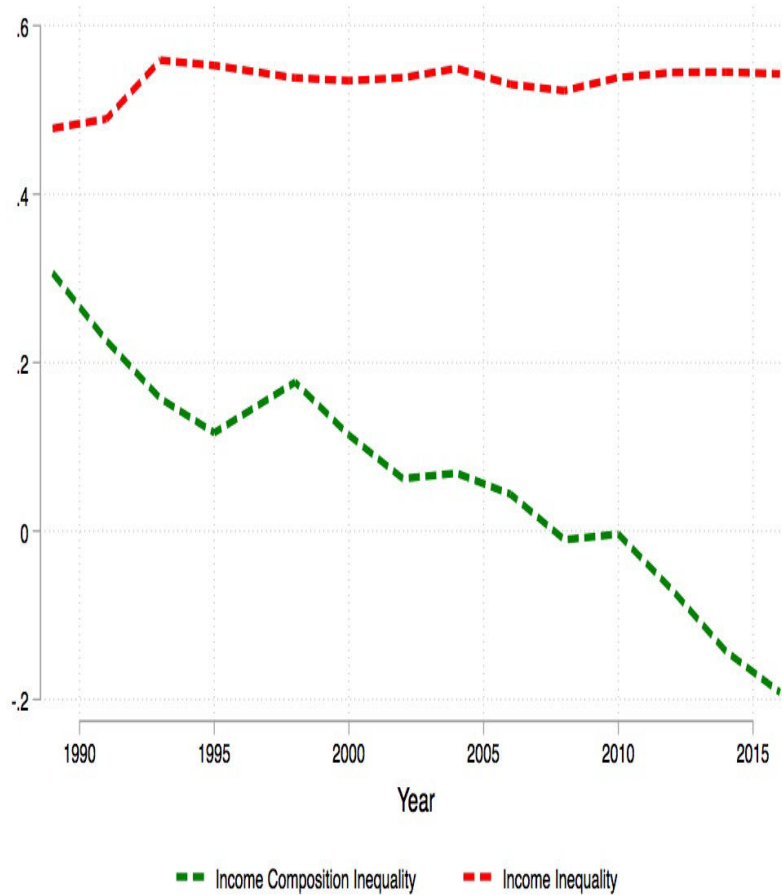


Figure 2: Les deux séries d'inégalité de composition du revenu, telle que mesurée par l'indice IFC, et d'inégalité de revenu, telle que mesurée par le coefficient de Gini, construites à l'aide des données SHIW.

graphique 1.2). Les conséquences de ce résultat, qui résiste à différentes définitions du capital et du revenu du travail, sont doubles. Premièrement, les fluctuations de la part totale des facteurs dans le revenu ont un impact de plus en plus faible sur les inégalités de revenus en Italie. Deuxièmement, l'Italie est devenue une société de logement et de travail indépendant, mais pas une société dans laquelle les revenus tirés des dividendes, des intérêts et des loyers sont devenus moins associés au niveau de revenu élevé. Enfin, dans ce chapitre, nous concevons une règle simple pour le décideur politique qui vise à

Getting Redistribution Right

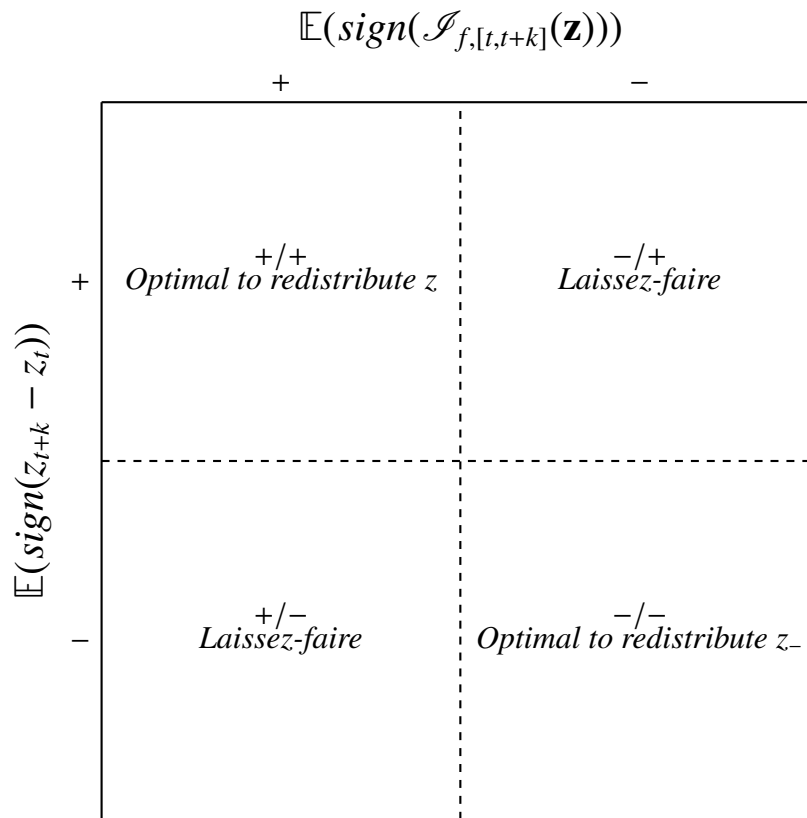


Figure 3: Cette figure illustre les quatre différents scénarios qui sous-tendent la proposition du chapitre 4.

réduire les inégalités de revenus dans le long terme. Cette règle relie les fluctuations des parts de facteurs totales et le niveau d'inégalité de composition du revenu par rapport à la source de revenu spécifique à redistribuer.

Au chapitre 5 j'utilise le concept d'inégalité de composition du revenu pour proposer une nouvelle classification des systèmes économiques. Cette classification repose sur une méthodologie résumant les informations relatives à l'hétérogénéité de la composition des revenus des individus ainsi que dans leurs décisions d'épargne et de consommation dans un environnement économique. En particulier, je construis une boîte à deux dimensions dont les dimensions sont l'inégalité de composition du revenu et l'inégalité de compo-

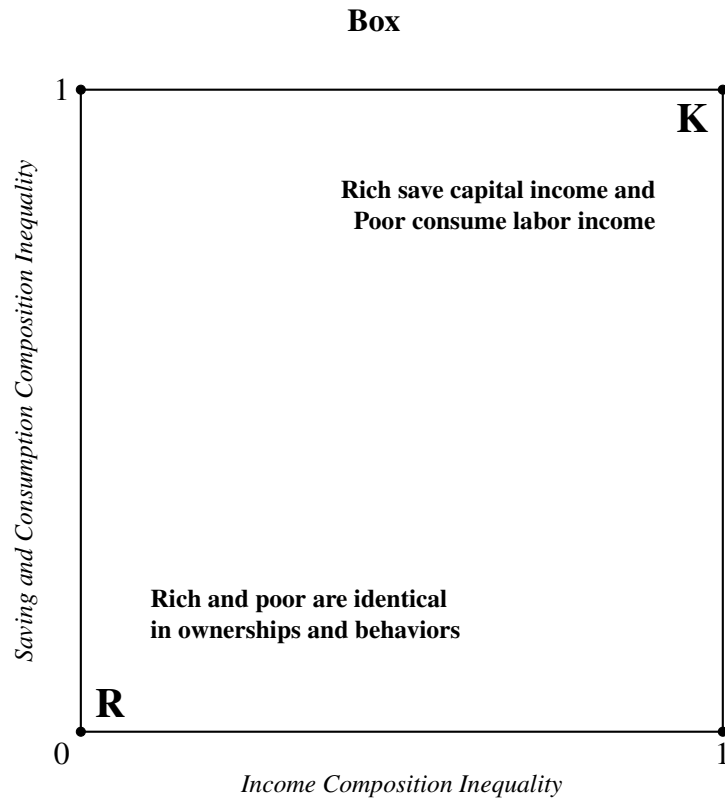


Figure 4: Le diagramme présenté au chapitre 5.

tion d'épargne et de consommation.

Comme pour les inégalités de la composition des revenus, les inégalités de la composition de l'épargne et de la consommation est maximale lorsque les individus situés au sommet et à la base de la répartition du revenu épargnent et consomment séparément, et minimale lorsque tous les individus épargnent et dépensent de la même manière. Les inégalités dans la composition de l'épargne et de la consommation nous indiquent dans quelle mesure l'épargne et la consommation concernent séparément les individus situés au sommet et à la base du classement des revenus. Pour mesurer les inégalités de composition de l'épargne et de la consommation, je construis l'indice de concentration de l'épargne et de la consommation (ci-après SCC), qui est techniquement construit de la même manière que l'indice IFC. Chaque point de la boîte correspond à une paire spéci-

The Box

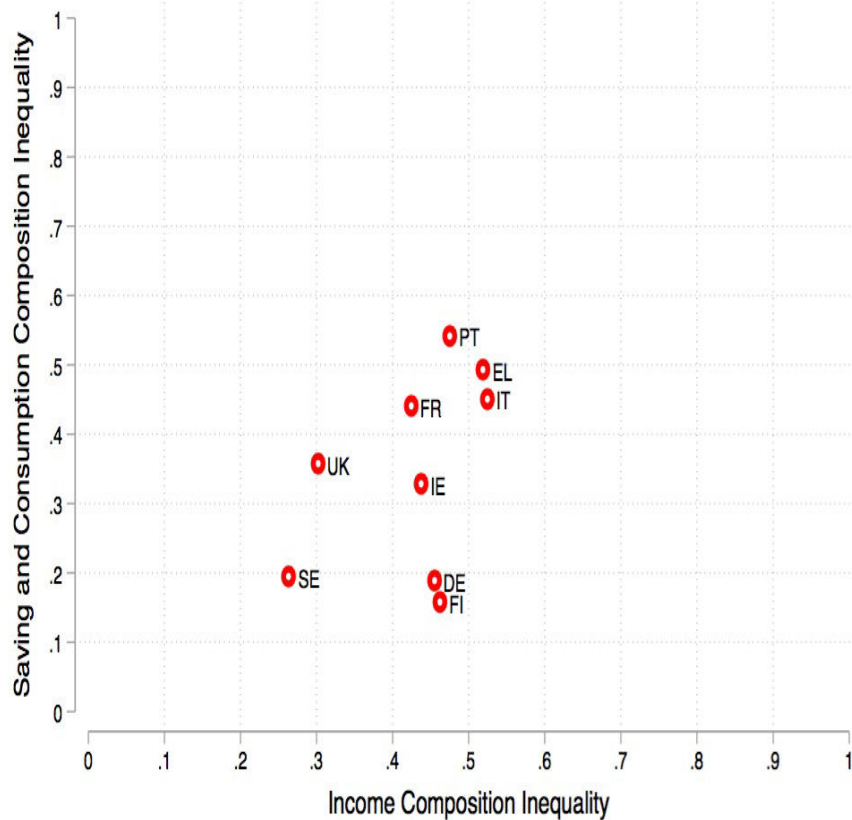


Figure 5: La position du pays développés dans le diagram présenté au chapitre 5.

fique des deux indices. En particulier, lorsque les deux indices sont égaux à 1, le système économique associé est caractérisé par un groupe d'individus riches qui possèdent le capital et épargnent, et par un groupe d'individus pauvres qui reçoivent le revenu du travail et consomment. Au contraire, lorsque les deux indices sont égaux à 0, chaque individu a la même population que le capital, le travail, la consommation et l'épargne. Nous appelons ces deux systèmes extrêmes système Kaldorien et système agent représentatif (voir la figure 3). Par la suite, je montre que, dans le contexte européen, le système d'agents représentatifs est bien adapté pour décrire la Suède, alors que le système Kaldorien est bien adapté pour caractériser les pays tels que l'Italie, le Portugal et la Grèce.

Comprendre la position relative d'un pays dans la boîte peut être utile pour prévoir la dynamique macroéconomique du même pays, ainsi que la manière dont les avantages des résultats macroéconomiques sont répartis dans la population. À cet égard, je montre que la distinction des systèmes économiques entre Kaldorian et agents représentatifs figure de manière évidente dans un modèle Kaldorien simple de distribution et de croissance. Quatre observations peuvent être mis en avant à partir du modèle proposé: i) Une augmentation du ratio investissements / revenus augmente la part du capital dans les revenus davantage dans le système des agents représentatifs que dans le système Kaldorien; ii) En l'absence d'investissement dans l'économie, la part totale du revenu du capital est plus élevée dans un système d'agents représentatifs que dans un système kaldorien; (iii) une augmentation de l'accumulation de capital augmente le taux de profit davantage dans le système d'agents représentatifs que dans le système Kaldorien; (iv) Une augmentation du ratio capital sur revenu réduit le taux des bénéfices davantage dans le système d'agents représentatifs que dans le système Kaldorien.

Dans cette thèse, je soutiens également que la combinaison de notre approche avec la littérature sur les régimes de croissance fondés sur les salaires et sur les revenus (voir [Lavoie et Stockhammer, 2012](#)) peut conduire à une analyse intéressante. Par exemple, si nous étions dans un régime de demande dirigé par les producteurs (c'est-à-dire qu'une augmentation de la part du capital entraînerait une augmentation du PIB), une augmentation du taux d'investissement conduirait à une croissance plus forte dans un système d'agents représentatifs que dans un système Kaldorien. À l'inverse, si nous étions dans un régime de demande basé sur les salaires (c'est-à-dire qu'une augmentation de la part de la main-d'œuvre entraînerait une augmentation du PIB), la situation serait inverse. Dans le même

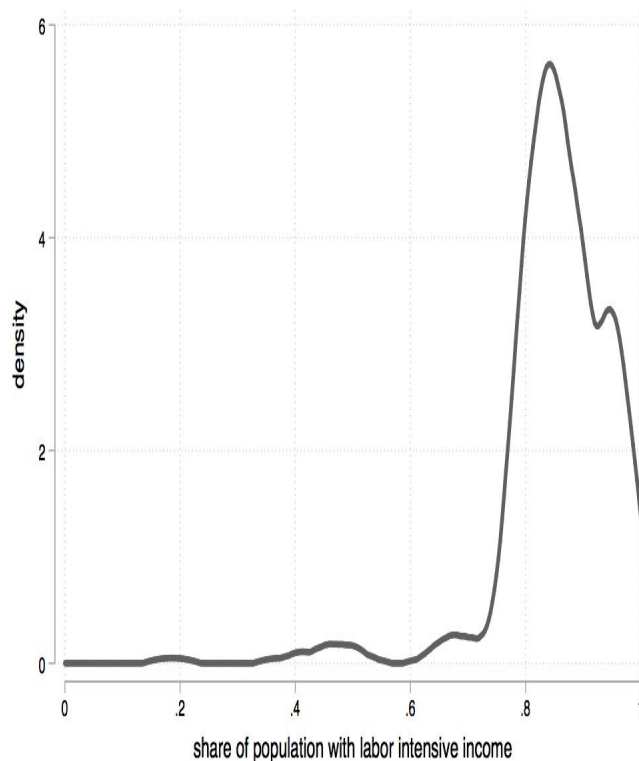


Figure 6: La répartition de la part des individus ayant un revenu à forte intensité de travail dans 28 pays européens entre 2007 et 2016 présenté dans les conclusions.

temps, étant donné que l'élasticité de l'inégalité des revenus personnels à la variation de la part du revenu du capital est plus élevée dans un système d'agents représentatifs que dans un système Kaldorien, une augmentation de la part du capital accentuera l'inégalité des revenus dans ce dernier système relativement plus que dans le précédent.

À la fin de cette thèse, je discute de la recherche future sur le sujet. Je présente également une nouvelle régularité de Pareto 80/20 liée à la composition du revenu des individus. Cette régularité a montré que 80% de la population a un revenu à forte intensité de travail (c'est-à-dire que la part du travail dans le revenu d'un individu est supérieur à la part de travail dans le revenu de la population), alors que 20% de la population dispose d'un revenu à forte intensité de capital (c'est-à-dire que la part du capital dans le revenu d'un

individu est supérieur à la part de capital dans le revenu de la population).

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Chapter 1

Introduction (*English*)

One of the most important findings from Piketty's *Capital in the Twenty-First Century* (Piketty, 2014) is the rise in the capital share of income in many developed countries over the last decades (see also Piketty, 2015). The capital share of income is the part of total income allocated to capital. Its dynamics is influenced by several macroeconomic phenomena, such as technical change, globalization, financialisation, bargaining power and market power of firms, among others (see Stockhammer et al. 2018).

Similar results are also found by Stockhammer (2013), who shows that the labour shares have fallen over the past 25 years in the OECD countries.¹ The rise in the capital share of income is generally considered to be one of the causes that led to the increase in personal income inequality. Piketty (2014) argues that, as inequality in capital income is generally greater than inequality in labor income, the rising share of capital income in net product leads to greater inter-personal inequality.

From an econometric perspective, Bengtsson and Waldenström (2018) find evidence of a strong positive link between the functional and personal distribution of income, a link which has grown stronger over the past century. On the contrary, Francese and Mulas-

¹See, also, IMF, 2007; Arpaia, Prerez, and Pichelmann, 2009; Piketty and Zucman, 2014; Karabarbounis and Neiman, 2014.

Granados (2015), based on an analysis that covers 93 countries between 1970 and 2013, find that the distribution of income between labor and capital has not been a major factor in explaining changes in income inequality. These works already provide evidence that, as Milanovic (2017) puts it, “the link [between the functional and personal distribution of income] is not as simple and unambiguous as it seems.” Indeed, understanding the relationship between the functional and personal distribution of income is at the core of the study on income distribution. According to Soci and Alacevich (2017), Atkinson and Freedman consider this relationship to be “the major gap in modern economic theory”. Throughout this dissertation I will argue that, in order to precisely investigate the link between the functional and personal distribution of income, we need to introduce the concept of *income composition inequality*. The various chapters that compose this thesis explore the concept of income composition inequality from a conceptual, mathematical, as well as political economy perspective. Furthermore, this concept is employed to propose a novel classification of economic systems. In the remainder of this introduction, I further discuss the concept of income composition inequality and I present the main contribution of each Chapter.

If we assume that income can be decomposed into two factors, such as *capital* and *labor income*, then *income composition inequality* is the extent to which the income composition is distributed unevenly in a group of people. Inequality in income composition is *maximal* when individuals at the top and at the bottom of the income distribution separately earn two different types of income, and *minimal* when each individual has the same composition of capital and labor income.

The reason why income composition inequality links the functional and personal distri-

bution of income is straightforward: if the rich earn all the capital income in the economy, then an increase in the capital income share rises the income of the rich. For this reason, it is easy to show that under a high level of income composition inequality the functional distribution of income can be seen as a measure of income inequality.

Moreover, income composition inequality tells us something about the *degree of capitalism* of a social system or economy, as defined by [Milanovic \(2017\)](#). Specifically, under high income composition inequality a society can be seen as a case of *classical capitalism*, where the rich earn the capital income and the poor the labor income. Such type of capitalism bears resemblance to a society characterized by social classes in their traditional configuration. On the contrary, under low income composition inequality a society can be regarded as a *new capitalism*, where rich and poor have the same composition of capital and labor income. A new capitalism can also be regarded as a *multiple sources of income society*. Such interpretation of the concept of income composition inequality allows for interesting multidisciplinary analysis of the evolution of social systems or economies, and gives a rough idea of the multiple uses and of the flexible nature of the inequality concept proposed here.

While we use capital and labor as income sources in this dissertation, it is important to highlight that the study of income composition inequality can be applied to analyze the joint distribution of any pair of income (or wealth) components, such as net income and taxes, saving and consumption, and financial and non-financial assets, among others.

To measure the degree of income composition inequality in a population of individuals, in Chapter 2 I construct a specific summary statistic. This summary statistic is constructed by means of concentration curves for income source. Similarly to the concentration curves

proposed by Kakwani (1977a, 1977b) and to the pseudo-Lorenz curves proposed by Fei et al. (1978), the concentration curve for income source is the cumulative distribution of income source across the population with individuals being indexed by their total income ranking. Differently from Kakwani's concentration curve (and from Fei et al.'s pseudo-Lorenz curve), however, this curve does not sum to one, but to the total level of the factor share. This characteristic of the curves in question allows us to graphically illustrate whether an income source is mainly concentrated at the top or at the bottom of the total income distribution. Furthermore, it allows us to visualize the relationship between the distribution of the income source across the population and the overall level of the same factor share.

To construct an indicator of income composition inequality, we combine three concentration curves: the *actual* concentration curve for income source, the *zero*-concentration curve and the *maximum*-concentration curve. The first curve describes the actual distribution of the income source, while the second curve represents the benchmark of zero inequality in income composition. Under zero inequality in income composition all individuals have the same composition of capital and labor income. I show in this Chapter that under zero inequality in income composition the Gini coefficient does not depend on the functional income distribution, and therefore an increase in the capital share of income does not result in an increase in the level of income inequality in the population. Visually, when the actual concentration curve lies above the zero-concentration curve, then the income source is concentrated at the bottom of the income distribution. On the contrary, when the concentration curve lies below the zero-concentration curve, then the income source is concentrated at the top of the income distribution.

Interestingly, while in the context of inequality in income the egalitarian line is the *same* for all population sets (i.e., bisector), in the context of inequality in income composition the zero-concentration curve is *specific* to each population set. In other words, two different population sets display different benchmarks of zero inequality in income composition.

Finally, the third curve acts as benchmark of maximum inequality in income composition: the rich and the poor separately earn the capital and labor income. Figure 1.1 provides an example of these three curves for Italy in 1989. If we denote by \mathcal{A} the area between zero-concentration curve and the actual concentration curve, and by \mathcal{B} the area between zero-concentration curve and the maximum-concentration curve, then this indicator is defined as the ratio between these two areas, namely $\mathcal{I}_f = \frac{\mathcal{A}}{\mathcal{B}}$. We label this indicator *income-factor concentration index* (IFC hereafter).

The IFC index ranges between 1 and -1 . It is equal to 1 when the rich earn the capital income and the poor earn the labor income. It is equal to -1 when the rich earn the labor income and the poor earn the capital income. Finally, it is equal to 0 when the two sources are equally distributed given the total level of the factor shares and the total level of income inequality.

In Chapter 2 I mathematically show that the IFC index can be seen as an *elasticity* of personal income inequality to fluctuations in the functional income distribution. In fact, the sign of this indicator determines whether an increase in the capital share of income will lead to an increase or a decrease in inter-personal income inequality.

This result relates to the one presented by Milanovic in a recent article ([Milanovic, 2017](#)), in which the author argues that in a context of rising share of capital income, the level

Concentration Curves - Italy 1989

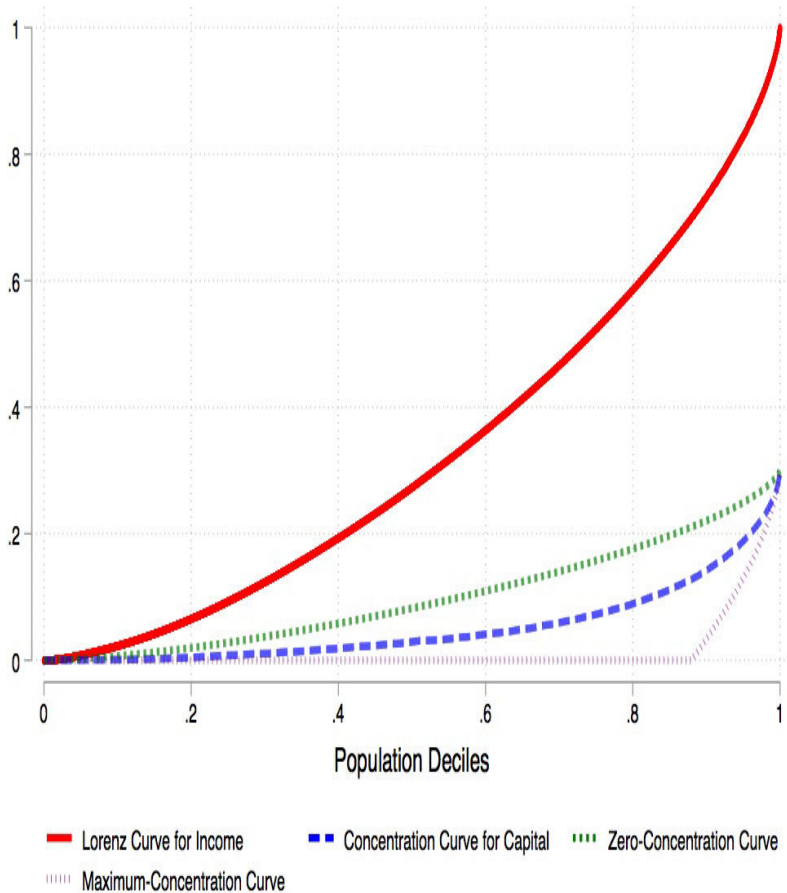


Figure 1.1: The concentration curve for capital (blue line), the zero-concentration curve (green line), the Lorenz curve for income (red line) and the maximum-concentration curve (purple line) for Italy in 1989 are presented using data from the 1989 *Survey on Household Income and Wealth* (SHIW) carried out by the Bank of Italy. Capital income is defined as the sum of property income and the capital component of net-self employment income. Labor income is instead defined as the sum of payroll income, pensions, net transfers and the labor component of mixed income. Both the capital and labor components of self-employment income are imputed following [Glyn \(2011\)](#).

of income inequality grows only under two conditions: (i) a high level of inequality in capital income and (ii) a high and positive association between capital-rich and overall income-rich people. The sign of the IFC index therefore expresses these two conditions.

In Chapter 3 I study the relationship between changes in income composition inequality and changes in income inequality. By means of the the Lerman-Yitzhaki (LY) decom-

position of the Gini coefficient (Lerman and Yitzacki, 1985) and a result from Chapter 2, I show that: (i) the IFC index emerges in a straightforward manner from the standard LY decomposition and (ii) changes in income composition inequality negatively correlate with changes in income inequality, both from a theoretical and an empirical perspective. More precisely, in Chapter 3 I show that income inequality variations can be divided into three movements: movement in functional income distribution (**FID**), movement in income-factor concentration (**IFC**), and movement in income-factor inequality (**IFI**). For each of the three movements to affect income inequality, a specific condition of transmission is derived.

The negative relationship between changes in income inequality and changes in income composition inequality is likely due to the nature of redistribution policies, which mainly redistribute labor rather than capital income. The latter result underlines the contradictory nature of these policies, that on the one hand, reduce income inequality in the short run, and on the other hand, increase income inequality in the long run via the rise in income composition inequality in a context of rising capital income share.

In Chapter 4, Roberto Iacono and I study the evolution of income composition inequality in Italy between 1989 and 2016. We show that income composition inequality has steadily decreased in Italy over the period considered (see Figure 1.2). The implications of this result, which is robust to different definitions of capital and labor income, are twofold. First, fluctuations of the total factor shares of income are having an increasingly weaker impact on income inequality in Italy. Second, Italy has become more of a home-owning and self-employment society, but not a society where income from dividends, interest and rent has become less associated with high income level overall. Finally, in this Chapter

Italy 1989 - 2016

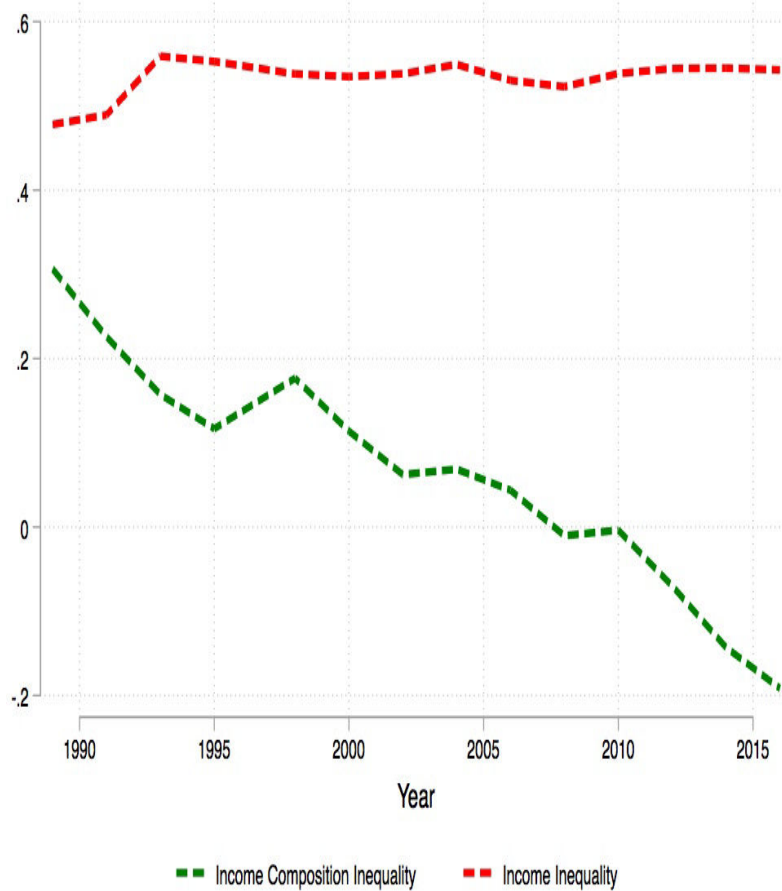


Figure 1.2: The two series of income composition inequality, as measured by the IFC index, and of income inequality, as measured by the Gini coefficient, are constructed using the SHIW data. Capital income is considered as the sum of property income and the capital component of net self-employment income and labor income as the sum of payroll income and the labor component of net self-employment income. Total income is the sum of capital and labor income as previously defined.

we conceptualize a simple rule of thumb for the policy maker which aims to lower income inequality in the long-run. This rule of thumb puts the fluctuations in total factor shares and the level of income composition inequality in relation to the specific income source to be redistributed.

In Chapter 5 I use the concept of income composition inequality to propose a novel classification of economic systems. Such classification is based on a methodology which sum-

marizes information regarding heterogeneity in individuals' income composition as well as in their saving and consumption decisions within an economic environment. Specifically, I construct a two-dimensional box whose dimensions are income composition inequality and *saving and consumption inequality*.

Similarly to income composition inequality, inequality in saving and consumption composition is *maximal* when individuals at the top and at the bottom of the income distribution separately save and consume, and *minimal* when all individuals save and consume in the same way. Saving and consumption composition inequality tells us the extent to which saving and consumption separately pertain to individuals at the top and at the bottom of the income ranking. To measure saving and consumption composition inequality, I construct the *saving and consumption concentration index* (SCC hereafter), which is technically constructed in the same way as the IFC index.

Every point in the box corresponds to a specific pair of the two indices. In particular, when the two indices are equal to 1, the related economic system is characterized by a group of rich people that own the capital and save, and by a group of poor people that earn the labor and consume. On the contrary, when the two indices are equal to 0, every individual has the same population shares of capital, labor, consumption and savings. We label these two extreme systems as *Kaldorian System* and as *Representative Agent System* (see Figure 1.3). Subsequently, by taking this method to data, I show that, within the European context, the Representative Agent System is well suited to describe the country of *Sweden*, whereas the Kaldorian System is well suited to describe the countries of *Italy*, *Portugal* and *Greece*.

Understanding the relative position of a country in the box can be useful to foresee the

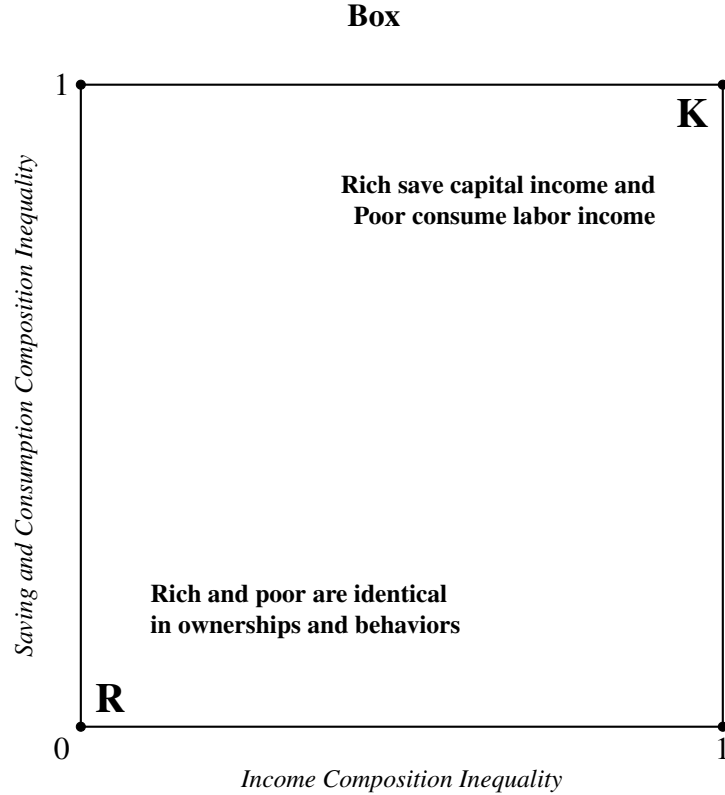


Figure 1.3: This box displays all combinations of the two indices $\mathcal{I}_{s/c}(s)$ and $\mathcal{I}_f(\pi)$ for a given society at a point in time. Note that the analysis is restrained to the positive values of the two metrics only. Point **K** represents the *Kaldorian System*, in which both income composition inequality and saving and consumption composition inequality are maximized. On the other side, point **R** displays the *Representative Agent System*, in which both dimensions are equal to zero. Under point **K** we expect a high level of saving out of capital income at the top of the distribution and under point **R** a low level. In point **K** the link between income inequality and both the saving rate and the factor shares is strong, while in point **R** is weak.

same country's macroeconomic dynamics, as well as the way the benefits from macroeconomic outcomes are distributed across the population. In this respect, I show that the Kaldorian / Representative Agent distinction of economic systems features prominently in a simple Kaldorian model of distribution and growth. Four observations can be put forward from the model proposed: (i) A rise in the investment-to-income ratio increases the capital share of income more in the Representative Agent System than in the Kaldorian System; (ii) In the absence of investment in the economy, the total level of capital income share is higher in a Representative Agent System than in a Kaldorian System; (iii) A rise

in the capital accumulation increases the rate of profits more in the Representative Agent System than in the Kaldorian System; (iv) A rise in the capital-to-income ratio reduces the rate of profits more in the Representative Agent System than in the Kaldorian System. In this dissertation I also argue that the combination of our approach with the literature on *wage-led* and *profit-led growth regimes* (see [Lavoie and Stockhammer, 2012](#)) can lead to interesting analysis. For instance, if we were in a profit-led demand regime (i.e., an increase in the capital share will lead to an increase in GDP), then an increase in the investment rate would lead to higher growth in a Representative Agent System than in a Kaldorian System. Conversely, if we were in a wage-led demand regime (i.e., an increase in the labor share will lead to an increase in GDP) the situation would be the reverse. At the same time, given that the elasticity of personal income inequality to changes in the capital income share is higher in a Representative Agent System than in a Kaldorian System, an increase in the capital share will boost income inequality in the latter system relatively more than in the former.

At the end of this dissertation, I discuss future research on the matter (Chapter 6). I also present a novel Pareto 80/20 regularity related the composition of individuals' income. This regularity shows that 80% of the population has an income which is labor-intensive (i.e., the individual's labor share $\frac{W_i}{Y_i}$ is higher than the population's labor share $\frac{W}{Y}$), whereas 20% of the population has an income which is capital-intensive (i.e., the individual's capital share $\frac{\Pi_i}{Y_i}$ is higher than the population's capital share $\frac{\Pi}{Y}$).

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Chapter 2

Income Composition Inequality

Abstract: The present Chapter proposes a methodology to examine the relationship between the functional and personal distribution of income. To this end, it introduces the concept of *inequality in income composition*. If we decompose total income into *two* factors, such as capital and labour income, then income composition inequality is the extent to which the income composition is distributed unevenly in a group of people. Inequality in income composition is maximal when individuals at the top and at the bottom of the income distribution separately earn the two different types of income. On the contrary, it is minimal when each individual earn the same composition of the two factors. This Chapter proposes an indicator to measure income composition inequality. The sign of this indicator determines the condition of transmission for the rising share of income from any source to increase overall income inequality. This methodology is then applied to several European countries on basis of EU-SILC data.

2.1 Introduction

The study of the relationship between the functional and personal distribution of income has seen a revival of interest over the past two decades (Atkinson, 2009, Piketty, 2014). In this Chapter we argue that, in order to determine a formal link between the two distributions, we need to introduce a novel inequality concept, that we call *income composition inequality*. Moreover, this Chapter introduces a summary statistic for its measurement. The need for introducing and then measuring income composition inequality can be motivated by the very development of the literature and of economies over time. Already in 1997, Atkinson argued that to understand the drivers of inequality, the economic theory of the distribution of income is in need of further development (Atkinson, 1997, p. 317). He argues that the current priority should be to bring the several existing contributions on this theory together into a single framework (p. 317). He also argues that, among the different aspects which affect the dynamics of the distribution of income, the relationship between the functional and personal distribution should feature prominently (p. 298).

Such relationship binds a macroeconomic phenomenon with a microeconomic one.¹ Brandolini (1992) claims that this link connects economic systems and people, and it is provided by what he calls “entitlement rules”.² As Glyn (2011) points out, unfair entitlement rules may lead the employer’s profit rate to grow faster than the employee’s wage rate. Moreover, unfair entitlement rules are likely to trigger political tensions between differ-

¹In a later article, Atkinson wrote that one reason for studying this link is that “there is at present and evident disjuncture between the macroeconomic measures of economic performance and the perceptions by citizens as to what is happening to their incomes?” (Atkinson, 2009, p. 5).

²According to Brandolini, the entitlement rules are “rules stating who has the right to receive a given type of income and which proportion of it” (Brandolini, 1992, p. 3).

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ent interest groups. Income inequality needs therefore to be analyzed with an eye for the multidimensional nature of the typologies of income. Unsurprisingly, the laws which regulate the distribution were considered to be the principal problem in political economy by the classical author Ricardo ([Ricardo, 1911](#)).³

Several contributions have recently explored the empirical nature of the link between the functional and personal distribution. The most popular one has been made by [Piketty \(2014\)](#), who analyzes the long-run evolution of the functional distribution and of the top income shares at the international level. In his framework, Piketty considers top income shares as measures of income inequality.⁴ His landmark book *Capital in the Twenty-First Century* (2014) is an attempt to combine the different data sources available, such as fiscal data, survey data and national accounts in a systematic way.⁵ One of the most important findings from his research is that the capital share of income has increased in many developed countries over the last decades (see also [Piketty, 2015](#)). Furthermore, Piketty shows that the capital income share tends to move together with the capital-income ratio in the long run. Given that inequality in capital income is generally greater than inequality in labor income, the rising share of capital income in net product leads to a greater inter-personal inequality. This result highlights the positive relationship between the functional and personal distribution of income from a historical perspective.

³ We report the famous statement by Ricardo, which says: “the produce of the earth - all that is derived from its surface by the united application of labour, machinery and capital, is divided among three classes of the community, namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated . . . To determine the laws which regulate this distribution is the principal problem in Political Economy” ([Ricardo, 1911](#) [1817], p. 1 in 1911 edition).

⁴The advantage of considering top income share as a measure of income inequality is that they can be easily compared both across countries and cross time.

⁵Piketty himself states that his book is primarily about the history of the distribution of income and wealth ([Piketty, 2015](#)).

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Another empirical contribution on the matter is the article by [Bengtsson and Waldenström \(2018\)](#), who find evidence of a “strong, positive link [between the functional and personal distribution of income] that has grown stronger over the past century” by means of a novel historical cross-country database they personally assembled. However, they do not believe this relationship to remain stable over time, insofar as it can be contingent on production technology, the structure of personal income, and the institutional context. [Francese and Mulas-Granados \(2015\)](#), based on an analysis that covers up to 93 countries between 1970 and 2013, find instead that the distribution of income between labor and capital has not been a major factor in explaining income inequality. The two previous works provide evidence that, as [Milanovic \(2017\)](#) puts it, “the link is not as simple and unambiguous as it seems”.

On a technical level, few works have attempted to precisely measure the strength of this link. In his recent work, [Milanovic \(2017\)](#) argues that in a context of rising share of capital income the level of income inequality grows only under two conditions: (i) a high level of inequality in capital income and (ii) a high and positive association between capital-rich and overall income-rich people. These two conditions, operationalized by the Gini of capital income and the correlation coefficient between capital and total income respectively,⁶ suggest an important theoretical connection between factor shares and income inequality. Particularly, the correlation coefficient between capital and total income, which is an elasticity of inter-personal income Gini to changes in capital income share, may act as an intuitive and simple measure of such link. However, this correlation coefficient does not formally determine the condition of transmission of changes in the functional distribution

⁶These two variables emerge from the Yitzhaki-Lerman decomposition of the Gini coefficient ([Yitzhaki and Lerman, 1984](#)).

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into income inequality, as it will be discussed later in the Chapter.

[Atkinson and Bourguignon \(2000\)](#) and [Atkinson \(2009\)](#) approach the measurement of this link by decomposing the squared coefficient of variation of income, where there are two types of income: wage income and capital income.⁷ In such way, they manage to show the condition under which an increase in the capital income share is transmitted into an increase in overall income inequality, as measured by the standard deviation of income. Another way of measuring the association between capital and labor have also recently been proposed by [Atkinson and Lakner, 2017](#). The authors study the association between capital and labor by constructing a rank-based measure of association which is a discrete approximation of the copula density. All these methods, however, do not aim at precisely measuring the strength of this link, nor to create a single summary statistic for such purpose. [Atkinson and Lakner, \(2017\)](#), for instance, do not precisely discuss under which specific joint distributions of capital and labor the strength of the link is maximal and minimal. On the other end, [Atkinson and Bourguignon \(2000\)](#) do not provide any summary statistics that can be used to measure the strength of this relationship.

As previously stated, the purpose of this Chapter is to fill this gap by proposing a metric which captures the strength of the link between the functional and personal distribution of income. To this end, the Chapter first introduces a novel inequality concept, labeled *income composition inequality*.

If we decompose total income into *two* factors, such as capital and labour income, then in-

⁷Specifically, the coefficient of variation of income V^2 can be written as a function of the capital share of income π , of the inequality of wage income V_w and capital income V_k , and of the correlation ρ between wage income and capital income: $V^2 = (1 - \pi)^2 V_w^2 + \pi^2 V_k^2 + 2\pi(1 - \pi)\rho V_w V_k$. Now, if we define λ as the relationship between wage income dispersion and capital income dispersion, then a rise in the capital share of income is transmitted into personal income inequality only when the following condition is satisfied: $\pi > \frac{1-\lambda\rho}{1+\lambda^2-2\lambda\rho}$.

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come composition inequality is the extent to which the income composition is distributed unevenly across the population. Inequality in income composition is *maximal* when individuals at the top and at the bottom of the income distribution separately earn the two different types of income. On the contrary, it is *minimal* when each individual earns the same composition of the two factors.

While we use capital and labor as income sources in this Chapter, it is important to stress that the study of income composition inequality can be applied to analyze the joint distribution of *any pair* of income (or wealth) components, such as net income and taxes, saving and consumption,⁸ and financial and non-financial assets, among others.

A high level of income composition inequality is associated with a strong relationship between the functional and personal distribution of income. The underlying intuition is straightforward: if the rich earn all the capital income in the economy, then an increase in the capital income share rises the income of the rich. Analogous reasoning can be proposed to show that under a high level of income composition inequality the functional distribution of income can be seen as a measure of income inequality.

To measure income composition inequality we design a specific summary statistic. Such statistics is constructed by means of concentration curves for income source. Similarly to the concentration curves proposed by [Kakwani \(1977a, 1977b\)](#), or to the pseudo-Lorenz curves proposed by [Fei et al. \(1978\)](#), the concentration curve for income source is the cumulative distribution of income source across the population with individuals being indexed by their total income ranking. Differently from Kakwani's concentration curve (and from Fei et al.'s pseudo-Lorenz curve), however, this curve does not sum to one, but

⁸Saving and consumption composition inequality will be adopted in Chapter 5 to propose a novel classification of economic systems.

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to the total level of the factor share.

To design this summary statistic, in addition to the concentration curve for income source, we need two additional concentration curves: the *zero-* and the *maximum-concentration curves*. The zero-concentration curve characterizes a population in which income factors are evenly distributed with respect to both the overall level of income inequality and total factor shares in the economy. This curve provides a benchmark of zero inequality in income composition, as the egalitarian line does for inequality in income.⁹ The maximum-concentration curve, instead, provides a benchmark of maximum inequality in income composition. We show that under the zero-concentration condition the Gini coefficient does not depend on the functional income distribution.

Visually, when the concentration curve lies above the zero-concentration curve, then the income source is concentrated at the bottom of the income distribution. On the contrary, when the concentration curve lies below the zero-concentration curve, then the income source is concentrated at the top of the income distribution.

Following the way in which the Gini coefficient is computed,¹⁰ we define this indicator as the difference between the concentration curve for a given income source and its zero-concentration curve, suitably normalized.

This indicator can be looked at in two ways. Firstly, from a technical perspective, it can be considered an elasticity of personal income inequality to fluctuations in the functional

⁹The egalitarian line is the bisector with which the Lorenz curve is normally compared to assess the level of income inequality between individuals. Interestingly, while within the context of inequality in income the egalitarian line is the same for all population sets, within the context of inequality in income composition the zero-concentration curve is specific to each population set. Indeed, two population sets with different income inequality levels, or rather with different distributions between the capital and labor share, display different benchmarks of zero inequality in income composition.

¹⁰The Gini is computed by taking the difference between the Lorenz curve for income and the egalitarian line, suitably normalized

income distribution. In other words, it mathematically links the functional and personal distribution of income. Secondly, from a political economy perspective, it measures the “degree of capitalism” of a given social system. Specifically, following the classification proposed by Milanovic (2017), under the maximum-concentration condition a society can be considered a case of classical capitalism, while under the zero-concentration condition it can be regarded as a case of new capitalism.¹¹ For instance, a fall in the indicator suggests that the corresponding society is moving towards becoming a new form of capitalism, in which individuals have multiple sources of income at their disposal and where there is a weaker relationship between functional and personal distribution of income (and the other way around).

This Chapter is structured as follows. Section 2.2 introduces the general methodology and the indicator. Section 2.3 derives the indicator in a two-person economy and describes its mathematical properties. Section 2.4 applies the proposed methodology to several European countries, finding that income composition inequality is positive for all countries analyzed. Section 2.5 concludes.

2.2 Methodology

2.2.1 The Concentration Curve for Income Source

Suppose we have a fixed population of n individuals, each endowed with income Y_i with $i = 1, \dots, n$. We can define each individual’s income share as $y_i = \frac{Y_i}{Y}$, where $Y = \sum_{i=1}^n Y_i$ is the total income of the population. Total income is divided into two sources,

¹¹To be perfectly in line with Milanovic’s own framework, we should refer to a *new capitalism 2* under the zero-concentration condition.

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capital (Π) and labor (W), so that $Y = \Pi + W$ and hence $y = 1 = \pi + w$, where $\pi = \frac{\Pi}{Y}$ and $w = \frac{W}{Y}$ are the capital and labor shares in income, respectively. Consider the following decomposition of individual i 's income:

$$y_i = \alpha_i \pi + \beta_i w, \quad (2.1)$$

where $\alpha_i = \frac{\Pi_i}{\Pi}$ and $\beta_i = \frac{W_i}{W}$ are the relative shares of capital and labor of individual i , such that $\sum_{i=1}^n \alpha_i = \sum_{i=1}^n \beta_i = 1$ and Π_i and W_i represent i 's total amount of capital and labor. Assume that $y_i \leq y_{i+1} \forall i = 1, \dots, n-1$ and $y_0 = 0$, so that individuals are indexed by their income ranking. We can define $p = \frac{i}{n}$ as the proportion of the population with income less than or equal to y_p , so that $p \in \mathbb{Q} := [0, 1]$. Let $\mathcal{L}(\mathbf{y}, p) = \sum_{j=1}^i y_j$, with $i = 1, \dots, n$, be the Lorenz curve for income corresponding to the distribution \mathbf{y} .¹² We can define the concentration curve for capital, $\mathcal{L}(\boldsymbol{\pi}, p)$, corresponding to the distribution $\boldsymbol{\pi}$, as follows:

$$\mathcal{L}(\boldsymbol{\pi}, p) = \pi \sum_{j=1}^i \alpha_j \quad \forall i = 1, \dots, n. \quad (2.2)$$

Similarly, the concentration curve for labor, $\mathcal{L}(\mathbf{w}, p)$, corresponding to the distribution \mathbf{w} , is:

$$\mathcal{L}(\mathbf{w}, p) = w \sum_{j=1}^i \beta_j \quad \forall i = 1, \dots, n. \quad (2.3)$$

The two curves describe the cumulative distribution of capital and labor across the population with individuals being indexed by their income ranking. It is hence possible that an individual with a higher capital share be ranked below someone with a lower capital share, if the income of the latter is above that of the former (formally, we can find a pair (i, j) s.t. $\alpha_i > \alpha_j$ and $y_i < y_j$). Additionally, note that when $i \rightarrow n$ (or $p \rightarrow 1$) then

¹²We are defining the Lorenz curve here as in [Shorrocks \(1983\)](#).

$\mathcal{L}(\boldsymbol{\pi}, p) \rightarrow \pi$ and $\mathcal{L}(\mathbf{w}, p) \rightarrow w$, where $\pi, w \leq y$. The concentration curves for income source can also be regarded as *pseudo-Lorenz curves* (Fei et al., 1978) scaled down to the level of the related income share.

According to the previous decomposition of individual income, we can write as follows:

$$\mathcal{L}(\mathbf{y}, p) = \mathcal{L}(\boldsymbol{\pi}, p) + \mathcal{L}(\mathbf{w}, p) \quad \forall i = 1, \dots, n. \quad (2.4)$$

The Lorenz curve for income $\mathcal{L}(\mathbf{y}, p)$, for every p , can therefore be decomposed into the sum of the two previously-defined concentration curves. Now, we can write the Gini coefficient, \mathcal{G} , as follows:

$$\mathcal{G} = 1 - \frac{1}{n} \left(\sum_{i=1}^n \left[\mathcal{L} \left(\boldsymbol{\pi}, \frac{i}{n} \right) + \mathcal{L} \left(\boldsymbol{\pi}, \frac{i-1}{n} \right) + \mathcal{L} \left(\mathbf{w}, \frac{i}{n} \right) + \mathcal{L} \left(\mathbf{w}, \frac{i-1}{n} \right) \right] \right). \quad (2.5)$$

Figure 2.1 plots an example of $\mathcal{L}(\mathbf{y}, p)$ (the blue curve) and $\mathcal{L}(\boldsymbol{\pi}, p)$ (the red curve) for a population of size $n = 10$. Total income is equally split between capital and labor, hence $\pi = w = \frac{1}{2}$. The concentration curves allow us to understand whether a given income source is concentrated primarily at the bottom or at the top of the income distribution. Given the interdependence of the two concentration curves (i.e., when one source is concentrated at the top the other is concentrated at the bottom), a single curve is sufficient to analyze the joint distribution of capital and labor. However, to precisely assess the extent to which capital and labor are polarized across the income distribution, two benchmark conditions must be defined: the *zero-* and *maximum-concentration conditions*. On the basis of these two conditions, the corresponding *zero-* and *maximum-concentration curves* are hence introduced.

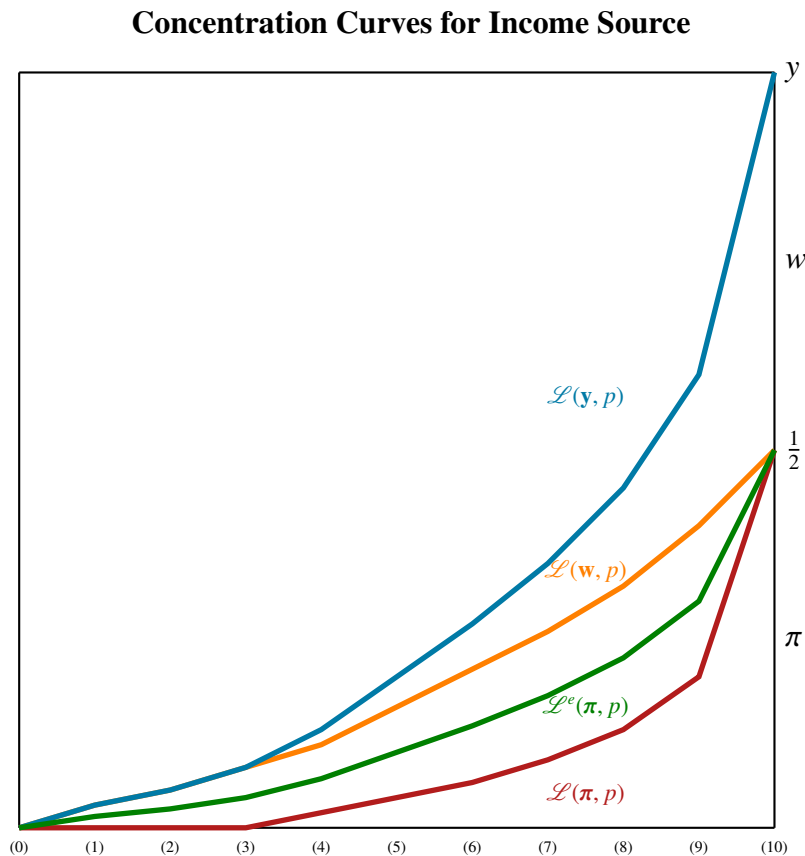


Figure 2.1: A graphical representation of the concentration curve for capital $\mathcal{L}(\pi, p)$, the concentration curve for labor $\mathcal{L}(w, p)$, the Lorenz curve for income $\mathcal{L}(y, p)$ and the zero-concentration curve $\mathcal{L}^e(\pi, p)$ with 10 individuals (or groups) and equal sources of income in the economy ($\pi = w = \frac{1}{2}$). As it can be noticed, for each population decile p the Lorenz curve for income $\mathcal{L}(y, p)$ equals the sum of the concentration curve for capital $\mathcal{L}(\pi, p)$ and the concentration curve for labor $\mathcal{L}(w, p)$. In addition, given that $\pi = w$, the two zero-concentration curves coincide: $\mathcal{L}^e(\pi, p) = \mathcal{L}^e(w, p) \forall p$.

2.2.2 The Zero-Concentration Curve

In this Section, we introduce in a formal setting the concept of the zero concentration of two income sources. As anticipated in the introduction, we define the benchmark of zero concentration in the following way.

Definition 2.2.1. *We say that two income sources are zero-concentrated across a population when each individual has the same population shares of capital and labor. Formally, we have zero concentration of income sources when $\frac{w_i}{\Pi_i} = \frac{w}{\pi} \forall i$, or, equivalently, when*

$$\alpha_i = \beta_i \forall i. \text{¹³}$$

Note that the previous definition is not related to the concept of income inequality: The population can exhibit zero concentration of income sources even with positive income inequality. Furthermore, note that only two elements are needed to determine the zero-concentration condition, notably the functional and personal distribution of income. Two populations characterized by different Lorenz curves, or by different shares of capital income, have two different conditions of zero-concentration. At this stage of the analysis we can define the zero-concentration curve, $\mathcal{L}^e(\mathbf{z}, p)$, corresponding to the distribution \mathbf{z} , which is the concentration curve for the income source z when the income sources are not concentrated as:

$$\mathcal{L}^e(\mathbf{z}, p) = \mathbf{z} \sum_{j=1}^i y_j \quad \forall i = 1, \dots, n, \quad (2.6)$$

with $\mathbf{z} = \pi, w$. The choice of \mathbf{z} depends on the particular source we analyze. If we were interested in the distribution of capital in the population, we would compare the *actual* concentration curve for capital with the concentration curve for capital in the case of zero concentration, $\mathcal{L}^e(\pi, p)$. It should be noted that the zero-concentration curve is a *scaled* version of the Lorenz curve for income, indeed we can write $\mathcal{L}^e(\mathbf{z}, p) = \mathbf{z}\mathcal{L}(\mathbf{y}, p) \forall p$. Let us now consider the following relationship:

$$\mathcal{L}(\mathbf{z}, p) = \mathcal{L}^e(\mathbf{z}, p) + \mathcal{R}(\mathbf{z}, p) \quad \forall i = 1, \dots, n, \quad (2.7)$$

where $\mathcal{R}(\mathbf{z}, p)$ is the residual-concentration curve corresponding to the distribution \mathbf{z} . When $\mathcal{L}(\mathbf{z}, p)$ is above $\mathcal{L}^e(\mathbf{z}, p)$ over all of the domain (i.e., $\mathcal{L}(\mathbf{z}, p) > \mathcal{L}^e(\mathbf{z}, p) \forall p$) then $\sum_{i=1}^n \mathcal{R}(\mathbf{z}, p) > 0$ and source \mathbf{z} is concentrated primarily at the bottom of the dis-

¹³As $\frac{W_i}{\Pi_i} = \frac{w}{\pi} \iff \frac{W_i}{w} = \frac{\Pi_i}{\pi} \iff Y \times \frac{W_i}{W} = Y \times \frac{\Pi_i}{\Pi} \iff \alpha_i = \beta_i$.

tribution; on the contrary, when $\mathcal{L}(\mathbf{z}, p)$ is below $\mathcal{L}^e(\mathbf{z}, p)$ over all of the domain then $\sum_{i=1}^n \mathcal{R}(\mathbf{z}, p) < 0$ and the opposite situation holds. In the case of zero concentration of income sources, equation 2.5 becomes:

$$\mathcal{G} = 1 - \frac{1}{n} \left(\sum_{i=1}^n \left(\sum_{j=1}^i \beta_j + \sum_{j=1}^{i-1} \beta_j \right) \right), \quad (2.8)$$

which is also equivalent to:

$$\mathcal{G} = 1 - \frac{1}{n} \left(\sum_{i=1}^n \left(\sum_{j=1}^i \alpha_j + \sum_{j=1}^{i-1} \alpha_j \right) \right). \quad (2.9)$$

The Gini coefficient in this particular case can thus be written as a function of individuals' relative shares of any one income source. Note that none of the two expressions above are functions of π or w , meaning that an increase in either the capital share or the labor share of income does not affect personal income inequality when income sources are not concentrated. Similarly, we can say that the “elasticity of inter-personal income Gini to changes in capital income share” is zero.¹⁴ This distribution of income sources represents the long-run distribution of factors across individuals in a neoclassical framework in which heterogeneity of both non-accumulated and accumulated factors are considered (Bertola et al. (2005)). It also represents the underlying distribution of factors in the *new capitalism 2* society defined by Milanovic (2017).

We conclude this Section with the following definition.

Definition 2.2.2. *We say that under zero-concentration of income sources, inequality in income composition is minimal.*

¹⁴See Milanovic (2017) for further details.

2.2.3 The Maximum-Concentration Curve

Let us focus our attention on the benchmark of maximum-concentration of two income sources, which we can define as follows.

Definition 2.2.3. *We say that two income sources are maximum concentrated when the bottom $p\%$ of the income distribution has an income consisting only of the source z and the top $(1 - p)\%$ of the income distribution has an income consisting only of the source z_- , where p s.t. $y_p = \mathcal{L}(\mathbf{y}, p) = z$, $1 - p$ s.t. $y_{1-p} = 1 - \mathcal{L}(\mathbf{y}, p) = z_-$, $z_- = 1 - z$ and $z = \pi, w$.*

As for the condition of zero-concentration, also the condition of maximum-concentration is already present in the literature. In his recent article, Milanovic defines the classical capitalism as a society in which “ownerships of capital and labor are totally separated, in the sense that workers draw their entire income from labor and have no income from the ownership of assets, while the situation for the capitalists is the reverse. Moreover, we shall assume that all workers are poorer than all capitalists. This gives us [...] two social groups, non-overlapping by income level” (Milanovic, 2017). We can therefore say that under the condition of maximum-concentration and specifically when the capital is owned by the top of the income distribution and the labor by the bottom, a society is a classical capitalism á la Milanovic.¹⁵

From a technical perspective, we can define the maximum-concentration curve, $\mathcal{L}^{max}(\mathbf{z}, p)$,

¹⁵This type of society can also be found in the works by Kaldor (1955), Pasinetti (1962) or more recently by Stiglitz (2015), in which a class of capitalists is counterposed to a class of workers. However, these authors do not necessarily assume that the former class is poorer than the latter in terms of total income.

corresponding to the distribution \mathbf{z} , as follows:

$$\mathcal{L}^{max}(\mathbf{z}, p) = \begin{cases} \mathcal{L}^M(\mathbf{z}, p) = \begin{cases} \mathcal{L}(\mathbf{y}, p) & \text{for } p \leq p' \\ z & \text{for } p > p' \end{cases} \\ \mathcal{L}^m(\mathbf{z}, p) = \begin{cases} 0 & \text{for } p \leq p'' \\ \mathcal{L}(\mathbf{y}, p) - z_- & \text{for } p > p'' \end{cases} \end{cases}, \quad (2.10)$$

with p' s.t. $\mathcal{L}(\mathbf{y}, p') = z$, p'' s.t. $\mathcal{L}(\mathbf{y}, p'') = 1 - z$ and $\mathbf{z} = \pi, w$. In addition, we have:

- (i) $\mathcal{L}^{max}(\mathbf{z}, p) = \mathcal{L}^M(\mathbf{z}, p)$ if $\mathcal{L}(\mathbf{z}, p) \geq \mathcal{L}^e(\mathbf{z}, p) \forall p$ and $\exists p^*$ s.t. $\mathcal{L}(\mathbf{z}, p^*) > \mathcal{L}^e(\mathbf{z}, p^*)$,
- (ii) $\mathcal{L}^{max}(\mathbf{z}, p) = \mathcal{L}^m(\mathbf{z}, p)$ if $\mathcal{L}^e(\mathbf{z}, p) \leq \mathcal{L}(\mathbf{z}, p) \forall p$ and $\exists p^{**}$ s.t. $\mathcal{L}^e(\mathbf{z}, p^{**}) < \mathcal{L}(\mathbf{z}, p^{**})$.

To put it simply, $\mathcal{L}^{max}(\mathbf{z}, p) = \mathcal{L}^M(\mathbf{z}, p)$ when the actual concentration curve lies above the zero-concentration curve and that $\mathcal{L}^{max}(\mathbf{z}, p) = \mathcal{L}^m(\mathbf{z}, p)$ when the actual concentration curve lies below the zero-concentration curve.

However, the two conditions above-mentioned ((i) and (ii)) are rather strong, since they need the two curves not to intersect along the distribution of income. By contrast, a weaker condition is the one which takes into consideration the area covered by each curve, as follows:¹⁶

- (i) $\mathcal{L}^{max}(\mathbf{z}, p) = \mathcal{L}^M(\mathbf{z}, p)$ if $\sum_{i=1}^n \sum_{j=1}^i \eta_j^k > \sum_{i=1}^n \sum_{j=1}^i y_j$,
- (ii) $\mathcal{L}^{max}(\mathbf{z}, p) = \mathcal{L}^m(\mathbf{z}, p)$ if $\sum_{i=1}^n \sum_{j=1}^i \eta_j^k < \sum_{i=1}^n \sum_{j=1}^i y_j$,

¹⁶Similarly, the first and second group of conditions can be regarded as first and second-order stochastic dominance conditions.

where $\eta_j^k = \alpha_j$ if $z = \pi$ and $\eta_j^k = \beta_j$ when $z = w$.

As is the case for the previous Section, we conclude this Section with the following definition.

Definition 2.2.4. *We say that under maximum-concentration of income sources, income composition inequality is maximized.*

2.2.4 Measuring Income Composition Inequality

In the previous Sections, we defined the two benchmarks of zero and maximum inequality in income composition, together with their corresponding concentration curves. When the actual concentration curve is relatively close to the zero-concentration curve, then income composition inequality is low. On the contrary, when the actual concentration curve is sufficiently close to the maximum-concentration curve, then income composition inequality is high.

Now, to precisely measure income composition inequality, we introduce an indicator which serves this purpose. We label this metric *income-factor concentration index*, \mathcal{I}_f , which we construct as follows.

Let us denote by $\mathcal{A}(\mathbf{z})$ the area between the zero-concentration curve and the concentration curve for income source z and by $\mathcal{B}(\mathbf{z})$ the area between the zero-concentration curve and the maximum-concentration curve.¹⁷ We can define the income-factor concentration index, $\mathcal{I}_f(\mathbf{z})$, corresponding to the distribution \mathbf{z} , as follows:

$$\mathcal{I}_f(\mathbf{z}) = \frac{\mathcal{A}(\mathbf{z})}{\mathcal{B}^{\max}(\mathbf{z})}, \quad (2.11)$$

¹⁷Formally, $\mathcal{A}(\mathbf{z}) = \frac{1}{2n} \sum_{i=1}^n [(\mathcal{L}^e(\mathbf{z}, \frac{i}{n}) + \mathcal{L}^e(\mathbf{z}, \frac{i-1}{n})) - (\mathcal{L}(\mathbf{z}, \frac{i}{n}) + \mathcal{L}(\mathbf{z}, \frac{i-1}{n}))]$ and $\mathcal{B}^{\max}(\mathbf{z}) = \frac{1}{2n} \sum_{i=1}^n [(\mathcal{L}^e(\mathbf{z}, \frac{i}{n}) + \mathcal{L}^e(\mathbf{z}, \frac{i-1}{n})) - (\mathcal{L}^{\max}(\mathbf{z}, \frac{i}{n}) + \mathcal{L}^{\max}(\mathbf{z}, \frac{i-1}{n}))]$, with $\max = m, M$.

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with $\mathbf{z} = \boldsymbol{\pi}, \mathbf{w}$.

This measure has considerable intuitive appeal: It is the area between the zero-concentration curve $\mathcal{L}^e(\mathbf{z}, p)$ and the concentration curve for income source $\mathcal{L}(\mathbf{z}, p)$, divided by the area between the zero-concentration curve $\mathcal{L}^e(\mathbf{z}, p)$ and the maximum-concentration curve $\mathcal{L}^{max}(\mathbf{z}, p)$.¹⁸ This measure lies therefore between -1 (when individuals at the bottom own source z and individuals at the top own source z_-) and 1 (when individuals at the bottom own source z_- and individuals at the top own source z). It is equal to zero when the area of the concentration curve is the same as that of the zero-concentration curve.¹⁹

Furthermore, note that $\mathcal{I}_f(\mathbf{z}) = -\mathcal{I}_f(\mathbf{z}_-)$ (see the Appendix for further details).

In light of the relationship previously discussed between the concentration curves and the ideal-typical social systems proposed by Milanovic, we can also interpret such indicator as a measure of the degree of capitalism of a given social system. Furthermore, the new type of capitalism can also be considered as a multiple sources of income society.

The income-factor concentration index is not a rank-based measure of association between labor and capital (Atkinson and Lakner, 2017). Indeed, a monotone transformation in the marginal distributions would affect the index by changing the ranking in the distribution of total income.²⁰

Although it may seem of little interest to consider negative values of the index, they have a powerful meaning in terms of income composition dynamics, as stated by the following Proposition.

¹⁸Note that the areas between the curves $\mathcal{L}^M(\mathbf{z}, p)$ and $\mathcal{L}^e(\mathbf{z}, p)$ and the curves $\mathcal{L}^e(\mathbf{z}, p)$ and $\mathcal{L}^m(\mathbf{z}, p)$ are the same for specific functional form of $\mathcal{L}(\mathbf{y}, p)$ and for certain values of z (see the appendix for further details).

¹⁹The latter may happen without that the two curves coincide.

²⁰For a full discussion on rank-based measures of association, see Dardanoni and Lambert (2001), Atkinson and Lakner (2017), Aaberge, Atkinson and Königs (2018).

Proposition 2.2.1. *Let $sign_{t,t+1}$ be the sign of $\mathcal{I}_f^t(\mathbf{z}) \cdot \mathcal{I}_f^{t+1}(\mathbf{z})$, where $\mathcal{I}_f^t(\mathbf{z})$ is the income-factor concentration index at time t , while $\mathcal{I}_f^{t+1}(\mathbf{z})$ the one at time $t + 1$. We say that a change in the structure of income composition across the distribution of income occurs at time t if $sign_{t,t+1} < 0$.*

When a change in sign occurs at time $t + 1$ (i.e., $sign_{t,t+1} < 0$), those individuals who mainly own source z at time t , earn mainly source z_- at time $t + 1$ and vice versa.

The normalization coefficient $\mathcal{B}^m(\mathbf{z})$ is a function of $\mathcal{L}(\mathbf{y}, p)$, z and p'' , while the coefficient $\mathcal{B}^M(\mathbf{z})$ is a function of $\mathcal{L}(\mathbf{y}, p)$, z and p' . To simplify the notation, let us generally denote by $\mathcal{B}(\mathbf{z})$ the denominator of the income-factor concentration index. A more compact expression for the index is, for $z = \pi$, as follows:

$$\mathcal{I}_f(\boldsymbol{\pi}) = \frac{w\pi(\tilde{\mu}_w - \tilde{\mu}_\pi)}{\mathcal{B}(\boldsymbol{\pi})}, \quad (2.12)$$

where $\tilde{\mu}_\pi = \frac{1}{2n} \sum_{i=0}^n (\sum_{j=0}^i \alpha_j + \sum_{j=0}^{i+1} \alpha_j)$ and $\tilde{\mu}_w = \frac{1}{2n} \sum_{i=0}^n (\sum_{j=0}^i \beta_j + \sum_{j=0}^{i+1} \beta_j)$ are the areas of the concentration curves for labor and capital multiplied by $\frac{1}{w}$ and $\frac{1}{\pi}$ respectively.²¹

Similarly, for $z = w$, we have:

$$\mathcal{I}_f(\mathbf{w}) = \frac{w\pi(\tilde{\mu}_\pi - \tilde{\mu}_w)}{\mathcal{B}(\mathbf{w})}. \quad (2.13)$$

Equations 2.12 and 2.13 simply mean to illustrate the functional forms of this indicator once we separately analyze the concentration of capital and labor at the top, respectively. Specifically, when equation 2.12 is positive, then the capital is concentrated primarily at the top of the income distribution and the labor at the bottom. Conversely, when equation 2.13 is positive, then the labor is concentrated primarily at the top of the income distribution and the capital at the bottom. As we have previously discussed, the following

²¹Note that one minus twice $\tilde{\mu}_z$ gives the pseudo-Gini of income source z (see [Shorrocks, 1982](#)).

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relationship holds true: $\mathcal{I}_f(\boldsymbol{\pi}) = -\mathcal{I}_f(\mathbf{w})$.

The two functions $\tilde{\mu}_\pi$ and $\tilde{\mu}_w$ have a precise dynamics: They increase (decrease) when the source in question moves towards the bottom (top) of the distribution. These areas can thus be considered as approximate metrics of income-factor concentration.²² In a similar manner, the function $\tilde{\mu}_y$ is a measure of income inequality: When it rises so does the surface of the Lorenz curve, by therefore reducing its distance from the egalitarian line.

At a first glance, this indicator may bear resemblance to the *pseudo-Gini coefficient*, firstly proposed by Fei et al. (1978). However, these two metrics are very different from each other. Let us consider, for instance, the pseudo-Gini for capital income $\bar{\mathcal{G}}_\pi$, which can be written in the following way: $\bar{\mathcal{G}}_\pi = 1 - 2\tilde{\mu}_\pi$. This indicator is equal to zero when all individuals have the same *absolute level* of capital income, regardless of whether their total incomes may differ. Let me better illustrate this point with a simple example. Suppose we have a population of three individuals, whose relative income shares are described by the following vector $(y_1, y_2, y_3) = (\frac{1}{10}, \frac{3}{10}, \frac{6}{10})$. The pseudo-Gini coefficient is equal to zero when the vector of the relative shares of capital income is of the following form $(\alpha_1, \alpha_2, \alpha_3) = (\frac{1}{3}, \frac{1}{3}, \frac{1}{3})$. Now, given that individual 1 has the same share of capital income of individual 3, this makes the former individual more of a capital owner than the latter individual. Therefore, in a society as such, an increase in the capital share of income would rise the income of individual 1 relatively more than the income of individual 3. For this reason, the pseudo-Gini coefficient cannot be regarded as a measure of the relationship between the functional and personal income distribution.

²²We can also observe that the term $\tilde{\mu}_\pi$ (and similarly $\tilde{\mu}_w$ and $\tilde{\mu}_y$) can be expressed as follows: $\tilde{\mu}_\pi = \sum_{i=1}^n \alpha_i \left(\frac{2n-2i+1}{2n} \right)$. It suffices to note that $\tilde{\mu}_\pi = \frac{1}{2n} \sum_{i=0}^n \left(\sum_{j=0}^i \alpha_j + \sum_{j=0}^{i+1} \alpha_j \right) = \frac{1}{2n} \sum_{i=1}^n \left(2 \sum_{j=1}^i \alpha_j + \alpha_i \right) = \frac{1}{n} \sum_{i=0}^n \sum_{j=0}^i \alpha_j + \frac{1}{2n} \sum_{i=0}^n \alpha_i$, from which we obtain the result.

2.2.5 From Functional to Personal Distribution of Income

In this Section, we further investigate the relationship between functional income distribution and income inequality, in light of the novel metric previously illustrated. To this end, let us consider the well-known relationship between $\tilde{\mu}_y$ (the area of the Lorenz curve) and the Gini coefficient:

$$\mathcal{G} = 1 - 2\tilde{\mu}_y. \quad (2.14)$$

The latter can be further developed, so to obtain:

$$\mathcal{G} = 1 - 2(z\tilde{\mu}_z - \tilde{\mu}_{z-}) + \tilde{\mu}_{z-}. \quad (2.15)$$

The Gini coefficient can therefore be expressed as a function of the two approximate metrics of income-factor concentration $\tilde{\mu}_z$ and $\tilde{\mu}_{z-}$ and of the factor share z . If we take the derivative of \mathcal{G} with respect to z , we obtain:

$$\frac{\partial \mathcal{G}}{\partial z} = 2(\tilde{\mu}_{z-} - \tilde{\mu}_z). \quad (2.16)$$

The elasticity of personal income Gini to changes in the factor shares is (two times) the difference between the areas of the two concentration curves. Note that when $\tilde{\mu}_{z-} - \tilde{\mu}_z < 0$, then an increase in the capital share reduces income inequality.

If we consider the standard decomposition of total income Gini into inequality contributed by each income source:²³

$$\mathcal{G} = z\mathcal{R}_z\mathcal{G}_z + z-\mathcal{R}_{z-}\mathcal{G}_{z-}, \quad (2.17)$$

²³See [Lerman and Yitzhaki \(1985\)](#) for further details.

2.2. Methodology

where $\mathcal{R}_z = \frac{\text{cov}(r(y),z)}{\text{cov}(r(z),z)}$ is the correlation ratio between the source z and total income, $r(y)$ and $r(z)$ are the individual's ranks according to total income and source z respectively and \mathcal{G}_z is the Gini coefficient of income source z , we can write:

$$\frac{\partial \mathcal{G}}{\partial z} = \mathcal{R}_z \mathcal{G}_z - \mathcal{R}_{z-} \mathcal{G}_{z-}, \quad (2.18)$$

and by combining both equations 2.16 and 2.18 we get:

$$2(\tilde{\mu}_{z-} - \tilde{\mu}_z) = \mathcal{R}_z \mathcal{G}_z - \mathcal{R}_{z-} \mathcal{G}_{z-}. \quad (2.19)$$

According to Milanovic, “for the rising share of capital income to increase overall income Gini, we need therefore to have two ‘transmission’ tools, Gini coefficient of capital income and \mathcal{R}_π , positive and high” (Milanovic, 2017), or, from a more technical perspective, the following condition must hold: $\mathcal{R}_\pi \mathcal{G}_\pi > \mathcal{R}_w \mathcal{G}_w$. It appears that such condition is well captured by the sign of the income-factor concentration index, which exclusively depends on $\tilde{\mu}_{z-} - \tilde{\mu}_z$. Therefore, equation 2.16 shows that, for the analysis of the relationship between the functional and personal distribution of income, the indicator we propose can be considered a tool capable of linking these two concepts. For example, if the capital share of income was rising, then income inequality would grow only if the income-factor concentration index was greater than zero.

2.3 The Case of a Two-Person Economy

Let us now consider the scenario in which the population is divided into two groups (i.e., $n = 2$) of equal size. This exercise is of interest for two main reasons. The first reason is that, due to the lack of data, it may be difficult sometimes to compute the index previously illustrated, which requires information concerning the composition of individuals' income for the entire population.²⁴ The second reason is that the $n = 2$ version of the index has some interesting mathematical properties which deserve to be exposed.

Let us denote by y_p the income of the bottom $p\%$ of the income distribution and by y_{1-p} the income of the top $(1 - p)\%$, with $y_p \in]0, \frac{1}{2}[$. Figure 2.2 provides us with a graphical representation of the concentration curves for $n = 2$. The income-factor concentration index with $n = 2$ takes the following mathematical form:

$$\mathcal{I}_{f,2}(\mathbf{z}, p) = b_{z,p} w \pi (\eta_p^{z^-} - \eta_p^z) = t_{z,p} \rho I_f(\mathbf{z}, p), \quad (2.20)$$

where $\rho = w\pi$, $I_f(\mathbf{z}, p) = \eta_p^{z^-} - \eta_p^z$ and the normalization coefficient $b_{z,p}$ is defined as follows:

$$b_{z,p} = \begin{cases} \frac{1}{y_p z} & \text{if } y_p > \eta_p^z \\ \frac{1}{[\min(y_p, z) - y_p z]} & \text{if } y_p < \eta_p^z \end{cases}.$$

This version can thus be regarded as the product of three elements, notably $t_{z,p}$, ρ and $I_f(\mathbf{z}, p)$. An interesting way to grasp their meaning is to rewrite the index as follows:

$$\mathcal{I}_{f,2}(\mathbf{z}, p) = b_{z,p} \begin{vmatrix} w & 0 \\ 0 & \pi \end{vmatrix} \begin{vmatrix} \eta_p^{z^-} & \eta_p^z \\ \eta_{1-p}^{z^-} & \eta_{1-p}^z \end{vmatrix},$$

²⁴This information is generally provided by the surveys, which, however, tend to underestimate the income of individuals at the top of the distribution.

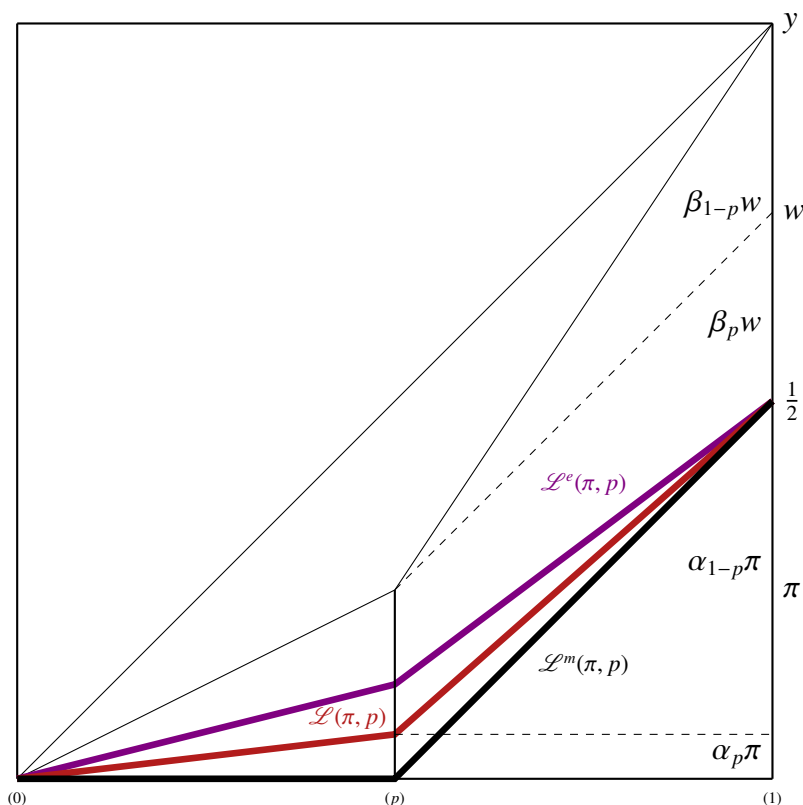
Concentration Curves for Income Source with $n = 2$


Figure 2.2: A graphical representation of the methodology in which two people (or groups) with different income ($y_p < y_{1-p}$, with $p = \frac{1}{2}$) and two sources of the same amount ($\pi = w$) are compared. The carnelian line $\mathcal{L}(\pi, p)$ is the concentration curve for capital, the violet line $\mathcal{L}^e(p)$ is the zero-concentration curve, while the black line $\mathcal{L}^m(\pi, p)$ is the maximum-concentration curve. The following values have been here assigned: $y_p = 0.25$, $\pi = w = \frac{1}{2}$, $\alpha_p = 0.12$ and $\beta_p = 0.38$.

where the product of the two determinants ρ and $I_f(\mathbf{z}, p)$ is simply the determinant of the following matrix A :

$$A = \begin{pmatrix} \eta_p^z w & \eta_p^z \pi \\ \eta_{1-p}^z w & \eta_{1-p}^z \pi \end{pmatrix}.$$

The $\mathcal{I}_{f,2}(\mathbf{z}, p)$ can hence be rewritten as the product between the determinants of two matrices and a normalizing coefficient. The first determinant, ρ , adjusts the degree of concentration for the level of income sources. The second determinant, $I_f(\mathbf{z}, p)$, is, instead, the channel through which the issue of income-source concentration is addressed.

2.3. The Case of a Two-Person Economy

Interestingly, we can note that the following matrix A^* :

$$A^* = \begin{pmatrix} \beta_p & \alpha_p \\ \beta_{1-p} & \alpha_{1-p} \end{pmatrix},$$

whose determinant equals the component $I_f(\mathbf{z}, p)$, comes from the following relationship:

$$\bar{y} = A^* \bar{x},$$

where $\bar{y} = \begin{pmatrix} y_p \\ y_{1-p} \end{pmatrix}$ and $\bar{x} = \begin{pmatrix} w \\ \pi \end{pmatrix}$, which in turns is equivalent to the following system of equations:

$$\begin{cases} y_p = \beta_p w + \alpha_p \pi \\ y_{1-p} = \beta_{1-p} w + \alpha_{1-p} \pi \end{cases}.$$

When the matrix A^* is nonsingular (i.e., $\det A^* \neq 0$, thus $I_f(\mathbf{z}, p) \neq 0$), then we can write:

$\bar{x} = (A^*)^{-1} \bar{y}$. It is of interest to observe that when $\det A^* = 1$, then ownerships of labor and capital are separated between individual 1 and 2. This explains why the coefficient $I_f(\mathbf{z}, p)$ can be considered as a proxy of $\mathcal{I}_f(\mathbf{z})$.

Another way of writing the $n = 2$ version of this indicator is the following. Assume that $y_1 < w$ and $\mathbf{z} = \boldsymbol{\pi}$, then we have:²⁵

$$\mathcal{I}_{f,2}(\boldsymbol{\pi}, p) = 1 - \frac{\alpha_1}{y_1}. \quad (2.21)$$

Equation 2.21 illustrates that the level of income composition inequality is in this very case determined by the ratio $\frac{\alpha_1}{y_1}$. This ratio combines individual 1's endowment of capital

²⁵This is a plausible assumption: In the contrary case, the labor share of income would have been lower than the capital share. In fact, if y_1 was greater than w , given that $y_1 < \frac{1}{2}$ by assumption, than we would have $w < \pi$. The latter is not supported by the empirical evidences concerning the developed countries (Stockhammer, 2013), with the exception of Mexico (Negrete, 2015).

2.3. The Case of a Two-Person Economy

and overall income. When the ratio is greater than one, then individual 1 is more capital poor than income poor. When it is equal to one, then she is as capital poor as income poor and when it is lower than one, then she is more income poor than capital poor. Therefore, income composition inequality is positive when the poorest part of the society is more capital poor than income poor and negative in the opposite case.

Let us now illustrate several properties of the $I_f(\mathbf{z}, p)$. First, the capital to labor ratio can be expressed as follows:

$$\frac{\pi}{w} = \frac{\frac{1}{1+\varphi} - \beta_{1-p}}{\frac{\varphi}{1+\varphi} - \alpha_p}, \quad (2.22)$$

where $\varphi = \frac{y_p}{y_{1-p}}$, from which we simply derive the following result.

Proposition 2.3.1. *A variation in φ has no effect on $\frac{\pi}{w}$ iff $I_f(\mathbf{z}, p) = 0$. Formally:*

$$\frac{\partial \frac{\pi}{w}}{\partial \varphi} = 0 \iff I_f(\mathbf{z}, p) = 0. \quad (2.23)$$

Proposition 2.23 sheds light on the relationship between income inequality, as measured by the ratio φ and factor shares of income ($\frac{\pi}{w}$).²⁶ A variation in φ does not affect the ratio $\frac{\pi}{w}$ when the determinant of the matrix A^* is equal to zero.

Let us now consider the relationship between the determinant $I_f(\mathbf{z}, p)$ and the between-group Gini coefficient G .²⁷ Precisely:

$$\frac{\partial G}{\partial z} = I_f(\mathbf{z}, p) p. \quad (2.24)$$

An increase in the factor share z reduces the between-group inequality G according to the degree of income-source concentration and the share of poor people, p . If we let p be equal to $\frac{1}{2}$ (thus we divide the population into two groups of equal size) and if we set

²⁶It is easy to note that $\frac{\partial \frac{\pi}{w}}{\partial \varphi} > 0$ when $I_f(\mathbf{z}, p) > 0$. In particular, when $I_f(\mathbf{z}, p) = 1$, an increase in φ raises the ratio $\frac{\pi}{w}$ of the same amount. Indeed, when $I_f(\mathbf{z}, p) = 1$ then $y_p = \pi$ and $y_{1-p} = w$, thus $\frac{\pi}{w} = \frac{y_p}{y_{1-p}}$.

²⁷See the appendix for further details.

$z = \pi$, then we get:

$$\frac{\partial G}{\partial \pi} = \frac{\alpha_{\frac{1}{2}} - \beta_{\frac{1}{2}}}{2}. \quad (2.25)$$

Equation 2.25 bears resemblance with equation 2.16. Specifically, in a two-person economy the condition for the rising share of capital income to increase income Gini is $I_f(\mathbf{z}, p) > 0$, or $\det A^* > 0$.

2.4 Empirical Application

In this Section, we apply the method previously illustrated to the case of six European economies, namely Finland, France, Germany, Italy, Norway and The Netherlands. The data used come from the European Union Statistics of Income and Living Conditions (EU-SILC), which provide a representative sample of the European population. This data are firstly produced by the national statistical offices and later harmonized and released by Eurostat. In our analysis, we consider the period between 2007 and 2016. The country samples vary between 7000 and 19000 units and the unit of analysis is the household. The choice of these specific countries is determined by their puzzling trends. Indeed, while income composition inequality follows a U-shaped trend for Germany, Norway and The Netherlands over the period considered, the reverse pattern is traced by Finland, France and Italy.

Our analysis relies on specific definitions of capital and labor incomes.²⁸ Precisely, we define capital income as the sum of household income from rental of a property or land, interests, dividends, capital from capital investments in unincorporated business, the capi-

²⁸The definitions of capital and labor income can be, to a certain extent, arbitrary. For instance, [Cirillo, Corsi and D'Ippoliti \(2017\)](#), who investigate the dynamics of the functional and personal distributions of income at the European level before and after the crisis, and who also rely on EU-SILC data, provide a slightly different definition of capital and labor income from that we propose. Indeed, their definition of income does not include self-employment remuneration.

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tal component of gross cash benefits or losses from self-employment (including royalties) and pensions from individual private plans. The capital component of self-employment income, which is not directly provided by EU-SILC, is imputed by means of the procedure proposed by Glyn (2011). We attribute the average payroll income of the entire sample to represent the labor income component of the self-employed and “the margin of value added per head [...] is then regarded as accruing to the [self-employer] as property income” (Glyn, 2011, p. 8).²⁹ As stated by Glyn, none of the methods adopted by the literature to decompose the self-employment income into its labor and capital components is wholly unproblematic. In this respect, also our method presents some issues. Namely, by considering the economy average payroll income as a threshold to determine the capital and labor components of self-employment income, we risk to underestimate the capital component for those sectors in which the sectorial average payroll income is lower than the economy average payroll income, and viceversa. However, we believe this decomposition to be more sophisticated than that which automatically attributes two thirds of the self-employment income in its labor component, and one third in its capital component. Furthermore, note that to the best of our knowledge, this is the first time such method is applied to decompose self-employment income at the micro level (as this method is generally adopted to decompose macroeconomic variables).

Labor income is defined as the difference between total household gross income minus

²⁹Precisely, we firstly compute the country average payroll income per household, $\mu_{payroll}$. Then, we decompose self-employment income into its capital and labor components in the following way. Let us denote by y_{se} the income from self-employment provided by EU-SILC.

We can write that $y_{se} = y_{se}^{\pi} + y_{se}^w$, where $y_{se}^w = \begin{cases} y_{se} & \text{if } y_{se} \leq \mu_{payroll} \\ \mu_{payroll} & \text{if } y_{se} > \mu_{payroll} \end{cases}$, while $y_{se}^{\pi} =$

$$\begin{cases} 0 & \text{if } y_{se} \leq \mu_{payroll} \\ y_{se} - \mu_{payroll} & \text{if } y_{se} > \mu_{payroll} \end{cases}.$$

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capital income.³⁰

To overcome the issue of negative values, we replace the bottom part of the concentration curves for which such problem occurs with the horizontal line (i.e., the x -axis).³¹

Let us begin the analysis with some descriptive statistics. Table 2.1 presents the income shares of four different income groups, defined as follows: 0-50%, 50-90%, 90-95% and 95-100%. These shares are computed for the six countries in 2007 and 2016, with the exception of Italy (2007 and 2015) due to missing information.

Table 2.1: Income Shares

Income Group	Norway		Germany		Netherlands		Italy		France		Finland	
	2007	2016	2007	2016	2007	2016	2007	2015	2007	2016	2007	2016
0-50%	24%	24%	23%	23%	26%	22%	18%	19%	24%	24%	22%	23%
50-90%	50%	49%	48%	48%	47%	47%	48%	48%	48%	46%	49%	48%
90-95%	9%	9%	10%	10%	9%	10%	11%	11%	10%	9%	10%	10%
95-100%	15%	17%	17%	17%	16%	19%	19%	19%	16%	18%	17%	17%
<i>Gini</i>	0.36	0.37	0.38	0.39	0.34	0.39	0.45	0.45	0.37	0.38	0.39	0.39
<i>IFC</i>	0.51	0.59	0.48	0.50	0.54	0.63	0.53	0.49	0.38	0.46	0.46	0.45

The distribution of total income is almost the same in 2007 and 2016 for all countries, with the sole exception of The Netherlands, where the 3% of total income has moved from the bottom 50% to the top 5%, by hampering the Gini coefficient of 0.5 percentage points. Italy displays the higher level of total income inequality, with a Gini coefficient above 0.4, and a $\frac{\text{top } 5\%}{\text{bottom } 50\%}$ ratio lower than 1 in 2007, and equal to 1 in 2015.

Tables 2.2 and 2.3, instead, show the distributions of the capital and labor shares re-

³⁰The sources of labor income that we consider are: gross employee cash or near cash income, gross non-cash employee income, employers' social insurance contributions, value of goods produced for own consumption, unemployment benefits, old-age benefits, survivor' benefits, sickness benefits, disability benefits, education-related allowances, family/children related allowances, social exclusion not elsewhere classified, housing allowances, regular inter-household cash transfers received and income received by people aged under 16.

³¹When a given variable at stake displays negative values, the bottom part of the corresponding concentration curve lies below the horizontal axe.

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spectively, with individuals being indexed by their income ranking. Following [Shorrocks \(1982\)](#) and [Atkinson and Lakner \(2018\)](#), we may call these shares as “pseudo-shares”.

Let us take a closer look at [Table 2.2](#). A simple way to read this Table is the following: in 2007 in Norway the individuals at the bottom 50% of the total income distribution earn the 13% of total capital income in the economy. The share of the capital income earned by the same income group in 2016 is 4% points lower than the share in 2007.

Table 2.2: Capital Shares (Income Ranking)

Income Group	Norway		Germany		Netherlands		Italy		France		Finland	
	2007	2016	2007	2016	2007	2016	2007	2015	2007	2016	2007	2016
<i>0-50%</i>	13%	9%	11%	9%	11%	6%	5%	7%	14%	15%	10%	9%
<i>50-90%</i>	22%	20%	25%	30%	22%	23%	30%	33%	29%	29%	31%	36%
<i>90-95%</i>	7%	9%	9%	8%	8%	9%	13%	15%	12%	12%	12%	13%
<i>95-100%</i>	57%	61%	53%	52%	57%	60%	49%	44%	43%	46%	45%	39%
<i>Capital Share</i>	6%	8%	9%	6%	7%	7%	17%	16%	8%	12%	13%	10%
<i>Gini</i>	0.36	0.37	0.38	0.39	0.34	0.39	0.45	0.45	0.37	0.38	0.39	0.39
<i>IFC</i>	0.51	0.59	0.48	0.50	0.54	0.63	0.53	0.49	0.38	0.46	0.46	0.45

The first thing to notice is that in Norway, Germany and The Netherlands the individuals at the top 5% of the income distribution earn more than 50% of all capital income in the economy. On the contrary, in Italy, France and Finland the share of capital income earned by the same income group is lower than 50%. Moreover, differently from the total income distribution, the capital income distribution has changed over the period considered in almost all countries. However, it is hard to identify clear patterns between the six countries.

In Norway and The Netherlands the capital income has moved from the bottom 50% to the top 5% between 2007 and 2016. A similar scenario can be described for France, although less markedly than in the previous two countries. In Italy and Finland, instead, the top 5% has seen a reduction of its capital income share. However, while in Italy the

2.4. Empirical Application

capital income has shifted towards the bottom 50% and the middle class (50 – 90%), in Finland it has moved towards the middle class only. Finally, in Germany the middle class has gained capital income from both the top 10% and the bottom 50%.

Table 2.3: Labor Shares (Income Ranking)

Income Group	Norway		Germany		Netherlands		Italy		France		Finland	
	2007	2016	2007	2016	2007	2016	2007	2015	2007	2016	2007	2016
<i>0-50%</i>	25%	25%	25%	24%	27%	24%	21%	21%	25%	26%	24%	24%
<i>50-90%</i>	51%	51%	51%	50%	49%	49%	53%	52%	50%	49%	51%	50%
<i>90-95%</i>	9%	9%	10%	10%	9%	10%	10%	10%	9%	9%	9%	10%
<i>95-100%</i>	12%	12%	13%	14%	13%	15%	14%	15%	14%	14%	13%	14%
<i>Labor Share</i>	94%	92%	91%	94%	93%	93%	83%	84%	92%	88%	87%	90%
<i>Gini</i>	0.36	0.37	0.38	0.39	0.34	0.39	0.45	0.45	0.37	0.38	0.39	0.39
<i>IFC</i>	0.51	0.59	0.48	0.50	0.54	0.63	0.53	0.49	0.38	0.46	0.46	0.45

Table 2.3, instead, shows that very little changes have been registered in the labor income distribution for almost all countries between 2007 and 2016. It is only worth mentioning that in The Netherlands the labor income has mainly moved from the bottom 50% to the top 10%. Furthermore, in each country the middle class earns, on average, the 50% of all the labor income in the economy.

At this point of the analysis, we may address the following question: How to make sense to all this information? As shown in Table 2.1, the dynamics of the four income shares is relatively well captured by the dynamics of the Gini coefficient. However, what can we say about the joint dynamics of the capital and labor shares? Are the capital and labor incomes better distributed across the populations or, rather, more concentrated at the top and at the bottom of the income distributions? Do these countries resemble more to a classical capitalism, characterized by the existence of social classes, or rather to a multiple sources of income new capitalism? To answer these questions, we apply the method we developed in the previous sections.

2.4. Empirical Application

Figure 2.3 shows the overall dynamics of income composition inequality for the two groups of European countries, respectively. The first group is composed by Germany, Norway and The Netherlands, whilst the second by Italy, France and Finland. To begin with, note that the IFC index ranges between 0.4 and 0.6 in all countries. However, as we said at the beginning of this section, the two groups follow different trends over the time considered. Income composition inequality in the first group follows a U-shaped pattern, with its major peaks in 2007 and 2016, and its lowest peak in 2013-2014 (a).

On the contrary, income composition inequality in the second group follows an inverted U-shaped curve, with its peaks in 2011/2012 and its lowest levels at the beginning, and at the end of the period considered (b).

The patterns of Germany and The Netherlands almost coincide in both levels and trends, whilst that of Norway starts from a lower level in 2007, and ends with a higher level of income composition inequality in 2016.

Instead, all the countries of the second group exhibit a similar dynamic of income composition inequality. However, France and Italy show higher levels of the IFC index as compared to Finland. Following the framework previously discussed, we can say that the first three countries considered are moving towards becoming a classical capitalism, characterized by a group of rich people owning capital income and a group of poor people owning labor income. This type of society allows for a greater transmission of changes in the functional distribution of income into personal income inequality. Conversely, the second group of countries is moving towards becoming a new capitalism, in which both sources of income are better distributed across the entire population. In the latter society, the relationship between functional and personal distribution of income is relatively weak,

Income Composition Inequality

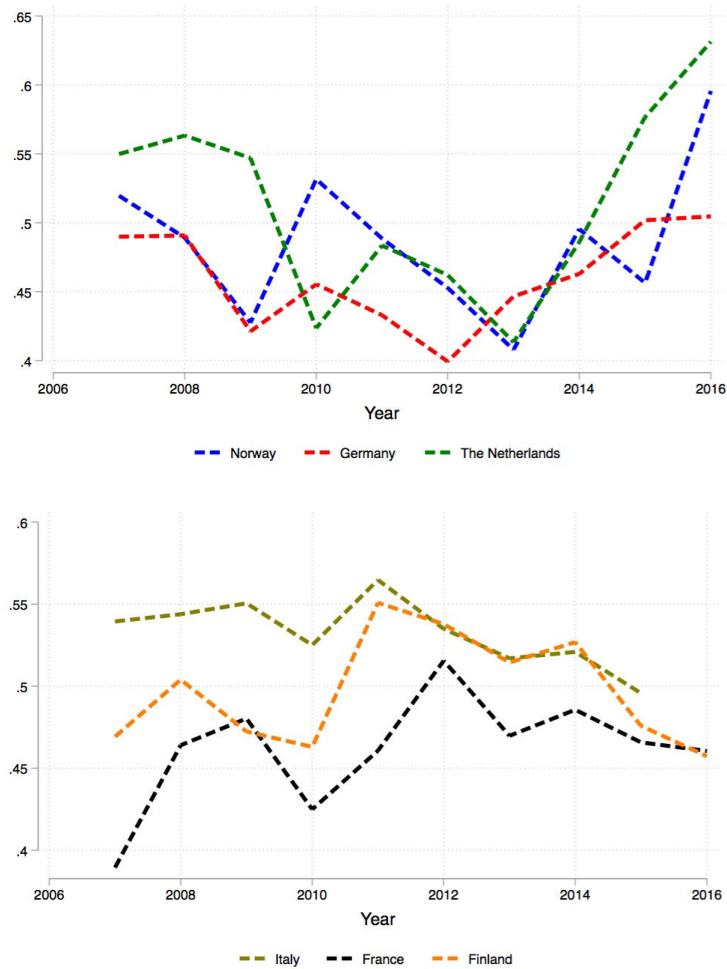


Figure 2.3: The series of income composition inequality 2007-2016. **Source:** Author's computation on basis of EU-SILC.

implying that fluctuations in both the capital and labor shares of income have a less severe impact on the dynamics of income inequality.

At this point of the analysis, let us analyze the role played by the two components of the iIFC index, notably $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$, in shaping its overall dynamics. The evolution of the areas of the concentration curves for capital and labor are illustrated by Figures 2.4 and 2.5. As already illustrated by Tables 2.2 and 2.3, the two metrics $\tilde{\mu}_w$ and $\tilde{\mu}_\pi$ follow completely independent patterns. Let us begin with the first group. For all countries the area of the concentration curve for capital rises up to 2013 and falls afterwards (Figure 2.4).

Area of the Concentration Curve for Capital

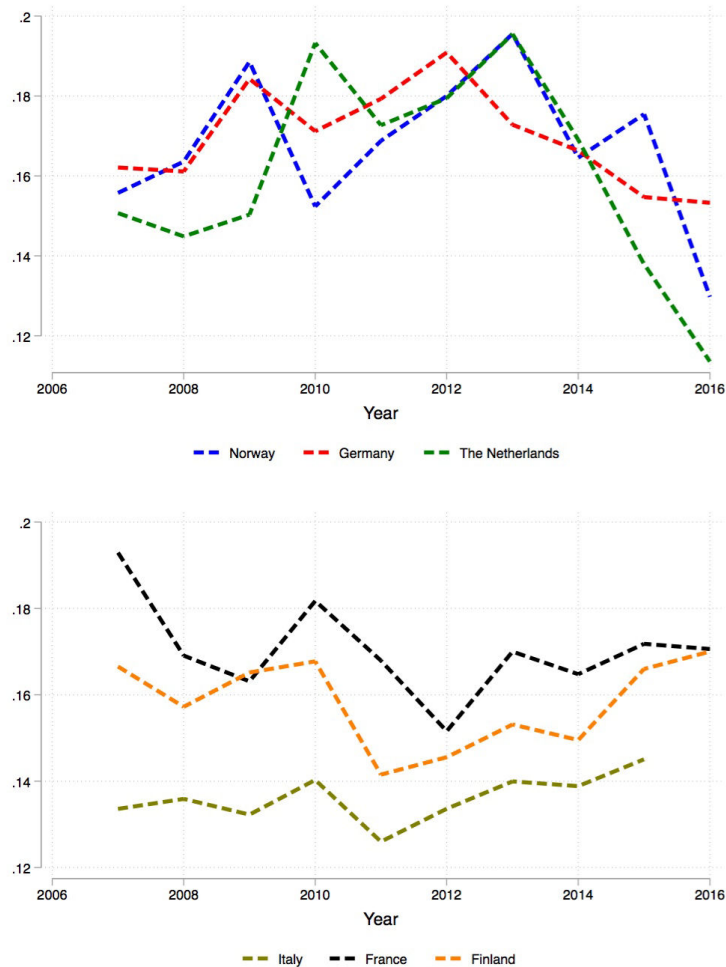


Figure 2.4: The series of the area of the concentration curves for capital income 2007-2016. **Source:** Author's computation on basis of EU-SILC.

We remind that an increase (decrease) in $\tilde{\mu}_\tau$ implies that the capital income moves towards the bottom (top) of the income distribution. Therefore, we can state that Germany, Norway and The Netherlands saw their capital income flowing in the hands of the bottom part of the income distribution up to 2013 and afterwards coming back into possession of the rich part of the population. At the same time, the almost flat motion of the area of the concentration curve for labor $\tilde{\mu}_w$ for all the countries (Figure 2.5) clearly suggests that the principal driver of income composition inequality was the fluctuation in capital income. A different story can be told with regards to the second group of countries. The evolution

Area of the Concentration Curve for Labor

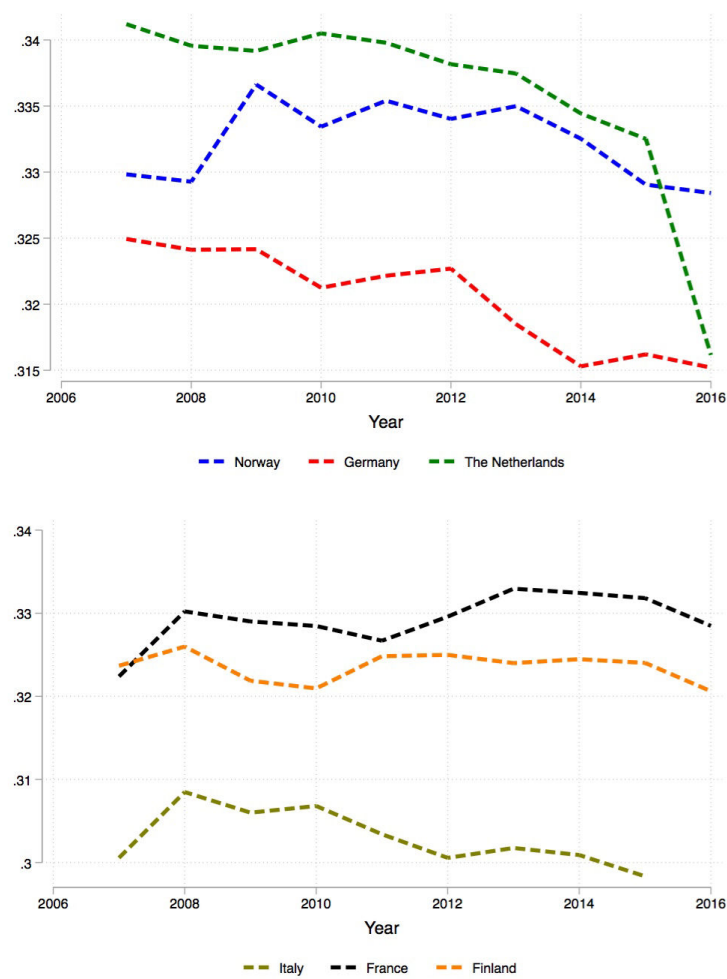


Figure 2.5: The series of the area of the concentration curves for labor income 2007-2016. **Source:** Author's computation on basis of EU-SILC.

of income composition inequality for Finland, France and Italy, also here determined by the behavior of capital income, has been characterized by the latter moving firstly towards the top (up to 2013) and later towards the bottom of the income distribution (from 2013 onwards).

Nevertheless, to explain the major causes behind the dynamics of income composition inequality in the countries considered, we should further explore the same countries' political contexts. In addition to that, given the nature of the data we use, which indeed tend

to underestimate the income of the individuals at the top of the distribution,³² our results should be taken with extreme caution.

2.5 Conclusion

One of the most important findings from Piketty's *Capital in the Twenty-First Century* (Piketty, 2014) is the rise in the capital share of income in many developed countries over the last decades (see also Piketty, 2015). Similar results were also found by Stockhammer (2013), who shows that the labour share has fallen over the past 25 years in the OECD countries. The dynamics of the capital share of income (and, hence, of the labor share) is influenced by many macroeconomic phenomena, such as technical change, globalization, financialisation, bargaining power and market power of firms, among others (see Stockhammer et al. 2018). The rise in the capital share of income is generally considered to be one of the causes that led to the increase in personal income inequality (Piketty, 2014; Bengtsson and Waldenstrom, 2018). However, the study of the link between changes in the capital share of income and changes in personal income inequality needs to be further investigated. For this reason, the present Chapter proposed a methodology to examine the relationship between the functional and personal distribution of income. To this end, it introduced the concept of inequality in income composition. If we decompose total income into *two* factors, such as capital and labour income, then income composition inequality is the extent to which the income composition is distributed unevenly across the population. Inequality in income composition is *maximal* when individuals at the top and at the bottom of the income distribution separately earn the two different types of income. On the contrary, it is *minimal* when each individual earns the same composition of the

³²See Jenkins (2017) for an overview of the issues which raise the survey data.

two factors. Under a high level of income composition inequality the link between the functional and personal distribution of income is strong, whereas under a low level of income composition inequality the link is weak. We then constructed a summary statistic to measure income composition inequality, and applied it to study the evolution of income composition inequality in six European economies. We showed that this summary statistic can be looked at in two ways. Firstly, from a technical perspective, it can be considered an elasticity of personal income inequality to fluctuations in the functional income distribution. In other words, it mathematically links the functional and personal distribution of income. Secondly, from a political economy perspective, it measures the “degree of capitalism” of a given social system.

While we use capital and labor as income sources in this Chapter, it is important to underline that the study of income composition inequality can be applied to analyze the joint distribution of *any pair* of income (or wealth) components, such as net income and taxes, saving and consumption, and financial and non-financial assets, among others. Such flexible nature of the methodology proposed paves therefore the way for further research on the topic.

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2.6 Appendix

2.6.1 Sign of the Indicator

In order to show that $\mathcal{I}_f(\mathbf{z}) = -\mathcal{I}_f(\mathbf{z}_-)$, we need to prove that $\mathcal{B}^m(\mathbf{z}) = \mathcal{B}^M(\mathbf{z}_-)$. The latter relationship states that the denominator of $\mathcal{I}_f(\mathbf{z})$ equals that of $\mathcal{I}_f(\mathbf{z}_-)$. To this end, we should consider two different maximum-concentration curves.

From equations 2.12 and 2.13 we can simply notice that $\mathcal{A}(\mathbf{z}) = -\mathcal{A}(\mathbf{z}_-)$, thus that the numerator of the income-factor concentration index changes its sign (and not its absolute level) according to the source we analyze. Without loss of generality, if we assume that source z is mainly concentrated at the top, and that source z_- at the bottom, then the relationship $\mathcal{B}^m(\mathbf{z}) = \mathcal{B}^M(\mathbf{z}_-)$ can be written as follows:

$$\int_0^1 z \mathcal{L}(\mathbf{y}, p) dp - \int_{p^*}^1 [\mathcal{L}(\mathbf{z}, p) - z_-] dp = \int_0^{p^{**}} \mathcal{L}(\mathbf{y}, p) dp + (1 - p^{**}) z_- - \int_0^1 z_- \mathcal{L}(\mathbf{y}, p) dp.$$

Considering that p^* and p^{**} are such that $\mathcal{L}(\mathbf{y}, p^*) = \mathcal{L}(\mathbf{y}, p^{**}) = z_-$, then $p^* = p^{**}$, and the relationship holds true.

2.6.2 Normalization Coefficient

As stated before in this Chapter, we show that for specific functional forms of the Lorenz curve for income $\mathcal{L}(\mathbf{y}, p)$, and for specific values of z (and, thus, z_-), the following relationship holds true:

$$\mathcal{L}^M(\mathbf{z}) - \mathcal{L}^e(\mathbf{z}) = \mathcal{L}^e(\mathbf{z}) - \mathcal{L}^m(\mathbf{z}). \quad (2.26)$$

For simplicity, let us move to the continuous space. Suppose, therefore, that we have three continuous distribution functions: \mathbf{y} , $\boldsymbol{\pi}$, \mathbf{w} . The relationship 2.26 is equivalent to the

following one:

$$z \int_0^1 \mathcal{L}(\mathbf{y}, p) dp - \int_{p''}^1 (\mathcal{L}(\mathbf{y}, p) - z_-) dp = \int_0^{p'} \mathcal{L}(\mathbf{y}, p) dp + (1 - p') z - z \int_0^1 \mathcal{L}(\mathbf{y}, p) dp. \quad (2.27)$$

We remember that p' s.t. $\mathcal{L}(\mathbf{y}, p') = z$, p'' s.t. $\mathcal{L}(\mathbf{y}, p'') = 1 - z$ and $\mathbf{z} = \pi, w$. From equation 2.27 we can write:

$$2z \int_0^1 \mathcal{L}(\mathbf{y}, p) dp = \int_{p''}^1 (\mathcal{L}(\mathbf{y}, p) - z_-) dp + \int_0^{p'} \mathcal{L}(\mathbf{y}, p) dp + (1 - p') z.$$

If we call $p' = f(z)$ and $p'' = f(z_-)$, where $f(y) = \mathcal{L}^{-1}(\mathbf{y}, p)$ then, after further manipulations, we get:

$$\int_0^1 \mathcal{L}(\mathbf{y}, p) dp = 1 + \frac{1}{z - z_-} \int_{f(z)}^{f(z_-)} \mathcal{L}(\mathbf{y}, p) dp + \frac{zf(z) - z_-f(z_-)}{z - z_-},$$

which is true only if the following relationship is satisfied:

$$(z - z_-) \int_0^1 f(y) dy = \int_z^{z_-} f(y) dy. \quad (2.28)$$

Note that equation 2.28 is true for $\pi = w$, $\pi = 1$, $w = 1$, regardless of the functional form of \mathcal{L} , and for the family of functions f of the form $f(x) = x^n$, for $n = 1, +\infty, -\infty$ only.

2.6.3 Result 2.3.1

Provided that $y_p = \alpha_p\pi + \beta_p w$, and $y_{1-p} = \alpha_{1-p}\pi + \beta_{1-p}w$, where $y_p + y_{1-p} = y = \pi + w$,

we can write:

$$\varphi = \frac{\beta_p w + \alpha_p \pi}{\beta_{1-p} w + \alpha_{1-p} \pi}, \quad \Leftrightarrow$$

$$y_p(\beta_{1-p} w + \alpha_{1-p} \pi) = y_{1-p}(\beta_p w + \alpha_p \pi), \quad \Leftrightarrow$$

$$\frac{\pi}{w} = \frac{\beta_p y_{1-p} - \beta_{1-p} y_p}{\alpha_{1-p} y_p - \alpha_p y_{1-p}}, \quad \Leftrightarrow$$

$$\frac{\pi}{w} = \frac{\beta_p - \varphi \beta_{1-p}}{-\alpha_p + \varphi \alpha_{1-p}}, \quad \Leftrightarrow$$

$$\frac{\pi}{w} = \frac{1 - (1 - \varphi) \beta_{1-p}}{\varphi - (1 - \varphi) \alpha_p}, \quad \Leftrightarrow$$

$$\frac{\pi}{w} = \frac{\frac{1}{1-\varphi} - \beta_{1-p}}{\frac{\varphi}{1+\varphi} - \alpha_p}.$$

If we now take the first derivative of $\frac{\pi}{w}$ with respect to φ and we further manipulate, we obtain result 2.3.1.

2.6.4 Relationship between Gini and IFC for $n = 2$

Let us rewrite y_1 (from equation 2.1) as follows:

$$y_1 = \beta_1 w \pm \alpha_1 w + \alpha_1 \pi.$$

After some algebraic manipulations, we get:

$$y_1 = I_f w + \alpha_1,$$

where I_f is the distribution's component of the index \mathcal{J}_f when $n = 2$. Let us now recall the expression of the Gini coefficient:

$$G = 1 - \sum_{k=1}^n (x_{k+1} - x_k)(y_{k+1} + y_k),$$

where the whole population is divided into n groups, and x_k, y_k represent the bottom $x_k\%$ of the population, and their cumulative income respectively. When $n = 2$ we can write:

$$G = 1 - py_p - (1 - p)y_p,$$

where p is the share of the poor group, and $(1 - p)$ the share of the rich. The following can be derived:

$$G = 1 - p(I_f w + \alpha_p) - (1 - p)$$

whence:³³

$$G = p(\alpha_{1-p} - I_f w)$$

from which, by taking the derivative with respect to w , we obtain equation 2.24.

³³It can be noticed that $G = p(\alpha_{1-p} - I_f w) = p(1 - y_p) = py_{1-p}$, which is a different way to express the two-groups Gini coefficient. Indeed, it clearly appears from the equation that inequality rises when either the share of poor people increases, or when the income share of the rich augments.

Chapter 3

The Factors of Income Inequality Variation

Abstract: We interpret variations in income inequality as due to three type of movements: movements in the *functional income distribution* (**FID**), movements in the *income-factor concentration* (**IFC**) and movements in the *income-factor inequality* (**IFI**). For each of these three movements to affect income inequality, a specific condition of transmission is derived in this Chapter. We show that, within the European context, in the period between 2007 and 2016, the dynamics of **FID** and **IFI** positively correlate with income inequality variation, whilst the dynamics of **IFC** negatively correlates with income inequality variation.

3.1 Introduction

The distinction between *variations* and *levels* has always been of the utmost importance for the analysis of economic trends. Levels provide information on the *magnitude* of a given phenomenon. Variations describe its *dynamics*. Within the methodological literature on income inequality, significant attention has been given to the issue of levels. The most known decompositions of income inequality by income sources and population subgroups¹ principally focus on what determines inequality levels, without further discussing whether such determinants are also responsible for their variation.

Variations have generally been the object of less attention. There is, however, a significant number of methodological works that have addressed the issue of income inequality variation and its determinants. [Bourguignon and Ferreira \(2005\)](#) survey the main methods to decompose changes in both specific summary inequality measures and the distribution of individual welfare. The Oaxaca-Blinder technique ([Blinder, 1973](#); [Oaxaca, 1973](#)) is considered to be the best available to explain changes in a summary inequality statistics. It allows us to identify changes in the means and inequality measures of various sociodemographic groups or income sources. With respect to the distribution of individual welfare, [Bourguignon and Ferrera \(2005\)](#) illustrate a simple generalization of Oaxaca-Blinder by means of nonparametric and parametric methods. [Muller \(2008\)](#) introduces a dynamic decomposition based on integral approximation, whilst [Bossert & Dutta \(2018\)](#) propose and characterize a class of measures of welfare change that are based on the generalized Gini

¹[Shorrocks \(1982\)](#) and [Lermand and Ytzhaki \(1985\)](#) are the first to tackle the factorial decomposition. According to the subgroups or population characteristics decomposition, baseline articles are those of [Theil \(1972\)](#), [Bourguignon \(1979\)](#), [Shorrocks \(1980; 1984\)](#). However, [Heshmati \(2004\)](#) and [Cowell and Fiorio \(2009\)](#) offer a very comprehensive review of the literature on inequality decomposition.

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social welfare functions. Building on a different approach, [Shorrocks \(2013\)](#) applies the Shapley decomposition method ([Sastre and Trannoy, 2002](#)) for the assessment of changes of inequality measures over time. In the context of poverty studies, [Datt and Ravallion \(1992\)](#) propose a methodology to decompose poverty changes into three components: a balanced growth component, a change in inequality component and a residual term. Similarly, [Alkire et al. \(2015\)](#) describe four types of poverty change rates: absolute rate of change, relative rate of change, annualized absolute rate of change and annualized relative rate of change. Differently from [Datt and Ravallion \(1992\)](#), [Alkire et al. \(2015\)](#) focus on changes in multidimensional poverty (see [Alkire and Foster, 2011](#)).

In this Chapter, we examine the same issue of variations, but we do so by highlighting the political economy nature of income inequality changes. Specifically, we propose a decomposition of changes in the level of income inequality, as measured by the Gini coefficient, which shows that the novel concept of *income composition inequality* discussed in Chapter 2, as measured by the *income-factor concentration index*, is one of the elements of such decomposition. Recall that a high level of income composition inequality mirrors a class-based society, whereas a low level of income composition inequality describes a society characterized by multiple sources of income.

From a technical perspective, we combine the Lerman-Yitzhaki (LY) decomposition of the Gini coefficient ([Lerman and Yitzhaki, 1985](#)) with a result from Chapter 2 to show that income inequality variations can be divided into three movements: movements in the *functional income distribution (FID)*, movements in the *income-factor concentration (IFC)* and movements in the *income-factor inequality (IFI)*. For each of the three movements to affect income inequality, a specific condition of transmission is derived. Al-

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though this is not a proper analytical decomposition, it is relevant for three main reasons. The first reason is that this decomposition underlines the central role that income composition inequality plays in the assessment of income inequality. The concept of income composition inequality emerges in a straightforward manner from the standard LY decomposition.

The second reason is that our approach extends the work by [Milanovic \(2017\)](#) who identifies the condition of transmission of changes in the capital share of income into inter-personal income inequality. Specifically, this Chapter detects two additional variables, together with their related conditions of transmission, which directly affect inter-personal income inequality. These two variables are income-factor concentration, as measured by the income-factor concentration index and income-factor inequality, as measured by the Gini of capital income.

The third reason is that this decomposition reveals a negative relationship between changes in income composition inequality and changes in income inequality. We argue that this negative relationship is likely due to the nature of redistribution policies, which mainly redistribute labor rather than capital income. The latter result underlines the contradictory nature of these policies, that on the one hand, reduce income inequality in the short run, and on the other hand, increase income inequality in the long run via the rise in income composition inequality in a context of rising capital income share.

The rest of the Chapter is structured as follows. Section [3.2](#) illustrates the method. Section [3.3](#) empirically tests the method by means of the EU-SILC data. Section [3.4](#) discusses the results of such decomposition. Section [3.5](#) concludes.

3.2 Methodology

Let us consider the following decomposition of the Gini coefficient proposed by [Lerman and Yitzhaki \(1985\)](#) for two income sources, notably capital (π) and labor (w):

$$\mathcal{G} = \pi \mathcal{R}_\pi \mathcal{G}_\pi + w \mathcal{R}_w \mathcal{G}_w, \quad (3.1)$$

where \mathcal{G} is the Gini coefficient for total income, \mathcal{G}_π is the Gini coefficient for capital, \mathcal{G}_w is the Gini coefficient for labor and, finally, \mathcal{R}_π and \mathcal{R}_w are the correlation ratios between the respective source and total income. These two correlation ratios can be considered as elasticities of personal income Gini to changes in the functional income distribution ([Milanovic, 2017](#)). The previous equation can be further rearranged so to obtain:

$$\mathcal{G} = w(\mathcal{R}_w \mathcal{G}_w - \mathcal{R}_\pi \mathcal{G}_\pi) + \mathcal{R}_\pi \mathcal{G}_\pi, \quad (3.2)$$

and by plugging in the following result from [Chapter 2](#):

$$2(\tilde{\mu}_\pi - \tilde{\mu}_w) = \mathcal{R}_w \mathcal{G}_w - \mathcal{R}_\pi \mathcal{G}_\pi. \quad (3.3)$$

where $\tilde{\mu}_\pi$ and $\tilde{\mu}_w$ are the areas of the concentration curves for capital and labor respectively, we get:

$$\mathcal{G} = 2w(\tilde{\mu}_\pi - \tilde{\mu}_w) + \mathcal{R}_\pi \mathcal{G}_\pi. \quad (3.4)$$

Let us now consider the income Gini coefficient as a function of time. As a consequence, all the elements of the decomposition are also functions of time, hence we can write equation [3.1](#) as:

$$\mathcal{G}(t) = \mathcal{G}(\pi(t), \mathcal{R}_\pi(t), \mathcal{G}_\pi(t), w(t), \mathcal{R}_w(t), \mathcal{G}_w(t)).$$

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If we now take the total derivative of $\mathcal{G}(t)$ with respect to time, from equation 3.4 we obtain:

$$\frac{\partial \mathcal{G}}{\partial t} = 2(\tilde{\mu}_\pi - \tilde{\mu}_w) \frac{\partial w}{\partial t} + 2w \frac{\partial(\tilde{\mu}_\pi - \tilde{\mu}_w)}{\partial t} + \mathcal{R}_\pi \frac{\partial \mathcal{G}_\pi}{\partial t} + \mathcal{G}_\pi \frac{\partial \mathcal{R}_\pi}{\partial t}. \quad (3.5)$$

Let us now assume as follows:

$$\frac{\partial \mathcal{R}_\pi}{\partial t} \approx -\epsilon \frac{\partial(\tilde{\mu}_\pi - \tilde{\mu}_w)}{\partial t}, \quad (3.6)$$

where ϵ is a coefficient. For the moment, we take the truthfulness of the previous relationship for granted. In the next Section, we provide empirical evidences in its support.

At this point of the analysis, we can observe that the term $(\tilde{\mu}_\pi - \tilde{\mu}_w)$ is one of the components of the numerator of the *income-factor concentration index*. As the term $(\tilde{\mu}_\pi - \tilde{\mu}_w)$ is the key driver of changes in income-factor concentration,² we can further rearrange equation 3.5 to get the following relationship:

$$\dot{\mathcal{G}} \approx 2\tilde{\mathcal{I}}_f(w) \times \dot{w} + (2w - \mathcal{G}_\pi \epsilon) \times \dot{\mathcal{I}}_f(w) + \mathcal{R}_\pi \times \dot{\mathcal{G}}_\pi, \quad (3.7)$$

where $\tilde{\mathcal{I}}_f(w) = \tilde{\mu}_\pi - \tilde{\mu}_w = \frac{\mathcal{I}_f(w)}{\mathcal{B}(w)\pi w}$ is the *non-normalized* income-factor concentration index and the dots indicate derivatives with respect to time. Note that, by construction, we can write $\mathcal{I}_f(w) = -\mathcal{I}_f(\pi)$ (and, therefore, $\dot{\mathcal{I}}_f(w) = -\dot{\mathcal{I}}_f(\pi)$), as shown in Chapter 2.

Let us now closely analyze equation 3.7. It states that changes in income inequality are driven primarily by the dynamics of three elements:

1. *functional income distribution (FID)*,
2. *income-factor concentration (IFC)*,

²See Section 3.3 for an empirical support of this statement.

3. *income-factor inequality (IFI)*.

However, the conditions of transmission of changes in the FID, IFC and IFI into inter-personal income inequality are different.

Changes in the functional income distribution (i.e., changes in the labor/capital share of income) affect income inequality if $\tilde{\mathcal{J}}_f \neq 0$, or equivalently if $\frac{\tilde{\mu}_w}{\tilde{\mu}_\pi} \neq 1$, which is in line with the result from Chapter 2. Therefore, when the sign of the income-factor concentration index $\mathcal{J}_f(w)$ is positive, then an increase in the labor share of income rises income inequality. This happens when the labor income distribution is worse than the capital income distribution (i.e., when $\tilde{\mu}_\pi > \tilde{\mu}_w$). However, instead of considering changes in the labor share of income, we can look at changes in the capital share of income, π . To this end, we should replace the term $\dot{\mathcal{J}}_f(w)$ by $\dot{\mathcal{J}}_f(\pi) = -\dot{\mathcal{J}}_f(w) = \tilde{\mu}_w - \tilde{\mu}_\pi$ in equation 3.7. We can further observe that the capital share of income π can also be written as $\pi = \frac{rK}{Y}$, where r is the rate of return on capital and K the capital stock. If we assume that r remains constant over time and denoting $\beta = \frac{K}{Y}$ as in Piketty (2014), then we can write:

$$\dot{\mathcal{G}} \approx \left(2\tilde{\mathcal{J}}_f(\pi)r\right) \times \dot{\beta} + (\mathcal{G}_\pi \epsilon - 2w) \times \dot{\mathcal{J}}_f(\pi) + \mathcal{R}_\pi \times \dot{\mathcal{G}}_\pi, \quad (3.8)$$

where $2\tilde{\mathcal{J}}_f r$ represents the impact that one unit increase in β has on overall income inequality.

Changes in the income-factor concentration index $\mathcal{J}_f(\pi)$, instead, have an impact on income inequality when $\mathcal{G}_\pi \epsilon - 2w \neq 0$. In particular, when $\mathcal{G}_\pi \epsilon - 2w > 0$, then an increase (or decrease) of the income-factor concentration index increases (or decreases) income inequality. On the other hands, when $\mathcal{G}_\pi \epsilon - 2w < 0$, than an increase (or decrease) of the income-factor concentration index decreases (or increases) income inequality. As the first

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condition of transmission represents the numerator of the income-factor concentration index \mathcal{I}_f , this second condition can also be interpreted as a function of another indicator: The elasticity of income inequality to changes in income composition inequality. However, in order for such variable to be a proper indicator, it needs to be correctly normalized. To this end, as this variable can take both positive and negative values, two 'upper' bounds are required. The upper bound for positive values (i.e., when $\mathcal{G}_\pi \epsilon > 2w$) coincides with the situation in which there is no labor income in the economy (i.e., $w = 0$) and the level of capital income inequality is maximized (i.e., $\mathcal{G}_\pi = 1$).³ It is straightforward to verify that, in such situation, the upper bound is equal to ϵ . On the contrary, the upper bound for negative values (i.e., when $\mathcal{G}_\pi \epsilon < 2w$) is equal to 2. The latter upper bound mirrors a situation in which the income of the economy is only composed by labor and hence the level of capital income inequality is zero. Formally, we can write the normalized elasticity, which we call \mathcal{E}_I , as follows:

$$\mathcal{E}_I = \begin{cases} \frac{\mathcal{G}_\pi \epsilon - 2w}{\epsilon} & \text{if } \mathcal{G}_\pi \epsilon > 2w \\ \frac{\mathcal{G}_\pi \epsilon - 2w}{2} & \text{if } \mathcal{G}_\pi \epsilon < 2w \end{cases}. \quad (3.9)$$

Finally, the third condition discloses that changes in the level of capital income inequality have an impact on income inequality which is proportional to the correlation ratio between capital and total income \mathcal{R}_π .

³We thus assume that the elasticity ϵ is given.

3.3 Empirical Application

In the present Section, the method is tested via an empirical application to the EU-SILC survey data. Recall from Chapter 2 that the EU-SILC statistics provide harmonized data at the European level on households' income and living conditions. We here analyze 30 European countries between 2007 and 2016.⁴ We adopt the same definitions of gross capital and labor that we use in Chapter 2. Specifically, we define capital income as the sum of household income from rental of a property or land, interests, dividends, capital from capital investments in unincorporated business, the capital component of gross cash benefits or losses from self-employment (including royalties) and pensions from individual private plans. The capital component of self-employment income, which is not directly furnished by EU-SILC, is imputed by means of the procedure proposed by Glyn (2011) and formalized in Chapter 2. Labor income is defined as the difference between total household gross income minus capital income.⁵

In this Section we will hence calculate, for each country and in every year, both the variations of the three main variables of the decomposition (i.e., the capital share of income, the income-factor concentration index and the Gini coefficient of capital income) and the levels of their related conditions of transmission. This will allow us to identify (i) which

⁴Austria (AT), Belgium (BE), Bulgaria (BG), Switzerland (CH), Cyprus (CY), Czech republic, (CZ), Germany (DE), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Croatia (HR), Hungary (HU), Ireland (IE), Island (IS), Italy (IT), Lithuania (LT), Luxembourg (LU), Latvia (LV), Malta (MT), Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Sweden (SE), Slovenia (SI), Slovak republic (SK), United Kingdom (UK).

⁵The sources of labor income that we consider are: gross employee cash or near cash income, gross non-cash employee income, employers' social insurance contributions, value of goods produced for own consumption, unemployment benefits, old-age benefits, survivor' benefits, sickness benefits, disability benefits, education-related allowances, family/children related allowances, social exclusion not elsewhere classified, housing allowances, regular inter-household cash transfers received and income received by people aged under 16.

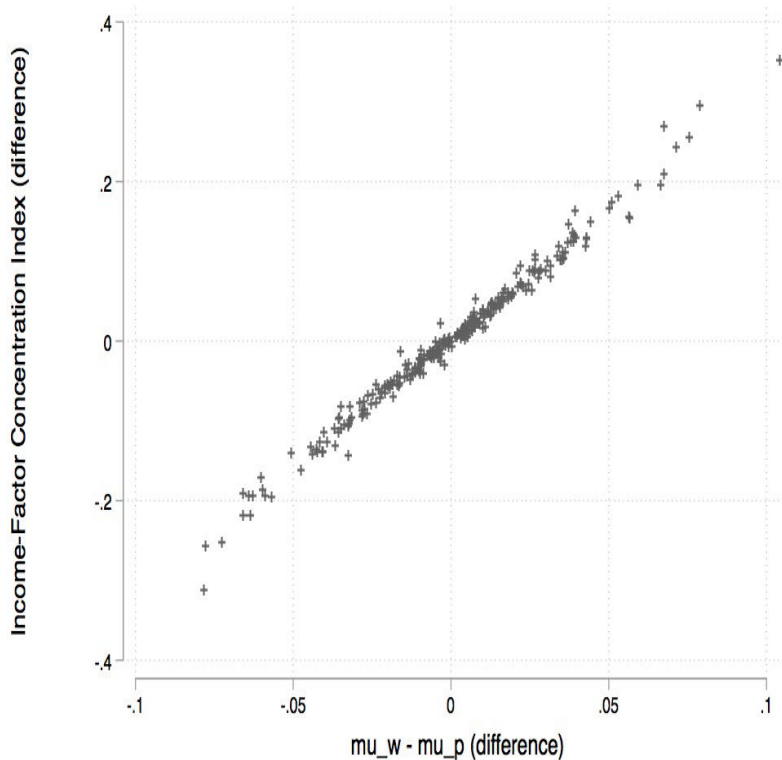


Figure 3.1: The scatter plot of the income-factor concentration index $\mathcal{I}_f(\pi)$ and the difference between the areas of the concentration curves for labor and capital $\tilde{\mu}_w - \tilde{\mu}_\pi$. **Source:** Author's calculations on basis of EU-SILC.

one of the three main variables of the decomposition fluctuates the most and (ii) what is the sign and the level of their conditions of transmission. We recall that if the sign of a given condition of transmission is positive, then an increase in the variable related to this condition determines an increase in the overall level of inter-personal income inequality. To begin with, Figure 3.1 plots absolute variations of the income-factor concentration index against absolute variations of the term $(\tilde{\mu}_\pi - \tilde{\mu}_w)$. Their correlation is extremely high, meaning that the term $(\tilde{\mu}_\pi - \tilde{\mu}_w)$ is the major driver of the IFC index. Figure 3.2 plots the IFC index against the correlation coefficient between capital and total income \mathcal{R}_π .

Not surprisingly, their correlation coefficient is particularly high (**0.91**). Furthermore, once we plot changes over time of IFC index against changes over time of the correlation

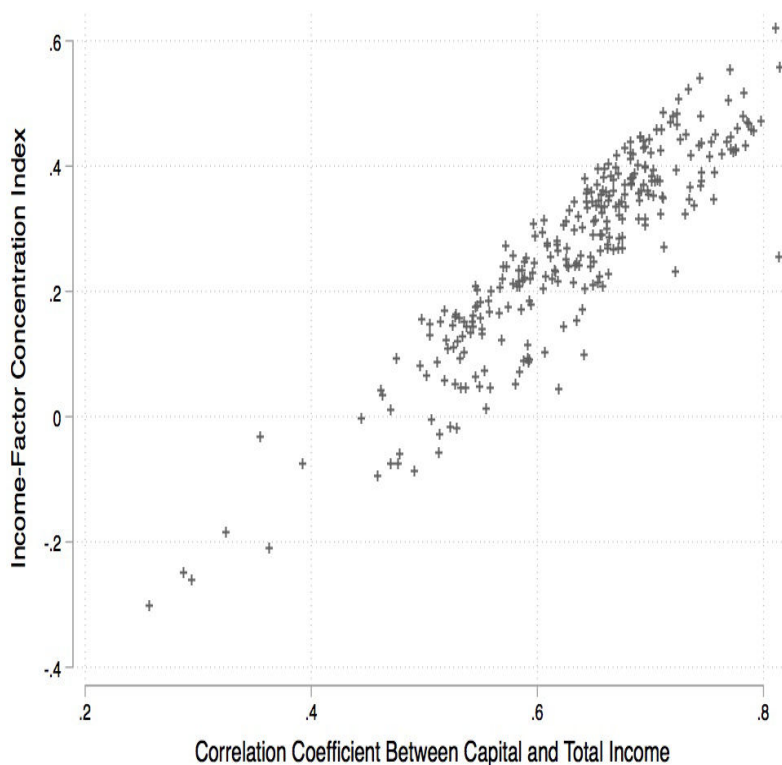


Figure 3.2: The scatter plot of the income-factor concentration index $\mathcal{I}_f(\pi)$ and the correlation ratio \mathcal{R}_π . The correlation coefficient is **0.88**. **Source:** Author's calculations on basis of EU-SILC.

coefficient \mathcal{R}_π , operationalized by absolute differences (i.e., $\Delta\mathcal{I}_f(\pi) = \mathcal{I}_{f,t}(\pi) - \mathcal{I}_{f,t-1}(\pi)$ and $\Delta\mathcal{R}_\pi = \mathcal{R}_{\pi,t} - \mathcal{R}_{\pi,t-1}$), their correlation remains almost the same (**0.88**) (see Figure 3.3). This simple exercise already provides ample support to assumption 3.6.

Let us now denote by \mathcal{C}_1 , \mathcal{C}_2 and \mathcal{C}_3 the three conditions of transmission (or transmission factors) previously discussed. Formally, $\mathcal{C}_1 = 2\tilde{\mathcal{I}}_f(w)$, $\mathcal{C}_2 = (2w - \mathcal{G}_\pi\epsilon)$ and $\mathcal{C}_3 = \mathcal{R}_\pi$. Once again, these three conditions link changes in the three main variables of the decomposition, namely the capital share of income, income composition inequality and capital income inequality, with changes in income inequality.

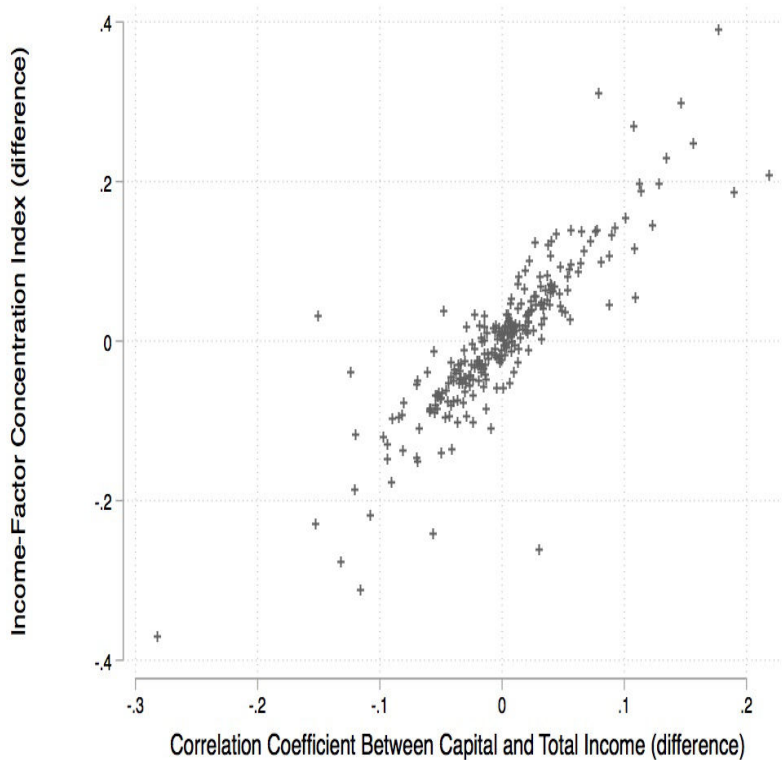


Figure 3.3: The scatter plot of changes in income-factor concentration index $\Delta \mathcal{I}_f(\pi)$ and changes in the correlation coefficient $\Delta \mathcal{R}_\pi$. The correlation coefficient is **0.86**. **Source:** Author's calculations on basis of EU-SILC.

To estimate the elasticity ϵ , we run a linear regression between $\Delta \mathcal{R}_\pi$ and $\Delta \mathcal{I}_f(\pi)$:⁶

$$\Delta \mathcal{R}_\pi = \epsilon \times \Delta \mathcal{I}_f(\pi) + \eta,$$

where η is the error term. We find that $\epsilon = \mathbf{0.55} \approx \frac{1}{2}$ and that the R-squared of the regression is **0.78**. The latter result suggests that a unit increase in income composition inequality is associated with a half unit increase in the correlation coefficient between capital and total income. By doing that, we are able to estimate the three conditions of transmission for each country in every year. Table 3.1 presents summary statistics of the

⁶We are not interested in detecting any form of causality between the two variables, but only the slope of the regression line.

3.3. Empirical Application

these conditions for all countries in all years. We do also attribute a second value to ϵ , notably $\epsilon = 1$.

Table 3.1

Variable	Obs	Mean	Std. Dev.	Min	Max
\mathcal{C}_1	293	.157	.154	-1.022	.377
$\mathcal{C}_{2, \epsilon=0.55}$	293	-1.270	.086	-1.421	-1.001
$\mathcal{C}_{2, \epsilon=1}$	293	-.876	.080	-1.006	-.620
\mathcal{C}_3	293	.630	.094	.257	.814

The three conditions display similar standard deviations, but different means. Specifically, conditions \mathcal{C}_1 and \mathcal{C}_3 have a positive mean, whilst condition \mathcal{C}_2 has a negative mean, for both levels of ϵ . This suggests that an increase in the capital share of income π , or in the capital income inequality \mathcal{G}_π , *positively* affect income inequality, whilst an increase in income composition inequality *negatively* affects income inequality. A plausible explanation for the positive signs of \mathcal{C}_1 and \mathcal{C}_3 is that the distribution of capital income is worst than the distribution of labor income. With respect to the negative sign of \mathcal{C}_2 , we can argue that common redistribution policies mainly transfer labor income from the top to the bottom of the income ladder. In such way, the overall level of income inequality immediately reduces, whilst income composition inequality increases, as the concentrations of the capital income at the top and of the labor income at the bottom rise.

Table 3.2 reports instead summary statistics concerning overall absolute fluctuations in the three main variables π , $\mathcal{I}_f(\pi)$ and \mathcal{G}_π .

Table 3.2

3.3. Empirical Application

Variable	Obs	Mean	Std. Dev.	Min	Max
$\Delta\pi$	262	.000	.025	-.136	.104
$\Delta\mathcal{I}_f(\pi)$	259	.001	.093	-.409	.313
$\Delta\mathcal{G}_\pi$	262	-.000	.020	-.126	.112

Income composition inequality fluctuates more on average than both the capital share of income and the capital income Gini coefficient. This result can be simply explained by the fact that fluctuations in income composition inequality are driven by changes in both the capital and the labor distribution.

3.3.1 Testing Dependency Between the Motions

As anticipated in the introduction, the decomposition we propose is not an analytical one. Recall that this is due to assumption 3.6, which states that variations in the correlation coefficient between capital and total income \mathcal{R}_π and variations in the term $\tilde{\mu}_\pi - \tilde{\mu}_w$ are linearly correlated. In this Section, we therefore discuss the issue of dependency between the three main variables of the decomposition. Indeed, the three motions are likely to influence each other, as the concepts they describe are strongly interrelated.

To this end, we firstly compute the correlation matrix of the main variables. Then, we run a regression between changes in income inequality and changes in the three motions and we check for multicollinearity between the three regressors through the variance inflation factor (**vif**) test.

Let us begin by computing the correlation matrix of the absolute variations of the three variables. The results are reported below.

Table 3.3

3.3. Empirical Application

	$\Delta\pi$	$\Delta\mathcal{I}_f(\pi)$	$\Delta\mathcal{G}_\pi$
$\Delta\pi$	1		
$\Delta\mathcal{I}_f(\pi)$.32	1	
$\Delta\mathcal{G}_\pi$	-.61	.10	1

Absolute variations in the capital share of income are negatively correlated with absolute variations in the Gini coefficient of capital income, while the other two correlations are relatively weak. This first test already underlines that the three variables of the decomposition are dependent from each other, which is unsurprising given the way they are mathematically constructed. The question at stake is whether such dependence may bias our interpretation of the overall decomposition. Therefore, we firstly run a regression between changes in the Gini coefficient of income and changes in the three movements, and later we test whether there is multicollinearity between the regressors. The first regression can hence be formally written as follows:

$$\Delta\mathcal{G} = \alpha + \beta_1 \times \Delta\pi + \beta_2 \times \Delta\mathcal{I}_f(\pi) + \beta_3 \times \Delta\mathcal{G}_\pi + \eta \quad (3.10)$$

where η is the error term. The results of the regression are shown in Table 3.4. All variables are statistically significant and the R-squared of the regression is **0.30** (and the adjusted **0.29**). Note that, although the magnitude of the coefficients may differ from the condition of transmission that we have previously calculated, their signs coincide.

Table 3.4

3.3. Empirical Application

(1)	
$\Delta \mathcal{G}$	
$\Delta \pi$	0.694*** (10.31)
$\Delta \mathcal{J}_f(\pi)$	-0.092*** (-6.32)
$\Delta \mathcal{G}_\pi$	0.504*** (6.31)
const	0.000 (0.79)

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of the regression remain the same if we introduce all the interaction terms. At this point of the analysis, to check for multicollinearity between the regressors, we compute the **vif** of each regressor. As a rule of thumb, when the vif is lower than 10 for all the regressors, than the assumption of multicollinearity falls. As it is shown in Table 3.5, this exercise rejects the hypothesis of multicollinearity between the regressors, as the **vif** is on average lower than 2.

Table 3.5

3.4. Transmission Factors: An Interpretation

Variable	VIF	1/VIF
$\Delta\pi$	2.14	.46
$\Delta\mathcal{S}_f(\pi)$	1.94	.51
$\Delta\mathcal{G}_\pi$	1.35	.74
Mean VIF	1.81	

3.4 Transmission Factors: An Interpretation

The three transmission factors previously discussed provide the links between the FID, IFC and IFI movements and income inequality variation. Both the levels and the signs of these transmission factors are therefore useful to understand the nature and possible causes of changes in income inequality. For instance, a positive and high level of \mathcal{C}_1 , which links the capital share of income (π) with income inequality (\mathcal{G}), implies that a rise in π increases \mathcal{G} of a considerable amount.

In this Section, we jointly study these factors for a group of European economies. We limit our analysis to the study of the first two conditions, namely those relating the functional income distribution (FID) and income composition inequality (IFC) to income inequality, respectively. The third condition, IFI, which relates income-factor inequality to income inequality, does not convey a clear political economy message, as do the FID and IFC conditions. For this latter reason, we put it aside from our analysis.

By contrast, variation in the functional income distribution (FID) can be determined by several factors, with a strong political economy nature. [Stockhammer \(2013\)](#) identifies five determinants of functional income distribution for advanced economies, namely *tech-*

3.4. Transmission Factors: An Interpretation

*nical change, globalization, financialisation,*⁷ *welfare state retrenchment and the bargaining power of labour and bargaining power and market power of firms.* Similarly, [Dünhaupt \(2013\)](#) considers *neo-liberalism and financialization, skilled-biased technological change, globalization, labour market and product market policies and sectoral composition and privatization* as the major determinants of changes in the functional income distribution. Furthermore, changes in the power relations between different social actors are also relevant in this respect ([Sotckhammer et al., 2018](#)), as they may lead to an unstable political environment (see also [Kalecki, 1943](#)). Variations in income composition inequality, as already stated in the introduction, may reflect changes in the type of capitalism towards which a country is moving.

Figure 3.4 plots condition \mathcal{C}_1 against condition \mathcal{C}_2 for all European countries and for each year (from 2007 to 2016). Note that \mathcal{C}_1 takes almost entirely positive values, whilst \mathcal{C}_2 takes solely negative values. Therefore, an increase in the capital share of income and/or a fall in income composition inequality can increase income inequality in European economies nowadays.

Let us now focus on a restrained group of rich economies, namely Finland (FI), France (FR), Germany (DE), Greece (EL), Ireland (IE), Italy (IT), The Netherlands (NL), Norway (NO), Portugal (PT), Spain (ES) and the UK. To be able to compare these countries in the \mathcal{C}_1 - \mathcal{C}_2 graph, we calculate the average values of \mathcal{C}_1 and \mathcal{C}_2 between 2007 and 2016 for each of them. The results are shown in Figure 3.5.

The countries in Figure 3.5 can be split into three major groups. The first group, com-

⁷In a recent article, [Stockhammer et al. \(2018\)](#) detect four channels through which financialisation can affect the wage share: *enhanced exit options of firm, rising price mark-ups due to financial overhead costs for businesses, increased competition on capital markets and shareholder value orientation and the role of household debt in increasing workers' financial vulnerability and undermining their class consciousness.*

3.4. Transmission Factors: An Interpretation

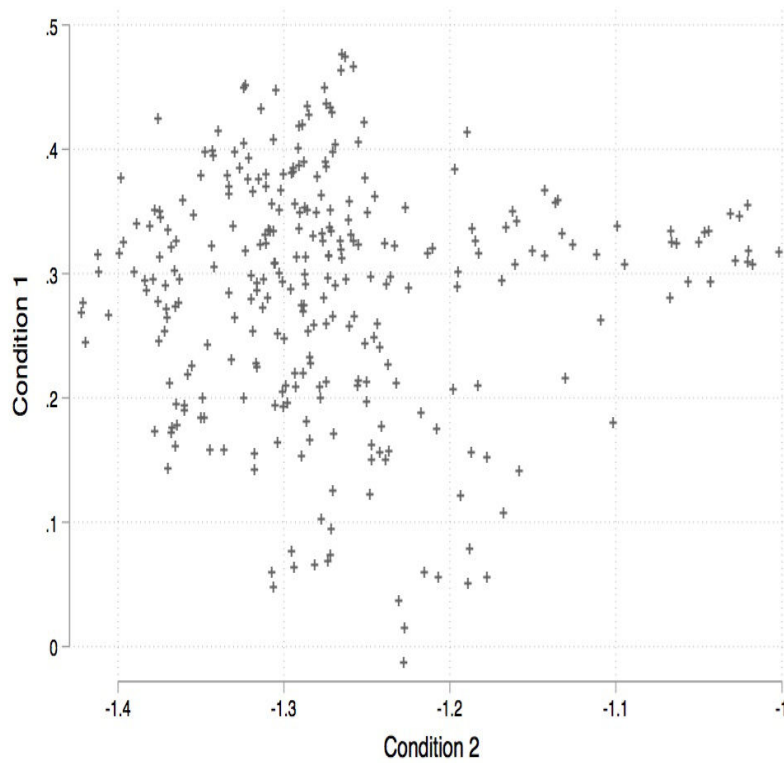


Figure 3.4: The scatter plot of \mathcal{C}_1 and \mathcal{C}_2 for twelve European countries for all years. **Source:** Author's calculations on basis of EU-SILC.

posed by Germany, Norway and The Netherlands, is characterized by high absolute levels of both \mathcal{C}_1 and \mathcal{C}_2 . By contrast, the second group, which includes Finland, France, Greece and Italy is characterized by low absolute levels of \mathcal{C}_2 and high levels of \mathcal{C}_1 . Finally, the third group is characterized by high absolute levels of \mathcal{C}_2 and low levels of \mathcal{C}_1 . The countries belonging to this latter group are, instead, Ireland, Portugal, Spain, Sweden and the UK. All these results are summarized in Table 3.6 below.

Table 3.6:

3.4. Transmission Factors: An Interpretation

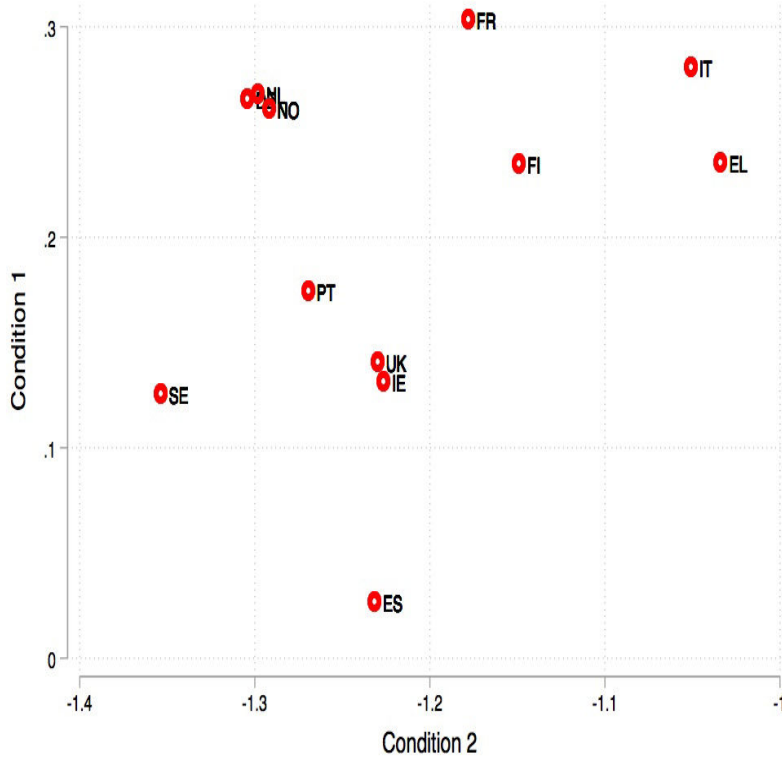


Figure 3.5: The scatter plot of the average value of \mathcal{C}_1 between 2007 and 2016 and the average value of \mathcal{C}_2 between 2007 and 2016 for twelve European countries. **Source:** Author's calculations on basis of EU-SILC.

	<i>Low</i> $ \mathcal{C}_1 $	<i>High</i> $ \mathcal{C}_1 $
<i>Low</i> $ \mathcal{C}_2 $		EL, FI, FR, IT
<i>High</i> $ \mathcal{C}_2 $	ES, IE, PT, SE, UK	DE, NL, NO

The link between the functional and personal distribution of income, as measured by condition \mathcal{C}_1 , is weak for the third group of countries and strong for the first two groups. In other words, an increase in the capital income share would jeopardize the fairness of income between individuals relatively more in groups one and two than in group three. On the other side, the link between income composition inequality and income inequality is weak for the second and strong for the first and the third groups. This means that a fall in

3.5. Conclusion

income composition inequality would positively affect income inequality more in groups one and three than in group two.

The following example highlights the relevance of these transmission factors in explaining different potential trends in income inequality across countries. In this respect, consider the following example. Assume the signs of \mathcal{C}_1 and \mathcal{C}_2 remained the same over the second half of the XXth century for all countries considered, as well as their relative positions in the \mathcal{C}_1 - \mathcal{C}_2 graph. As the capital income share has been rising over the last decades in almost all developed economies (Piketty, 2014) and assuming that income composition inequality has fallen over the same period,⁸ we can conclude that the well documented rise in income inequality over the same period can be partially explained by the combination of these two factors. Moreover, the presence of country-specific patterns can be an insightful indication pointing out the role that institutional features play in determining income inequality dynamics.

3.5 Conclusion

This Chapter proposed a novel way of decomposing income inequality changes. This decomposition allows for the novel concept of *income composition inequality*, developed in Chapter 2, to emerge as one of the determinants of income inequality variation.

This result sheds new light on the political economy nature of income inequality variation. Indeed, a high level of a country's income composition inequality mirrors a class-based society, whereas a low level depicts a society characterized by multiple sources of income.

⁸This is a plausible assumption given that we are moving towards becoming a multiple sources of income society (Atkinson, 2009 and Atkinson and Lakner, 2017). This assumption finds also further support in the Chapter 4, co-written with Roberto Iacono, which discusses the *fall* in income composition inequality in Italy between 1989 and 2016.

3.5. Conclusion

From a technical viewpoint, this decomposition hinges on the Lerman-Yitzhaki decomposition of the Gini coefficient (Lerman, Yitzhaki, 1985). Specifically, we combine the Lerman-Yitzhaki decomposition with a result from Chapter 2 to show that income inequality variations can be divided into three movements: movements in the (i) *functional income distribution*, movements in the (ii) *income-factor concentration* and movements in the (iii) *income-factor inequality*.

We show that, within the European context in the period between 2007 and 2016, the dynamics of functional income distribution and of income-factor inequality positively correlate with income inequality variation, whilst the dynamics of income-factor concentration negatively correlates with income inequality variation.

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Chapter 4

Sources of Inequality in Italy

Abstract: In this Chapter we study the evolution of income composition in terms of capital and labor income in Italy, between 1989 and 2016. To this end, we rely on the novel concept of *income composition inequality*. The higher the overall degree of income composition inequality is, the stronger the link between the functional and personal distribution of income. We show that the strength of this link decreased steadily in Italy over the period considered. This result is robust to the use of different definitions of capital and labor and different estimation techniques of the degree of income composition inequality. The implications of this result are twofold. First, fluctuations in the total factor shares of income are having an increasingly weaker impact on income inequality in Italy. Second, Italy is moving towards becoming a multiple sources of income society. Finally, we conceptualize a simple rule of thumb for policy makers seeking to reduce income inequality in the long run: This rule relates fluctuations in the total factor shares and the level of income composition inequality to the specific income source to be redistributed.

“In my view, Economics has become too splintered into sub-disciplines [...]. There is a great need, particularly at this juncture, to unify the different branches of Economics. The link between macro and micro is essential, and Economics has suffered from allowing these to go their separate ways. Empirically, the national accounts need to be brought closer to micro-data on households. Theoretically, the aggregate analysis of distribution needs to look at both profits and the wages of heterogeneous workers. Growth theory, Macroeconomics, and Labour Economics are all part of the mix.”

A.B. Atkinson, (2009).

4.1 Introduction

To motivate our study, let us introduce some stylized facts. Table 4.1 below shows the distribution of individuals' total disposable income in Italy, for the years 1989 and 2016 (data source: Bank of Italy). Four different income groups are considered, namely the poorest 50%, the middle 40%, and the richest 10%, which is further divided into the bottom part of the decile (90-95%) and the upper part (95-100%).

Table 4.1 shows that income inequality has slightly increased in Italy between 1989 and 2016, since the Gini coefficient has jumped from 0.47 to 0.54 over the period considered. Specifically, the bottom 50% of the income distribution has seen its share of total income falling by 6 percentage points, from 17% to 11%. On the contrary, the middle class (50-90%) and the top 10% have registered an increase in their shares by 3 and 2 percentage points, respectively.

Table 4.1: Total income shares, by income group

Income group	1989	2016
0-50%	17%	11%
50-90%	51%	54%
90-95%	11%	12%
95-100%	20%	21%
<i>Gini</i>	0.47	0.54

Let us now focus on Table 4.2. It shows the distribution of capital income across the *total* income ranking. We here consider capital income as the sum of property income and of the capital component of self-employment income. Table 4.2 should be read as follows: in 1989 the bottom 90% in terms of total income earned the 46% of capital income in the economy. The richest 10% of the distribution earned instead 51% of capital income in the same year.

By comparing 1989 with 2016, Table 4.2 shows that capital income has shifted from the top to the bottom of the income distribution. In 2016, the capital income accruing to the bottom 90% increased by 13 percentage points, dropping by the same amount for the richest 10%. Overall, the capital share of income increased by 7 percentage points.

Table 4.2: Capital income shares, by income group

Income group	1989	2016
0-50%	14%	22%
50-90%	32%	37%
90-95%	14%	10%
95-100%	37%	28%
<i>Capital Share</i>	36%	43%

Finally, let us look at Table 4.3 showing the distribution of labor income along the income

4.1. Introduction

rank. The bottom 50% went from earning 18% of labor income share in 1989 to a miser 3% in 2016, whilst the richest 50% increased its fraction of labor income from 80% to 95% over the period considered.

In other words, we observe for labor income the opposite pattern with respect to capital income: a significant fraction of the labor income share went from the bottom 50% to the top 50% of the income distribution, comparing 1989 with 2016. Overall, the labour share of income has lost 7 percentage points to the capital share.

Table 4.3: Labor income shares, by income group

Income group	1989	2016
0-50%	18%	3%
50-90%	62%	66%
90-95%	8%	13%
95-100%	10%	16%
<i>Labor Share</i>	64%	57%

These clear-cut descriptive statistics convey one take-home message about the Italian economy: a structural change in the *composition* of individuals' income has taken place over the last three decades. Those at the top of the income distribution have seen their share of capital income decreasing and, at the same time, their share of labor income increasing. In 2016, the top 10% of the income distribution owns less than half of the share of capital income (38%), as opposed to 1989 (when they owned 51%). The contrary dynamics has taken place at the bottom of the distribution.

In light of the stylized evidence of Tables 4.1-4.2-4.3, several fundamental questions arise: How can we measure the dynamics of income composition in Italy? While the Gini coefficient is a tool capable of synthesizing the overall dynamics of income inequality in a

population, is there a tool to jointly analyze the dynamics of income composition? What can we learn from such investigation? And which policy recommendation can we formulate accordingly? This Chapter attempts to provide an answer to all these questions.

To this end, we adopt the methodology developed in Chapter 2 to study the evolution of *income composition inequality* in Italy between 1989 and 2016. As proposed in Chapter 2, income composition inequality can be measured through the *Income-Factor Concentration* (IFC, hereafter) index. Whenever two income sources are *concentrated* correspondingly in the hands of the top (e.g., capital income) and the bottom (e.g., labor income) of the income distribution, then the IFC index signals a high degree of income composition inequality. By contrast, the IFC index signals a low degree of income composition inequality whenever the two income sources are equally shared across the population, given the overall levels of income inequality and factor shares.

A high degree of income composition inequality entails a strong link between the functional and personal distribution of income. The underlying intuition is explained as follows: when the rich own all the capital income in the economy, an increase in the capital income share will boost the income of the rich, by therefore boosting income inequality in the population. The contrary situation of a weak link between the functional and personal distribution of income holds true under a low degree of income composition inequality. In the latter case, a change in the factor shares of income will not significantly influence the level of inequality in the population.

By applying this method to the case of Italy we show that income composition inequality, and therefore the link between the functional and personal distribution of income, decreased steadily between 1989 and 2016. This result, which is robust to different defi-

nitions of capital and labor and different estimation techniques of the IFC index, has two major implications. The first implication is that fluctuations in the total factor shares of income are having an increasingly weaker impact on income inequality in Italy. In other words, the fraction of the variance of the Gini coefficient explained by the change in factor shares has been decreasing. The second implication is that Italy has moved in the last decades from a *class-based* society in which class and ownership of factor income coincide (workers owning labor income and capital-owners receiving capital income), to a *multiple sources of income* society in which class and ownership of factor income no longer overlap. Furthermore, we show that Italy has become more of a home-owning and self-employment society, but not a society where income from dividends, interest and rent has become less associated with high income level overall. Our analysis also reveals that the values taken by the IFC index move from positive to negative throughout the period considered. Hence, while in 1989 an increase in the capital share would have increased the level of income inequality, today the same increase would reduce income inequality in the society.

In parallel to the empirical findings, this Chapter conceptualizes a simple rule of thumb for policy makers seeking to effectively reduce income inequality in the long run. The intuition here is that the the degree of income composition inequality (measured by the IFC index) becomes a key variable for the design of effective redistribution policies. Specifically, the rule of thumb relates the fluctuations in total factor shares and the level of income composition inequality to the specific income source to be redistributed. In other words, we claim that when the policy maker's expectation regarding the sign of the variation in factor share z coincides with her expectation regarding the sign of income com-

position inequality, it is preferable to redistribute source z to reduce inequality in the long run.

This Chapter is structured as follows. Section 4.2 introduces the related literature. Section 4.3 presents the data we adopt. Section 4.4 introduces some descriptive statistics, whilst Section 4.5 shows the main results. Section 4.6 traces the policy implications of our study. Section 4.7 concludes.

4.2 Background and related literature

In recent years, and with increased impetus following the pioneering works of [Piketty \(2014\)](#) and [Piketty and Zucman \(2014\)](#), the dynamics of factor income shares are again the subject of economists' attention given their potential effects on the level of personal income inequality ([Atkinson, 2009](#); [Glyn, 2011](#)) and thereby on macroeconomic variables. As [Atkinson \(2009\)](#) puts it: one of the three reasons to study factor shares is "to make a link between incomes at the macroeconomic level (national accounts) and incomes at the level of the household" ([Atkinson, 2009](#); page 5). This statement by Atkinson is in line with the rationale behind the current work, that aims at building a bridge between Italian individual-level data on labor and capital income on the one hand, and the aggregate factor shares of income in Italy over the last decades on the other hand.

There is not yet an established consensus in the literature on the shape of the relationship between (changes in) the share of factor incomes and (the effect on) income inequality at the aggregate level. Recent empirical work by [Bengtsson and Waldenstrom \(2018\)](#) seeks to shed light on this relationship for 21 economies and going as back as the 1930s. [Bengtsson and Waldenstrom \(2018\)](#) argue that the link between factor shares and inequality does

not need to be constant over time and across countries. Indeed, they claim that this link can be "contingent on the production technology, the structure of personal incomes or the institutional context, all of which may—and do indeed—change over time" (Bengtsson and Waldenstrom, 2018; page 713). All in all, Bengtsson and Waldenstrom (2018) find evidence of a strong and positive link between factor shares and inequality, although the magnitude of the result varies from country to country. In light of the result in Bengtsson and Waldenstrom (2018) of a non constant relationship hinging on institutional factors, our aim is to analyze the underlying dynamics between factor shares and inequality zooming on the case of Italy. In our view, focusing on a specific country allows us to analyze the dynamics of this relationship at a higher level of accuracy.

On a theoretical level, Milanovic (2017) identifies the two necessary analytical conditions for the "pass-through" or transmission of a change in factor income shares to the aggregate level of inequality. More specifically, these conditions (for the example of capital income) are (i) a high level of concentration of capital income and (ii) a high and positive association between owners of capital income and overall top income earners. If both conditions apply, then a rise in capital income as documented in Piketty (2014) leads to a greater level of personal income inequality. The case in which top income earners own capital income and labor income is owned at the bottom of the distribution, is labeled by Milanovic (2017) as "classical capitalism". Further, Milanovic (2017) suggests that in order to reduce the overall level of income inequality, one has to deal with diversification of the ownership of capital income, hence breaking down on the first condition mentioned above. The resulting ideal-typical social system for which ownership of a specific factor income no longer coincides with class, is labeled by Milanovic (2017) as "new capital-

ism". On these lines, the current Chapter intends to pin down which ideal-typical social system is the Italian economy resembling, by analyzing the dynamics of income composition inequality from 1989 to 2016. Further, the adoption of the methodology presented in Chapter 2 allows us to reduce from two to one the necessary conditions for a pass-through from factor shares to income inequality. Specifically, the sign of the IFC index will determine the consequence for personal income inequality of a change in factor shares. Last but not least, our work relates to [Milanovic \(2017\)](#)'s policy proposal of reducing the concentration of the factor income whose share is increasing, by proposing a rule-of-thumb which identifies the specific income source to be redistributed in order to reduce overall income inequality.

In a related work on labour shares and income inequality in Italy over the long run, [Gabbuti \(2018\)](#) provides novel estimates and confirms that the relationship between trends in functional and personal income distribution varies over time, adding that "the Italian case reveals that factor shares offer great, complementary insights in the historical analysis of inequality, reflecting fundamental changes in the economy and society" ([Gabbuti, 2018](#); page 2). To complement the historical analysis by [Gabbuti \(2018\)](#), this Chapter focuses more specifically on the last three decades of the relationship between factor shares and income inequality, aiming at showing why a thorough analysis of the dynamics of income composition inequality delivers lessons and stylized facts that aggregate estimates of income inequality fail to provide.

A recent work by [Barbieri and Bloise \(2018\)](#) focuses on the EU-SILC waves of 2007 and 2014 to disentangle the extent to which the financial crisis has influenced personal income inequality via its impact on the different sources of income. Their analysis focuses on

eight European countries. To this end, they follow the approach developed by [Shorrocks \(1982\)](#) in decomposing the one-half the squared coefficient of variation (HSCV, their measure of income inequality) as to evaluate the contribution to personal inequality of each factor component. First, they conclude that inequality in labor income has increased dramatically, contributing only partially to the overall increase in personal income inequality. On the other hand, they show that higher income inequality has been caused by the increased capital share in several European countries, due to its high concentration at the top of the income distribution.

4.3 Data

At this point of the analysis, we introduce the data employed and the definitions of capital and labor that we adopt. To compute the IFC index, we use the Survey of Household Income and Wealth (*SHIW*) provided by the Bank of Italy.¹ The survey covers 8274 households composed of 25150 individuals and 13864 income-earners, distributed over approximately 300 Italian municipalities. This survey has been carried out since the 1960s, although information concerning returns on financial assets has only been available since 1989 (see Brandolini et al., 2018, for further information). Therefore, our analysis ranges from 1989 to 2016. The surveys are available every two years, with a two-year gap between 1995 and 1998.

The type of income provided by the Bank of Italy is net disposable income, which includes four different sources: (i) payroll income, (ii) pensions and transfers, (iii) net self-employment income and (iv) property income. All of these sources can be further

¹The SHIW has been the main source of information on incomes at both the household and individual levels in recent decades.

Concentration Curves - Italy 1989

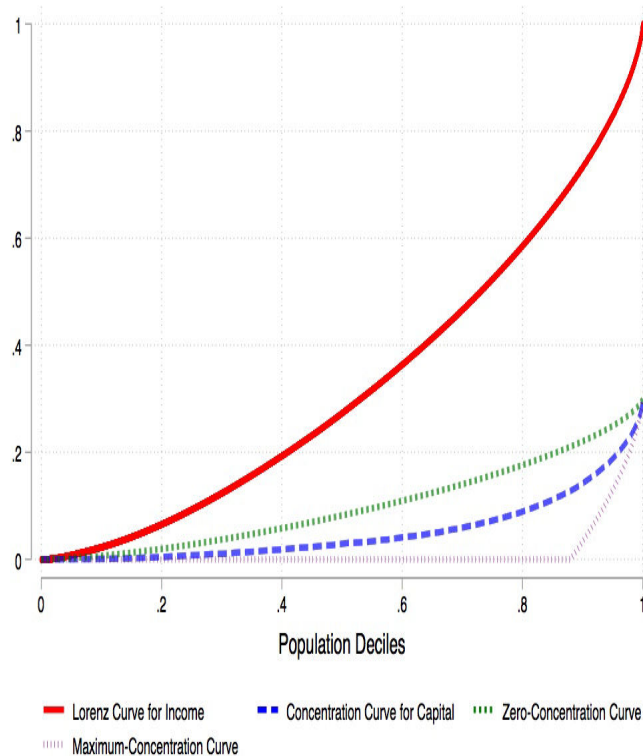


Figure 4.1: The concentration curve for capital (blue line), the zero-concentration curve (green line), the Lorenz curve for income (red line) and the maximum-concentration curve (purple line) for Italy in 1989 are presented using data from the 1989 *Survey on Household Income and Wealth* (SHIW) carried out by the Bank of Italy. Capital income is defined as the sum of property income and the capital component of net-self employment income. Labor income is instead defined as the sum of payroll income, pensions, net transfers and the labor component of mixed income. Both the capital and labor components of self-employment income are imputed following [Glyn \(2011\)](#).

decomposed.² In what follows, we adopt a single definition of capital and labor income, whereas in the appendix we will run the same analysis under different definitions of the two sources, although this will not affect the main results of this Chapter.

Capital income is defined as the sum of property income (Y_{pr}) and the capital component

²Payroll income is composed of net wages and salaries and fringe benefits, while pensions and net transfers comprise pensions, arrears, financial assistance scholarships, alimony payments and gifts. Net-self employed income is computed as the sum of self-employment income and entrepreneurial income, while property income is the sum of income from real-estate and financial assets. Income from real estate includes actual rents and imputed rents, while income from financial assets includes interest on deposits, interest on government securities and income from other sources.

of net self-employment income (Y_{st}). Formally:

$$\Pi = Y_{pr} + Y_{st}.$$

Regarding labor income, the main definition we adopt includes payroll income (Y_{pa}) and the labor component of self-employment income (Y_{sw}). Formally, we can write:

$$W = Y_{pa} + Y_{sw}.$$

As the Bank of Italy does not furnish the capital and labor components of net self-employment income, we impute them. To this end, we adopt the imputation strategy proposed by [Glyn \(2011\)](#), which attributes the average payroll income \bar{Y}_{pa} of the entire sample (in every year) to represent the maximum value that the labor income component can take. If individual i 's net self-employment income is less than \bar{Y}_{pa} (i.e., $Y_s < \bar{Y}_{pa}$), then this quantity is accounted as her labor component of net self-employment income. On the contrary, if i 's net self-employment income is greater than \bar{Y}_{pa} , then we regard the amount $Y_{st} - \bar{Y}_{pa}$ as her capital component of net self-employment income. It is important to notice that such assumption may present some issues. Indeed, by considering the economy average labor income as a threshold to determine the capital and labor components of self-employment income, we risk to underestimate the capital component for those sectors in which the sectorial average payroll income is lower than the economy average payroll income, and viceversa. The common example is that of the agricultural sector, in which the average labor income is lower than the society's average labor income. Another aspect to consider as regards this decomposition is that it is usually used

4.4. Descriptive Statistics

to decompose macroeconomic, instead of microeconomic variables. Having said that, we believe this technique to be more sophisticated than that which attributes two thirds of the self-employment income in its labor component, and one third in its capital component. To analyze the functional distribution of income, we rely on the national accounts, specifically on the European System of National and Regional Accounts (*ESA*).³ The series of capital and labor share that we obtain from the *ESA* are first compared with the survey of capital and labor share from the *SHIW*, to identify possible discrepancies between the two data sources, and then combined with the *SHIW* to obtain alternative estimates of the IFC index in the appendix.

From a technical perspective, we consider the functional distribution of gross value added at factor costs. First, we define capital income as value added minus employee compensation. To account for self-employed workers, we assume, as in [Torrini \(2016\)](#), that their earnings are the same as those of waged employees in all sectors.⁴ In a second step, we split the two components of self-employment income in light of the estimates $Y_{s\pi}$ and Y_{sw} previously derived with the micro data. Finally, the different estimates of the IFC index, which reflect the different definitions of capital and labor income that we adopt, are related to the estimates of the capital and labor shares of income.

4.4 Descriptive Statistics

Let us begin our analysis with some descriptive statistics. In this Section, we further extend Tables [4.1-4.2-4.3](#) previously illustrated in Section [4.1](#). Table [4.4](#) shows the evolution of the distribution of total income across the four income groups previously

³We consider the 2010 release.

⁴Precisely, this definition relates to the second series of capital income built by [Torrini \(2016\)](#).

4.4. Descriptive Statistics

considered. The years we consider are 1989, 1995, 2000, 2004, 2012, 2016. The first aspect to notice is that, after a sudden increase in income inequality between 1989 and 1995, as mirrored by the Gini coefficient jumping from 0.47 to 0.55, income inequality has remained stable for approximately the whole period. Such rise is due to the foreign exchange crisis occurred in 1992 (Fратиanni and Artis, 1996), remembered as the Great Crisis. This crisis was due to a lost of confidence by foreign investors that, after having acquired shares of public debts for several years, speculated against the Italian lira. As we can see from Table 4.4, the Great Crisis mainly hit the bottom 50% of the distribution, which lost 6% of its total share of income. On the contrary, the top 5% benefited from the crisis, given that their income share increased from 20% to 23%. Overall, we can say that the middle class has maintained almost the same share of total income over the whole period 1989-2016, which amount to about the 50% of total income.

Table 4.4: Total income shares, by income group

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	17%	11%	12%	12%	13%	12%	11%
50-90%	51%	53%	52%	51%	53%	52%	54%
90-95%	11%	12%	12%	11%	12%	12%	12%
95-100%	20%	23%	22%	24%	21%	22%	21%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54

Let us now analyze the distribution of capital income across the total income ranking (Table 4.5). As stated in Section 4.1, the capital income owned by the bottom 50% of the total income distribution has steadily increased over the last three decades, precisely from 14% in 1989 to 22% in 2016. Also the middle class have seen their capital income share rising, from 32% to 37%. The opposite has happened to the top 10%, whose total share of capital income has fallen from 51% to 38%. Such fall was particularly pronounced for the

4.4. Descriptive Statistics

top 50% of the top 10% income group. Simultaneously, the survey capital income share has risen of 7 percentage points, going from 36% to 43%.

Table 4.5: Capital income shares, by income group

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	14%	15%	18%	18%	21%	20%	22%
50-90%	32%	34%	33%	31%	33%	36%	37%
90-95%	14%	13%	13%	11%	12%	12%	10%
95-100%	37%	35%	35%	37%	31%	30%	28%
<i>Capital Share</i>	36%	39%	41%	43%	41%	43%	43%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

The distribution of labor income across the income rank has, instead, evolved in the opposite manner with respect to capital, as shown by Table 4.6. The bottom 50% has registered a reduction in its labor share of 15 percentage points, whereas the top 10% has seen its labor share increasing by 11 percentage points. Finally, the middle class has been characterized by a mild rise of its labor share.

Table 4.6: Labor income shares, by income group

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	18%	7%	8%	7%	7%	5%	3%
50-90%	62%	65%	66%	66%	66%	65%	66%
90-95%	8%	11%	11%	12%	11%	12%	13%
95-100%	10%	14%	13%	14%	14%	16%	16%
<i>Labor Share</i>	64%	61%	59%	57%	59%	57%	57%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

By now combining information from Tables 4.5 and 4.6, we can clearly state that the structural change in the composition of individual's income in Italy over the last three

4.4. Descriptive Statistics

decades has mainly involved the two extremes of the income distribution, namely the bottom 50% and the top 10%. Indeed, the bottom 50% has seen its total income becoming increasingly more capital intensive, whereas the top 10%'s income has become increasingly more labor intensive. At the same time, the middle class has maintained almost the same income composition, as its shares of labor and capital income have increased of almost the same amount.

4.4.1 Factor income components

At this point of the analysis, let us take a closer look at the way each capital and labor income component has evolved between 1989 and 2016. Table 4.7 refers to the evolution of the distribution of the capital component of self-employment income. Clearly, such component has moved from the hands of the bottom 95% to that of the top 5% of the income distribution. However, such result can be determined by the way the capital component of self-employment income is estimated.

Table 4.7: Capital component of self-employment income shares

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	4%	1%	1%	0%	1%	0%	0%
50-90%	34%	35%	31%	22%	29%	30%	29%
90-95%	18%	14%	15%	11%	16%	15%	11%
95-100%	43%	48%	51%	64%	52%	53%	58%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

Table 4.8, instead, displays the distribution of the capital income from real estates. Differently from the capital component of self-employment income, this source has moved from the top 10% to the bottom 90% of the distribution. We can notice that, between

4.4. Descriptive Statistics

2008 and 2012, this share dropped only for those individuals at the bottom 50% of the distribution. This is due to the effect of the 2008's financial crisis.

Table 4.8: Capital shares from real estates

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	22%	22%	27%	28%	30%	27%	29%
50-90%	33%	37%	36%	36%	36%	39%	40%
90-95%	12%	12%	12%	12%	11%	11%	10%
95-100%	30%	27%	23%	22%	21%	21%	19%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

To conclude our analysis on the capital components, Table 4.9 illustrates a clear result. The share of income from financial assets has grown from 45% to 71% for the top 5% over the three decades, whereas it has fallen for all the other groups. Interestingly, while the financial crisis hit the bottom 50% via the housing market, it hit both the middle class and the bottom 50% of the top 10% via the financial market. Moreover, it appears that the middle class has been hit by the financial crisis before the top 90-95%. Having said that, given the low weight the financial capital has in the total capital income captured by the survey, its overall effect on the dynamics of income composition has been relatively marginal.

Table 4.9: Capital shares from financial assets

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	15%	11%	14%	21%	10%	9%	n.a.
50-90%	26%	20%	20%	10%	0%	11%	n.a.
90-95%	13%	12%	11%	6%	15%	6%	n.a.
95-100%	45%	55%	53%	62%	73%	71%	n.a.
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

4.4. Descriptive Statistics

Let us now analyze how the distribution of the two labor income components has evolved over the time considered. Table 4.10 describes the evolution of payroll income. It appears that, while the share of payroll income of the middle class has remained stabled, the top 10% has seen its share considerably increasing, at the expenses of the bottom 50%, whose share has fallen by 15 percentage points.

Table 4.10: Labor shares from payroll income

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	17%	6%	7%	6%	6%	5%	2%
50-90%	64%	67%	67%	68%	68%	66%	67%
90-95%	8%	11%	11%	11%	11%	12%	13%
95-100%	9%	14%	13%	13%	13%	16%	16%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

Finally, also the labor component of self-employment income has progressively shifted from the bottom 50% to the top 10% of the distribution, as shown by Table 4.11.

Table 4.11: Labor component of self-employment income shares

Income group	1989	1995	2000	2004	2008	2012	2016
0-50%	22%	21%	18%	12%	15%	13%	10%
50-90%	47%	52%	51%	51%	49%	55%	56%
90-95%	13%	10%	12%	12%	13%	13%	11%
95-100%	16%	15%	18%	23%	21%	19%	21%
<i>Gini</i>	0.47	0.55	0.53	0.54	0.52	0.54	0.54
<i>IFC</i>	0.30	0.11	0.11	0.06	-0.1	-0.06	-0.19

In order to synthesize all these facts and be able to precisely grasp the dynamics at stake, the next Section 4.5 applies the methodology previously presented in Section 4.3.

4.5 Main results

This Section reports the main results of the Chapter and lays the foundations for the policy recommendations that will be provided in Section 4.6. Let us begin with the stylized facts about the factor income shares in Italy in the period 1989 – 2016. We begin by adopting as a benchmark the series obtained from the ESA national accounts, which is represented by the dotted blue line in Figure 5.6 (labeled *ESA 2010*). In line with the results obtained by Torrini (2016), the series from ESA confirms that the capital share rises in the periods 1995 – 2000 and 2010 – 2016, whereas it falls between 2000 and 2010.

Regarding the survey data, as explained in detail in Section 4.3, we employ a definition of labor (and, hence, total) income which excludes income from pensions and transfers. This implies that the corresponding capital/labor share of total income is higher/lower than the capital income share that account for pensions and transfers in the denominator (this is further discussed in Appendix A). This series corresponds to the green line in Figure 5.6. The trend for the *SHIW* series is increasing for the periods 1989 – 2004 and 2008 – 2010 and decreasing for the periods 2004 – 2008 and 2010 – 2016. The series *SHIW* therefore shows an increase of slightly less than 10 percent throughout the period, from approximately 0.36 points in the early 1990s to approximately 0.44 in 2014.⁵

Let us now turn to the core of the analysis, introducing the estimations of the degree of income composition inequality in Italy. As illustrated in Section 4.3, Figure 4.1 plots a one-year (1989) snapshot of the decomposition of the Lorenz Curve (in red) into the

⁵The proximity between the green and the blue line is explained by the fact that both series do not include pensions or transfers in their denominators, which is standard practice in the computation of the official measures of the capital share, normally calculated as the share of employees' compensation in total value added. However, the two series have started to diverge from 2008 onward. The 2008 financial crisis appears to have differently affected the two series.

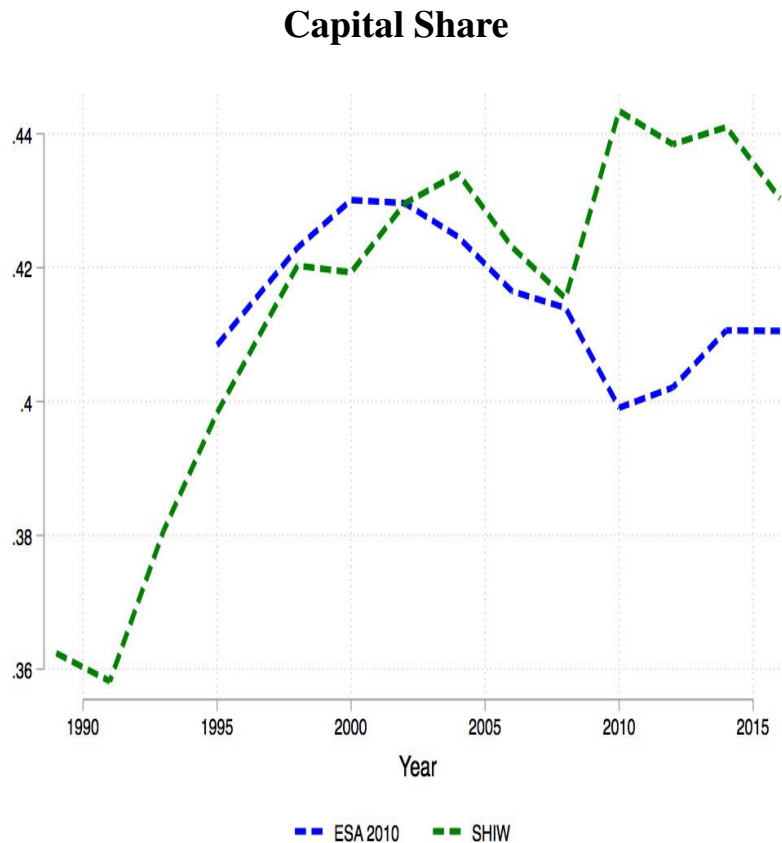


Figure 4.2: Two different series of the capital income share in Italy are presented here. The first series (ESA 2010), which runs from 1995 to 2016, is constructed from the ESA 2010 National Accounts and is calculated as the difference between value added at factor prices minus employee compensation. To account for self-employed workers, we assume that they earn the same as waged employees in all sectors. The second (SHIW 2) series (dotted green line), which covers the period between 1989 and 2016, is built from the Survey of Household Income and Wealth (SHIW) prepared by the Bank of Italy. Total income is the sum of payroll income, net-self employment income. Capital income equals property income plus the capital component of net self-employment income. The latter is imputed following [Glyn \(2011\)](#).

concentration curves for capital (in blue) and labor (the latter does not appear in [Figure 4.1](#) since it can be derived from the other concentration curve, holding the Lorenz curve constant). The concentration curve for capital lies below the zero-concentration curve, indicating that in 1989, capital income was concentrated at the top of the population (displayed in deciles and ranked with respect to income), whereas labor was concentrated among the bottom of the population.

4.5. Main results

For each year in the period 1989 – 2016, we then compute the level of the IFC index, precisely as shown in equation 3.1 in Section 4.3. Once again, the IFC index is represented by the ratio between the area given by the difference between the concentration curve for capital and the zero-concentration curve (\mathcal{A}) and the area between the zero-concentration curve and the maximum-concentration curve (\mathcal{B}). Figure 4.3 conveys one of the main results of the Chapter, by plotting the 1989 – 2016 series of the IFC index, as a measure of the degree of income composition inequality in Italy. As we can see from Figure 4.3 below, income composition inequality follows a completely different trend than income inequality, as measured by the Gini coefficient.

This result can be summarized as follows: Italy experiences a decreasing degree of income composition inequality throughout the period 1989 – 2016. As it is shown in Appendix A, this result is robust to different definitions of capital and labor income. The degree of income composition inequality decreases steadily from 0.3 to a level below zero, thereby confirming the structural change in the composition of individuals' income that we have observed in Section 4.4 presenting the descriptive statistics. This negative trend is robust to different definitions of capital and labor income, as shown in the appendix.

How can this result be interpreted? A *lower* degree of income composition inequality indicates that, on aggregate, the two sources of income are *more equally* distributed across the population, given the total level of income inequality and of the factor shares. In other words, representing Italy in 2016 as a society in which social classes and sources of income perfectly coincide (for instance, with capital owners at the top and wage earners at the bottom) is not in line with the evidence in Figure 4.3. Italy is becoming a society in which a larger share of individuals earn *multiple* sources of income.

Income Composition Inequality

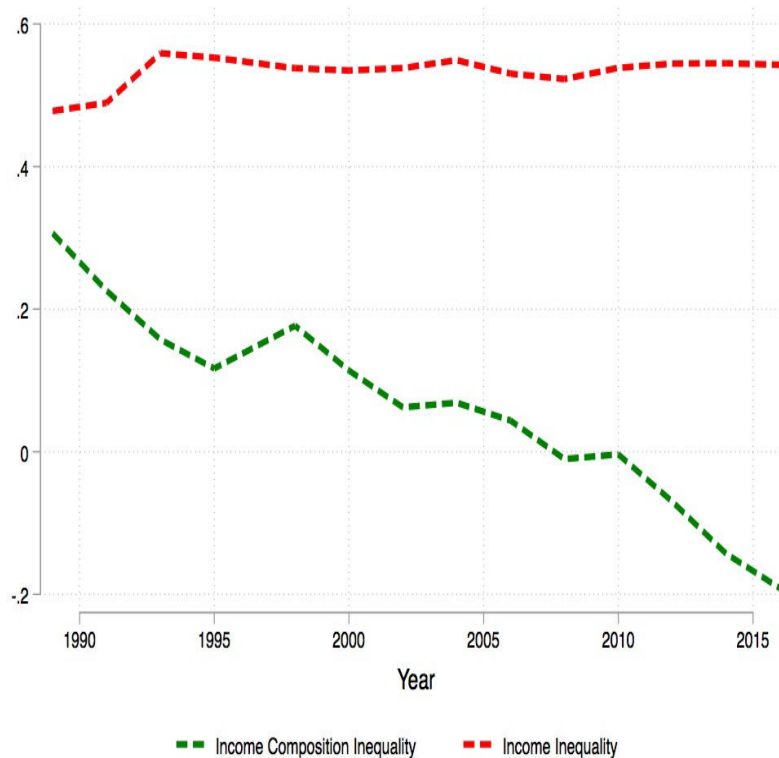


Figure 4.3: The series of the income factor concentration index and of the Gini coefficient are constructed using the SHIW data.

Let us turn now to the implications for the linkage between the functional and personal income distribution in Italy. Figure 4.3 plots the series of the Gini coefficient constructed using the *SHIW* data, showing that income inequality was increasing in Italy in the early 1990s and then stabilized from then onward at approximately 0.55. Now, to what extent have changes in the factor income shares (as plotted in Figure 5.6) been transmitted into the level of personal income inequality? Based on the lower level of the IFC index in 2016 with respect to 1989, we claim that the strength of the transmission mechanism from changes in factor incomes to changes in the level of personal income inequality has been weakening throughout the period.

To make this point clearer, recall equation 3.5 from Section 4.3. For each percentage

4.5. Main results

increase in the capital share of income, the right-hand side of equation 3.5 indicates that the contribution to the change in personal income inequality will be given by twice the difference between the area of the concentration curves.⁶ Now, the decreasing IFC series of Figure 4.3 implies that the elasticity of personal income inequality to changes in factor income has been decreasing throughout the period. Pinning down the dynamics of the strength of the transmission mechanism from factor income distribution to personal income distribution is in our view an important aspect that previous decompositions (Shorrocks, 1982; Atkinson, 2009) of variation of personal income inequality did not properly analyze.

Some words have to be spent on the meaning of the negative value of the IFC index from 2008 onward. A negative value of the IFC index in the last years under analysis implies that in those years, a hypothetical sudden increase in the share of capital income would *reduce* the level of personal income inequality. Recall that this is mainly driven by the changes in capital income shares across the population provided in Tables 4.5. The magnitude of the hypothetical effect on personal income inequality would be however rather small, as indicated by the fact that the level of income composition inequality is rather low.

To disentangle the mechanisms at work behind the evidence in Figure 4.3, Figures 4.4 and 4.5 show the series of the areas of the concentration curves for capital and labor.

While the series of the area of the concentration curve for labor (Figure 4.5) declined in

⁶Recall further that the actual series of the Gini coefficient is not determined solely by the dynamics of the factor shares, and hence, the evidence in Figure 4.3 (a stable level of income inequality from the early 1990s onwards) might be a net effect of a set of different forces. Regardless of this limitation, we can safely argue that the degree to which changes in the capital income shares yield a jump in the level of income inequality has been steadily *decreasing* for the Italian economy.

Area of the Concentration Curve for Capital

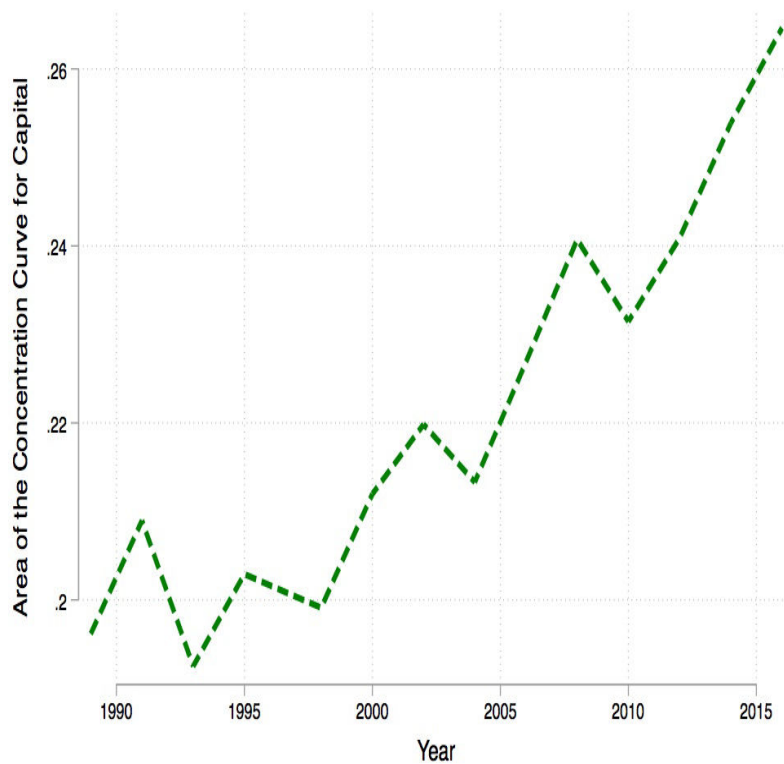


Figure 4.4: The series of the area of the concentration curve for capital constructed using the SHIW data.

the early 1990s but remained rather stable thereafter, a clear increasing trend can be observed in Figure 4.4. This implies a larger area below the concentration curve for capital, indicating that since the early 1990s, capital incomes have gradually accumulated more among the bottom of the population. In other words, when considering the distribution of the two income factors separately, it appears that capital incomes have indeed been partially redistributed across the Italian population, whereas no similar pattern can be observed for labor income.

Area of the Concentration Curve for Labor



Figure 4.5: The series of the area of the concentration curve for labor constructed using the SHIW data.

4.5.1 Decomposing factor income shares

Additional insights can be gained from Figures 4.6 and 4.7, in which the two series of Figures 4.4 and 4.5 have been plotted jointly with each of their three main components (summing up to 1 when normalized for the share of factor income related to each component). Let us start with Figure 4.6, for which it is straightforward to infer that the overall increasing dynamics of the green series has been driven primarily by the non-decreasing capital component of self-employment income and by real estate (housing rents). These two components have jointly implied a steady redistribution of capital incomes in Italy throughout the period, regardless of the counteracting trend from the fi-

Area of the Concentration Curve for Capital - Decomposition by Type of Capital

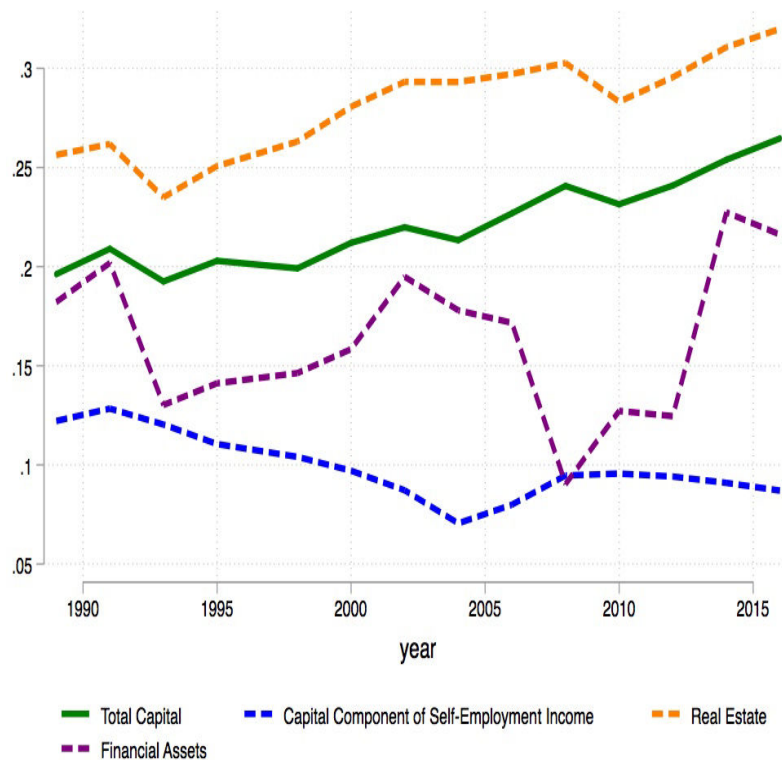


Figure 4.6: The series of the area of the concentration curve for capital (green line), together with the area of the concentration curves for the capital component of self-employment income (blue line), real estate (orange line) and financial assets (purple line) constructed using the SHIW data.

nancial assets component, which became more unequally distributed. In other words, the financial assets component of the concentration curve for capital has not decisively contributed to the overall dynamics, mainly due to its limited fraction of the total capital share of income. This evidence indicates that, if one intends to further redistribute aggregate capital incomes in Italy, targeting financial assets might not necessarily lead to a large overall effect. On the other hand, if one is targeting the component of capital incomes with the less unequal distribution, financial assets are the clear choice.

Focusing instead on Figure 4.7 in which the concentration curve for labor is now plotted

Area of the Concentration Curve for Labor - Decomposition by Type of Labor

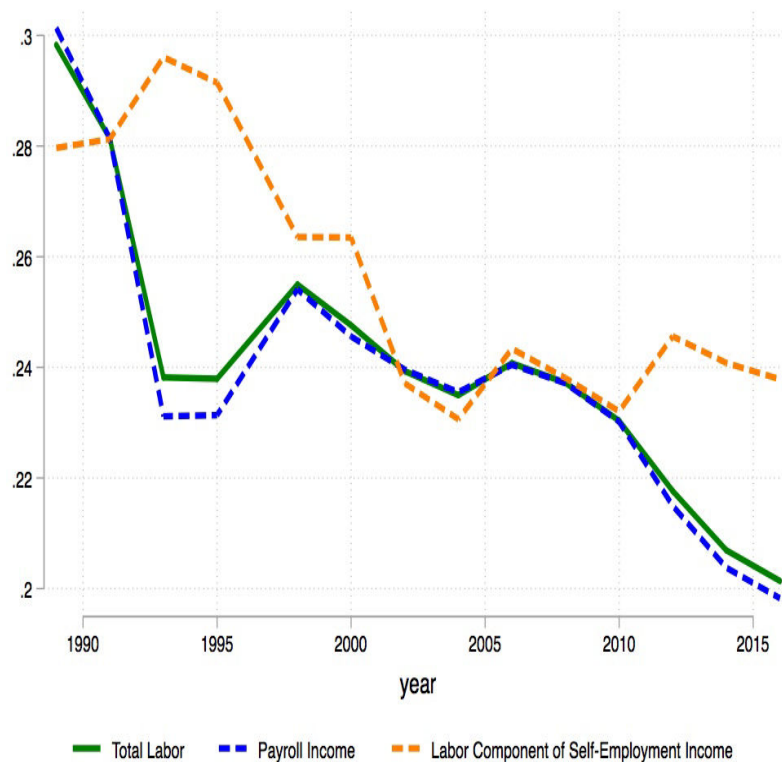


Figure 4.7: The series of the area of the concentration curve for labor (green line), together with the area of the concentration curves for payroll income (blue line) and the labor component of self-employment income (orange line) constructed using the SHIW data.

jointly with its two components (payroll income and labor component of self-employment income), we observe a similar decreasing trend for the three curves. In particular, it appears that the payroll income has been the major driver of the concentration curve for labor.

In the next Section, we provide further details on how the concept of income composition inequality can be crucial to the effectiveness of redistribution policies will be provided in Section 4.6.

4.6 Getting redistribution right

This Section introduces final contribution of this work. Imagine an economic policy maker seeking to reduce income inequality to maximize social welfare and, to that end, she designs a classic redistribution (income taxation and transfer) policy. This Section clarifies how a better understanding of the linkage between the functional and personal distribution of income can enhance the effectiveness of classic redistribution policies in terms of inequality reduction.

We argue that, while a classical redistribution policy does not necessarily require the policy maker to know the current (and expected future) level of income composition inequality, the same is not necessarily true once the same policy is also intended to be effective in the longer run. To grasp the intuition behind this statement, we introduce the following stylized example (a simple model related to this Section is developed in the Appendix).

Consider two different countries, labeled for simplicity Italy 1 and Italy 2. Italy 1's population is composed of workers earning payroll income, the self-employed earning self-employment income, capital owners earning property income and a group of pensioners and unemployed individuals earning pensions and transfers. In contrast, Italy 2's population is comprises only workers, the self-employed and capital owners, making the absence of pensioners and unemployed individuals in Italy 2 the only difference between the two countries. For simplicity, assume that the pension and transfer system is financed solely by income tax revenues and, hence, that the government maintains a balanced budget in each period. Specifically, one can assume, for instance, that the government progressively taxes the average total income at the top of the distribution, and it transfers the entire sum of tax revenues to the poor and elderly in the form of income transfers and pensions. For

4.6. Getting redistribution right

the sake of simplicity, time index $t = 1$ symbolizes the current period or the short run, whereas $t = 2$ represents the longer run.

First, we report comparative statics of the two countries. Clearly, at $t = 1$, the level of income inequality would be lower in Italy 1 than in Italy 2, due to the equalizing effect produced by the Italian pension and transfer system. On the other hand, at $t = 1$ the level of income *composition* inequality in Italy 1 would be higher than that in Italy 2, as the introduction of pensioners and unemployed individuals boosts the concentration of capital at the top (since pensioners and the unemployed receive a limited amount of capital income) and that of labor at the bottom of the income distribution (pensions and net transfers count as labor incomes that are mainly targeted to the poor).

Now, let us turn to the core of our example. The policy maker of Italy 1 expects the effect of her redistribution policy (which implied lower inequality with respect to Italy 2 at $t = 1$) to also be in place in the longer run, namely at $t = 2$. She is however unaware of the role played by income *composition* inequality, in the case of a shift in the factor shares of total income (our exogenous shock in this stylized example). Assume that, *ceteris paribus*,⁷ the level of capital income share in the economy grows by $x\%$ points from $t = 1$ until $t = 2$. As the term $2(\tilde{\mu}_w - \tilde{\mu}_\pi)$, which is the exact elasticity of changes in the capital share of income to changes in personal income inequality, is lower for Italy 2 (due to its lower degree of income composition inequality), such an increase in the capital share will not have a significant impact on the level of income inequality for Italy 2. On the contrary, the same increase in the capital share will substantially increase the Gini coefficient in Italy 1 at $t = 2$, due to a higher level of the elasticity of changes in the factor

⁷The drawbacks of this assumption should be further analyzed, as an increase in the capital share of income has in turn an impact on the level of income composition inequality.

4.6. Getting redistribution right

income distribution to the personal income distribution. As a consequence, the difference in the level of inequality between the two stylized countries at $t = 1$ will be reduced or eventually inverted.

Illustratively, assume that elasticity $2(\tilde{\mu}_w - \tilde{\mu}_\pi)$ equals 0.3 in Italy 1 and 0.1 in Italy 2 at time $t = 1$, with a Gini coefficient of 0.35 for Italy 1 and 0.55 for Italy 2. Imagine then that the levels of capital income share in both economies grow by 10 percentage points from $t = 1$ until $t = 2$. How will this affect the level of income inequality in the next period? Knowledge of the elasticity $2(\tilde{\mu}_w - \tilde{\mu}_\pi)$ allows us to claim that the same increase in the capital share of income in the two stylized countries will hamper income inequality at time $t = 2$ *three* times more in Italy 1 than in Italy 2. In other words, the positive variation in the Gini coefficient will be 3% for Italy 1 and 1% for Italy 2, reducing the effect of the redistribution policy designed in the previous period.

Although the previous example obviously oversimplifies reality, it helps to clarify the role that both income composition inequality and the fluctuations in the factor shares have in affecting income inequality in the long run. In practice, to avoid the emergence of a scenario like that depicted in the numerical example, the policy maker should identify at $t = 1$ the *correct* type of income source to redistribute. The following proposition provides a simple *rule of thumb* that the policy maker should adopt to do so:

Proposition 4.6.1. *If the expected sign at $t + k$ of the factor share z 's variation coincides with the expected sign of $\mathcal{I}_f(\mathbf{z})$ over the interval $[t, t + k]$, i.e., $\mathbb{E}(\text{sign}(z_{t+k} - z_t)) = \mathbb{E}(\text{sign}(\mathcal{I}_{f,[t,t+k]}(\mathbf{z})))$, with $z = \pi, w$, then it is preferable to redistribute source z to reduce inequality in the long run.*

The intuition behind this proposition is as follows. As long as the level of income

Getting Redistribution Right

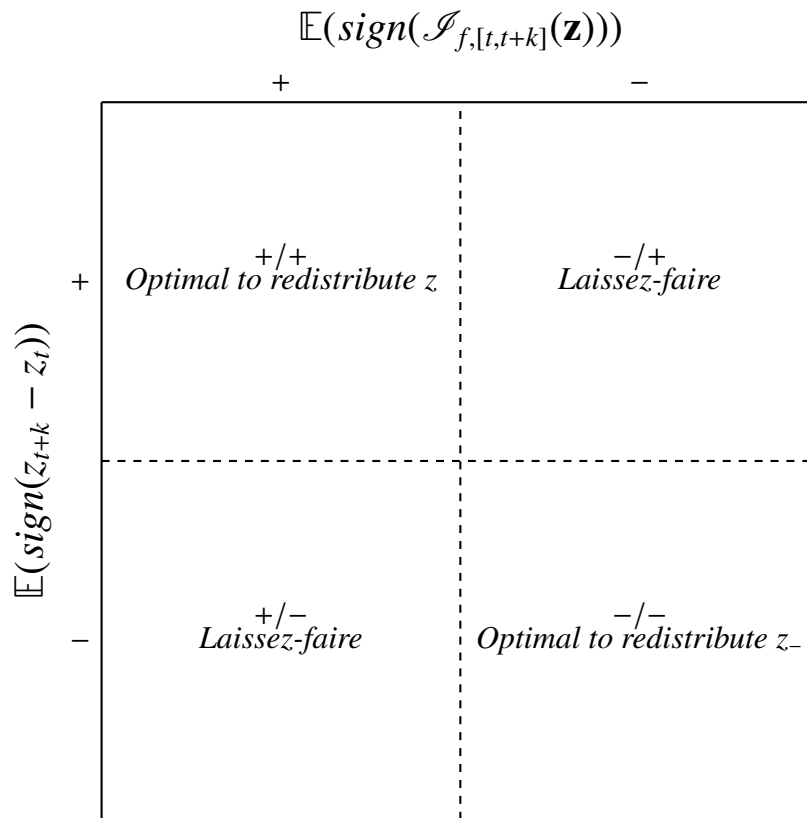


Figure 4.8: This Figure shows the four different scenarios behind Proposition 6.1 in Section 4.6. **Scenario 1:** As long as the level of income composition inequality (at top of the table) is expected to be positive (e.g., capital income is concentrated primarily at the top and labor income at the bottom of the distribution) and the *capital* income share (on the left of the table) is expected to rise, it is preferable to redistribute income in the form of *capital* (such as housing or financial assets) so that the expected increase in the capital income share will not have a strong impact on income inequality. **Scenario 2:** this scenario depicts the opposite case. For a negative level of income composition inequality (e.g., capital incomes mostly accruing at the bottom and labor income at the top of the distribution), an expected increase in the *labor* share in the upcoming years will signal that it is indeed *labor* income that has to be redistributed to reduce inequality in the longer run. **Scenarios 3 and 4:** for the sake of completeness, we consider two further scenarios that might arise. Precisely, when the two signs in the above proposition differ, this means that the expected change in the income source z is already acting in favor of the redistribution of income in the long run.

composition inequality is positive at $t = 1$ (e.g., capital income is mainly concentrated at the top and labor income at the bottom of the distribution) and the *capital* income share is expected to rise in the coming years up to $t = 2$, it is preferable to redistribute income in

4.6. Getting redistribution right

the form of *capital* (such as housing or financial assets, depending on their share of capital income) so that the expected rise in the capital income share will not have a strong impact on income inequality. The same will be true in the opposite case: For a negative level of income composition inequality (e.g., capital incomes mostly accruing at the bottom and labor income at the top of the distribution), an expected increase in the *labor* share in the coming years will signal that it is indeed *labor* income that has to be redistributed to reduce inequality in the longer run. For the sake of completeness, consider two further scenarios that might arise. Specifically, when the two signs in the above proposition differ, this means that the expected change in income source z is already acting in favor of the redistribution of income in the long run. In the latter case, then, knowledge of the degree of income composition inequality does not generate further insights for the policy maker. The four scenarios are summarized in Figure 5.1.

In summary, we argue that, in the event of an expected variation in a given factor share of income, a policy maker should consider the sign of the degree of income composition inequality to design effective redistribution policies. Choosing to redistribute the *correct* factor share will efficiently and more permanently reduce the burden of income inequality in the economy.

In the appendix we develop a simple model that shows that under incomplete information regarding changes in the functional income distribution and the level of income composition inequality, an inequality-averse social planner can choose a sub-optimal vector of taxes to reduce income inequality in the society.

4.7 Concluding remarks

This Chapter analyzes the relationship between the functional and personal distribution of income. To study this relationship, this Chapter builds on the novel concept of income *composition* inequality, formally developed in Chapter 2. The lower/higher the degree of income composition inequality is, the weaker/stronger the link between movements in factor income shares and personal income inequality. This nexus provides an important background for economic policies intended to redistribute income to effectively reduce the level of inequality. Hence, the focus of the Chapter is to highlight the relevance of the inequality of income composition to obtain a more advanced understanding of income and economic inequality.

Our main contribution to the economic literature is twofold. First, we conduct an empirical analysis of the dynamics of income composition inequality for Italy, between 1989 and 2016. By doing so, this study also contributes to the Italian economic debate by providing the first estimates of the level of income composition inequality in the country. The take-home message for the Italian debate is that Italy is steadily moving towards becoming a multiple sources of income society. The result of a decreasing trend in the IFC index in Italy is indeed a country-specific result. In conclusion, the results of the empirical analysis of this Chapter are consistent with different definitions of capital and labor and different estimation techniques of income composition inequality.

Second, we conceptualize a simple rule of thumb that relates fluctuations in the total factor shares and the level of income composition inequality to the specific income source to be redistributed. We argue that, in the event of expected variation in a given factor share of income, a policy maker should consider the sign of the degree of income composition

inequality to design redistribution policies with long-term efficacy.

We consider this Chapter a part of a broader research agenda on the issue of income *composition* inequality and specifically that on the link between factor shares and income inequality. We believe the technical assessment of this link introduces a novel dimension to the study of the income distribution. Understanding the relationship between the macro-level dynamics of economic aggregates such as the capital and labor shares of income and the micro-level changes in the dispersion of income across the population can further emphasize the political economy character of the issue of income distribution. As stated in Section 4.6, understanding this link is fundamental to design effective redistribution policies that pursue a lower level of income inequality in society. As such policies are the responsibility of the incumbent policy maker, the role politics plays in this setting should be considered with greater care in future research than what has been done in this study.

To conclude, given the relevance of a correct assessment of the marginal distributions of capital and labor across the population, the estimates of which are at the core of the study on the link between functional and personal distribution of income, we call for the development and design of better techniques that can improve the quality of these data, which remain rather inaccurate and imprecise.

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4.8 Appendix

4.8.1 Robustness

In this Section, we compute the IFC index for different definitions of labor and capital income. Let us start by considering labor income as the sum of: payroll income (Y_{pa}), the labor component of self-employment income (Y_{sw}), pensions (Y_{pe}) and transfers (Y_{tr}). Capital income is defined as the sum of: the capital component of self-employment income ($Y_{s\pi}$) and property income (Y_{pr}). Figure 4.9 shows the trend of the novel series (IFC_2) as compared to the benchmark series previously shown in Figure 4.3 (IFC_1). The gap between the two series remains roughly constant throughout the whole period. Looking at IFC_2 , the degree of income composition inequality decreases steadily from approximately 0.6 to below 0.4. The introduction of pensions and transfers in the definition of labor income has therefore increased the overall level of income composition inequality. Such result reflects the fact that pensions and transfers are rather concentrated at the very bottom of the total income distribution. This highlights the fact that redistribution policies, which generally reduces income inequality, at the same time rises income composition inequality.

When we remove both the labor and the capital components of self-employment income from the series IFC_2 , we obtain the series IFC_3 (Figure 4.10). Also IFC_3 displays a decreasing trend of income composition inequality over the period covered, although this trend is less marked than those of IFC_1 and IFC_2 . Finally, by removing pensions and transfers from the series IFC_3 we get IFC_4 (Figure 4.11). Figure 4.11 shows that, by defining capital income as property income and labor income as payroll income, income composition inequality is always negative. This result illustrates that payroll income tends

Income Composition Inequality



Figure 4.9: The series IFC_1 considers capital income as the sum of the capital component of self-employment income ($Y_{s\pi}$) and property income (Y_{pr}), and labor income as the sum of payroll income (Y_{pa}) and the labor component of self-employment income (Y_{sw}). Instead the series IFC_2 , differently from IFC_1 , adds pensions and transfers in the definition of labor income, leaving the definition of capital income unchanged.

to be concentrated at the top of the income distribution relatively to property income.

Overall, the four series IFC_1 - IFC_2 - IFC_3 - IFC_4 show that, regardless of which definition of capital and labor income we may adopt, income composition inequality has constantly decreased over the last three decades in Italy.

Combining survey with national accounts

At this point of the analysis, we provide alternative estimates of both the factor shares and income composition inequality by combining the survey data with the national ac-

Income Composition Inequality

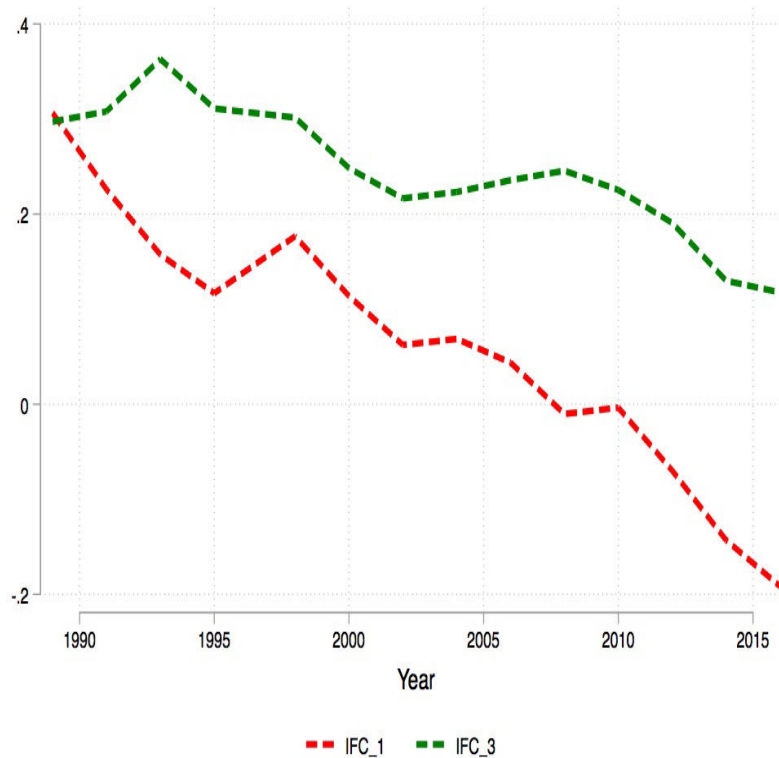


Figure 4.10: The series IFC_1 considers capital income as the sum of the capital component of self-employment income ($Y_{s\pi}$) and property income (Y_{pr}), and labor income as the sum of payroll income (Y_{pa}) and the labor component of self-employment income (Y_{sw}). Instead the series IFC_3 , differently from IFC_1 , adds pensions and transfers in the definition of labor income, and remove both the capital and labor component of self-employment income.

counts. To this end, we first construct a new series of the functional income distribution in Italy, and then we consider the latter series, jointly with the ESA 2010 series, to obtain new estimates of the degree of income composition inequality for Italy.

To propose an alternative series of the functional income distribution in Italy, and specifically of the capital share of income, we combine information from both the national accounts and the Bank of Italy's SHIW. Specifically, the new series (the dotted purple line in Figure 5.8) is an adjustment of the ESA 2010 series in light of the estimates of the

Income Composition Inequality

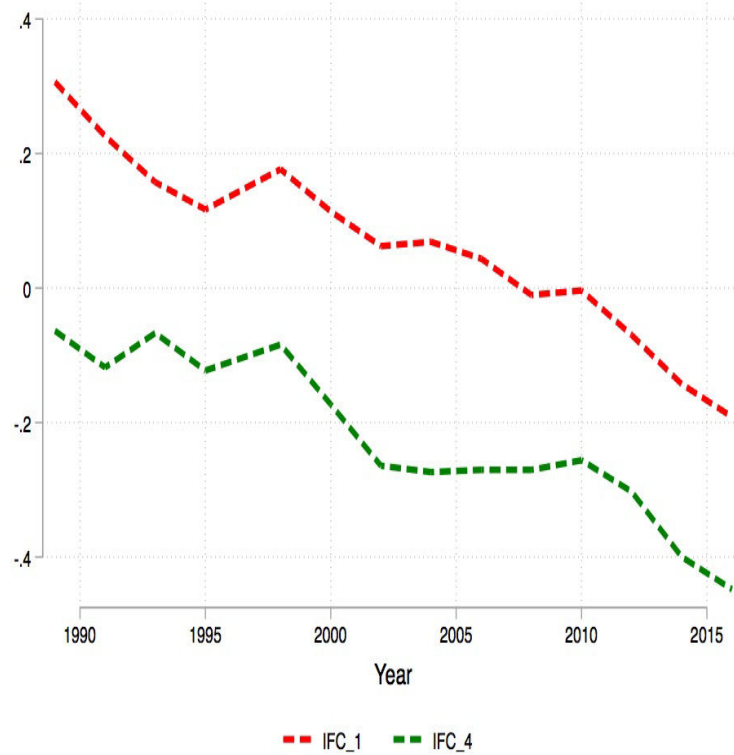


Figure 4.11: The series IFC_1 considers capital income as the sum of the capital component of self-employment income ($Y_{s\pi}$) and property income (Y_{pr}), and labor income as the sum of payroll income (Y_{pa}) and the labor component of self-employment income (Y_{sw}). Instead the series IFC_4 , differently from IFC_1 , remove both the capital and labor component of self-employment income.

capital and labor components of self-employment income from the survey.⁸ Denote by π_t^s the survey capital share at time t and by π_t^{na1} and π_t^{na2} the capital shares from the original and the adjusted ESA 2010 series, respectively. Formally, if we denote by $Y_{s\pi}$ and Y_{sw} the total survey capital and labor components of self-employment income, respectively, we

⁸Recall that the two components of self-employment income were obtained from the micro data by adopting the imputation strategy in [Glyn \(2011\)](#), which can be formally written as follows. We define the total income from self-employment Y_s of individual i as $Y_{s,i} = Y_{s\pi,i} + Y_{sw,i}$, where $Y_{sw,i} = \begin{cases} Y_{s,i} & \text{if } Y_{s,i} \leq \bar{Y}_{pa} \\ \bar{Y}_{pa} & \text{if } Y_{s,i} > \bar{Y}_{pa} \end{cases}$, while $Y_{s\pi,i} = \begin{cases} 0 & \text{if } Y_{s,i} \leq \bar{Y}_{pa} \\ Y_{s,i} - \bar{Y}_{pa} & \text{if } Y_{s,i} > \bar{Y}_{pa} \end{cases}$, where \bar{Y}_{pa} is the average payroll income in the sample.

Capital Share (alternative)

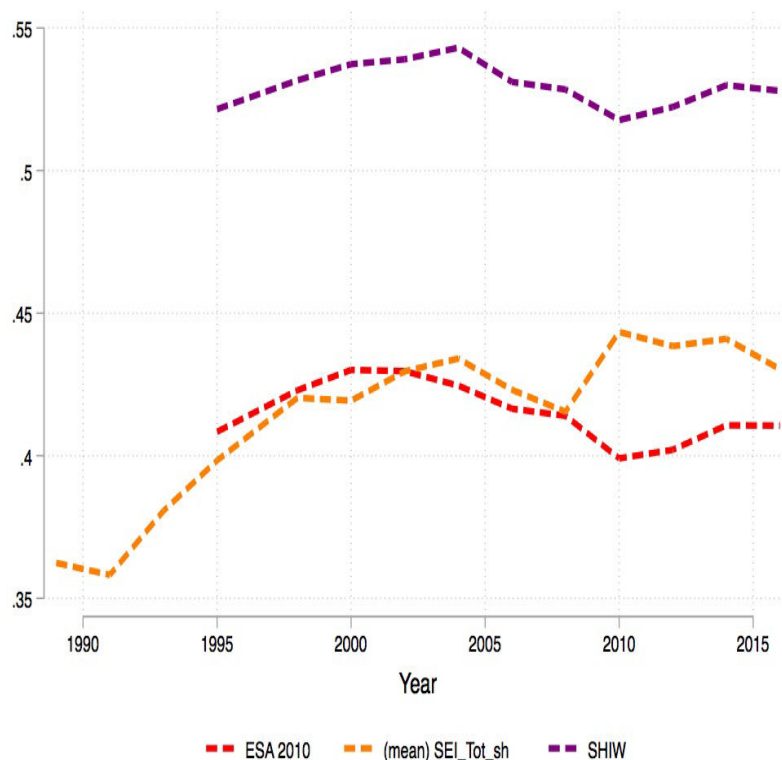


Figure 4.12: Three different series of the capital income share in Italy are presented here. The first series (ESA 2010), which runs from 1995 to 2016, is constructed from the ESA 2010 National Accounts and is calculated as the difference between value added at factor prices minus employee compensation. To account for self-employed workers, we assume that they earn the same as waged employees in all sectors. The second (SHIW 2) series, which cover the period between 1989 and 2016, is built from the Survey of Household Income and Wealth (SHIW) prepared by the Bank of Italy. Total income is the sum of payroll income, net-self employment income and property income. Capital income, instead, is equal to property income plus the capital component of net self-employment income. The latter is imputed following [Glyn \(2011\)](#). The third series is built by combining information on the capital and labor component of self-employment income and the national accounts.

can define the adjusted capital share series π^{na_2} as:

$$\pi^{na_2} = \frac{VA - CE - Y_{sw} \times VA}{VA}, \quad (4.1)$$

where VA is value added, and CE is employee compensation.

The evidence in [Figure 5.8](#) shows that the trend of π^{na_2} is rather similar to that of the

Adjusted Series of Income Composition Inequality

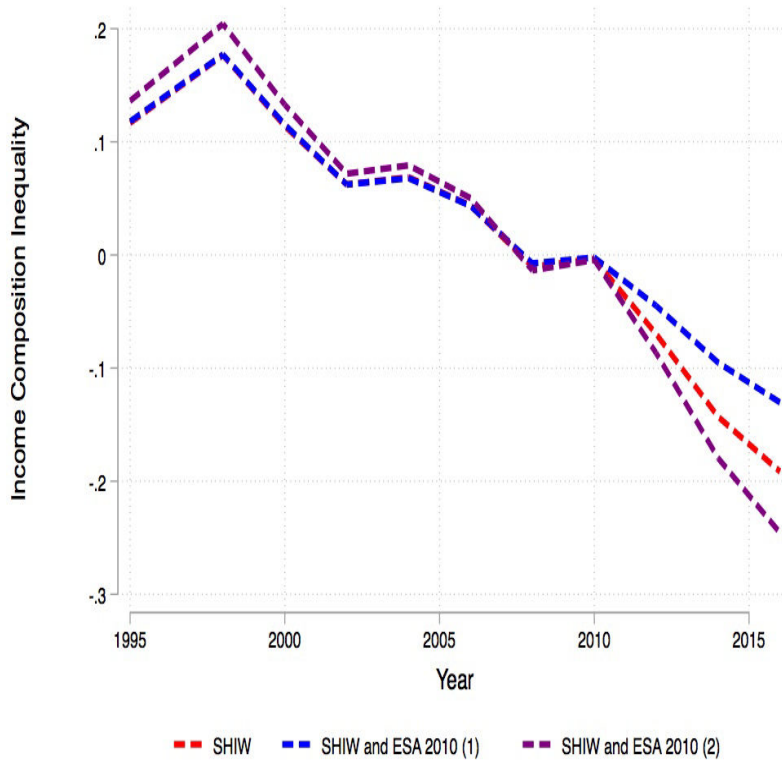


Figure 4.13: The series of income composition inequality constructed using data from SHIW (red line) is compared with (i) the series of income composition inequality when the survey capital and labor shares are replaced by those from ESA 2010 (blue line) and with (ii) the series of income composition inequality when the survey capital and labor shares are replaced by those from the adjusted ESA 2010 (purple line). The adjusted ESA 2010 series is obtained by combining information on the capital and labor components of self-employment income from SHIW with information from the national accounts. The definition of income here considered is Y_2 (i.e., individuals are ranked according to Y_2).

non-adjusted ESA 2010 series, although its level is nearly 0.1 points higher throughout the period considered. This result entails that the capital component of self-employed income accounts for 10% of total value added. Now, to construct a different series of the IFC index, we replace the total level of the survey capital and labor shares with that of the two previously discussed series from the national accounts (π_t^{na1} and π_t^{na2}). For this purpose, we multiply each individual i 's relative share of capital income at time t by the level of the capital share obtained from the two ESA series at the same time. Formally,

if we denote by $\alpha_i = \frac{\Pi_i}{\Pi^s}$ the relative share of capital of individual i , we can define the adjusted concentration curves for capital as $\mathcal{L}_t^{na1}(\boldsymbol{\pi}, p) = \pi_t^{na1} \sum_{j=1}^i \alpha_j \forall i = 1, \dots, n$ and $\mathcal{L}_t^{na2}(\boldsymbol{\pi}, p) = \pi_t^{na2} \sum_{j=1}^i \alpha_j \forall i = 1, \dots, n$. Note that while the aggregate level of the capital share in the survey is replaced by that of the two national account series, each individual's relative share of capital remains the same, as the denominator of α_i is still the survey's total amount of capital. In other words, while we modify the aggregate level of π , we leave unchanged the two marginal distributions.⁹

In a similar manner, we modify the zero- and maximum-concentration curves and thereby obtain the two novel series of the income-factor concentration index, which we call IFC^{adj1} and IFC^{adj2} . Each of these adjustments is made for every income definition adopted, and thus, we have four new series of the IFC index in total, IFC_1^{adj1} , IFC_2^{adj1} , IFC_1^{adj2} and IFC_2^{adj2} . Figure 4.13 shows the result. These new estimates also confirm, for both adjustments, the decreasing trend of income composition inequality.

⁹Although it would be preferable to also modify the marginal distributions, and thus correct for the capital income not captured by the survey, there is no consensus in the literature on how to adjust them.

4.8.2 Correlation evidence

In this Section we further document the role played by income composition inequality in shaping the overall dynamics of income inequality, as measured by the Gini coefficient \mathcal{G} . In particular, we separately discuss the impact of income composition inequality on income inequality due to its *variation* from that due to its *level*. To provide a more thorough methodological foundation for the analysis that follows, we adopt the analytical decomposition of income inequality variation proposed in Chapter 3. This method, which is based on the Lerman-Yitzhaki (LY) decomposition of the Gini coefficient in factor components (Lerman and Yitzhaki, 1985), affirms that variation in income inequality can be interpreted as a result of three types of movements: (a) movements in the functional income distribution, (b) movements in the income-factor concentration, and (c) movements in income-factor inequality. This decomposition suggests that such movements explain a large part of the variance in income inequality.

These three motions are operationalized below by changes in the capital share of income (movement (a) and first term on the right-hand side), changes in the IFC index (movement (b) and second term) and changes in the Gini of capital income (movement (c) and third term). Because of the limited sample size (12 observations), this OLS exercise is solely meant to provide the reader with some correlation evidence and additional points of discussion for a comprehensive analysis of the dynamics involved. The first specification we consider is, thus, the following:

$$\Delta\mathcal{G} = \alpha_1 \times \Delta\pi + \alpha_2 \times \Delta\mathcal{I}_f(\boldsymbol{\pi}) + \alpha_3 \times \Delta\mathcal{G}_\pi + \epsilon, \quad (4.2)$$

where Δ refers to absolute changes (first differences), \mathcal{G}_π is the Gini of capital income, and ϵ is the *iid* error term. The OLS results are shown in column (1) in Table 4.12:

	(1)	(2)
Variables	$\Delta\mathcal{G}$	$\Delta\mathcal{G}$
$\Delta\pi$	0.274 (0.232)	
$2(\tilde{\mu}_w - \tilde{\mu}_\pi)\Delta\pi$		4.065* (2.207)
$\Delta\mathcal{I}_f(\pi)$	-0.252*** (0.0591)	-0.238*** (0.0551)
$\Delta\mathcal{G}_\pi$	1.526*** (0.236)	1.407*** (0.228)
Observations	12	12
R-squared	0.857	0.880

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 4.12: Correlation evidence between income inequality variation and movements a, b, c.

Column (1) of Table 4.12 shows that, while changes in the capital share do not correlate with variation in income inequality, changes in income composition inequality and in capital income inequality are rather correlated. In particular and most important, variation in

income composition inequality is *negatively* correlated with variation in income inequality, whereas variation in capital inequality is positively correlated with it.

We set up an alternative model specification (shown in column 2 of Table 4.12) in which the absolute change in capital income (movement (a)) is replaced by its product with the elasticity $2(\tilde{\mu}_w - \tilde{\mu}_\pi)$, as in equation 3.5. This modification can be interpreted as introducing a weight on $\Delta\pi$ that reflects the degree of its *condition of transmission*. Formally, this modified specification reads:

$$\Delta\mathcal{G} = \beta_1 \times 2(\tilde{\mu}_w - \tilde{\mu}_\pi)\Delta\pi + \beta_2 \times \Delta\mathcal{I}_f(\boldsymbol{\pi}) + \beta_3 \times \Delta\mathcal{G}_\pi + \epsilon. \quad (4.3)$$

The results reported in column (2) of Table 4.12 show that the newly introduced term $2(\tilde{\mu}_w - \tilde{\mu}_\pi)\Delta\pi$ appears to be more correlated with variation in income inequality than $\Delta\pi$ was in the first specification. Additionally, $2(\tilde{\mu}_w - \tilde{\mu}_\pi)\Delta\pi$ is positively correlated with variation in income inequality, which is in line with equation 3.5. In fact, equation 3.5 predicts that if the IFC index is positive (which is indeed the case here), then an increase in the capital share positively affects the Gini coefficient.

The results from Table 4.12 highlight how changes in the degree of income composition inequality (movement (b), the second term in both model specifications) correlates with changes in income inequality. Specifically, the negative correlation between the variation in these two variables stresses a very important aspect: the reduction in income inequality caused by redistribution policies designed to transfer income from the top to the bottom of the distribution in the form of labor income simultaneously is associated to a rise in income composition inequality. The latter happens because such policies hamper the degree of concentration of both labor income at the bottom and of capital income at the

4.8. Appendix

top of the income distribution, as shown by the areas of the concentration curves for capital and labor.

Income Inequality by Region

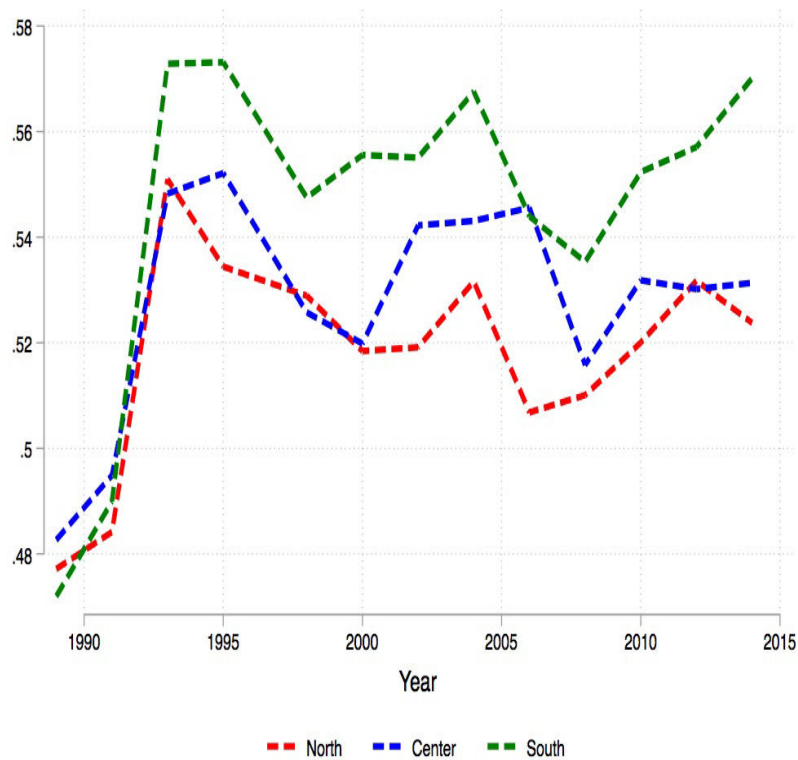


Figure 4.14: The series of the net income Gini coefficient for North, Center and South Italy, 1989-2016, constructed using data from SHIW. The definition of income considered here is Y_2 .

4.8.3 North-South divide

The origins of the regional divide between Northern-Center and Southern Italy (including the islands) can be considered "one of the oldest and most controversial issues in Italian economics and politics" (Federico et al., 2017). The long-lasting backwardness of the southern part of the country is well documented in the economic history literature (for an overview, see Felice, 2018) and supported by the vast range of statistical indicators reflecting low regional performance, for example: lower per capita disposable income (13512 euros against 21307 euros in the North); a lower share of individuals having completed tertiary education (20.7% against 28.6% in the North); and a lower employment

Income Composition Inequality by Region

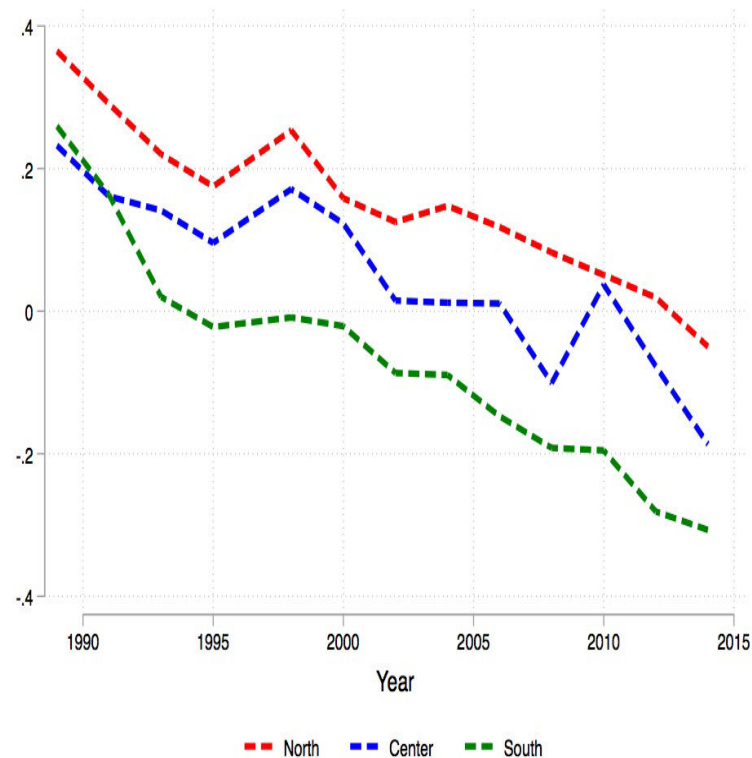


Figure 4.15: The series of the income factor concentration index for North, Center and South Italy, 1989-2016, constructed using data from SHIW. The definition of income considered here is Y_2 (i.e., individuals are ranked according to Y_2).

rate (47% against 70.6% in the North)¹⁰

Figure 4.14 reports the evolution of the Gini coefficient under the definition of income employed in this work. The three regions or macro areas (North, Center and South) display a rather similar *pattern* of income inequality, with a sharp increase in 1991 due to the currency and financial crisis that occurred at that time, and a stable decline from 1995 onward.

Although the patterns of income dispersion within each area show very similar dynamics, the movement of income *composition* inequality highlights important differences across

¹⁰These data refer to 2016 and can be found at the official ISTAT webpage (www.istat.it).

Area of the Concentration Curve for Capital by Region

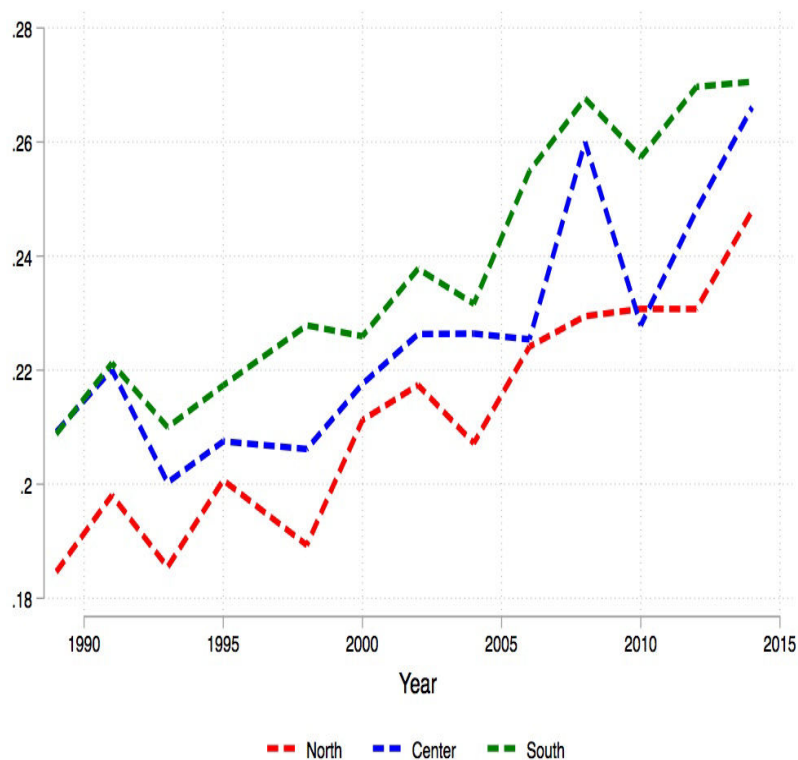


Figure 4.16: The series of the area of the concentration curve for capital for North, Center and South Italy, 1989-2016, constructed using data from SHIW. The definition of income considered here is Y_2 (i.e., individuals are ranked according to Y_2).

Italy. Figure 4.15 shows the evolution of the *IFC* series over the time period considered.

Interestingly, the level of income composition inequality is lower in the South than in the Center and the North throughout the period considered. However, its decreasing trends for all areas perfectly reflect the national trend. The entire Italian economy is hence moving towards a new type of capitalism, characterized by multiple sources of income for an increasing number of individuals.

How can this evidence be interpreted? The series portray a dichotomous Italy, with higher *concentration* of income sources in the North and Center areas. Borrowing again the definitions from Milanovic (2017) as done in Section 4.3, the evidence in this Section

Area of the Concentration Curve for Labor by Region

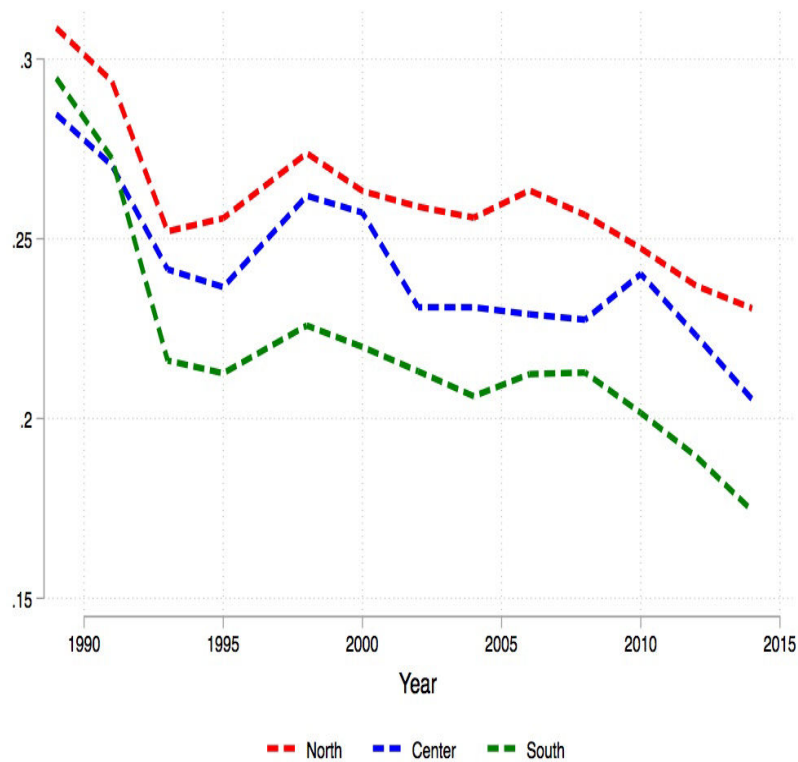


Figure 4.17: The series of the area of the concentration curve for labor for North, Center and South Italy, 1989-2016, constructed using data from SHIW. The definition of income considered here is Y_2 (i.e., individuals are ranked according to Y_2).

indicates that Italy is divided into a *Northern Classical Capitalism* and a *Southern New Capitalism*. This suggests that the effect of changes in the capital share of income on personal inequality would be stronger in the former than in the latter area.

In conclusion, an aspect that can be relevant for future research, although it lies outside the scope of this Chapter, is as follows: *low* levels of income composition inequality are associated with *high* levels of the unemployment rate, as illustrated in Figure 4.18. The causality behind this association has to be more properly understood in future research.

IFC and Unemployment rate by Region

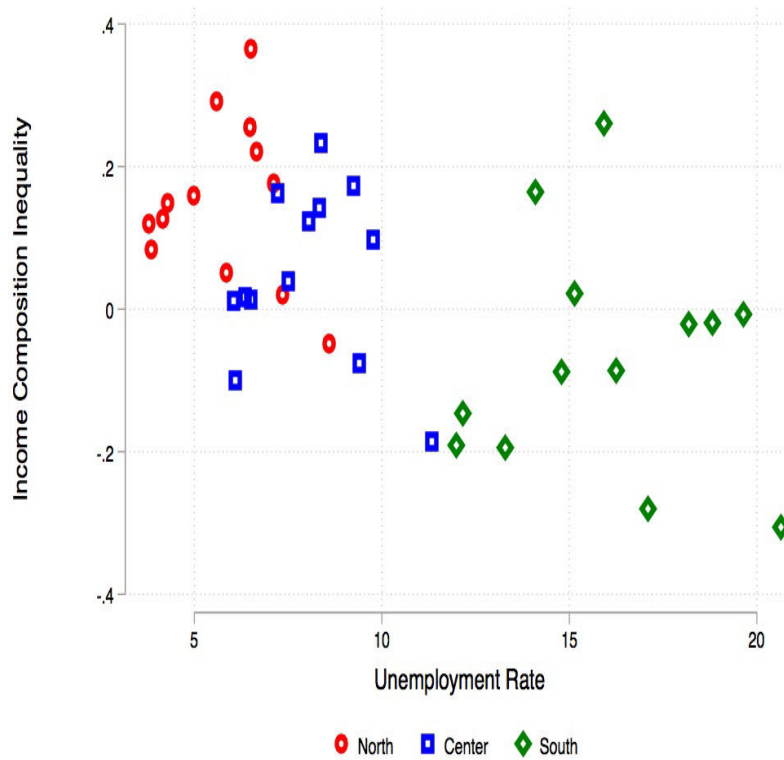


Figure 4.18: The scatter plot of the income-factor concentration index and unemployment rate for North, Center and South Italy. The definition of income considered here is Y_2 .

4.8.4 A simple model

This Appendix develops a partial-equilibrium model whose rationale is simply to provide a more thorough explanation of Proposition 4.6.1. Specifically, in what follows we show that under incomplete information regarding changes in the functional income distribution and the level of income composition inequality, an inequality-averse social planner can choose a sub-optimal vector of taxes to reduce income inequality in the society.

For the sake of simplicity, consider an economy composed of 2 agents, A and B, with total income Y_A and Y_B , respectively. Total income in the economy is the sum of capital and labor income, $Y = \Pi + W$. The two agents may hold shares of each income source,

as follows:

$$Y_A = \alpha_A \Pi + \beta_A W,$$

$$Y_B = \alpha_B \Pi + \beta_B W.$$

where α_A , α_B , β_A and β_B are the relative shares of capital and labor of each agent. The utility function of agent $i = A, B$ is given by:

$$U_i(Y) = \log(Y_i). \quad (4.4)$$

Assume that the social planner of this society is inequality-averse á la Rawls, hence she maximizes the following social welfare function (SWF):

$$\max_{\{Y_A, Y_B\}} SWF = \max \min\{Y_A, Y_B\}. \quad (4.5)$$

In the following, a baseline and an alternative scenario will be analyzed.

Baseline Scenario

In this baseline scenario, we assume the following: $0 < Gini < 1$; $\Delta \Pi = 0$; $Y_A > Y_B$; $\alpha_A = 1$, $\alpha_B = 0$, $\beta_A = 0$, $\beta_B = 1$, hence $Y_A = \Pi > Y_B = W$. Income composition inequality is therefore maximal and no changes in the factor shares will occur between $t = 1$ and $t = 2$.

Suppose that at $t = 1$ the Rawlsian social planner seeks to reduce the positive level of income inequality, although she is unaware of the high degree of income composition inequality in the society.

Therefore, in order to reduce income inequality, the Rawlsian social planner finds optimal to transfer income between agents. This can be formalized by the following maximization

problem:

$$\max_{\{Y_A, Y_B\}} SWF = \max \min\{Y_A, Y_B\}, \quad (4.6)$$

subject to the constraint given by the following balanced government budget:

$$t_\pi \Pi + t_w W = \Omega, \quad (4.7)$$

where Ω represents the value of the redistributive transfer.

This maximization problem ends only when full equality of incomes between agents is achieved. Hence, the SWF is maximal when:

$$Y_A(t_\pi, t_w) = Y_B(t_\pi, t_w). \quad (4.8)$$

By solving the maximization problem we can find the following result

$$\Pi(1 - t_\pi) = W(1 - t_w). \quad (4.9)$$

The optimal vector of taxes $\mathbf{t}^*(t_\pi, t_w)$ that solves this problem is not unique. For simplicity, we assume that the Rawlsian social planner intends to redistribute by moving income from the rich to the poor solely. Hence, by substituting $t_w = 0$ we find that $\mathbf{t}^*(t_\pi, t_w) = [\frac{\Pi - W}{\Pi}; 0]$. At time $t = 2$, the optimal vector of taxes \mathbf{t}^* reduces income inequality, as measured by the Gini coefficient, to 0. In other words, in the baseline scenario with unchanged factor shares of income, knowledge of the degree of income composition inequality was irrelevant for the social planner.

Alternative scenario

In this alternative scenario, we further assume that: $\Delta\Pi > 0$ and $\Delta W < 0$. Hence, changes in the factor shares will occur between $t = 1$ and $t = 2$, and income composition

inequality is still maximal.

In time $t = 1$, since the Rawlsian social planner is unaware of the role played by the degree of income composition inequality, she adopt the same redistribution policy described in the baseline scenario, given by the optimal vector of taxes $\mathbf{t}^*(t_\pi, t_w) = [\frac{\Pi-W}{\Pi}; 0]$ and the corresponding transfer Ω^* .¹¹

At this point, the positive degree of income composition inequality implies that the change in the factor income shares has a substantial effect on income inequality, invalidating the optimality of the specific redistribution policy derived in the baseline scenario.

Indeed, in $t = 2$ equality of incomes between agents would be ensured by $\mathbf{t}^{**}(t_\pi, t_w) = [\frac{\Pi'-W'}{\Pi'}; 0] \neq [\frac{\Pi-W}{\Pi}; 0] = \mathbf{t}^*(t_\pi, t_w)$ since $\frac{\Pi'-W'}{\Pi'} > \frac{\Pi-W}{\Pi}$. Such result invalidates the optimality of the redistribution policy of the baseline scenario. In other words, having a knowledge of the degree of income composition inequality in the society has proved to be crucial in determining equality in incomes in the society.

¹¹Note that after the redistribution policy adopted by the social planner, the level of income composition inequality has decreased given that the poor agent has received some capital income. However, the level of income composition inequality remains still positive.

Chapter 5

Distributional Aspects of Economic Systems

Abstract: This Chapter proposes a methodology to jointly analyze the distributions of capital and labor and of saving and consumption across the population. Hinging on the novel concept of *income composition inequality* and on its technical assessment through a specific indicator, this Chapter classifies economic systems by bringing together these two distributions in a two-dimensional box. Economic systems can be classified as *Kaldorian Systems* or as *Representative Agent Systems* depending on their position in the box. In a Kaldorian Systems the rich individuals save capital income and the poor individuals consume labor income. In a Representative Agent Systems all individuals are identical in terms of ownerships and behaviors. The Chapter illustrates this methodology via an empirical application to the European context, in which two major clusters of economic systems - *Mediterranean* and *Northern European* - emerge. Furthermore, this Chapter shows how the classification proposed can be useful in understanding a country's long-run performance in terms of capital accumulation, inequality and growth.

5.1 Introduction

Distributional aspects of economic systems are fundamental to understand long-term trajectories of countries' macroeconomic performances. In his pioneering work, [Kuznetz \(1955\)](#) advanced the hypothesis of the inverted-U shaped relationship between economic growth and income inequality. More recently, [Piketty \(2014\)](#) has formulated a fundamental inequality law, whereby the growth rate of the economy is generally lower than the rate of capital accumulation. These important studies reflect upon two key elements of modern economic systems: The distribution of income across individuals, and individuals' ability to accumulate wealth over time. This brings our attention to the distribution of capital and labor, and to the distribution of saving and consumption across the income distribution.

Indeed, the distribution of capital and labor across the population provides precious information not only on the gap between the rich and the poor, but also on the *type* of gap that is present. A capital-rich person is (economically) different from a labor-rich person in a number of ways. Capital-rich and labor-rich people have a different command over resources, and occupy different roles in society.¹ The distribution of saving and consumption, instead, makes us understand which people manage to save an important share of their income, and which people do not.

From a more technical perspective, the distribution of capital and labor among individuals can be considered ranging between two extreme distributions, structured in the following way: The capital is owned by the top (or bottom) and the labor is owned by the bottom

¹For instance, we can consider an aerospace engineer, who approximately earns a gross salary of 100.000\$ per year in the US, as labor-rich and the owner of a factory, who has the power to hire and fire other workers, as capital-rich.

(or top),² and both factors are evenly distributed across the population.³ Likewise, the distribution of saving and consumption ranges between two extreme distributions which are similar in nature. The interaction between these two distributions or, in other words, between *endowment* and *choice* represents the core of this Chapter.⁴ Specifically, we propose a methodology which summarizes information regarding heterogeneity in individuals' income composition as well as in their saving and consumption decisions within an economic environment. Then, by taking this method to data, we show that heterogeneity *matters* and is *country specific*.

The method we propose hinges on the concept of *income composition inequality*, and on its technical assessment via the *income-factor concentration index* \mathcal{I}_f (IFC), developed in Chapter 2.⁵ Specifically, we first introduce the concept of *saving and consumption composition inequality*, which, similarly to that of income composition inequality, studies how unequally saving and consumption composition is distributed across the population. We then define the *saving and consumption concentration index* $\mathcal{I}_{s/c}$ (SCC), which is constructed as the IFC index, by means of specific concentration curves. Secondly, we combine these two dimensions of concentration, thus the IFC index and SCC index, to

²This distribution reflects the condition of maximum-concentration of income sources as shown in Chapter 2, and corresponds to the *classical capitalism*, as defined by Milanovic (2017).

³The second extreme distribution, in which both factors are evenly distributed across the population, is defined given (i) the way total income is distributed, and (ii) the total amount of capital and labor in the economy. This distribution correspond to the condition of zero-concentration of income sources as proposed in Chapter 2, as well as to the *new capitalism 2* described by Milanovic (2017).

⁴The term *choice* is here referred to the decision of saving and consuming of an individual.

⁵The IFC index measures the extent to which two income sources are separately earned by the top and the bottom of the income distribution, or rather they are jointly earned by each individual, as described by the two extreme distributions previously discussed. The higher the IFC, the stronger the link between the functional and the personal distribution of income. Furthermore, when the IFC is high, changes in the factor shares have a strong impact on personal income inequality.

5.1. Introduction

construct a 1×1 box. Every point in the box corresponds to a specific pair of the two indices. In particular, when $(\mathcal{I}_f, \mathcal{I}_{s/c}) = (1, 1)$, the economic system is composed by a group of rich people that own the capital and save, and by a group of poor people that earn the labor and consume. On the contrary, when $(\mathcal{I}_f, \mathcal{I}_{s/c}) = (0, 0)$, every individual has the same population shares of capital, labor, consumption and savings. We label these two extremes as *Kaldorian System* and as *Representative Agent System*.

This method allows us to synthesize, in a simple and straightforward manner, information on households' heterogeneity in terms of income composition and of consumption and saving decisions. From an empirical perspective, we show that the Representative Agent System is well suited to describe the country of *Sweden*, whereas the Kaldorian System to describe the countries of *Italy*, *Portugal* and *Greece* within the European context.

Understanding the relative position of a country in the box can be useful to foresee the same country's macroeconomic dynamics, as well as the way the benefits from macroeconomic outcomes are distributed across the population. For instance, it can be shown that savings out of capital income are greater in Kaldorian Systems than in Representative Agent Systems. Furthermore, information on the relative position of a country in the box, if embedded in macroeconomic models, allows for a higher degree of realism in terms of households' heterogeneity. In this regard, it is shown in the Chapter that the two indices emerge from a simple Kaldorian model of distribution and growth.

For all these reasons, we believe our method can provide us with a direct link between *institutional setting* and *macroeconomic performances* of economic systems; a link which is dynamic by nature. The institutional aspect of economic systems emerges from our em-

pirical investigation (Section 5.5.6), which highlights the presence of two major clusters of countries: the *Mediterranean* cluster and the *Northern European* cluster. The countries' macroeconomic performances, instead, depend on their relative position in the box (as discussed in Section 5.3), which can potentially change over time, underlying the dynamic nature of this link.

This Chapter is structured as follows. Section 5.2 discusses the related literature. Section 5.3 introduces the methodology. Section 5.4 illustrates the notions of *behavior-* and *distribution-led inequality regimes*. Section 5.5 provides the first estimation of the European countries' position in the box using EU-SCIL and HBS data. Section 5.6 concludes.

5.2 Related Literature

The present Chapter builds on two different strands of research. The *first* strand is the macroeconomics of income distribution. Classical economists such as Kaldor and Kalecki used to pay a great deal of attention to the way capital and labor were distributed among the various classes in society. Moreover, they used to make precise assumptions according to the way individuals from each social class save and consume their income. For instance, in his pioneering work, Kaldor (1955) assumes the marginal propensity to save of the capitalists, who draw their income from capital, to be higher than the marginal propensity to save of the workers, who draw their income from labor. This assumption influences the long-run trajectories of both the capital share of income and the rate of profit in the economy. Hinging on Kaldor 1955's piece, Pasinetti (1962) wrote an article in which, by allowing also the workers to earn some profits, he proves that the steady-state capital output ratio, the capital labour ratio and the share of income going to capital

5.2. Related Literature

are independent of the propensity to save of the workers (Pasinetti Theorem). Pasinetti 1962's article has been subsequently subject to the critique by [Samuelson and Modigliani \(1967\)](#), who show the conditions under which an Anti-Pasinetti outcome can occur in a neoclassical framework.⁶

The interest on distributional issues have subsequently decreased after the neoclassical theoretical development. Indeed, as stated by [Bertola et al. \(2006\)](#), “crucial progress in microfounding behavioral relationships in terms of optimal choices and expectations accompanied heavy reliance on “representative agent” modeling strategies. The distribution of income and wealth across consumers was viewed as a passive outcome of aggregate dynamics and market interactions, and little attention was paid to feedback effects from distribution into growth and other macroeconomic phenomena”.

However, an important revival of interest on distributional issues has then taken hold also within the neoclassical tradition. The early works of [Stiglitz \(1967; 1969\)](#) and [Atkinson \(1975\)](#) studied the dynamics of income and wealth distribution in neoclassical models of capital accumulation.⁷ Particularly, [Stiglitz \(1969\)](#) developed a theory of distribution of wealth and income among individuals, to study the forces for equality under alternative assumptions about the shape of the consumption function, heterogeneity of labor skills and endowments, inheritance policies and the rate of reproduction.

While the pioneering work by [Stiglitz \(1969\)](#) was based on a model of accumulation,

⁶The Anti-Pasinetti outcome refers to the result whereby the average product of capital completely depends on the propensity to save of the workers, and not on that of capitalists. Samuelson and Modigliani illustrate in their article that the Pasinettian conditions whereby the propensity to save of the workers must be lower than that of the capitalists, and that the capital stocks of both the capitalists and the workers must be non-negative, tend to be extremely unrealistic within a neoclassical framework. Moreover, the Anti-Pasinetti case can also occur as a result of financing a public good with capital taxes (see [Mattauch et al., 2018](#)).

⁷See [Bertola et al., 2006](#), for a survey of the related literature.

5.2. Related Literature

[Aiyagari \(1994\)](#) presented a version of the neoclassical growth model with idiosyncratic but no aggregate risk. Aiyagari's model, which was a further development of the model proposed by [Bewley \(1986\)](#), has then become a leading model for modern dynamic macroeconomics. The underlying intuition of the model is that, in an economy populated with heterogeneous infinitely lived agents, adverse income shocks caused by borrowing constraints and fluctuations in consumption can be mitigated only by precautionary savings. As a result of individuals' heterogeneity in both income levels and income shocks, the Aiyagari's model generates different equilibrium cross-section distributions of wealth, saving and consumption. Furthermore, the novelty of [Aiyagari \(1994\)](#)'s article was also related to the development of numerical techniques to solve the dynamic model proposed. After Aiyagari's article, several computational models of the income and wealth distributions in general equilibrium have been formulated,⁸ until the more recent HANK models.⁹ More recently, [Stiglitz \(2015\)](#) has published a series of four articles with novel theoretical perspectives on the distribution of income and wealth among individuals. Following the Kaldor's fact,¹⁰ these four papers aim at explaining a new set of stylized facts. According to Stiglitz, five empirical observations feature prominently in our contemporary societies, namely: (i) the growing inequality in both wages and capital income (wealth),

⁸See [Heathcote et al., 2009](#), for a review of the literature.

⁹The HANK models, or Heterogeneous Agent New Keynesian models, combine New Keynesian models with Bewley models. They are based on three building blocks: uninsurable idiosyncratic income risk, nominal price rigidities and assets with different degrees of liquidity.

¹⁰In an influential paper written in 1957, Kaldor described the properties of long-term economic growth by means of empirical findings of that time. Specifically, Kaldor pointed out six statements about economic growth, namely: (i) the shares of national income received by labor and capital are roughly constant over long periods of time; (ii) the rate of growth of the capital stock per worker is roughly constant over long periods of time; (iii) the rate of growth of output per worker is roughly constant over long periods of time; (iv) the capital/output ratio is roughly constant over long periods of time; (v) the rate of return on investment is roughly constant over long periods of time; (vi) there are appreciable variations (2 to 5 percent) in the rate of growth of labor productivity and of total output among countries.

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and growing inequality overall; (ii) the fact that wealth is more unequally distributed than wages; (iii) the stagnation of average wages, even as productivity has increased, so the share of capital has increased; (iv) the significant increases in the wealth income ratio; (v) the fact that the return to capital has not declined, even as wealth-income ratio has increased. Stiglitz argues that these stylized facts can be described by slightly modifying the old models of distribution and growth.

Outside of the neoclassical approach to macroeconomics, a large number of macroeconomic models of distribution have been proposed thus far. [Bhaduri and Marglin \(1990\)](#) is an important example in this respect.¹¹ This is a post-Kaleckian model capable of generating different regimes of demand and growth, as well as to establish relationship between the functional distribution of income and macroeconomic variables such as the capacity utilization, the capital accumulation, growth and the rate of profit.

Along similar lines, [Carvalho and Rezai \(2016\)](#) have studied the effect of changes in the size distribution of income on both aggregate demand and demand regime of an economy, whereas [Jump \(2017\)](#) has extended the textbook IS-LM and IS-MP models to allow them for a short-run effect of an increase in household income inequality, as measured by the coefficient of variation. Furthermore, the emerging literature on agent-based modeling is putting at the forefront the issue of income distribution, as we can see from the works of [Cardaci and Saraceno \(2015\)](#) and [Roventini et al. \(2017\)](#).¹²

Our work differs from those previously discussed in two ways. Firstly, we adopt a *measurement-based* approach to deal with the issue of households' heterogeneity in terms of income

¹¹For a complete analysis of the post-Keynesian approaches to distribution and growth, see [Hein \(2014\)](#).

¹²The agent based models are classes of computational models that simulate the interactions of different agents in a complex environment.

5.2. Related Literature

composition (i.e., the joint distribution of labor and capital income across the population) and propensities to save and consume. In fact, instead of assuming specific saving functions (as illustrated by [Stiglitz, 1969](#)), or specific joint distributions of labor and capital income across the income ranking, we rely on appositely created indicators capable of capturing these two types of heterogeneity in a straightforward manner. Then, by estimating these indicators for a group of European countries,¹³ we can classify these countries as Kaldorian Systems (high level of both indicators) or as Representative Agent System (low level of both indicators). Secondly, we show that these metrics formally emerge from a Kaldorian model of distribution and growth. The latter result shows that the type of economic system (Kaldorian vs Representative Agent) in place is relevant in determining the same country's long-run macroeconomic performances. We believe that the choice of a specific model of growth and accumulation should therefore be made with an eye on the type of economic system analyzed. For instance, it directly follows from our result that Italy can be better described by a Kaldorian model of accumulation and growth, whereas Sweden by a representative agent model.

The *second* strand is the distribution of saving and consumption across the population from an empirical perspective. Many scholars have already explored this issue, such as [Lawrance \(1991\)](#), [Attanasio \(1994\)](#), [Dynan et al. \(2004\)](#), [Carvalho and Rezai \(2015\)](#), [Piketty and Zucman \(2015\)](#), [Saez and Zucman \(2016\)](#), [Spath and Schmid \(2016\)](#). The previous works show that, although in different contexts, the households' propensity to save is an increasing function of households' total income.

In line with this result, we find that the SCC index is positive for all European countries

¹³The countries we analyze are: Germany (DE), Greece (EL), Finland (FI), France (FR), Ireland (IE), Italy (IT), Portugal (PT), Sweden (SE) and United Kingdom (UK).

considered in 2010, meaning that a large share of total savings in the economy is concentrated in the hands of those at the top of the income ranking, whilst the people at the bottom consume more than those at the top relatively to their income.

In addition to that, we find a strong and negative correlation between the SCC and the saving rate. Hence, countries with a low saving rate are also characterized by a high level of saving and consumption composition inequality.

5.3 Methodology

5.3.1 Saving and Consumption Composition Inequality

In this Section, we define the concept of saving and consumption composition inequality, which directly hinges on the concept of income composition inequality proposed in Chapter 2. These two concepts are then put together (Section 5.3.2) to design the box previously discussed.

We say that saving and consumption composition inequality is high when the top and the bottom of the income distribution separately save and consume, and low when all people in the population save and consume in the same way. Formally, we define the *saving and consumption concentration index*, $\mathcal{I}_{s/c}(s)$, as follows:

$$\mathcal{I}_{s/c}(s) = \frac{sc(\tilde{\mu}_c - \tilde{\mu}_s)}{\mathcal{B}(s)}, \quad (5.1)$$

where s is the saving rate, c is the consumption rate, $\mathcal{B}(s)$ is a normalization coefficient and $\tilde{\mu}_c$ and $\tilde{\mu}_s$ are the areas of the concentration curves for consumption and saving respectively. The construction of the saving and consumption concentration index hinges

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on the following individual i 's income decomposition:

$$y_i = \delta_i s + \gamma_i c, \quad (5.2)$$

where $\delta_i = \frac{S_i}{S}$ and $\gamma_i = \frac{C_i}{C}$ are the relative shares of individual i 's income consumed and saved respectively.

We can further observe there is a mathematical relationship between the $\mathcal{I}_{s/c}(s)$ and individuals' propensities to save and consume for specific values of the $\mathcal{I}_{s/c}(s)$. When $\mathcal{I}(s)_{s/c} = 0$, then the propensity to save of each individual in the population is equal to the total saving rate s , thus $\mathcal{P}_s(i) = \frac{S_i}{Y_i} = s \forall i$.¹⁴ Conversely, when $\mathcal{I}(s)_{s/c} = \{1, -1\}$, then $\mathcal{P}_s(i)$ takes specific functional forms. In particular, when $\mathcal{I}(s)_{s/c} = 1$, then we have:

$$\mathcal{P}_s(i) = \begin{cases} 0 & \text{for } p \leq p' \\ 1 & \text{for } p > p' \end{cases}$$

with p' s.t. $\mathcal{L}(\mathbf{y}, p') = c$, and when $\mathcal{I}(s)_{s/c} = -1$:

$$\mathcal{P}_s(i) = \begin{cases} 1 & \text{for } p \leq p'' \\ 0 & \text{for } p > p'' \end{cases}$$

with p'' s.t. $\mathcal{L}(\mathbf{y}, p'') = s$, where $\mathcal{L}(\mathbf{y}, p)$ is the Lorenz curve for income.

¹⁴When $\mathcal{I}(s)_{s/c} = 0$ then $\frac{S_i}{C_i} = \frac{S}{C} \forall i$, therefore we can write that $y_i = \delta_i s + \gamma_i c = \epsilon_i (s + c) = \epsilon_i \forall i$, given that $s + c = y = 1$. We can thus conclude that $\frac{Y_i}{Y} = \frac{S_i}{S} \forall i$, which implies that $\mathcal{P}_s(i) = \frac{S_i}{Y_i} = \frac{S}{Y} = s \forall i$.

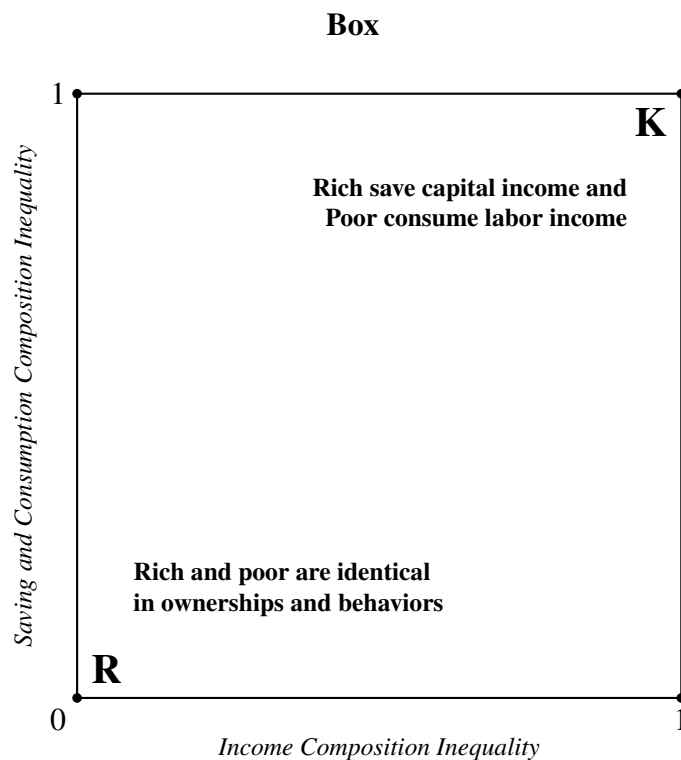


Figure 5.1: This box displays all combinations of the two indices $\mathcal{I}_{s/c}(s)$ and $\mathcal{I}_f(\pi)$ for a given society at a point in time. Note that the analysis is restrained to the positive values of the two metrics only. Point **K** represents the *Kaldorian System*, in which both income composition inequality and saving and consumption composition inequality are maximized. On the contrary side, point **R** displays the *Representative Agent System*, in which both dimensions are equal to zero. Under point **K** we expect a high level of saving out of capital income at the top of the distribution and under point **R** a low level. In point **K** the link between income inequality and both the saving rate and the factor shares is strong, while it is weak in point **R**.

5.3.2 The Box

In this Section, we illustrate a novel tool which summarizes information regarding heterogeneity in individuals' income composition as well as in their saving and consumption decisions within an economic environment.

This tool is a 2×2 box (see Figure 5.1) which displays all possible combinations of the two previously discussed indicators, namely $\mathcal{I}_f(\pi)$ and $\mathcal{I}_{s/c}(s)$. It is worth mentioning that, although the value of the two indicators ranges between -1 and 1 , it is unlikely that they take negative values, as it will be clear in the empirical Section. These two indicators act

as measures of individuals' heterogeneity in income composition and consumption and saving decisions, respectively. Note that, to be more precise, we should refer to heterogeneity in the distribution of income composition and in the distribution of saving and consumption across the population.

To understand the functioning of this box, let us focus on some of its representative points. For the seek of simplicity, in what follows, we assume to be in an artificial economic system composed of two individuals, each endowed with the same level of income (i.e., $y_1 = y_2$). In addition, we further assume that the capital share of income is equal to the saving rate, both equal to $\frac{1}{2}$ (i.e., $\pi = s = \frac{1}{2}$). These assumptions allow us to keep the analysis as simple as possible, and do not undermine the generality of the argument.

The Kaldorian System

Point **K** = (1, 1) represents the *Kaldorian System*. In point **K** both indices are equal to one, meaning that one person owns the capital and saves it, whilst the other person earns the labor and consumes it. In a system as such, an increase in the capital share of income, or in the saving rate, directly rises income inequality, as the total amounts of capital or saving in the economy are concentrated in the hands of a single person only.

Formally, we can write that $y_1 = c = w$ and $y_2 = s = \pi$, and thus an increase in the capital share of income π boosts the income of individual 2, by in turns hampering income inequality in the economy. In addition, note that *total saving out of capital income*, π_s , is equal to $\frac{1}{2}$, suggesting that all capital in the economy is saved.¹⁵

We can therefore argue that the Kaldorian System is characterized by the highest level of capital accumulation at the *top* of the income distribution. Additionally, in point **K** the

¹⁵This result follows from the fact that $y_2 = \pi = s = \frac{1}{2}$.

relationship between income inequality and both the functional income distribution and the saving and consumption rates is very strong.

This particular allocation of income sources and of saving and consumption across the population is similar to the one proposed by Kaldor in his article on alternative theories of income distribution (Kaldor, 1955).¹⁶ It is undoubtedly very difficult to find a similar society nowadays. For this reason, we should consider it for its figurative power only.

Point **A-K** is the *Anti-Kaldorian System*, in which individual 1 takes the place of individual 2 and *viceversa*. Obviously, having assumed that both individuals have the same income level, there is no substantial difference between **K** and **A-K** given the anonymity principle. However, once we relax such assumption, an increase in the capital income share or in the saving rate would reduce income inequality in **A-K**.

The Representative Agent System

Let us now turn to the center of the Box. Point **R** = (0,0) identifies what we call the *Representative Agent System*. In **R** each individual has the same population shares of capital and labor, consumption and saving.¹⁷

An increase in the capital share of income, or rather in the saving rate does not affect personal income inequality. The saving out of capital income π_s is therefore lower or equal than $\frac{1}{4}$ (i.e., $\pi_s \leq \frac{1}{4}$) and, in turn, lower than in the Kaldorian System.¹⁸ We expect this kind of system to be characterized by a lower rate of capital accumulation at the top of the

¹⁶The main difference between our Kaldorian System and the one defined by Kaldor in his 1955's article relies on the fact that Kaldor allows the workers to save out of their labor income.

¹⁷Formally, we can notice that the Representative Agent System respects the following two conditions: $\frac{\pi}{w} = \frac{\Pi_i}{W_i}$ and $\frac{s}{c} = \frac{S_i}{C_i} \forall i$.

¹⁸Each individual saves only half of her income, which is composed by capital and labor in the same proportion. Therefore, the total amount of savings from capital income can be at maximum $\frac{1}{4}$.

income ranking. To note that the level of income inequality in this society is not determined by changes in the functional income distribution or in the saving and consumption rates.

When we move from point *K* to point *R* we go from a *class-based* to a *representative-agent-based* system. This consideration sheds new light on the possibility to design country-specific macroeconomic models depending on the countries' relative position in the box. For instance, if country *A* is in point *R*, then we can further assume that a representative agent (in terms of individuals' income composition and saving and consumption decisions) model is well suited to describe country *A*'s macroeconomic performances. On the contrary side, if country *B* is in point *K*, then a *two-classes* model would be better suited to describe country *B*'s macroeconomic dynamics.

The Pasinettian System

In his 1962's article *Rate of Profits and Income Distribution in Relation to the Rate of Economic Growth*, Pasinetti introduced in a two-class Kaldorian model of distribution and growth the hypothesis whereby also the workers may be in possession of some capital income. In fact, Pasinetti argues that "when any individual saves a part of his income, he must also be allowed to own it, otherwise he would not save at all [...] And since ownership of capital entitles the owner to a rate of interest, if workers have saved [...] then they will also receive a share of the total profits" (pp. 270). The Pasinetti's novel formulation of the Kaldorian model shows that, in the end, capitalists determine the size of the capital stock, whereas the workers only its distribution.¹⁹

¹⁹See [Mattauch et al. \(2017\)](#) for a discussion on the Pasinetti's theorem, also in relation to the critique by [Samuelson and Modigliani \(1966\)](#).

Therefore, we refer to the *Pasinettian System* to describe economic systems characterized by mild levels of both indicators. This makes the Pasinettian System as an intermediate system lying between the two extremes previously discussed, which remain our benchmark systems. We can easily show that in the Pasinettian System the saving out of capital income varies between $\frac{1}{4}$ and $\frac{1}{2}$ (i.e., $\frac{1}{4} \leq \pi_s < \frac{1}{2}$).

5.3.3 The Macroeconomics of the Box

In this Section, we derive simple macroeconomic relations which explain some macroeconomic characteristics of the economic systems previously discussed. For simplicity, we keep the assumption whereby the economy is composed only by two groups, whose income is defined as Y_1 and Y_2 .

To begin with, let us consider the following accounting identity:

$$Y = \Pi + W, \quad (5.3)$$

where Π and W represent total capital and total labor in the economy respectively. Further, we can express total income of each group as follows:

$$Y_i = \alpha_i \Pi + \beta_i W \quad \forall i = 1, 2, \quad (5.4)$$

where $\alpha_i = \frac{\Pi_i}{\Pi}$ and $\beta_i = \frac{W_i}{W}$ are the relative shares of capital and labor of group i respectively. We define total saving of group i as S_i , hence $s_i = \frac{S_i}{Y_i}$ is the the saving rate of group i . As total saving is the sum of S_1 and S_2 , i.e., $S = S_1 + S_2$, then, after some

rearrangements, we can write:

$$S = s_1 Y_1 + s_2 Y_2 = \Pi(\alpha_1 - \beta_1)(s_1 - s_2) + Y(s_1 \beta_1 + s_2 \beta_2). \quad (5.5)$$

Now, let us consider the condition in which the system is in a (long-run) dynamic equilibrium, that is $S = I$, where I is the amount of investment necessary to withstand either population growth and technological progress. Furthermore, if we supposed to be in a closed economy without government spending, from equation 5.5 we can define both the capital share of income $\frac{\Pi}{Y}$ and the rate of profit $\frac{\Pi}{K}$ in the economy as:²⁰

$$\frac{\Pi}{Y} = \pi = \frac{1}{\alpha_1 - \beta_1} \frac{1}{s_1 - s_2} \frac{I}{Y} + \frac{s_1 \beta_1 + s_2 \beta_2}{(\alpha_1 - \beta_1)(s_1 - s_2)}, \quad (5.6)$$

and:

$$\frac{\Pi}{K} = \frac{1}{\alpha_1 - \beta_1} \frac{1}{s_1 - s_2} \frac{I}{K} + \frac{s_1 \beta_1 + s_2 \beta_2}{(\alpha_1 - \beta_1)(s_1 - s_2)} \frac{Y}{K}. \quad (5.7)$$

Equations 5.6 and 5.7 generalize the equations of the capital share and of the profit rate introduced by Kaldor (1955).²¹ The choice of $\frac{\Pi}{Y}$ and $\frac{\Pi}{K}$ as dependent variables follows directly from the works of Kaldor (1955), Pasinetti (1962), Samuelson and Modigliani (1966). Particularly, to use Kaldor's words: "The interpretative value of the model [...] depends on the "Keynesian" hypothesis that investment, or rather, the ratio of investment

²⁰Note that the term $\frac{s_1 \beta_1 + s_2 \beta_2}{(\alpha_1 - \beta_1)(s_1 - s_2)}$ can also be written as $\frac{\beta_1}{\alpha_1 - \beta_1} + \frac{s_2}{(\alpha_1 - \beta_1)(s_1 - s_2)}$.

²¹In his pioneering work, Kaldor develops what we can define as the Post-Keynesian theory of income distribution and of the rate of profit. In his article, the author assumes *maximum concentration of income sources* among the two groups, as $Y_1 = \Pi$ and $Y_2 = W$. This assumption is equivalent to say that $\alpha_1 = 1$ and $\beta_2 = 1$ (and, therefore, that $\alpha_2 = 0$ and $\beta_1 = 0$). Chiang (1973) proposed a threefold saving ratio model, where workers have two different propensities to save depending on the income type. In such way, Chiang shows that Kaldor's equation is a special case of his own generalization.

5.3. Methodology

to output, can be treated as an independent variable, invariant with respect to changes in the two savings propensities” (Kaldor (1955), p. 95). However, our major objective simply remains to show that an economic system’s position in the box features prominently in shaping its long-run macroeconomic outcomes. At this point of the analysis, if we further assume that $Y_1 > Y_2$, we can observe that the term $\alpha_1 - \beta_1$ is one of the three main components of the income-factor concentration index for $n = 2$ (see Chapter 2). In other words, this term is equivalent to the difference between the areas of the two concentration curves for labor and capital ($\tilde{\mu}_w - \tilde{\mu}_\pi$) in the framework with a population of size n . Therefore, we can consider the term $\alpha_1 - \beta_1$ as a proxy for income composition inequality: $\alpha_1 - \beta_1 \approx \mathcal{I}_f(\boldsymbol{\pi})$.²² Additionally, in order for the equations 5.6 and 5.7 to be economically meaningful, we shall assume that $\alpha_1 - \beta_1 > 0$. Such an assumption is reasonable as the sign of the IFC, which solely depends on $\tilde{\mu}_w - \tilde{\mu}_\pi$, is positive for all European countries (see Section 5.5).

Likewise, the term $s_1 - s_2$ can be regarded as an increasing function of saving and consumption composition inequality: When the rich save relatively more than the poor with respect to their total income, then savings are relatively more concentrated at top rather than at the bottom of the income ranking. Therefore, we can write: $s_1 - s_2 = f(\mathcal{I}_{s/c}(\mathbf{s}))$, with $\frac{\partial f}{\partial \mathcal{I}_{s/c}(\mathbf{s})} > 0$.

In light of the previous considerations, and noticing that $\frac{Y}{K} = \frac{1}{\beta}$ and $\frac{I}{K} = \dot{K}$, where β is the capital-output ratio as in Piketty (2014) and \dot{K} is the rate of capital accumulation,

²²Recall that $\alpha_1 - \beta_1$ is the determinant of $\mathbf{A} = \begin{pmatrix} \alpha_1 & \beta_1 \\ \alpha_2 & \beta_2 \end{pmatrix}$ with \mathbf{A} such that $\mathbf{Y} = \mathbf{A}\mathbf{X}$, where $\bar{\mathbf{y}} = \begin{pmatrix} Y_1 \\ Y_2 \end{pmatrix}$ and $\bar{\mathbf{x}} = \begin{pmatrix} \pi \\ w \end{pmatrix}$. Interestingly, when \mathbf{A} is an identity, then the two equations for $\frac{\Pi}{Y}$ and $\frac{\Pi}{K}$ are as in Kaldor (1955), whilst when \mathbf{A} is of the form $\begin{pmatrix} a & 0 \\ b & c \end{pmatrix}$ with $a, b, c \neq 0$, then the two equations for $\frac{\Pi}{Y}$ and $\frac{\Pi}{K}$ are as in Pasinetti (1962).

equations 5.6 and 5.7 can be further expressed as:

$$\frac{\Pi}{Y} = \pi = \frac{1}{\mathcal{I}_f(\boldsymbol{\pi})} \frac{1}{f(\mathcal{I}_{s/c}(\mathbf{s}))} \frac{I}{Y} + \frac{s_1\beta_1 + s_2\beta_2}{\mathcal{I}_f(\boldsymbol{\pi})f(\mathcal{I}_{s/c}(\mathbf{s}))}, \quad (5.8)$$

and:

$$\frac{\Pi}{K} = \frac{1}{\mathcal{I}_f(\boldsymbol{\pi})} \frac{1}{f(\mathcal{I}_{s/c}(\mathbf{s}))} \dot{K} + \frac{s_1\beta_1 + s_2\beta_2}{\mathcal{I}_f(\boldsymbol{\pi})f(\mathcal{I}_{s/c}(\mathbf{s}))} \frac{1}{\boldsymbol{\beta}}. \quad (5.9)$$

Equations 5.8 and 5.9 suggest that the levels of income composition inequality and of saving and consumption composition inequality are central to understand the long-run dynamics of the capital share of income and of the rate of profits. Particularly, if we define \mathcal{S} as follows: $\mathcal{S} = \frac{1}{\mathcal{I}_f(\boldsymbol{\pi})} \frac{1}{f(\mathcal{I}_{s/c}(\mathbf{s}))}$, then we can say that a country's position in the box, which is a function of \mathcal{S} , determines the ‘‘sensitivity of distribution’’, since it indicates the change in the share of profits in income which follows upon a change in the share of investment in output’’ (Kaldor, (1955), p. 95). Considering that \mathcal{S} is high in a Kaldorian System, and low in a Representative Agent System, four observations can be put forward:

1. A rise in the investment-to-income ratio $\frac{I}{Y}$ increases the capital share of income π more in the Representative Agent System than in the Kaldorian System,
2. In the absence of investment in the economy, the total level of capital income share π is higher in a Representative Agent System than in a Kaldorian System,
3. A rise in the capital accumulation \dot{K} increases the rate of profits $\frac{\Pi}{K}$ more in the Representative Agent System than in the Kaldorian System,
4. A rise in the capital-to-income ratio $\boldsymbol{\beta}$ reduces the rate of profits $\frac{\Pi}{K}$ more in the

Representative Agent System than in the Kaldorian System.

Let us now further analyze the observations above. The first tells us that in a Representative Agent System a sudden boost in the investment rate increases the capital income share relatively more than in a Kaldorian System. While such rise in the investment rate does not hamper income inequality in a Representative Agent System (as the composition of the two factors is equally distributed across the population), it does boost income inequality in a Kaldorian System, in which the capital income is mainly concentrated at the top end of the income ranking. It is of utmost importance now to understand how does the rise in the investment rate differently affect economic growth in the two systems. To answer this question, we recall the literature on *wage* and *profit led growth* ([Lavoie and Stockhammer, 2012](#)).²³ In a wage led growth regime an increase in the labour share will lead to an increase in GDP, whereas in a profit led growth regime an increase in the capital share will lead to an increase in GDP. According to the underlying theoretical framework, in a wage led growth regime the rise in the GDP via the increase in the labor share of income is possible thanks to the fact that total consumption is an increasing function of the labour share. On the other hand, in a profit led growth regime the rise in the GDP via the increase in the capital share is due to the fact that total investment and net exports are positive functions of the capital share. Coming back to our own framework, we can conclude that if we are in a profit led demand regime, then an increase in the investment rate leads to a higher demand (and, hence, to a higher growth) in a Representative Agent System than in a Kaldorian System. Conversely, if we are in a wage led demand regime

²³The origin of the wage led (and, hence, of the profit led) aggregate demand hypothesis can be found in the works of Michael Kalecki and Josef Steindl through the contributions of [Rowthorn \(1981\)](#), [Dutt \(1984\)](#), and [Bhaduri and Marglin \(1990\)](#) (see also [Jump and Mendieta-Munoz \(2018\)](#) for a survey).

the situation is the reverse.

Let us now focus on the third and the fourth observations and leave aside the second one, which does refer to a rather improbable scenario in which the investment rate is equal to zero.

The third observation states that when we increase the stock of capital in the economy, then the capital tends to be more profitable in a Representative Agent System than in a Kaldorian System. In other words, under an increase in the stock of capital, the capital tends to be more profitable when better distributed across the population. Instead, the fourth observation states that under a rise in the capital-to-income ratio, or the Piketty's β , the capital tends to be less profitable when it is better distributed across the population.

These results simply mean to illustrate that the two concepts of income composition inequality and saving and consumption composition inequality feature prominently in shaping the long-term relations between key macroeconomics variables, such as the capital-to-output ratio, the rate of profits, the capital share of income and the investment rate.

Although the construction of a sound macroeconomic model of the box goes well beyond the scope of our work, we believe equations 5.8 and 5.9 bring interesting insights for future research on the matter.²⁴

²⁴ A first way to forward on the macroeconomics of the box, is to build on [Stiglitz \(2015\)](#). In the third part of his collection of four NBER's articles with title "Theoretical Perspectives on the Distribution of Income and Wealth among individuals", Stiglitz extends the standard life cycle model to a world composed by workers and, also, capitalists. Similarly to a two-class model á la [Pasinetti \(1962\)](#), Stiglitz designs a model in which, in its more general formulation, workers engage in life cycle savings, and capitalists pass on wealth from one generation to another. By assuming savings of each individual i as a function of her end of period wealth \mathbf{W}_t , hence $S_{i,t} = s(\mathbf{W}_t)\mathbf{W}_t$, with $s(\mathbf{W}_t)$ be S-shaped, and the wealth dynamic to be $\mathbf{W}_t = w_t + (1 + r_t)k_t$, it is possible to extend Stiglitz's model in light of different compositions of each individual's incomes (here determined by w_t and $r_t k_t$) and of different compositions of her savings and consumption expenditures (here depending on $s(\mathbf{W}_t)$). On a similar level, [Franks et al. \(2018\)](#) also extend a Pasinetti-type model to several different types of saving behavior and different asset classes. A second way, is to build on [Carvalho and Rezai \(2014\)](#) which, building on [Taylor et al. \(2004\)](#), incorporate personal income inequality in a neo-Kaleckian model. The most interesting feature

5.4 Inequality Regimes

In this Section, we discuss how fluctuations in the saving rate and in the capital income share jointly affect income inequality. Specifically, we examine the extent to which income inequality in a given economic system is most seriously threatened by an increase in the saving rate or by an increase in the capital share. Normally, these two elasticities cannot be directly observed: They can be estimated econometrically, or through specific decomposition techniques. In what follows, we show that, by means of the methodology we adopt, it is straightforward to establish a simple relationship between these two elasticities. Precisely, they are linearly related, and their link depends on four parameters, namely: the area of the concentration curve for capital $\tilde{\mu}_\pi$, the area of the concentration curve for saving $\tilde{\mu}_s$, the capital share of income π and the saving rate s .

Formally, let us consider the following relationship, previously developed in Chapter 2:

$$\frac{\partial \mathcal{G}}{\partial \pi} = 2(\tilde{\mu}_w - \tilde{\mu}_\pi), \quad (5.10)$$

as well as its analogous but in the context of saving and consumption composition inequality:

$$\frac{\partial \mathcal{G}}{\partial s} = 2(\tilde{\mu}_c - \tilde{\mu}_s). \quad (5.11)$$

of their model for our scopes is the assumption according to which the propensity to save out of wages depends on the size distribution of income among workers.

5.4. Inequality Regimes

After manipulating equations 5.10 and 5.11 we can write:²⁵

$$\frac{\partial \mathcal{G}}{\partial \pi} = \frac{2}{w} (\tilde{\mu}_s - \tilde{\mu}_\pi) + \frac{c}{w} \frac{\partial \mathcal{G}}{\partial s}, \quad (5.12)$$

which can also be written as:

$$\frac{\partial \mathcal{G}}{\partial \pi} = A + B \frac{\partial \mathcal{G}}{\partial s},$$

where $A = \frac{2}{w} (\tilde{\mu}_s - \tilde{\mu}_\pi)$ and $B = \frac{c}{w}$. We label equation 5.12 as *Double-Elasticity Equation (DEE)*, which establishes a linear relationship between the two elasticities.²⁶ When $B > 1$ (thus $\pi > s$), then we can say that $\forall \frac{\partial \mathcal{G}}{\partial s} > \frac{2(\tilde{\mu}_s - \tilde{\mu}_\pi)}{(s - \pi)} \equiv \mathcal{X}$ the elasticity of income inequality to changes in the capital share is greater than the elasticity of income inequality to changes in the saving rate ($\frac{\partial \mathcal{G}}{\partial \pi} > \frac{\partial \mathcal{G}}{\partial s}$). Conversely, when $B < 1$ then $\forall \frac{\partial \mathcal{G}}{\partial s} > \mathcal{X}$ and the contrary situation holds true. Note that when $B = 1$, to compare the two elasticities we only need to check whether the term $\tilde{\mu}_s - \tilde{\mu}_\pi$ is greater or lower than zero.

Figure 5.2 provides an illustration of the **DDE** when $A > 0$ and $B < 1$. The latter two conditions describe an economic system in which the capital distribution is worse than the saving distribution across the population ($\tilde{\mu}_s > \tilde{\mu}_\pi$), and the capital share of income is greater than the saving rate ($\pi > s$).

Now, we can define the *behavior-led* and *distribution-led* inequality regimes as follows.

Definition 5.4.1. *We are in a behavior-led inequality regime (BLI) when $\frac{\partial \mathcal{G}}{\partial s} > \mathcal{X}$, whilst*

²⁵Note that $\tilde{\mu}_y = \pi \tilde{\mu}_\pi + w \tilde{\mu}_w$ and thus we can easily find $\frac{\partial \mathcal{G}}{\partial \pi} = \frac{2}{w} (\tilde{\mu}_y - \tilde{\mu}_\pi)$. By expressing $\frac{\partial \mathcal{G}}{\partial s}$ in the same way (i.e. $\frac{\partial \mathcal{G}}{\partial s} = \frac{2}{c} (\tilde{\mu}_y - \tilde{\mu}_s)$), and by solving the system of two equations (which both share the variable $\tilde{\mu}_y$), we find equation 5.12.

²⁶Another interesting way to read equation 5.12 is the following. If we rewrite equation 5.12 as follows: $w \frac{\partial \mathcal{G}}{\partial \pi} - c \frac{\partial \mathcal{G}}{\partial s} = 2 (\tilde{\mu}_s - \tilde{\mu}_\pi)$, we can notice that the term in the right-hand side of the equation resembles the derivative of the Gini coefficient of total incomes with respect to π . However, instead of the variable $\tilde{\mu}_w$, we have $\tilde{\mu}_s$. Such expression can, therefore, be interpreted as the derivative of the Gini coefficient of the variable \tilde{y} with respect to π , where \tilde{y} is, for each individual, the sum of its savings and profits. Precisely, if we define the variable $\tilde{y}_i = s_i + \pi_i \quad \forall i$ and then take the derivative of the Gini coefficient of this variable with respect to $\pi = \frac{\Pi}{s + \Pi}$, then we obtain $2 (\tilde{\mu}_s - \tilde{\mu}_\pi)$.

Double-Elasticity Diagram

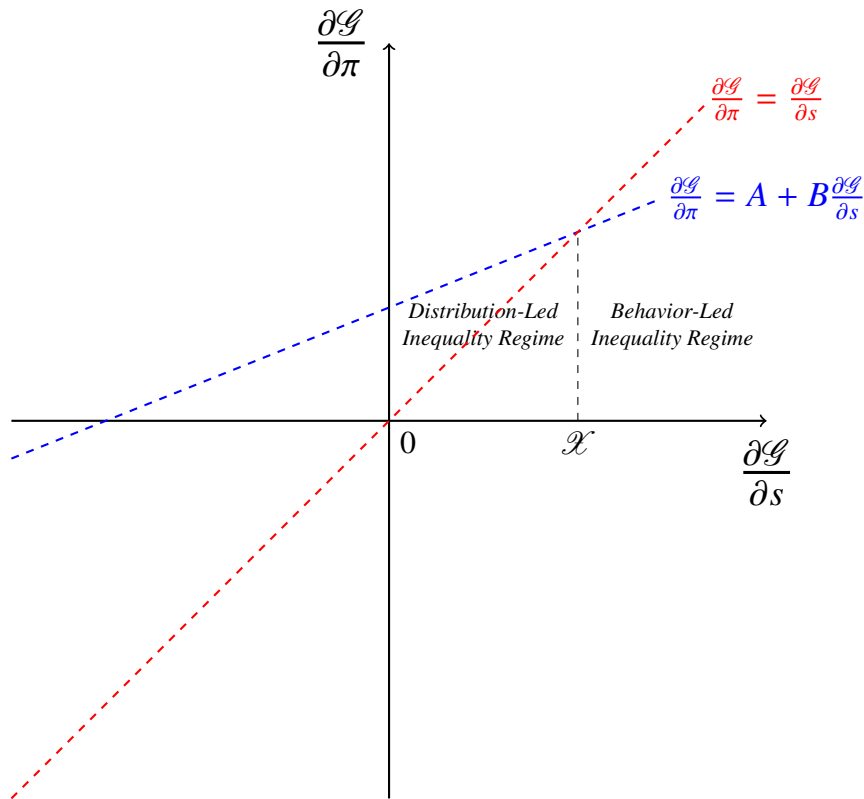


Figure 5.2: The elasticity of income inequality as measured by the Gini coefficient (\mathcal{G}) to changes in the capital share of income ($\frac{\partial \mathcal{G}}{\partial \pi}$) is put against the elasticity of income inequality to changes in the saving rate ($\frac{\partial \mathcal{G}}{\partial s}$). The blue line is the *double-elasticity equation*, which links these two elasticities, whilst the red line is the bisector. These two curves together allow us to categorize countries according to their inequality regime, which can be either *behavior-*, or *distribution-led*.

we are in a *distribution-led inequality regime (DLI)* when $\frac{\partial \mathcal{G}}{\partial s} < \mathcal{X}$.

In a **BLI** regime income inequality is more sensitive to fluctuations in the saving rate (and, thus, in the investment rate, in case we were in a Keynesian framework) rather than to fluctuations in the functional income distribution. The contrary situation holds true when we are in a **DLI** regime.

It is worth mentioning that the causal relation going from income inequality to both the functional income distribution and the saving rate, the latter of which has already received

much attention (see [Schmidt-Hebbel and Servén, 2000](#) for a survey of the literature), is not discussed in this Chapter.

5.5 Empirical Application

In this Section we take the Kaldorian/Representative Agent distinction of economic systems to data. To this end, Subsections 5.5.1 and 5.5.2 introduce the data that we use as well as the definitions of capital, labor, consumption and saving that we adopt. Subsections ?? presents useful descriptive statistics for our analysis. Subsections 5.5.4 and 5.5.5 separately discuss the results concerning the first and the second dimension of the box respectively. Finally, Subsection 5.5.6 illustrates the first estimate of the European countries' relative position in the box in 2010.

5.5.1 Data

In this Section, the framework illustrated is applied to the EU-SILC and Household Budget Survey (HBS) data. The EU-SILC provides harmonized data on households' income and living conditions, while the HBS contains detailed information on their consumption expenditures.

The European countries analyzed are 9 in total.²⁷ The EU-SILC are available from 2007 to 2016, whilst the HBS for 2010 only. Therefore, the estimation of the box is limited to 2010, although several hypothesis on the countries' relative position in 2007 and 2016

²⁷The countries considered are: *Germany* (DE), *Greece* (EL), *Finland* (FI), *France* (FR), *Ireland* (IE), *Italy* (IT), *Portugal* (PT), *Sweden* (SE) and *United Kingdom* (UK).

will also be formulated.

Despite the many limitations these data carry with them, they are, to the best of our knowledge, the most comprehensive and reliable sources to jointly study income composition inequality and saving and consumption composition inequality. Indeed, they provide a harmonized set of variables on households' income sources and saving and consumption decisions at the European level.

5.5.2 Definitions

To construct the IFC index, we consider households' *gross* income. If we considered net income we would require information concerning taxes on capital and on labor at the household level, which is not provided by the EU-SILC.

In what follows, we define capital income as the sum of (1) household's income from rental of a property or land, (2) interests, dividends, capital from capital investments in unincorporated business, (3) the capital component of gross cash benefits or losses from self-employment (including royalties) and (4) pensions from individual private plans. The capital component of self-employment income, which is not directly furnished by EU-SILC, is imputed by means of the procedure by [Glyn \(2011\)](#).²⁸ We define labor income as the difference between total household gross income minus capital income.²⁹

Let us now turn to the definitions of households' consumption and saving. Note that the definition of income we consider now is households' *net* income, as the HBS data do

²⁸See Chapter 2 for a formalization of this imputation strategy.

²⁹The sources of labor income that we consider are: gross employee cash or near cash income, gross non-cash employee income, employers' social insurance contributions, value of goods produced for own consumption, unemployment benefits, old-age benefits, survivor' benefits, sickness benefits, disability benefits, education-related allowances, family/children related allowances, social exclusion not elsewhere classified, housing allowances, regular inter-household cash transfers received and income received by people aged under 16.

5.5. Empirical Application

not provide information on gross income. In what follows, we consider three different definitions of consumption, which are precisely:

- C_1 = total consumption expenditure - housing, water, electricity, gas and other fuels
- transport,
- C_2 = total consumption expenditure - actual rentals for housing - imputed rentals
for housing - transport for housing - transport,
- C_3 = total consumption expenditure - actual rentals for housing - imputed rentals
for housing.

Three definitions of saving follow accordingly:

- S_1 = net monetary income (in-kinds income excluded) – C_1 ,
- S_2 = net monetary income (in-kinds income excluded) – C_2 ,
- S_3 = net monetary income (in-kinds income excluded) – C_3 .

These three definitions of consumption can be regarded as alternative estimates of *consumption of non-durable goods*. The choice of considering non-durable goods to estimate households' consumption is motivated by the fact that in 2010 all European countries were heavily hit by the financial crisis, which especially affected housing prices (see [Stockhammer and Moore, 2018](#)).

At this point of the analysis, before to illustrate the first picture of the countries' relative position in the box, we separately analyze the two dimensions at stake, starting with some descriptive statistics.

5.5.3 Descriptive Statistics

Table 5.1 presents the income shares of four different income groups, defined as follows: 0-50%, 50-90%, 90-95% and 95-100%. The incomes here considered are from the EU-SILC. Overall, the nine countries are characterized by a bottom 50% of the whole population earning about the 20% of the total income in the survey, a middle class (50-90%) earning almost a half of the total income and a top 10% earning approximately the 25-30% of the total. However, fundamental differences can be observed among the countries. Sweden, Germany, France and Finland are the most equal countries in the sample, with the top 5% of the population earning less than 20% of the total income and the bottom 50% earning more than 20%. On the contrary, Ireland, Greece and the UK are the most unequal countries, with a Gini coefficient of about 0.47, the top 5% of the population earning more than 20% of the total income and the bottom 50% earning less than 20%. Finally, Italy and Portugal have a Gini coefficient of 0.44 and, for both countries, the bottom 50% and the top 5% of the population earn approximately the 20% of total income in the sample. Although the Italian middle class is relatively richer than the Portuguese's one.

Table 5.1: Income Shares

Income Group	FI	FR	DE	EL	IE	IT	PT	SE	UK
0-50%	22%	23%	23%	17%	17%	19%	20%	26%	18%
50-90%	48%	46%	48%	48%	48%	49%	46%	48%	48%
90-95%	10%	19%	10%	11%	12%	11%	11%	9%	11%
95-100%	17%	18%	17%	22%	22%	19%	20%	15%	21%
<i>Gini</i>	0.39	0.38	0.38	0.47	0.48	0.44	0.44	0.33	0.47

Let us now analyze the distribution of capital income across the *total* income ranking. Indeed, Table 5.2 shows the share of the capital income earned by the different total

5.5. Empirical Application

income groups. For instance, in Finland in 2010 the poorest 50% of the total income distribution earned the 10% of the capital income in the economy, whereas the top 50% of the total income distribution earned the 90% of the capital income in the economy.

It is striking to notice that, on average, the richest 5% in terms of total income earned in 2010 more than the 40% of the total capital income captured by the survey in all countries considered. And in addition to that, considering that the surveys are generally unable to properly capture the capital income in the economy (see the levels of the capital share in the same Table), we should consider these numbers as lower bounds.

The capital income earned by the bottom 50% is the highest in Sweden and Greece, immediately followed by the UK. Recall that the capital component of self-employment income plays an important role in this analysis, and it may explain the reason for such a high level of capital income at the bottom in countries like Greece. Italy, Portugal and Ireland are, instead, associated by a low level of capital income concentrated at the bottom of the income distribution.³⁰ The share of capital income earned by the middle class ranges between a low 24% in countries such as the UK and Ireland, and a high 34% in Greece. It is also worth noticing that the distribution of the capital income within the top 10% can be very different across the countries. Particularly, in Sweden and Germany the capital income is mainly concentrated in the hands of the top 50% of the top 10%, whereas in countries such as Portugal and Italy the capital income is better distributed

³⁰Note that according to the definition of capital income that we adopt and to the source of data that we use the results can differ, at least in their absolute numbers. For instance, in Chapter 4 we saw that the capital income owned by the bottom 50% of the total income distribution in Italy in 2010 was approximately the 20% of the total. Such difference with the result shown in this Chapter is likely to be determined by differences in the way we treat the imputed rent. Indeed, imputed rent is excluded by the definition of total income adopted in this Chapter, whereas is likely to be present in the total income variable provided by the data from the Bank of Italy. Having said that, the decreasing trend in income composition inequality in Italy seems to be confirmed by both sources.

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across the whole top 10% income group.

Table 5.2: Capital Shares (Income Ranking)

Income Group	FI	FR	DE	EL	IE	IT	PT	SE	UK
0-50%	10%	13%	12%	17%	9%	6%	7%	21%	14%
50-90%	31%	29%	27%	34%	24%	32%	32%	29%	24%
90-95%	10%	12%	9%	10%	11%	13%	18%	7%	10%
95-100%	47%	45%	51%	47%	54%	47%	42%	41%	50%
<i>Capital Share</i>	11%	15%	7%	18%	8%	18%	6%	6%	10%
<i>IFC</i>	0.46	0.42	0.45	0.51	0.43	0.52	0.47	0.26	0.30

Let us now take a closer look at the labor income distribution (Table 5.3). The countries seem to share a very similar distribution of labor income across the total income ranking, with a middle class earning approximately the 50% of the total labor income in the economy, the top 10% earning less than the 20% of the total labor income and the bottom 50% earning around the 20%. Ireland, Portugal and the UK, however, appear to have the labor income which is more concentrated at the top rather than at the bottom of the income distribution relatively to the other countries in the sample. Such difference is likely to reflect a different skill composition across the population.

Table 5.3: Labor Shares (Income Ranking)

Income Group	FI	FR	DE	EL	IE	IT	PT	SE	UK
0-50%	22%	25%	24%	20%	17%	22%	21%	26%	18%
50-90%	51%	50%	50%	51%	50%	52%	47%	50%	50%
90-95%	10%	9%	10%	11%	12%	10%	11%	9%	11%
95-100%	13%	13%	14%	15%	19%	13%	19%	13%	18%
<i>Labor Share</i>	89%	85%	93%	82%	92%	82%	94%	94%	90%
<i>IFC</i>	0.46	0.42	0.45	0.51	0.43	0.52	0.47	0.26	0.30

At this point, let us move to the distribution of saving and consumption across the income ranking (Tables 5.4 and 5.5). The definition of consumption, and hence of saving

5.5. Empirical Application

here adopted is the second one (C_2). For this reason, the overall saving rates are relatively higher than those that can be found from macroeconomic data. As we previously said, we need to reduce the risk that our estimates on the propensities to save and consume are strongly affected by the financial crisis. To this end, we have removed some durable goods from the households' consumption basket, which have automatically reduced the saving rate in the sample.

Overall, we can notice that the shares of income saved by the top 5% in all countries are higher than the shares of income consumed by the same income group. At the same time, the shares of income saved by the bottom 50% are lower than the shares of income consumed by the same income group. This result already emphasizes that the propensity to consume of the poor are higher than that of the rich.

Table 5.4: Saving Shares (Income Ranking)

Income Group	FI	FR	DE	EL	IE	IT	PT	SE	UK
0-50%	22%	0%	18%	-7%	11%	6%	-10%	21%	8%
50-90%	44%	49%	48%	55%	52%	51%	47%	46%	48%
90-95%	10%	15%	11%	15%	12%	14%	18%	9%	12%
95-100%	22%	35%	21%	36%	23%	27%	45%	22%	31%
<i>Saving Rate</i>	49%	45%	48%	33%	51%	23%	41%	54%	51%
<i>SCC</i>	0.15	0.43	0.18	0.49	0.32	0.45	0.54	0.19	0.35

If we focus on Table 5.4 we can notice that in Greece and Portugal the share of income saved by the bottom 50% is negative. This means that the bottom 50% of the income distribution in these two countries consumed more than they actually earned in 2010.

While the consumption distribution is relatively similar in all countries, the saving distributions change considerably from the countries. For instance, countries like Finland, Germany and Sweden have a low share of income saved at the top and a high share of

5.5. Empirical Application

income saved at the bottom relatively to the other countries. On the contrary, Portugal and Greece have a saving distribution which is very skewed against the poor.

Table 5.5: Consumption Shares (Income Ranking)

Income Group	FI	FR	DE	EL	IE	IT	PT	SE	UK
0-50%	30%	31%	30%	28%	32%	32%	30%	33%	30%
50-90%	50%	49%	49%	47%	48%	46%	47%	48%	47%
90-95%	8%	8%	9%	10%	8%	8%	9%	7%	9%
95-100%	10%	11%	11%	14%	10%	12%	12%	9%	12%
Consumption Rate	51%	55%	52%	67%	49%	77%	59%	46%	49%
SCC	0.15	0.43	0.18	0.49	0.32	0.45	0.54	0.19	0.35

From these descriptive statistics we can already infer that the two indicators are likely to be both positives. However, in order to precisely grasp all differences in the concentrations of capital, labor, saving and consumption across the nine countries, we need to estimate them. This is the purpose of the next Sections.

5.5.4 First Dimension

Let us start by analyzing the income composition inequality dimension. Figure 5.3 shows the level of the IFC index for the nine European countries in 2010.

The countries can be divided into three groups according to their level of the IFC index, which can be *low*, *average* and *high*. The countries with low IFC index (below 0.4) are Sweden and the UK. The countries with average IFC index (between 0.4 and 0.5) are France, Ireland, Germany, Finland and Portugal. Finally, the countries with high IFC index (above 0.5) are Greece and Italy.

Figure 5.4 portrays the income composition inequality trend of the nine countries between 2007 and 2016.³¹ The fact that IFC index is positive for all countries means that a rise in

³¹Note that, although the bottom 50% in Greece owns the 17% of capital income whereas in Italy only the 6%, the reason for not finding such difference in the two estimates of the IFC index

Income Composition Inequality

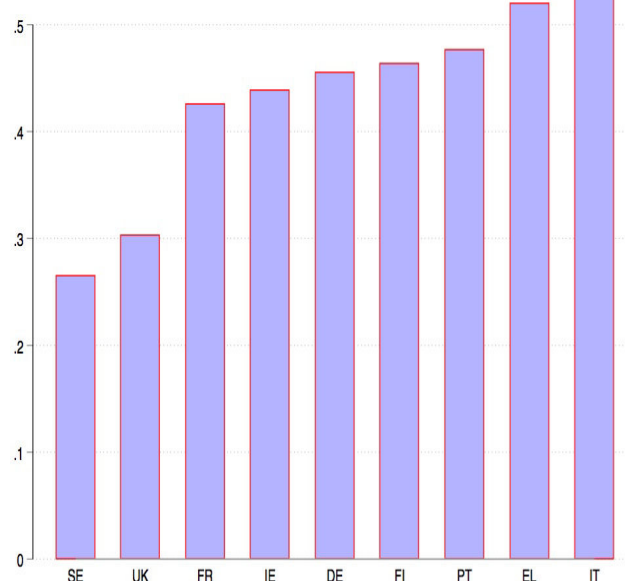


Figure 5.3: The levels of income composition inequality, as measured by IFC index, for 9 European countries in 2010. **Source:** Author's calculations on basis of EU-SILC.

the capital income share can positively affect inter-personal income inequality.

If we plot the IFC index against the Gini coefficient (Figure 5.11) we notice that a slightly positive relationship seems to emerge among the countries. Countries with a high level of income composition inequality, like Greece, Italy and Portugal share a high level of income inequality. On the other hand, Sweden combines low levels of both dimensions. Finland, Germany and France, instead, occupy an intermediate position within the diagram. Finally, the UK combines a high inequality level with a low degree of income composition inequality.

Let us now plot the IFC index against the survey capital share of income (Figure 5.12).

Interestingly, we can observe that Italy and Greece are, once again, in the upper right of

is mainly explained by the presence of negative values at the bottom of the distribution. Negative values at the bottom disappear in the estimates of the indicator from the moment in which the concentrations curves coincide with the x-axis when they goes below zero.

Income Composition Inequality - Trend

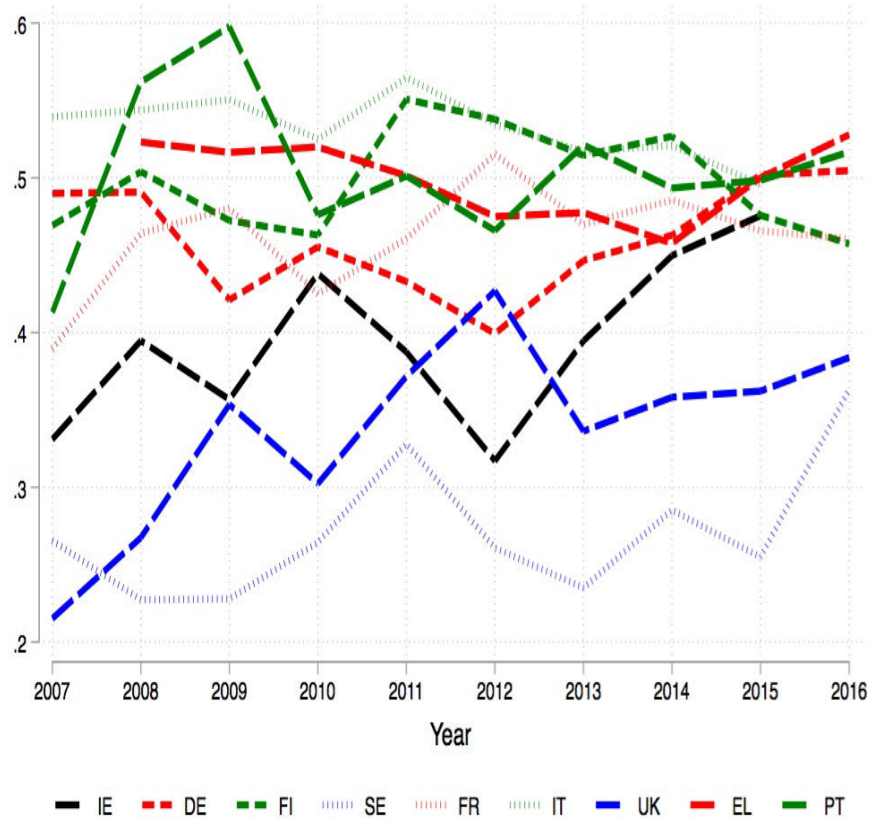


Figure 5.4: The series of income composition inequality, as measured by the IFC index, for the richest 9 European countries 2007-2016. **Source:** Author's calculations on basis of EU-SILC.

the scatter. This is in line with the intuition that a high level of capital income at the top of the income distribution, coupled with a high capital share, implies high inequality in total income. The reverse situation holds true for Sweden, which is in fact situated in the bottom left of the diagram. Having said that, we should take into consideration the role that the capital share of income plays in the construction of the IFC index. Indeed, this index tends to be higher for values of the capital share which are closer to $\frac{1}{2}$. The intuition is simple: we have the highest level of income composition inequality when the top and the bottom of the income distribution separately own the same amount of the two sources. Such technical feature of the indicator, however, does not undermine the validity of our

Saving and Consumption Composition Inequality

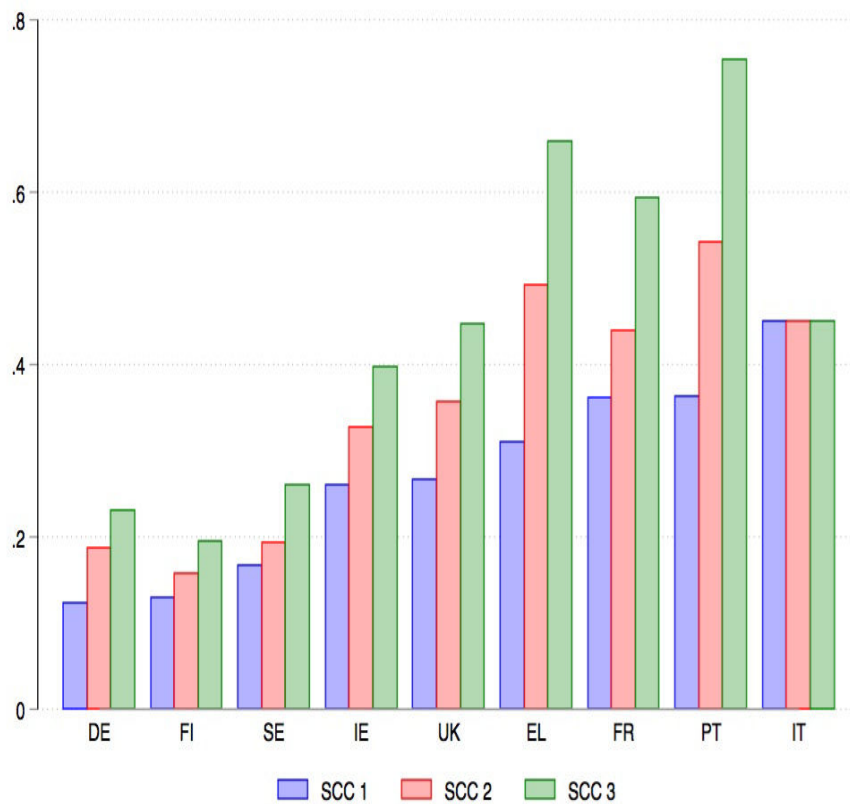


Figure 5.5: The levels of saving and consumption composition inequality, as measured by the saving and consumption concentration index, in 2010 for 9 countries. We consider three definitions of consumption (and, hence, savings), hence we have three different estimates of the SCC index. The first definition of consumption (SCC_1) includes non-durable goods only; the second definition of consumption (SCC_2) includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing); the third definition of consumption (SCC_3) includes non-durable goods plus some housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing) plus transports. **Source:** Author's calculations on basis of HBS.

finding concerning its relationship with the capital share. Indeed, as we will see in the next section, the SCC index, which is constructed like the IFC index, negatively correlates with the saving rate.

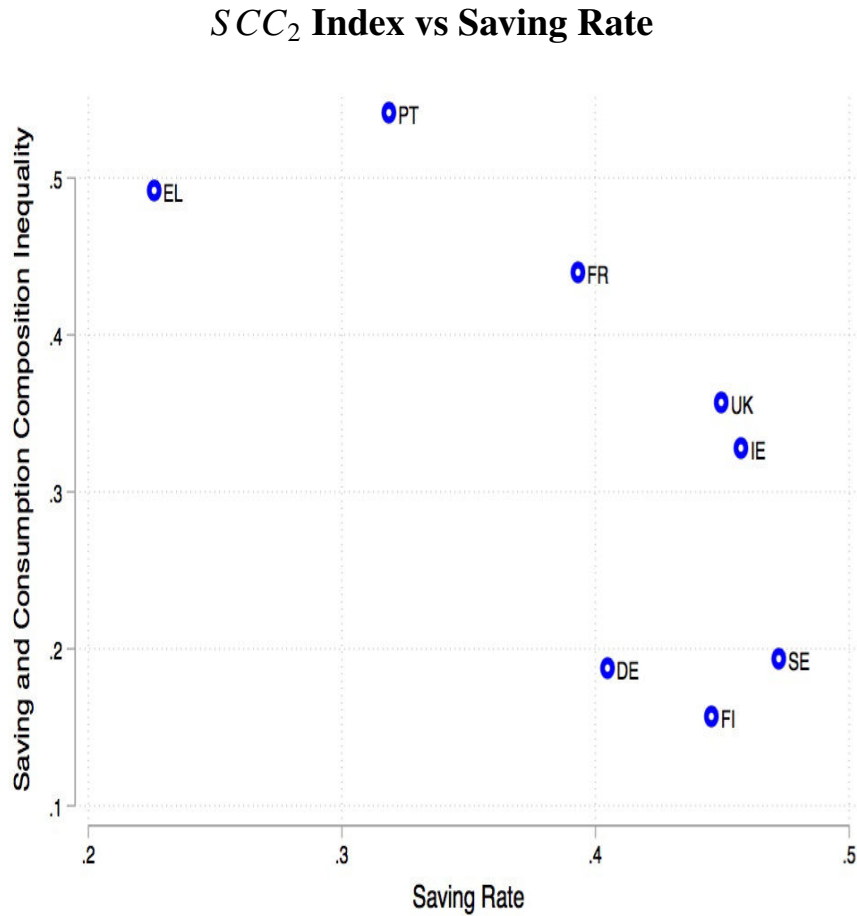


Figure 5.6: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and saving rate. We here consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of HBS.

5.5.5 Second Dimension

We estimate saving and consumption composition inequality for three different definitions of households' saving and consumption. Figure 5.5 shows, for all countries, the three levels of the saving and consumption concentration index in 2010. The first thing to notice from the graph is that the level of the SCC index, for all countries considered, increases once we move from the first, to the third definition of consumption (and, there-

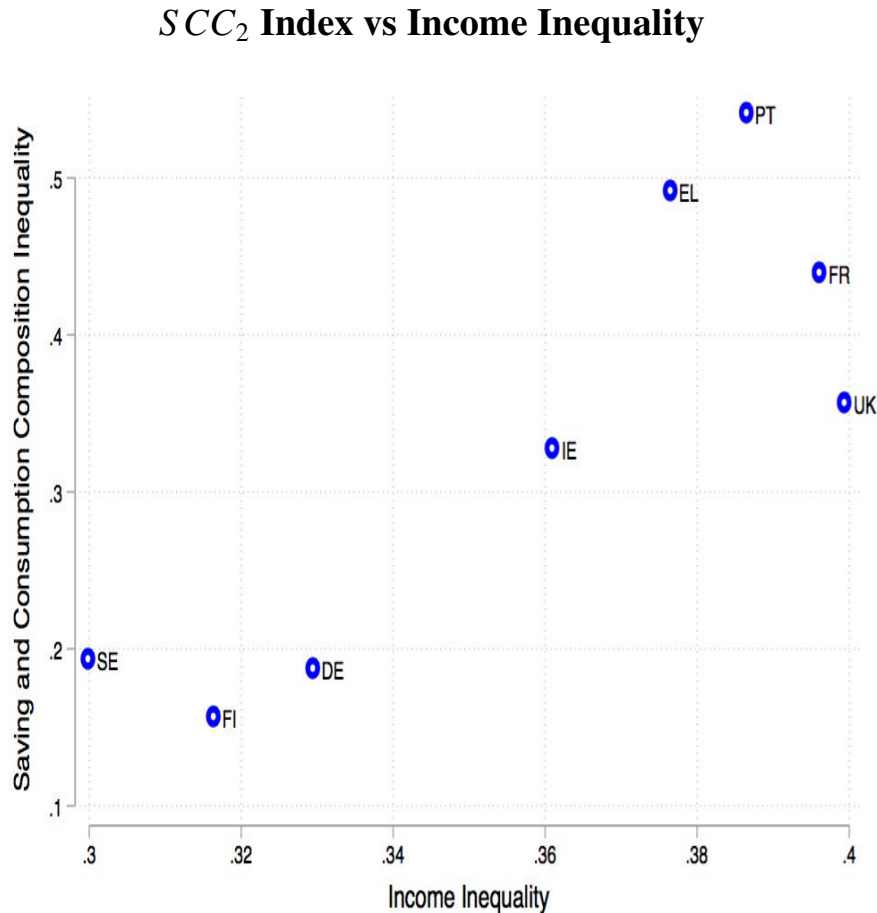


Figure 5.7: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and Gini coefficient. We here consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of HBS.

fore, saving).³² This is explained by the fact that, while the first definition of consumption excludes all possible durable goods, the second and the third exclude only a part of them. Specifically, the second definition only partially excludes housing expenses (actual rentals and imputed rentals), whilst the third definition does also include transport expenditures. As expected, the more durable goods we introduce in the households' consumption basket, the higher is saving and consumption composition inequality, i.e., the higher is the

³²The exception of Italy is due to the fact that the Bank of Italy does not allow for such a finer decomposition of the consumption and saving dimensions.

ability to save of the rich against that of the poor.

By following the previous classification adopted to compare countries with respect to their IFC level, and by considering the SCC_2 as our reference estimate, we find that Italy, Portugal, France and Greece display *high* levels of the SCC_2 index, whilst Ireland and the UK have *average* levels of the SCC_2 index. Finally, Germany, Finland and Sweden register *low* levels of the SCC_2 index.

Interestingly, the SCC metric is negatively correlated with the saving rate, as illustrated by Figure 5.6 for the SCC_2 index. The same is also true for the SCC_1 and SCC_3 , as shown in Figures 5.13 and 5.14 respectively. This finding suggests that a more equal distribution of saving across the population is associated with a higher overall saving rate.

Let us explore the relationship between the SCC index and income inequality. When we plot the SCC index against income inequality, as measured by the Gini coefficient, we can observe that the two variables are positively correlated. Figures 5.15, 5.7 and 5.16 illustrate this relationship for the three different definitions of consumption and saving. This latter result goes in the direction of the fact that the distribution of savings across the income ranking can be seen as a proxy of income inequality in a population. The more the rich manage to save their income relatively to the poor, the higher the disparity between their income and that of the poor.

5.5.6 A Novel Taxonomy of Economic Systems

Figure 5.8 brings together the two dimensions of income composition inequality and saving and consumption composition inequality, and provide the first estimate of the box. The second definition of consumption and saving is considered in the analysis (i.e., the SCC_2 index).

The Box

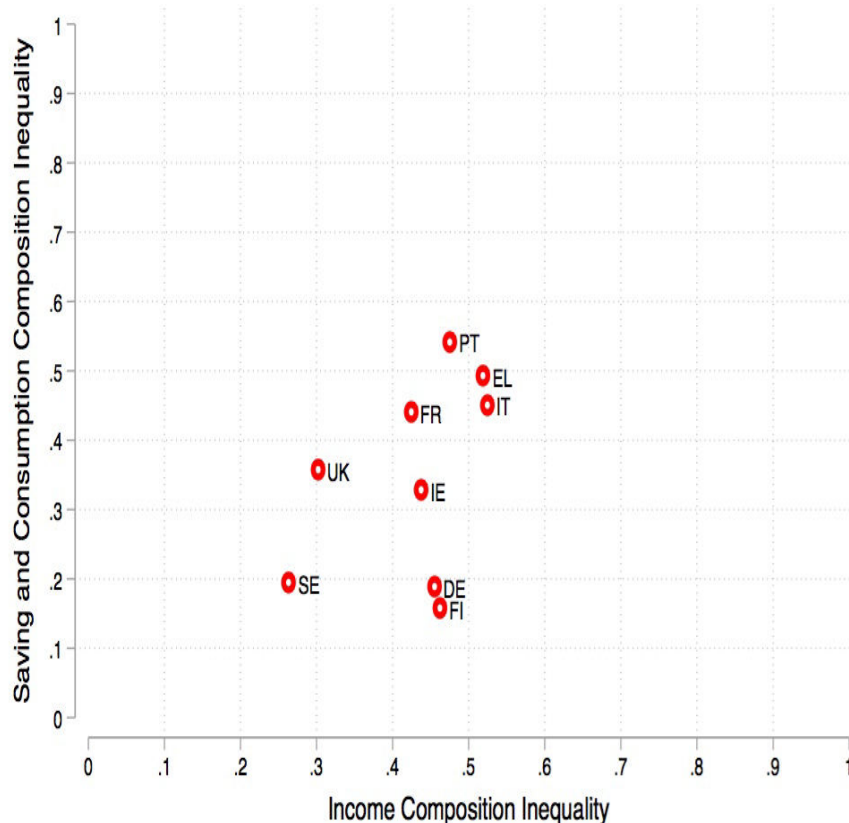


Figure 5.8: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and income composition inequality, as measured by the income-factor concentration index. We consider all countries in the sample in 2010. According to the SCC, we consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of EU-SILC and HBS.

The first thing to notice is that the nine European countries occupy different positions in the box, by hence validating the hypothesis whereby households' heterogeneity matters, and it is country specific.

In light of the classification of economic systems previously proposed, the Representative Agent System seems to be well suited to describe the country of *Sweden*, whereas the Kaldorian System to describe the countries of *Portugal*, *Greece* and *Italy*.

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Furthermore, Figure 5.8 shows the emergence of two counterposed clusters in the box: The first cluster is constituted by Greece, France, Italy and Portugal, and it is the closest cluster to the Kaldorian representation of economic systems, whereas the second cluster is constituted by Finland, Germany and Sweden, and it is better represented by the Representative Agent System. We label these two clusters as *Mediterranean* and *Northern European*, respectively. The two remaining countries in the sample, Ireland and the UK, are located in intermediate positions.³³ Mediterranean countries display, on average, a slightly higher level of the IFC index than Northern European countries. Furthermore, Mediterranean countries are characterized by a higher concentration of savings at the top and of consumption at the bottom of the income ranking than Northern European countries. In addition, Mediterranean countries have, on average, a higher level of income inequality than Northern European countries, considering that the SCC index is positively correlated to income inequality (see Figure 5.7).

If we now separate all the countries according to their inequality regime, which can be either behavior-led or distribution-led, we can notice that the classification between Mediterranean and Northern European countries only partially holds. Indeed, although all Northern European countries have a distribution-led inequality regime (fluctuations in the capital share have a stronger impact on changes in income inequality than fluctuations in the saving rate), the Mediterranean countries are split. Namely, Greece has a distribution-led inequality regime, whereas Portugal and France have a behavior-led inequality regime. At this point of the analysis, we wonder whether these two major clusters remain approximately the same across time. Therefore, we try to estimate the

³³A classification of societies as such bears resemblance to the one proposed by Schmidt (2002), which identifies three ideal-typical models: *market*, *managed* and *State-enhanced* capitalism, mirrored by the UK, Germany and France, respectively.

The Box - BLI Countries

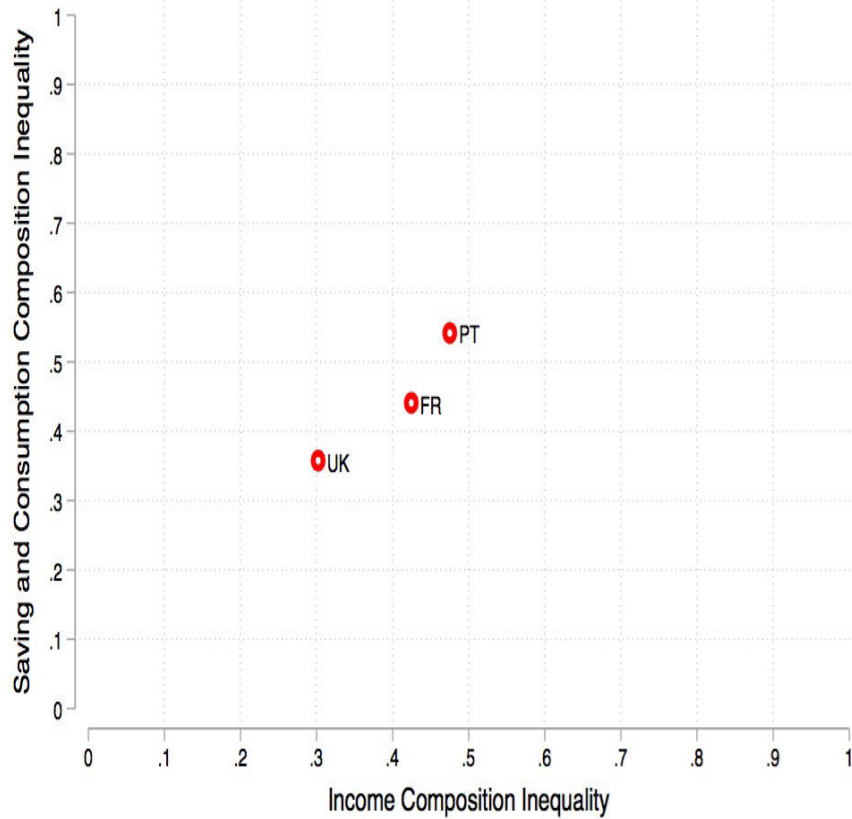


Figure 5.9: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and income composition inequality, as measured by the income-factor concentration index. We consider only BLI countries in 2010. According to the SCC, we consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of EU-SILC and HBS.

box for the years 2007 and 2016. To this end, we assume that the SCC index does not change over the time considered, that is $SCC_{2007} = SCC_{2016} = SCC_{2010}$.

Figures 5.17 and 5.18 show the estimates of the box in 2007 and 2016 respectively. Surprisingly, almost all relative countries' positions remained the same and, in particular, once we move from 2007 to 2016 we observe the two clusters become even more compact. These findings illustrate that the two major clusters have remained approximately

The Box - DLI Countries

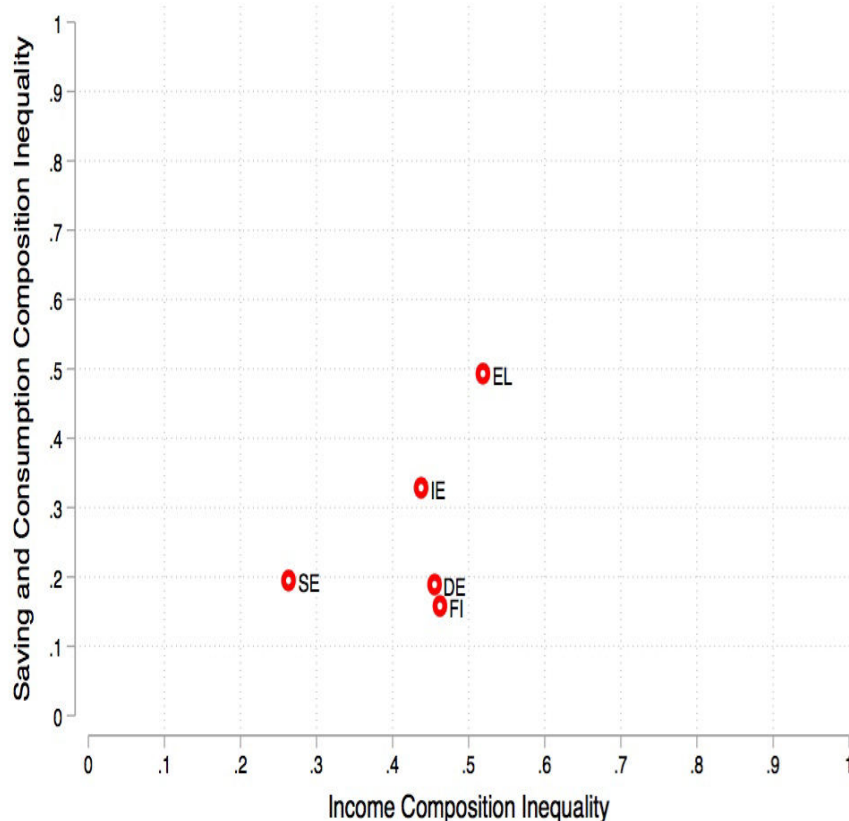


Figure 5.10: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and income composition inequality, as measured by the income-factor concentration index. We consider only DLI countries in 2010. According to the SCC, we consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of EU-SILC and HBS.

the same before, and after the recent financial crisis, under the core assumption that no major changes have occurred in term of the propensities to save and consume of European households.

In summary, our empirical investigation showed that Mediterranean countries such as Italy, Portugal and Greece bear more resemblance to Kaldorian Systems rather than to Representative Agent System, as it is the case for Northern European countries such as

Sweden, Germany and Finland, whose positions in the box are the closest to point (0, 0). Furthermore, the very existence of these two clusters, whose configuration has already extensively been discussed within the comparative political economy literature (see [Amable, 2003](#)), shows that institutional setting and macroeconomic performances are profoundly interconnected. Additionally, such relationship has a dynamic nature, as the countries' relative position in the box can change over time. This box, hence, allows us for a simple dynamic macro-institutional framework, which brings income distribution at the center of the analysis.

5.6 Conclusion

In this Chapter, we proposed a method to jointly study households' heterogeneity in income composition (i.e., the joint distribution of capital and labor across the population) and in propensities to save and to consume within an economic system. To this end, hinging on the concept of income composition inequality recently developed (Chapter 2) and on its technical assessment through the income-factor concentration index, we proposed a novel representation of economic systems through the construction a two dimensional box.

The first dimension of this box is income composition inequality, whilst the second dimension is saving and consumption composition inequality. As for income composition inequality, saving and consumption composition inequality tells you how unequally saving and consumption composition is distributed across the population. We say that saving and consumption composition inequality is high when the top and the bottom of the income distribution separately save and consume, and low when all people in the population save and consume in the same way.

5.6. Conclusion

According to our framework, economic systems range between two extremes, namely the Kaldorian System and the Representative Agent System. The former system is characterized by a group of rich people that earn the capital income and save, and by a group of poor people that earn the labor income and consume, whereas the latter system is characterized by individuals who have the same population shares of capital, labor, consumption and savings.

Understanding the relative position of a country in the box can be useful to foresee the same country's macroeconomic performances, such as the level of capital accumulation and the profit share of income. In this regard, we showed that the two dimensions of income composition inequality and saving and consumption composition inequality emerge from a simple Kaldorian model of distribution and growth.

Finally, we estimated the box for nine European countries in 2010 jointly using EU-SILC and HBS data. Two major clusters of economic systems - Mediterranean and Northern European - emerged from the analysis. The former cluster is characterized by higher levels of income composition inequality and saving and consumption composition inequality than the latter cluster.

The appearance of these two clusters illustrated, in a simple and straightforward manner, that countries' institutional setting and macroeconomic performances are profoundly interconnected, and that the same countries' distributional characteristics are at the heart of this connection.

We believe that the choice of a specific model of growth and accumulation should therefore be made with an eye on the type of economic system analyzed. For instance, it directly follows from our result that Italy can be better described by a Kaldorian model of

5.6. Conclusion

accumulation and growth, whereas Sweden by a representative agent model.

Furthermore, in this paper we argued that the combination of our approach with the literature on wage-led and profit-led growth regimes (see [Lavoi and Stockhammer, 2012](#)) can pave the way for interesting analysis. For instance, if we were in a profit led demand regime (i.e., an increase in the capital share will lead to an increase in GDP), then an increase in the investment rate would lead to higher growth in a Representative Agent System than in a Kaldorian System. Conversely, if we were in a wage led demand regime (i.e., an increase in the labor share will lead to an increase in GDP) the situation would be the reverse. At the same time, given that the elasticity of personal income inequality to changes in the capital income share is higher in a Representative Agent System than in a Kaldorian System, an increase in the capital share will boost income inequality in the latter system relatively more than in the former. For these reasons, in the context of a profit led growth regime, a specific fiscal policy aiming at better distributing the composition of individuals' incomes would allow for more inclusive returns of both private and public investments. Having said that, we believe that at this very stage any such policy conclusion would require a specific analysis. However, we do also believe our work can be regarded as a starting point for future research on the matter.

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5.7 Appendix

IFC Index vs Income Inequality

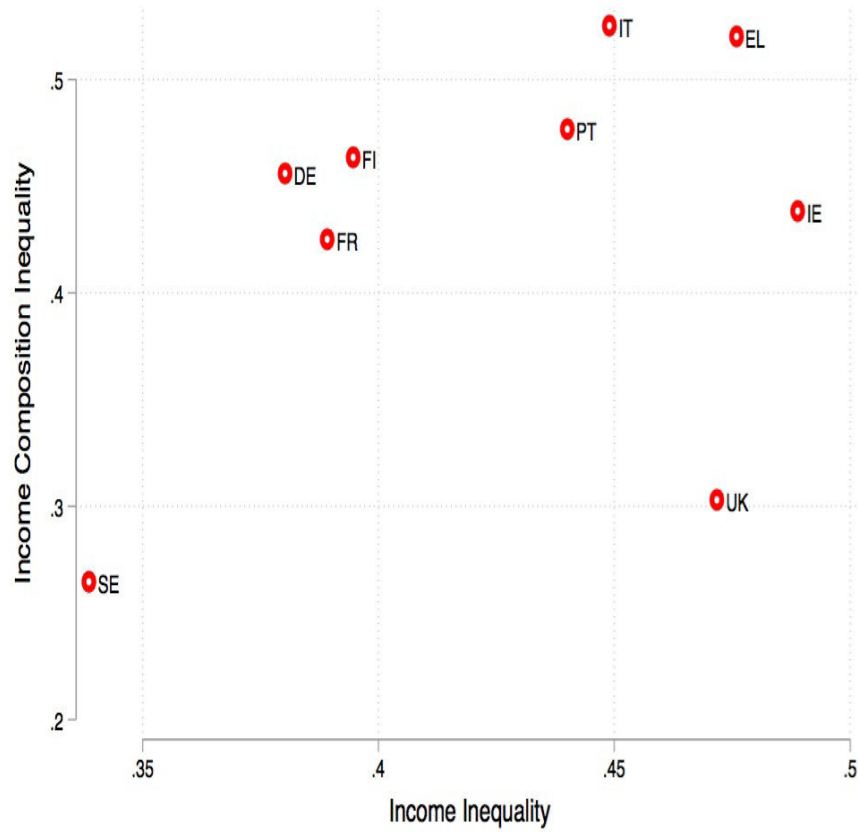


Figure 5.11: The scatter plot of income composition inequality, as measured by the IFC index, and income inequality, as measured by the Gini coefficient. **Source:** Author's calculations on basis of EU-SILC.

IFC Index vs Capital Share

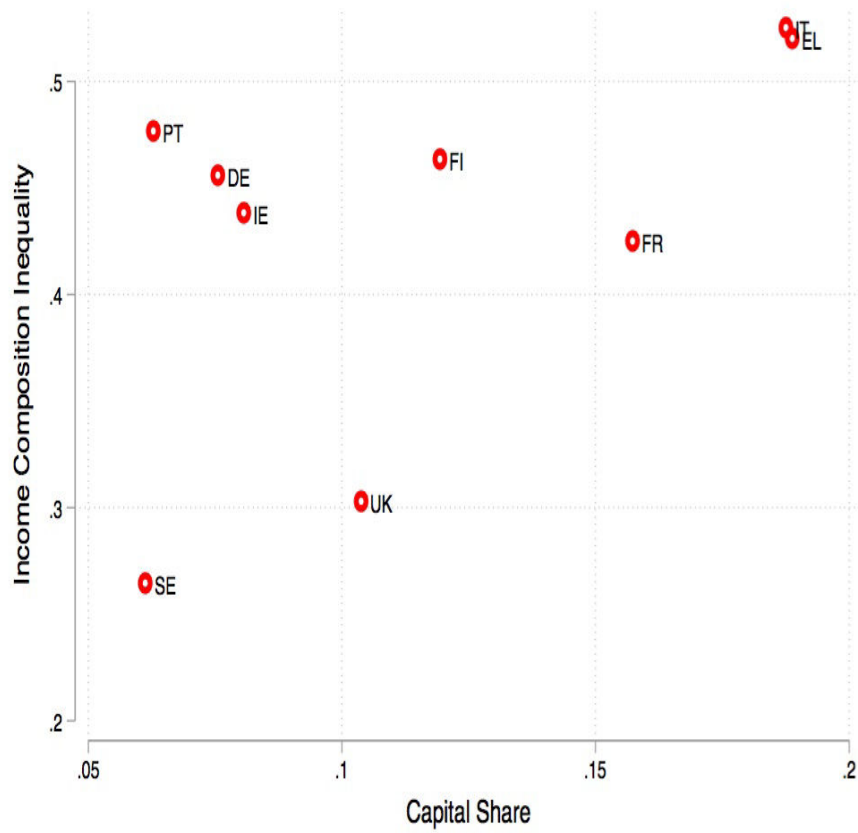


Figure 5.12: The scatter plot of income composition inequality, as measured by the IFC index, and the survey capital share of income. **Source:** Author's calculations on basis of EU-SILC.

SCC₁ Index vs Saving Rate

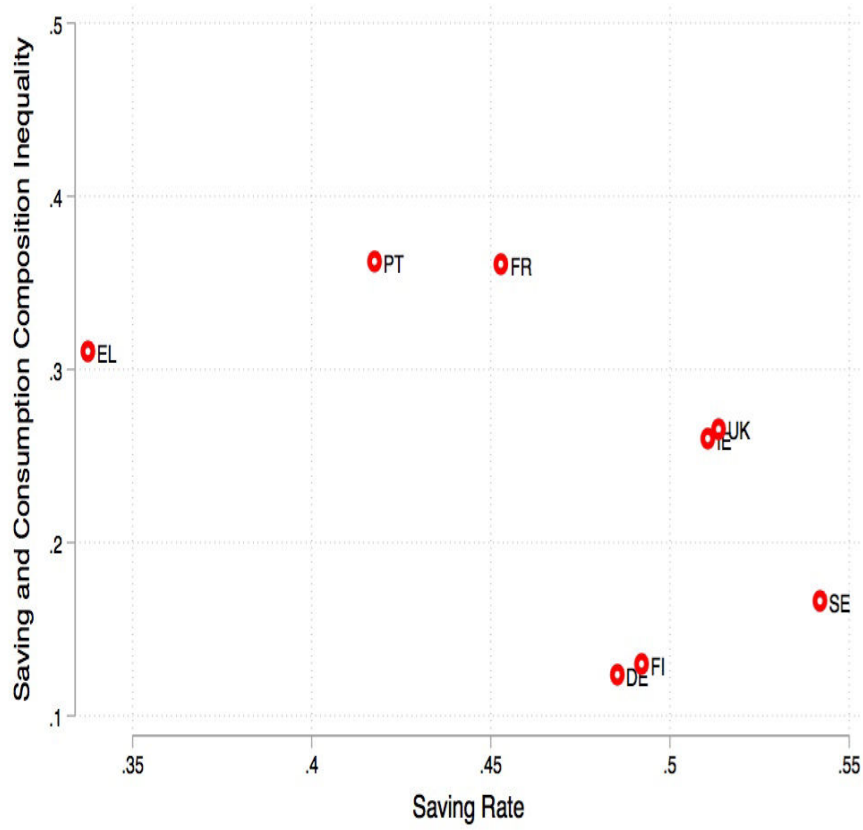


Figure 5.13: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and saving rate. We here consider the first definition of consumption (SCC_1), which includes non-durable goods only. **Source:** Author's calculations on basis of HBS.

SCC_3 Index vs Saving Rate

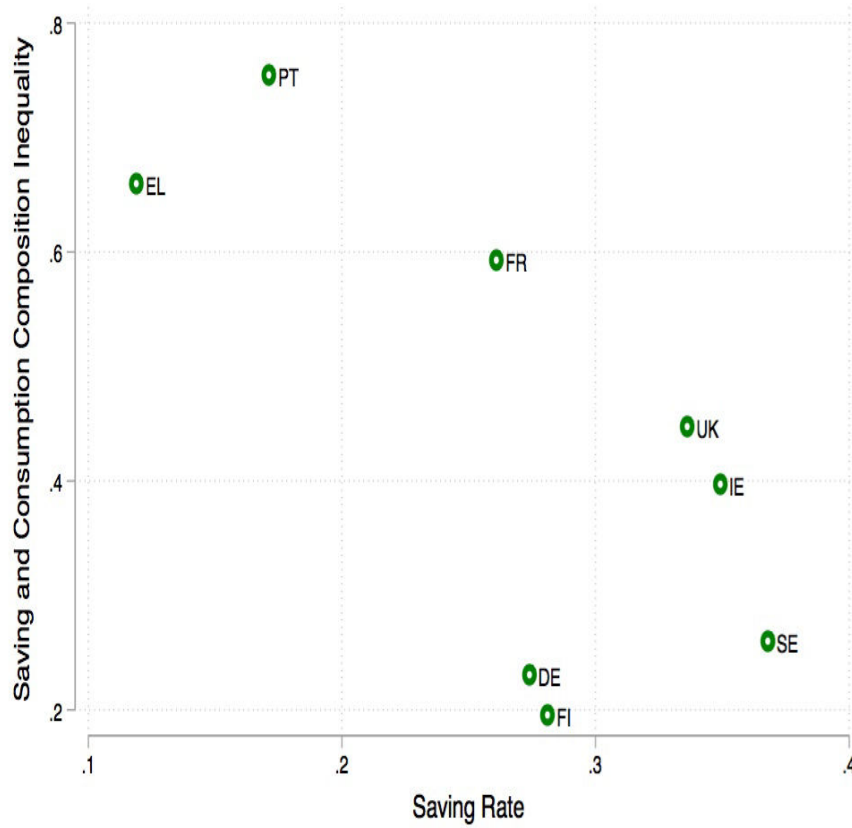


Figure 5.14: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and saving rate. We here consider the third definition of consumption (SCC_3), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing). **Source:** Author's calculations on basis of HBS.

SCC_1 Index vs Income Inequality

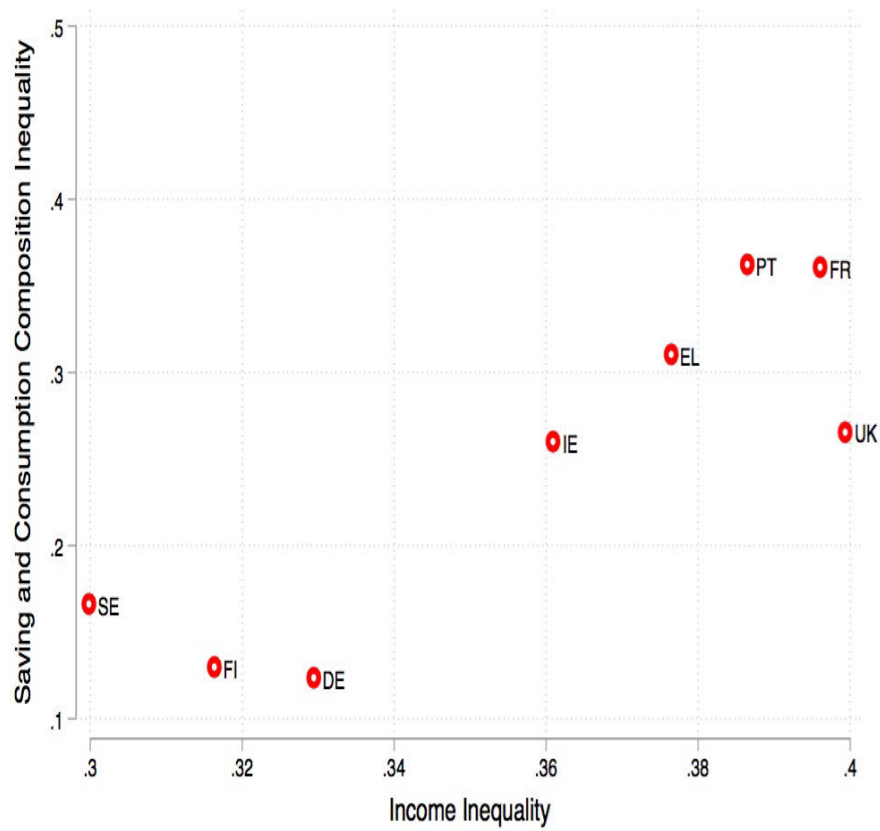


Figure 5.15: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and Gini coefficient. We here consider the first definition of consumption (SCC_1), which includes non-durable goods only. **Source:** Author's calculations on basis of HBS.

SCC₃ Index vs Income Inequality

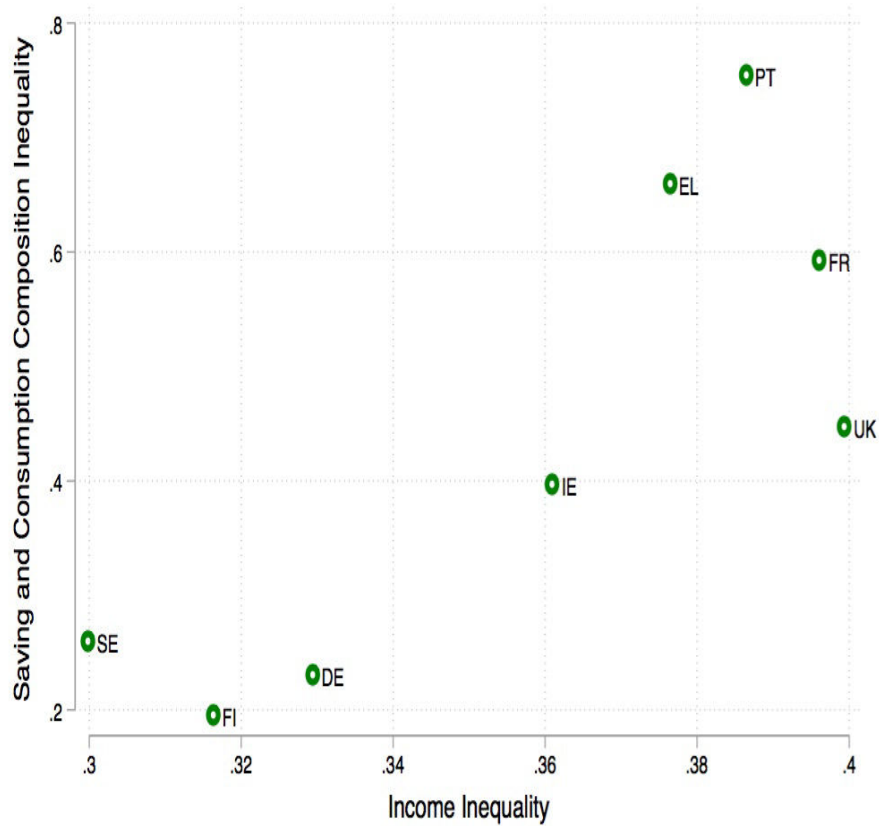


Figure 5.16: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and Gini coefficient. We here consider the third definition of consumption (SCC_3), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing). **Source:** Author's calculations on basis of HBS.

The Box - 2007 Estimate

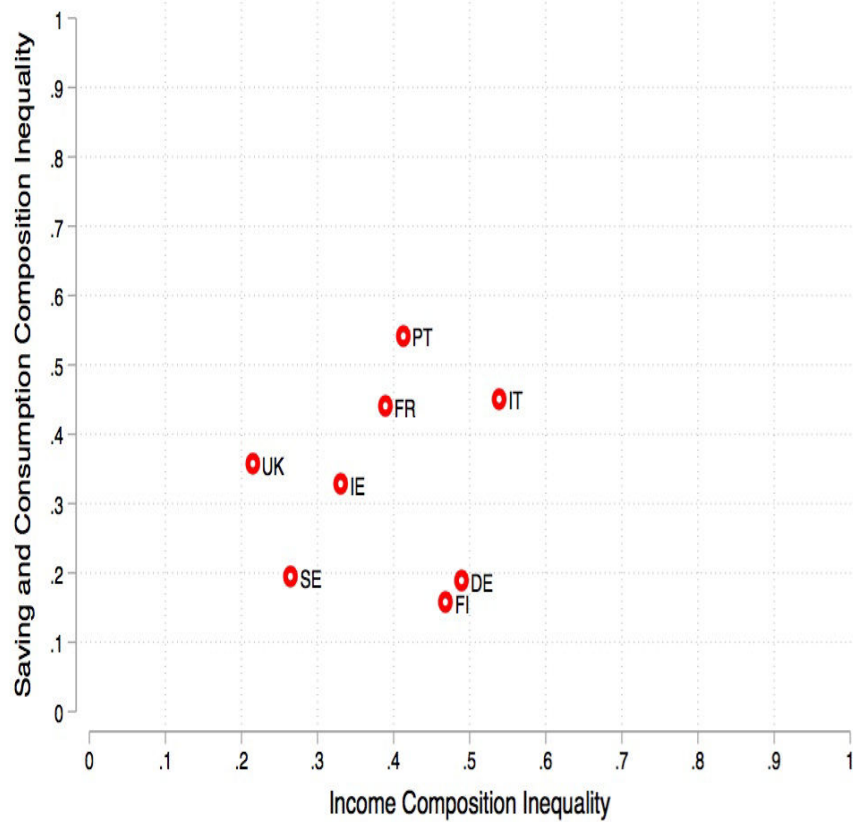


Figure 5.17: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and income composition inequality, as measured by the income-factor concentration index. We consider the ten richest countries in the sample. The SCC measure refers to 2010, whilst the IFC measure to 2007. According to the SCC, we consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of EU-SILC and HBS.

The Box - 2016 Estimate

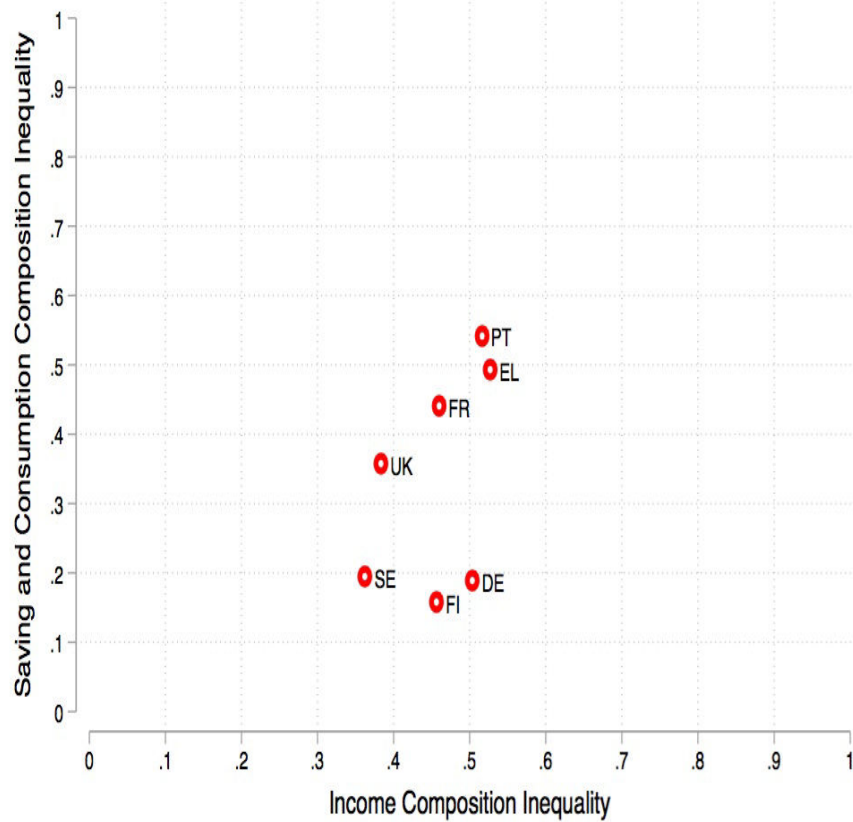


Figure 5.18: The scatter plot of saving and consumption composition inequality, as measured by the saving and consumption consumption index, and income composition inequality, as measured by the income-factor concentration index. We consider the ten richest countries in the sample. The SCC measure refers to 2010, whilst the IFC measure to 2016. According to the SCC, we consider the second definition of consumption (SCC_2), which includes non-durable goods plus *some* housing expenses (without considering actual rentals for housing, imputed rentals for housing and transport for housing plus transports). **Source:** Author's calculations on basis of EU-SILC and HBS.

Chapter 6

Conclusion

In this dissertation I have introduced a novel inequality concept, which I have labeled *income composition inequality*, and a summary statistic for its measurement, the IFC index. I have shown that income composition inequality links the functional and personal distribution of income, therefore filling an important gap in the economic literature. I have shown that changes in income composition inequality negatively correlate with changes in income inequality. I have further advanced the hypothesis that the standard redistribution policies can be contradictory. In fact, while these policies reduce income inequality in the short term, on the other hand they increase income inequality in the long term by rising income composition inequality in contexts of rising capital share. I have reported a novel stylized fact about Italy, whereby the level of income composition inequality has decreased over the last three decades. Such result highlights a structural transformation in the composition of individuals' income that has occurred in Italy over the period considered. Finally, I have employed the concept of income composition inequality to propose a novel classification of economic systems. Economic systems can be either Kaldorian Systems or Representative Agent Systems, depending on their joint distributions of capital and labor and saving and consumption in the population. I have shown that such

classification is crucial to understand a country's long-run dynamics of growth and capital accumulation.

This dissertation raises a number of questions for future inquiry. From a historical perspective, looking at the evolution of income composition inequality in a given country, jointly with its economic growth, is crucial to answer several fundamental questions: Does income composition inequality increase or decrease as an economy grows? In other words, is there any relationship between the type of capitalism at work in a country and its economic development? If this is the case, is this relationship country-specific, or rather specific to the time period we are analyzing? And how does it relate to [Kuznets' \(1955\)](#) hypothesis on the relationship between income inequality and growth, and to [Milanovic's \(2016\)](#) theorization of the Kuznets Waves? Also, building upon [Van der Weide and Milanovic \(2018\)](#), how is income composition inequality related to income growth rates of individuals at different points of the income distribution? To answer all these questions in a context in which survey data is scarce, the IFC index can be approximated by its $n = 2$ version. The latter version requires data on two representative individuals only, a rich and a poor. The rich can be represented by a chosen top share of the income distribution (e.g. top 10% or top 1%), whilst the poor can be represented by a chosen bottom share (e.g. 90% or 50%). As I have shown in the dissertation, the IFC index for $n = 2$ can be expressed as a function of two variables only: the relative share of capital (or labor) income and the relative share of total income of one of the two individuals only. This allows to make reasonable assumptions concerning the degree of the IFC index in the distant past. From a policy perspective, it is important to understand the impact that redistribution policies have on income composition inequality, and not only on income inequality. In

Chapter 4 Roberto Iacono and I design a rule of thumb for policy makers seeking to reduce income inequality in the long run. However, the rule of thumb we propose considers income composition inequality to be totally unaffected by the redistribution policy adopted. Therefore, it would be important to relate this work to Tony Atkinson's latest book with title "Inequality, What Can Be Done", in which the author proposes novel schemes to better redistribute both the capital and labor incomes in a society.

Finally, as mentioned in Chapter 2, the study of income composition inequality can be applied to analyze the joint distribution of any pair of income (or wealth) components. For instance, in Chapter 5 I have considered the composition of income in terms of the individual's savings and consumption. As a next step, it would be interesting to explore other possible applications of this framework. The IFC index can in fact be applied to study the joint distribution of net income and taxes across the income ranking, as well as that of financial and non-financial assets across a population. It is also possible to decompose total wealth, instead of total income, in order to study the distribution of wealth composition across the wealth ranking.

As a way of concluding this dissertation, I present what appears to be an interesting regularity regarding the composition of individuals' income in European economies. This regularity bears resemblance to the 80/20 rule formulated by Pareto, which states that, for many events, roughly 80% of the effects come from 20% of the causes.

Suppose to separate the individuals in a population into two groups: those with an income which is labor-intensive, and those with an income which is capital-intensive. We say that an individual's income is labor-intensive when her labor share $\frac{W_i}{Y_i}$ is higher than the population's labor share $\frac{W}{Y}$; whilst we say that an individual's income is capital-intensive

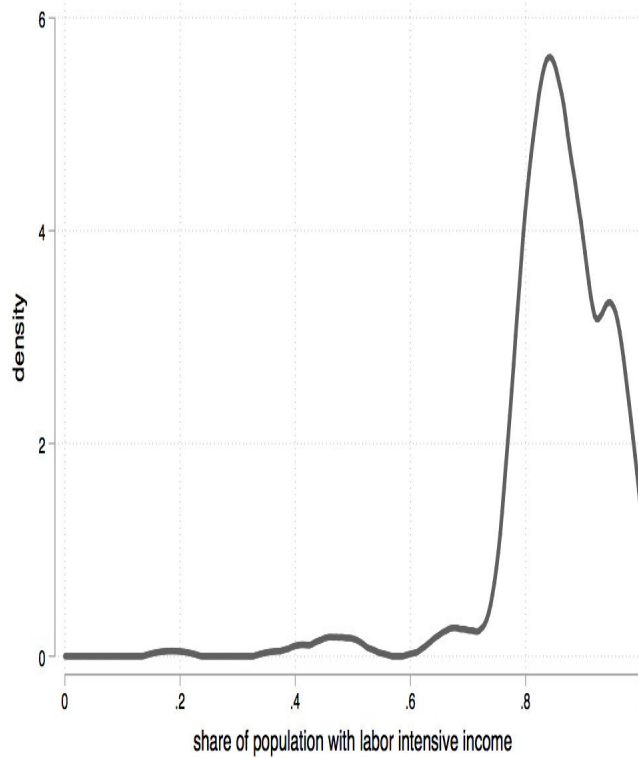


Figure 6.1: The distribution of the share of individuals with an income that is labor-intensive in 28 European countries between 2007 and 2016. Having established that an individual's income is labor-intensive when her labor share $\frac{W_i}{Y_i}$ is higher than the population's labor share $\frac{W}{Y}$, I compute the share of individuals with income which is labor-intensive in each European country for each year between 2007 and 2016. Finally, I plot the distribution of these values.

Source: Author's computation on the basis of EU-SILC.

when her capital share $\frac{\Pi_i}{Y_i}$ is higher than the population's capital share $\frac{\Pi}{Y}$. Then, compute the share of individuals with an income that is labor-intensive.

By doing such exercise using microdata from EU-SILC for a set of 28 countries in 10 different years (from 2007 to 2016), I find the result shown in Figure 6.1. The density is computed from a vector of 28×10 observations, each of which corresponds to the share of individuals in the population with income that is labor-intensive in country i at time j . The unit of analysis here is the household and the definition of the capital and labor in-

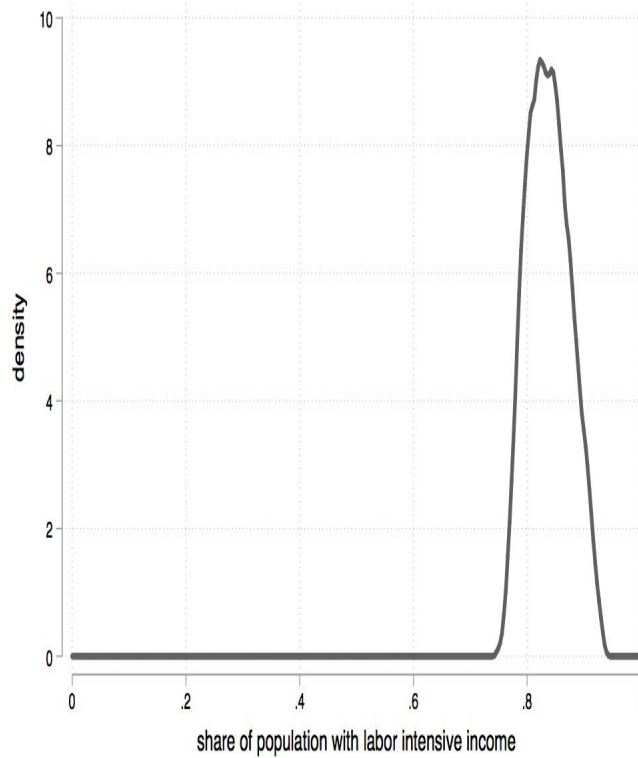


Figure 6.2: The distribution of the share of individuals with an income which is labor-intensive in the 12 richest European countries in terms of GDP between 2007 and 2016. Having established that an individual's income is labor-intensive when her labor share $\frac{W_i}{Y_i}$ is higher than the population's labor share $\frac{W}{Y}$, I compute the share of individuals with income that is labor-intensive in each European country for each year between 2007 and 2016. Finally, I plot the distribution of these values. The countries analyzed are: Italy, France, Germany, Sweden, the UK, Austria, Belgium, Greece, Finland, Ireland, The Netherlands and Portugal.
Source: Author's computation on the basis of EU-SILC.

come is similar to the one adopted throughout this dissertation.¹ If the analysis is limited to the 12 richest countries in the sample in terms of GDP (whose data are supposed to be more reliable)² we find the result illustrated in Figure 6.2. These two charts suggest that about 80% of the population tends to have a labor-intensive income, whereas 20% of the population tends to have a capital-intensive income. Note that the individuals composing

¹I do not consider self-employed income in this analysis. However, the result still holds with the introduction of self-employment income, further decomposed into its capital and labor component.

²The 12 countries considered in Figure 6.2 are: Italy, France, Germany, Sweden, the UK, Austria, Belgium, Greece, Finland, Ireland, The Netherlands and Portugal.

these two groups are not necessarily the richest or the poorest in the sample in terms of total income. A mathematical way to express such relationship is the following. Let us consider the random variable $z_i = \frac{\frac{\pi_i}{y_i}}{\frac{\Pi}{Y}} = \frac{\alpha_i}{y_i} \forall i$, with $\alpha_i = \frac{\pi_i}{\Pi}$ and $y_i = \frac{Y_i}{Y}$. Then, the probability that z_i is lower than 1 is 0.8, formally: $P(z_i < 1) \approx 0.8$. This can be also written as $P(\pi_i < \pi) \approx 0.8$, where π_i is the individual's i capital share and π the population's capital share.

The logical next step would be to understand the origin of such regularity. It could be mechanical, and therefore explained by several factors such as the type of data that we use, the countries we analyze, or the way surveys are designed; or it could reflect a more structural feature of contemporary economies.

In conclusion, the results of this dissertation are useful to enhance our understanding of the evolution of income inequality and its relationship with macroeconomic dynamics. Additionally, looking at income composition inequality through a political economy lens highlights the prominent role of the political economy in better regulating the issue of income inequality, and in providing shared prosperity.

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Title: Income Composition Inequality: The Missing Dimension for Distributional Analysis

Abstract: This thesis consists of four chapters on income distribution. All chapters are interrelated, and cohesively they serve the sole purpose of discussing the concept of *income composition inequality*. This concept is thoroughly explored from a conceptual, mathematical, as well as political economy perspective. Chapter 1 introduces this dissertation and its main findings. Chapter 2 presents the concept of *income composition inequality*, together with a summary statistics for its technical assessment. Chapter 3 analyzes the determinants of income inequality variation in light of the novel inequality dimension previously introduced. Chapter 4 studies the evolution of income composition inequality in Italy between 1989 and 2016. Chapter 5 proposes a method to jointly analyze the distributions of capital and labor and of saving and consumption across the population. This method hinges on the concept of income composition inequality. Finally, Chapter 6 concludes this dissertation and lays the ground for future research on the matter.

Keywords: income composition inequality, income inequality, functional income distribution

Titre: Inégalité dans la Composition du Revenu: La Dimensions Manquant pour l'Analyse de la Distribution

Resumé: Cette thèse comprend quatre chapitres sur la répartition des revenus. Tous les chapitres sont interdépendants et leur objectif commun est de discuter le concept d'inégalité dans la composition du revenu. Ce concept est étudié de manière approfondie du point de vue conceptuel, mathématique et économique. Le chapitre 1 présente cette thèse et ses principales conclusions. Le chapitre 2 présente le concept d'inégalité dans la composition du revenu, ainsi qu'un résumé statistique pour son évaluation technique. Le chapitre 3 analyse les déterminants de la variation de l'inégalité des revenus à la lumière de la nouvelle dimension de l'inégalité précédemment introduite. Le chapitre 4 étudie l'évolution de l'inégalité dans la composition du revenus en Italie entre 1989 et 2016. Le chapitre 5 propose une méthode pour analyser conjointement les répartitions du capital et du travail et de l'épargne et de la consommation. Cette méthode repose sur le concept d'inégalité dans composition du revenu. Enfin, le chapitre 6 conclut cette thèse et jette les bases de futures recherches en la matière.

Mots clés: inégalité dans la composition du revenu, inégalité des revenus, distribution fonctionnelle